2. Date/Tu 3. Results]		LABORATORY STAFF ONL		11K-120700-D3	PIK-12026-B2	(1K-120706-B)	NL-120706-032	PIK-DOTON-03	NK-DATA-13	PIK-MIRCI-AI	ALL ALL ALL		PIK-120705-037	CLIENT ID	Grav. Reduction ELAP 198.1 Other (specify	NY State Friable	EPA 600 - Visual Estimate EPA Point Count	O Other (specify	O NIOSH 7402	PC MCE Porosity	TEM Air - Place Indicate Filter Type:	O NIOSH 7400	PCM Air - Please Indicate Filter Type: PC MCF Perssity in a 25n	A sheetos Analysis	D Varhale:	D Please include COC/field dat		Address 3:	2. Address 7: Hat	Client Name:		(301) 459-2640 • (1	AIHA (#100470) N	
2. Date/Time Analyzed: / 3. Results Reported To: /		LABORATORY STAFF ONLY: (CUSTODY)						12						E INFORMATIO E LOCATION/ TIFICATION	AP 198.1 (QTY)		stimate(QTY) (QTY)			in a 25mm 37mm	(QTY)	(QTY)	Filter Type: in a 25mm 37mm		@ cell #	D Please include COC/field data sheets with results	-942-0273Fax #		2	ational uners		(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643	AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920) 4475 Entres Rivel • Lanham, MD 20706	and anolution Services. Inc.
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Time:		Sign:		-	Date/Time:				Date/Time:				Date/Tune:	SWAB		Surface Tanc	Mold - Direct Microscopic Analysis		Dust Wipe Furnace (wipe type)	Drinking Water		Air	D Paint Chip (wipe type (QTY)	Lead Analysis	C Email Copy:	fter-Hours* []]24br After-Hours*	Signature:	0 0	P.O. #	7			(riease seier 10-1118 Number For Inquires)	Diane Dafar
														(LABORATOR)		(OTY) Other (Specify	(QTY) DBulk		(wipe type	(QTY)	(0TY)	(QTY)	Red (QTY)			rs* 🗍 Late-Night		phone # 410-					iquires)	In Thio
Initials:					Contact:				Contact:				Contact:	(LABORATORY STAFF ONLY)		(Specify)	(QTY)		}			(36 101		8	t* (*must be pre-s						・ い (MD) Irreau	148424	
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88 q'q× 00 Section 1 mer North C in the Column T أها ط *أ* Fred Britch સ જે 60, <u>ارًا</u> ال २ दु かる É LO unda ે Smell Smell 13124 ~ Section } Ĩ, fool Browk 2 101 16'8" k +3,61 ≠ 不らい تر الأرامي 2.64 Walk ¥. (14) A 2) usy Ş P1K-120706-001 01K-120100 - 003-Floor Samples URILE C 6 71, 1 Plaryz Door 1004 K- 18 3 D 4 1 2 2 01K-120706-004-Deer to Range 3"11" Proven 211 ین ڈا پہ ۳ 20106-002 3 Pastinon colicent to Ean fram Roxm 211 pict # 837 2000 211 Rod yaco Insille restreum plenoms to Hall Pc ≠ 838 Smell 4,00 Install POIA Requested Record #J-15-0085 (MD) PIC # 839 Nº # 840 Posted to NGB FOA Reading Room BEST AVAILABLE COPY May, 2018 Released by National Guard Bureau Page 1056 of 5269

PIK-120706-007-PIK-12 0705 - 008 - Rostraom 20 outside P1K- 1207 06-006 - LEAS side dias $\frac{1}{2} \frac{2^{1}}{6^{2}} well$ 1. dr Pantin **ا**به **ا** х ? 10" 1 ---- opening Dar to BA 24 Aborto rape Dea Runzh 120706 - 005 - Ares coulor -5 のためでは、「「「「「「「「」」」」という。 the Containmont anta Dutsick happet intra ITE Was Shace before my 285 to renge worth rechester in class to respect N. 7 841 pri-#-843 hic I shy At #842 (JIK-120706-012- Flown Fright Stade (August Scorple) (August Scorple) Posted to NGB FOIA Reading Room May 2018 PIK-120906-011- Floor inside regat side PIK - 120706-009 - Winduce SVII action & linkändi ko Canta janten t- 440-4 PIK- 120706- DIO all < p- chim 73 4 13 'S' WEL را بخ ا Range Floor Right side on top of Sontacio rading Roy 210 Crestran for the contrance 12 × 845 Ontrance. 12 Marcy 13ht 10 # 842 的不由多好的

Page 1057 of 5269

My Rout PI - gd 19 Raphrund Sney 10' G" 3'6" Right will (1K-120706-016-We 19 D. E. Jan restit side of Ringe PIK-120106-015- Flow Smill FIK- 120706 - 014 - Fliorsaft in Pik - 120706 - 013 - Flas carles redet J 'n Them Wish (When I) (referts) & renge (and) Do # 850 Tray Brenk I and Tight Plear S. , fre Trafision) Mid Joint between #3 on right sed What were reinde aceross from Smull with weath to right will p;~# 951 リッご 丼 じやろ 158 # 24J 1981 II I Trupping Was brank 2 And I Trupping Was brank 2 And I Trupping (pageas Supe) Smell PIK-120706-018 - Fleor Sample - [] & colomn 1 - Meddle range area PIK-120706-017- Iday Smple Plk-120706-019- Plan Suple werth Continue base (Repert Surger) Replied Longord between Smill us E.59 # 211 PIC # 835 Posted to NGB

Page 1058 of 5269

PIK-120706-023- Well Sangel in the - D on left with lift back of The - D on left with lift back of The with 191 I Brack 1 PIK-120) OL-021- Floor hert with the 19- Honek 1 - 524 - 510 the hert with the 19- Honek 1 - 524 ange 81K - 120706-020 - Place Surple 31 191 10-3 1 Frank 1 P1K-120706-022-· D or left sign Kange thoor left sule MALLS (inter ("July) (Repland Supple) No 859 (Repairs where his 857) 2 - Trap which on the laft side and left with and left with At # 858 Strand 31 gr∉. [] ----> Dooz. P1K-120706-027-No. 7 1 3' 2 Column MK-120706-025- Rea will reat Plk-120706 - 024 - Suple on Colomo 2. insul Face & min well P1K-120706-026 4121 6 (Repart) PIC#860 (naple of Surgel) J (4rd Zontel) well when to when a Well Sugel of DIC # 861 Und Simple rock Perer wind (Wardens) NE 863 to colomn - 2 they be Jrc 862 Posted to NGB FOIA Reading Room

the second 11K-120706+031 011 - 120706 - 030 1/K-120706-029-644 Face of clims P1K-120706-028-Left sub web 12 <u>~</u>□ Flor にたが見たい。時間にはなった。 They' 6.7 TAB (5 5 ۱ had Brock 2 - Right Free of Trap Browk 1 (Neprest Script) (Reysear Sayar) (regreat Saper) (neptier Suppl) I the mor weeks 12866 Pic 867 P10 # 864 DIC 868and when PIK-125706-ASIZI - Wired Mash, rest to column S DIK-120706 ASIZI - Brick mile mech ica wel DIK-120706 - ASB 3 P1K-120706-92 PIK-120706-B3 PIK-120766 - BZ Pik- 120706 - BI PIK-120706-033 41K-120706 - 032 ~~<u>~</u>D 7(43-II /1 New - 1013 3 - Richard Winder right with at Blank 4 Black 3 - Reay under Blank 1 Blank 2 (Repter & Sarper Charles Goverand Coundor Soit Right 628 24 Certily-828 24 (Replaced Sample) B

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Client:	Address:			Attention:		AMA Sample Number	0720056	0720057	0720058	0720059	0720060	0720061	0720062	0720063	0720064	0720066	0720967	0720068	0720069	0720070	0720071	0720072	0720073
National Guard Bureau	301-IH (Xd Bay Lone, Attn: NGB-AVN-S). State Military Reservation	Havre de Grace, Maryland 21078		Non-Re		Client Sample Number	20061215PIK4 01	20061215PIK4 02	20061215PIK4 03	20061215PtK4 04	20061215P1K4 05	20061215P1K4 06	20061215PIK4 07	20061215PIK4 08	20061215PIK4 09	20061215PIK4 11	20061215PIK4 12	20061215PIK4-13	20061215PIK4 14	20061215PIK4 15	20061215PIK4 16	20061215PiK4 17	20061215PIK4 18
_	Attn: NGB-AVN-SL	and 21078				Analysis Type	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame
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Pikesville Clear 4	Pikesville Armory	Not Provided	Not Provided		of Atomic	Air Volume (L)	****	***	***	***	***	****	****	****	а — Ф Н — Ф Н — Ф Н — Ф Н — Ф	***	****	****	****	****	****	* * * *	****
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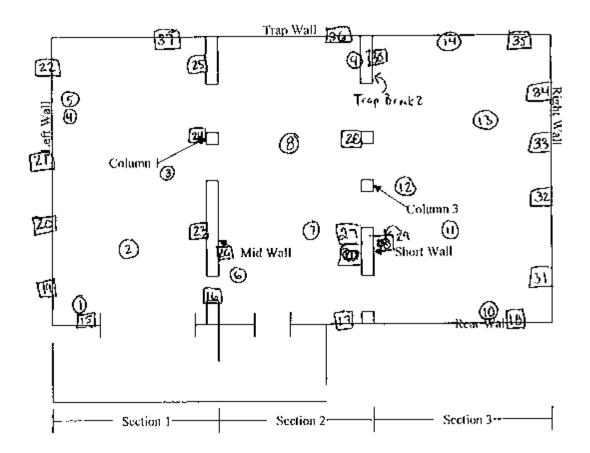
Pikesville Indoor Firing Range Clearance Sampling – W Attempt -26 Electro - 2006 - 28 November - 2006

Large range, approximately 15 lanes. Stone construction, slat and plaster visible in some areas.

Lead Check sticks tested positive for lead.

floor possibly seeled ?

Sampling Diagram:



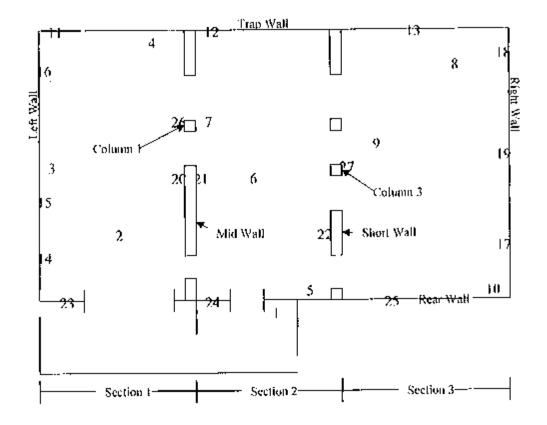
Pikesville Indoor Firing Range Clearance Sampling -- 1st Attempt 26 October 2006

Large range, approximately 15 lanes. Stone construction, slat and plaster visible in some areas.

Lead Check sticks tested positive for lead.

Sampling Diagram:

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Pikesville Indoor Firing Range Clearance Sampling – 1st Attempt 26 October 2006

Sample Number

Sample Location

2006 1016 PKV1 01 Entry Area, floor, 0.5 ft right of door, adjacent to Rear wall 2006 1016 PKV1 02 Floor, See I, 6 ft from Rear wall, 12 ft from Mid wall 2006 1016 PK V1 03 Floor, Sec 1, 54 ft from Rear wall, adjacent to Left wall 2006 1016 PK V1 04 Floor, Sec 1, adjacent to Trap wall, 18 ft from Left wall 2006 1016 PK V1 05 Floor, Sec 2, adjacent to Rear wall, 18 ft from Mid wall 2006 1016 PK V1 06 Floor, See 2, 48 ft from Rear wall, 12 ft Left of Column 3 2006 1016 PK V1 07 Floor, Sec 2, 70 ft from Rear wall, adjacent to Column 1 2006 1016 PK V1 08 Floor, Sec 3, 9 ft from Rear wall, 6 ft from Right wall 2006 1016 PKV1 09 Floor, Sec 3, 60 ft from Rear wall, 15 ft from Right wall 2006 1016 PK V1 10 Floor, Sec 3, corner of Rear wall and Right wall 2006 1016 PKV) 11 Wall, Trap, corner of Rear wall and Left wall, 3 ft from Floor 2006 [016 PKV1 12 Wall, Trap, adjacent to protruding column, 6 ft from Floor 2006 1016 PKV1 13 Wall, Trap, 9 ft from Right wall, 7 ft from Floor 2006 1016 PKV1 14 Wall, Left, 6 ft from Rear wall, 6 ft from Floor 2006 [016 PKV1 15 Wall, Left, 36 ft from Rear wall, 4 ft from Floor 2006 1016 PKV1 16 Wall, Left, 15 ft from Trap walk, 4 ft from Floor 2006 1016 PKV1 17 Wall, Right, 3 ft from Rear wall, 6 ft from Floor 2006 1016 PKV1 18 Wall, Right, 3 ft from Trap wall, 3 ft from Floor 2006 1016 PK V1 19 Wall, Right, 33 ft from Rear wall, 5 ft from Floor 2006 1016 PKV1 20 Wall, Mid, in sec 1, 3 It from trap end, 6 ft from Floor 2006 1016 PKV1 21 Wall, Mid, in sec 2, 3 ft from trap end, 3 ft from Floor 2006 [0]6 PKV1 22 Wall, Short, in sec 2, centered on column, 6 ft from Floor 2006 1016 PKV1 23 Wall, Rear, 3 ft from Left wall, 4 ft from Floor 2006 1016 PKV1 24 Wall, Rear, in sec 2, 3 ft from Mid wall, 6 ft from Ploor 2006 1016 PKV1 25 Wall, Rear, on glass, bottom row, closest to R wall, corner 2006 1016 PKV1 26 Column 1, in see 1, 8 ft from Floor, centered 2006 1016 PKV1 27 Column 2, in sec 3, 5 ft from Floor, centered 2006 1016 PK V1 28 Blank 2006 1016 PK V1 29 Blank 2006 1016 PK VI 30 Blank

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

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Survey, MG Harry C. Ruhl Armory, Towson, MD, Report No. 55-ML-048L-05/07, 26 August 2005

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

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

FOR THE COMMANDER:



Encl

Director, Occupational Health Sciences

CF: (w/o CD-ROMs) USACHPPM-NORTH (MCHB-AN-IH/MR.

Non-Responsive

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

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

Today, AEHA is redesigneted the U.S. Army Center for Health Promotion and Prevention Medicine. As mission for the Islane is to provide varianties technical support for implementing preventive medicine, public health and health promotion/weilness services into all separate of America's Army and the Army Community anticipating and repidly responding to operational needs and eduplicities to a changing work environment.

The protestional disciplines represented at the Center include chemists, physicists, engineers, physiciens, optionatriats, suctiningials, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specializes within times protestions.

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

- Integrity is the foundation
- Excelence is the standard
- Customer satisfaction is the focus.
- Is people are the most valued resource
- Continuous quality improvement is its pathway.

The organization, which stands on the Unschold of even grader chellenges and responsibilities, has Gammal Officer hadership. As it moves into the next certainy, new programs are being added related to health promotion/vallness, soldier fitness and disness surveillance. As always, its mission bous is cardinated upon the Army imperatives so that we are trained and needy to antiquos the Army's readiness for war and operations other than war.

It is an organization threaty proof of 2a history, yet equally excited about the future. 2 is destined to continue its development as a world-class organization with expanded services to the Army, DCD, other Federal Agencies, the Nation and the World Community.

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

INDUSTRIAL HYGIENE BASELINE SURVEY REPORT NO. 55-ML-048L-05/07 MARYLAND NATIONAL GUARD FACILITIES MG HARRY C. RUHL ARMORY TOWSON, MARYLAND 26 AUGUST 2005









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





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EXECUTIVE SUMMARY INDUSTRIAL HYGIENE BASELINE SURVEY REPORT NO. 55-ML-048L-05/07 MARYLAND ARMY NATIONAL GUARD FACILITIES MG HARRY C. RUHL ARMORY TOWSON, MARYLAND 26 AUGUST 2005

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. Significant health and safety concerns were: high levels of lead in dust and deteriorating lead-containing paint in the former indoor firing range (IFR) where toys and utensils were heing stored; inadequate vehicle exhaust ventilation; incompatible chemical storage; incomplete enrollment in the Hearing Conservation Program (HCP); and inadequate lighting.

3. RECOMMENDATIONS.

a. Lead Exposure. Health Risk Assessment Code (RAC) 3 for Child Exposure. Health RAC 4 for Adult Exposure. Clean horizontal surfaces in the administrative areas to the National Guard Bureau (NGB) Region North Industrial Hygiene Office and the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended levels. Follow the guidance in Appendix E and National Guard Pamphlet 420-15. 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 and State of Maryland lead in dust standards for young children, and clean other horizontal surfaces in the Drill Hall and Conference Room to the NGB Region North Industrial Hygiene Office and USACHPPM recommended level for lead in dust on frequently contacted surfaces. Eliminate the moisture source causing mold and deteriorating paint in the former IFR and repair paint. Ensure that personnel wear disposable gloves and disposable coveralls as extra protection when cleaning in all areas identified as having elevated levels of lead. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after clean up.

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b. <u>Vehicle Exhaust Ventilation</u>. Health RAC 3. Install a system that can provide at least 1,500 cubic feet per minute per drop to accommodate large turbocharged diesel engines. Evaluate the systems to ensure that exhaust generated by the engine is removed.

c. <u>Safety</u>. Safety RAC 3. Store the Super Tropical Bleach in a separate cabinet or storage area away from potential water sources. Inspect other stored chemicals for compatibility and relocate them as needed.

d. <u>Lighting</u>. Health RAC 4. Provide portable task lighting to conform to the Illuminating Engineering Society of North America guidelines.

e. <u>Safety and Occupational Health Programs</u>. Health RAC 3. Ensure that part time NGB employees are enrolled in the HCP. Ensure that personnel wear hearing protection when working in the automotive bay and in areas that require hearing protection. Ensure that personnel receive baseline and annual audiometric exams.

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INDUSTRIAL HYGIENE BASELINE SURVEY REPORT NO. 55-ML-048L-05/07 MARYLAND ARMY NATIONAL GUARD FACILITIES MG HARRY C. RUHL ARMORY TOWSON, MARYLAND 26 AUGUST 2005

1. REFERENCES. See Appendix A.

2. PURPOSE. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) MG Harry C. Ruhl Armory, Towson, MD, 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 (NGB) Region North Industrial Hygiene Office (NGB-ARS-IHNE/Ms. Non-Responsive, 22 June 2004, subject: SAB.

4. BACKGROUND INFORMATION.

a. <u>Background</u>. The resident units were the 129th Signal Battalion and the Headquarters Command Division Support Command. The original building, which included an attached automotive maintenance shop, was built in 1956. An addition was constructed in 1998 that included a weight room, classroom, and an office. A disused indoor firing range (IFR) had been converted into a storage room (See Photograph 1, Appendix B). The bullet trap had been removed. The IFR had reportedly been decontaminated, although no records of decontamination could be located, and there was a lead hazard warning sign posted outside the room.

b. <u>Armory Use by Children</u>. The manager stated that the Armory was used for family functions. After the survey, we informed the NGB Region North Industrial Hygiene Office of high lead in dust sample results. As of late 2005, the Maryland Military Department was advertising Ruhl Armory as available for rental for activities that include young children. We do not know whether the lead had been cleaned up.

c. <u>Armory Manager</u>. The Armory manager was Mr. Non-Responsive Phone: 410-616-0520.

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

5. METHODOLOGY.

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

b. <u>Calibration</u>. All instruments were calibrated in accordance with manufacturer's instructions using National Institute of Standards and Testing traceable method.

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

6. FACILITY EVALUATION.

a. Physical Condition of Facilities.

(1) Paint. The age of the original building indicated that the presence of lead in paint was likely. The converted IFR had extensive areas of deteriorated paint (See Photograph 2, Appendix B). The manager stated that there were no records of lead-based paint (LBP) abatement at the Armory.

(2) Asbestos. The manager stated that all asbestos had been abated in the Armory. A site Asbestos Management Program Plan was found.

(3) Mold and Moisture Problems. Mold was observed on the walls of the converted IFR (See Photograph 2, Appendix B).

(4) Safety Hazards. The only safety hazard observed was improper storage of a container of Super Tropical Bleach in the Petroleum Oil and Lubricant/Flammable Storage Room. This product is caustic and corrosive and should only be stored with other oxidizers. We separated the product from the other stored items during the survey.

(5) Heating, Ventilation, and Air-Conditioning (HVAC) Systems. The building was heated and cooled by central HVAC systems.

b. <u>Vehicle Exhaust Ventilation System</u>. Airflow measurements were conducted. No vehicle maintenance personnel were present the day of the survey.

c. <u>Safety and Occupational Health Programs</u>. Employees participated in the Armory Hazard Communication (HAZCOM) Program. There were no known tasks requiring respiratory protection. Employees were enrolled in a separate Hearing Conservation Program (HCP) for part time National Guard employees.

d. Noise Dosimetry. No noise producing operations were conducted the day of the survey.

e. <u>Lighting</u>. Lighting measurements were conducted to determine if the lighting in the Armory met the Illuminating Engineering Society of North America (IESNA) recommended guidelines. Lighting was measured in foot candles using a light meter.

f. <u>Indoor Air Quality (IAQ)</u>. Measurements were conducted to determine if the IAQ parameters met the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) recommended guidelines, and the ACGIH exposure limits adopted by the Army.

7. ASSESSMENT CRITERIA FOR LEAD.

a. <u>Lead in Air</u>. The Army complies with the OSHA 8 hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter of air.

b. Lead in Dust.

(1) The EPA and State of Maryland limits for lead in dust are 40 micrograms per square foot ($\mu g/ft^2$) on floors, 250 $\mu g/ft^2$ on windowsills, and 400 $\mu g/ft^2$ in window troughs. These limits apply to pre-1978 Army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The NGB Region North Industrial Hygiene Office concurs with the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended maximum level of 200 $\mu g/ft^2$ on floors and surfaces frequently contacted by facility employees, which is more stringent for windowsills than the EPA/State standards. This limit was adopted from guidance in OSHA CPL 02-02-58. Additional information is provided in Appendix C.

c. <u>Lead in Paint</u>. Paint containing lead levels of 0.5 percent or more by weight in dried solid (also reported as 5,000 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.

8. SAMPLING RESULTS AND DISCUSSION.

a. <u>Lead Sampling Locations and Results</u>. Samples were collected for lead on surfaces (wipe samples), and by bulk paint samples to determine the presence of lead hazards. The laboratory report is in Appendix D.

b. <u>Lead in Dust</u>. Lead in dust sample locations and analytical results are shown in Table 1. Sample results greater than 40 μ g/ft² for floors or 200 μ g/ft² for other surfaces are highlighted. High levels of lead were found throughout the converted IFR areas.

Wipe Sample Number	Location of Samples	Result (µg/ft ²)
RUHLW01	Blank	<2.7
RUIILW02	IFR Bullet Trap Corner	45,000
RUHLW03	IFR Light Fixture	80
RUHLW04	IFR Kitchen Supplies	9.4
RUHLW05	IFR Shelf	310
RUHLW06	IFR Plastic Utensils	13
RUHLW07	Blank	3.3
RUHLW08	IFR Heater	1,500
RUHLW09	IFR Cage Storage Toy Box	5.6
RUHLW10	IFR Bullet Trap Duct Work	3,400
RUHLW11	IFR Cage Storage Christmas Supplies	23
RUHLW12	Blank	<2.7
RUHLW13	IFR Storage Tent Bag Exterior	170
RUHLW14	IFR Storage Tent Camouflage	36
RUHLW15	IFR Outside Doorway End of Hallway	36
RUHLW16	Drill Floor Center	6.6
RUHLW17	Drill Floor North East Corner	3.6
RUHUW18	Blank	<2.7
RUHLW19	Drill Floor North West Corner	<2.7
RUHLW20	Drill Floor South West Corner	5.1
RUHLW21	Drill Floor South East Corner	4.1
RUHLW22	Drill Hall Supply Room Door	<2,7
RUHLW23	Drill Hall Chair	3.6
RUHLW24	Room 112 A Vault	1,100
RUHLW25	Room 124 Vault	100
RUHLW26	Blank	<2.7
RUHLW27	Kitchen- Max Soap Dispenser	9.21
RUHLW28	Dining Hall- Top of Heater	35
RUHLW29	Room 206- File Cabinet Northeast Exit Door	1!
RUHLW30	Room 206 Second Floor Logistics	9.7
RUHLW31	Second Floor Hallway	<2.7
RUHLW32	Second Floor Foyer (Original Building)	3.8
RUHLW33	Room 206 Supply Air Vent	<2.7
RUHLW34	Blank	<2.7
RUHLW35	Shop Office Desk	4.3
RUHLW36	Roof Air Supply	15
RUHLW37	Roof Air Return	I1

TABLE 1. LEAD IN SURFACE DUST

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(1) Child Lead Exposure. Three lead in dust sample results exceeded the EPA and the State of Maryland lead exposure standard for children of 40 μ g/ft² on floors and 250 μ g/ft² on windowsills. Some boxes of toys were stored in areas of the former IFR and were therefore liable to become contaminated (See Photograph 3, Appendix B). Some of the toys were made of fabrics that could not be easily cleaned. The toys were owned by the Family Support Group that resides in the Armory. We notified the Armory manager who stated that the toys would be removed and discarded as soon as possible.

(2) Adult Lead Exposure. Three lead in dust results exceeded the NGB Region North Industrial Hygiene Office and USACHPPM recommended maximum level for lead in dust on frequently contacted surfaces. There were very high levels of lead in dust throughout the converted IFR storage areas. Personnel working in these areas were potentially exposed to lead, and may have been tracking lead out of the area and redistributing it into adjacent rooms in the Armory. Photograph 4, Appendix B shows the lead hazard warning posted outside the converted IFR.

c. <u>Lead in Paint</u>. The deteriorated paint sample result was below the EPA standard for LBP of 0.5 percent lead in paint, and is referred to as LCP. Deteriorated LCP is potentially hazardous to employees and children.

d. <u>Vehicle Exhaust Ventilation System</u>. Table 2 summarizes the vehicle exhaust system measurements. Photograph 5, Appendix B, shows one of the two drops.

Tailpipe Exhaust Drop #	Average Face Velocity (feet per minute)	Duct Opening Diameter (in) / Area (ft ²)	Calculated Flow Rate (cubic feet per minute) (cfm)
	(fpm)		
1	1338	7.5" / 0.2925	391
2	1410	7.5" / 0.2925	412

TABLE 2. Vehicle Exhaust Ventilation Flow Rates.

(1) Vehicle exhaust ventilation was measured using a thermoanemometer. Both drops had a $7\frac{1}{2}$ inch flanged opening.

(2) The manager stated that the vehicles serviced included $2\frac{1}{2}$ and 5 ton diesel trucks.

(3) The system should provide at least 1,500 cubic feet per minute (cfm) exhaust at each drop in accordance with the ACGIH Industrial Ventilation Manual recommendation for 9 liter displacement turbocharged diesel engines run at 1,000 revolutions per minute. This exhaust rate is intended to accommodate large turbocharged diesel engines that are, or may be, maintained at this Organizational Maintenance Shop. Neither drop met this criterion, and the fan was unlikely to be able to meet it even if fitted with a single larger drop.

c. IAQ. Table 3 summarizes IAQ measurements.

Location	CO ₂ (ppm)	CO ₂ Standard	Temp (°F)	T Standard (°F) (summer)	T Standard (°F) (winter)	RH (%)	RH Standard (%)	CO (ppm)	CO Exposure Limit (ppm)
Outdoors	345		75.0			48.0		0	
Automotive Bay	454	1080	76.0	71-81	68.0- 74.5	54.0	30-60	6	25
IFR Bullet Trap	680	1080	78.0	71-81	68.0- 74.5	49,0	30-60	NA	NA
Drill Hall	540	1080	72.0	71-81	68.0- 74.5	45.0	30-60	NA	NA
Dining Hall	580	1080	77.0	71-81	68.0- 74.5	43.0	30-60	NA	NA
Room 206	450	1080	77.0	71-81	68.0- 74.5	44.0	30-60	NA	NA
Room 118	575	1080	75.0	71-81	68.0- 74,5	47.0	30-60	NA	NA

TABLE 3. INDOOR AIR QUALITY MEASUREMENTS

(1) Temperature. The indoor temperatures of all rooms sampled were within the ASHRAE recommended guidelines of 71-81 degrees Fahrenheit for an acceptable thermal environment in the summer at 50 percent relative humidity (RH).

(2) Carbon Dioxide. The indoor carbon dioxide levels for all rooms sampled were within the ASHRAE recommended guidelines. The outdoor carbon dioxide measurement was 345 parts per million (ppm) versus a true value of approximately 380 ppm, indicating that readings had a downward bias. The ASHRAE recommends, for occupant comfort, maintaining carbon dioxide levels below the value of 700 ppm plus the outdoor ambient level. Therefore, carbon dioxide levels should be maintained below 1,045 ppm (700 ppm plus 380 ppm). All measured spaces complied, even after accounting for readings being biased low.

(3) RH. The RH levels in the rooms were all within the ASHRAE recommended guidelines of 30-60 percent RH.

(4) Carbon Monoxide. Carbon monoxide levels were well below the 25 ppm 8-hour time-weighted average ACGIH exposure limit adopted by the Army.

f. Lighting. Table 4 summarizes the lighting measurements. Lighting levels were measured throughout the Armory. Several areas of the Maintenance Bay, the Drill Hall, the Arms Room, and the Division Support Command Supply Room Storage area were not adequately lit. According to the IESNA these areas should have at least 50 foot candles of illumination.

Location	Measurement (Foot candles)	Standard (Foot candles)
Maintenance Bay Area	24.4-29.5	75
Drill Hall (Center, Doors Open)	18.0	50
Dining Hall	70.0-80.0	50
Room 206 (Table, Center of Room)	48.0	50
Room 118	65.0	50
Arms Room 124 HHC DISCOM	29.5-31.0	50
DISCOM Supply Room NCO Office	55.0	50
DISCOM Supply Room Storage Area	13.0	50

TABLE 4. LIGHTING

g. Safety and Occupational Health Programs.

(1) HAZCOM (Title 29 Code of Federal Regulations (CFR) 1910.1200). Armory records document that employees attended annual HAZCOM training. Material Safety Data Sheets and appropriate safety signs were in a central location and easily accessible to employees. A comprehensive Hazardous Materials Inventory was maintained in the Armory.

(2) Hearing Conservation Program (29 CFR 1910.95 and Department of the Army Pamphlet 40-501). According to LTC Sharon Hoffman, MDARNG Safety and Occupational Health Manager, automotive maintenance personnel were not enrolled in the HCP because they were "traditional" or part time NGB employees. The MDARNG is currently working on an initiative to include personnel classified as part time employees statewide in the HCP.

9. CONCLUSIONS. Significant health and safety concerns were: high levels of lead in dust and deteriorating lead-containing paint in the former IFR where toys and utensils were being stored; inadequate vehicle exhaust ventilation; incompatible chemical storage; incomplete enrolment in the HCP; and inadequate lighting.

10. RECOMMENDATIONS. The Department of Defense Instruction 6055.1 provides Risk Assessment Codes (RACs) for health hazards, a procedure which allows assessment of the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and combines the hazard severity and accident probability into a single number. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

a. <u>Lead Exposure</u>. Health RAC 3 for Child Exposure. Health RAC 4 for Adult Exposure. Clean horizontal surfaces in the administrative areas to the NGB Region North Industrial Hygiene Office and USACHPPM recommended levels. Follow the guidance in Appendix E and National Guard Pamphlet 420-15. 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 and State of Maryland lead in dust standards for young children, and clean other horizontal surfaces in the Drill Hall and Conference Room to the NGB Region North Industrial Hygiene Office and USACHPPM recommended level for lead in dust on frequently contacted surfaces. Eliminate the moisture source causing mold and deteriorating paint in the former IFR and repair paint. Ensure that personnel wear disposable gloves and disposable coveralls as extra protection when cleaning in all areas identified as having elevated levels of lead. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after clean up.

b. <u>Vehicle Exhaust Ventilation</u>. Health RAC 3. Install a system that can provide at least 1,500 cfm per drop to accommodate large turbocharged diesel engines. Evaluate the systems to ensure that exhaust generated by the engine is removed.

c. <u>Safety</u>. Safety RAC 3. Store the Super Tropical Bleach in a separate cabinet or storage area away from potential water sources. Inspect other stored chemicals for compatibility and relocate them as needed.

d. <u>Lighting</u>. Health RAC 4. Provide portable task lighting to conform to the IESNA guidelines.

e. <u>Safety and Occupational Health Programs</u>. Health RAC 3. Ensure that part time NGB employees are enrolled in the HCP. Ensure that personnel wear hearing protection when working in the automotive bay and in areas that require hearing protection. Ensure that personnel receive baseline and annual audiometric exams.

11. ADDITIONAL ASSISTANCE. For additional assistance or questions concerning this report, please contact the undersigned at DSN 584-3118, commercial 410-436-3118, or by electronic mail: Non-Responsive Ques.army.mil



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

APPROVED:



MAJ, MS Administrative Program Manager Industrial Hygiene Field Services Program

Posted to NGB FOIA Reading Room May, 2018

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APPENDIX A

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

A-1

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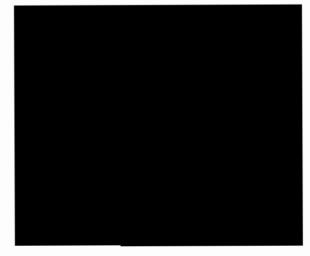
APPENDIX B

PHOTOGRAPHS

B-1



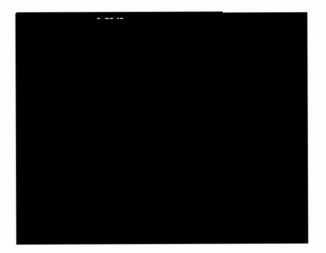
Photograph 1. Converted IFR - Storage Room



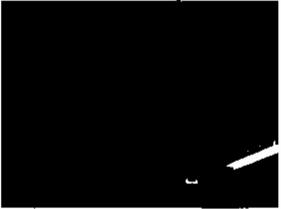
Photograph 2. Converted IFR – Deteriorated LCP and Mold



Photograph 3. Converted IFR - Toy Storage



Photograph 4. Converted IFR -Lead Hazard Sign



Photograph 5. Vchicle Exhaust Ventilation System

APPENDIX C

PROPOSED CRITERIA FOR LEAD

Subject: Recommendations for Surface Lead Dust in Armories

1. In armories that do not contain childcare facilities, the National Guard Bureau (NGB) Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 micrograms per square foot ($\mu g/ft^2$). If a special function will be held in which children will be present in this facility, consider thoroughly cleaning the areas that will be accessible to children prior to the function. This guidance is based on professional judgment, risk assessments, adaptation of Occupational Safety and Health Administration (OSHA) guidance, and feasibility of cleaning to a certain level.

a. Environmental Protection Agency (EPA) standards (40 Code of Federal Regulations (CFR) 745.227(h)(3)) are not directly applicable because they are criteria for dust-lead hazards developed for floors (40 μ g/ft²) and windowsills (250 μ g/ft²) in residential dwellings and child occupied facilities. A child occupied facility is defined as a building, or portion of a building, constructed prior to 1978, visited regularly by the same child, 6 years of age or under, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hours and the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60 hours. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

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

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

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

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

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

a. Clean all areas that will be accessible to children to the EPA dust-lead standard for children 6 years of age or under (40 μ g/ft² on floors and 250 μ g/ft² on windowsills).

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

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

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

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

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MDARNG IH Baseline Survey, MG Harry C. Ruhl Armory, Towson, MD, Report No. 55-ML-048L-05/07, 26 August 2005

APPENDIX D

LABORATORY REPORT

Posted to NGB FOIA Reading Room May, 2018

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D-1

A Spec	A Specialized Environmental Laboratory		CER								NYELAP
Client:	National Guard Bureau	-	Job Name:	RUHL Armory	2		Chain Of Custody:	ody:	142990		AHP
Address:	301 -IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	, Attn: NGB-AVN-SI, ttion	Job Location:	Towson, MD			Date Submitted:		9772005		
	Havre de Grace, Maryland 21078	/land 21078	Job Number:	Not Provided			Person Submitting:	ting:		Monet	
			P.O. Number:	Not Provided			Date Analyzed:	- 	9/9/2/0/5	Report Date:	09-Sep-05
Attention:	No-Hos						. 6. T	7			Paras 1 of 3
			Summary of Atomic Absorption Analysis for Lead	I ALOMIC A	nondrosa	Analysi	S IOF LEA				c la 1 aga 1
AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Repo	Reporting Limit	Fina	Final Result	Comments	ats
0564267	RUHL-W-01	Furnace	Wipe	1	0.111	2.70	ug/ft ²	א י	2.7 ug/ft ²		A set of the set of th
0564268	RUHL-W-02	Furnace	Wipe	:	0.111	13501.35	rŋ∕gu	45	45000 ug/ft ²		
0564269	RUHL-W-03	Furnace	Wipe	:	0.111	33.75	ug/ft²	-	50 ug/ft		
0564270	RUHL-W-04	Furnace	Wipe	:	0.111	2.70	t∬∕Bn	6	9.4 ug/ft ²		
0564271	RUHL-W-05	Fumace	Wipe	:	0.111	33.75	r₩/θn	ŝ	310 ug/ft²		
0564272	RUHL-W-06	Furnace	Wipe	:	0.111	2.70	ug/ft²				
0564273	RUHL-W-07	Fumace	Wipe	1	0.111	2.70	ug/ft1		3.3 ug/ft ²		
0564274	RUHL-W-08	Furnace	Wipe	ł	0.111	337.53	r₩/₿n	-	1500 ug/ft ²		
0564275	RUHL-W-09	Furnace	Wipe	:	0.111	2.70	r¶∕gu				
0564276	RUHL-W-10	Furnace	Wipe	:	0.111	1350.14	ug/ft²	ň	3400 ug/ft ²		
0564277	RUHL-W-11	Furnace	Wipe	:	0.111	13.50	ug/ft3				
0564278	RUHL-W-12	Furnace	Wipe	:	0.111	2.70	ug/ft²	v			
0564279	RUHL-W-13	Furnace	Wipe	ł	0.111	33.75	ug/ft²	-	170 ug/ft ²		
0564280	RUHL-W-14	Fumace	Wipe	:	0.111	33.75	ug/ft²		36 ug/ft ²		
0564281	RUHL-W-15	Furnace	Wipe	:	0.111	33.75	ug/ft²		36 ug/ft ²		
0564282	RUHL-W-16	Furnace	Wipe	:	0.111	2.70	ug/ft1	•	6.6 ug/ft²		
0564283	RUHL-W-17	Furnace	Wipe	:	111.0	2.70	ug/ft1		3.6 ug/ft ²		
0564284	RUHL-W-18	Furnace	Wipe	:	0.111	2.70	t∬/βn	v	2.7 ug/ft ²		
0564285	RUHL-W-19	Furnace	Wipe	:	0.111	2.70	ug/ft1	v	2.7 ug/ft ²		
0564286	RUHL-W-20	Furnace	Wipe	:	0.111	2.70	ug/ft		5.1 ug/ft ²		

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1091 of 5269

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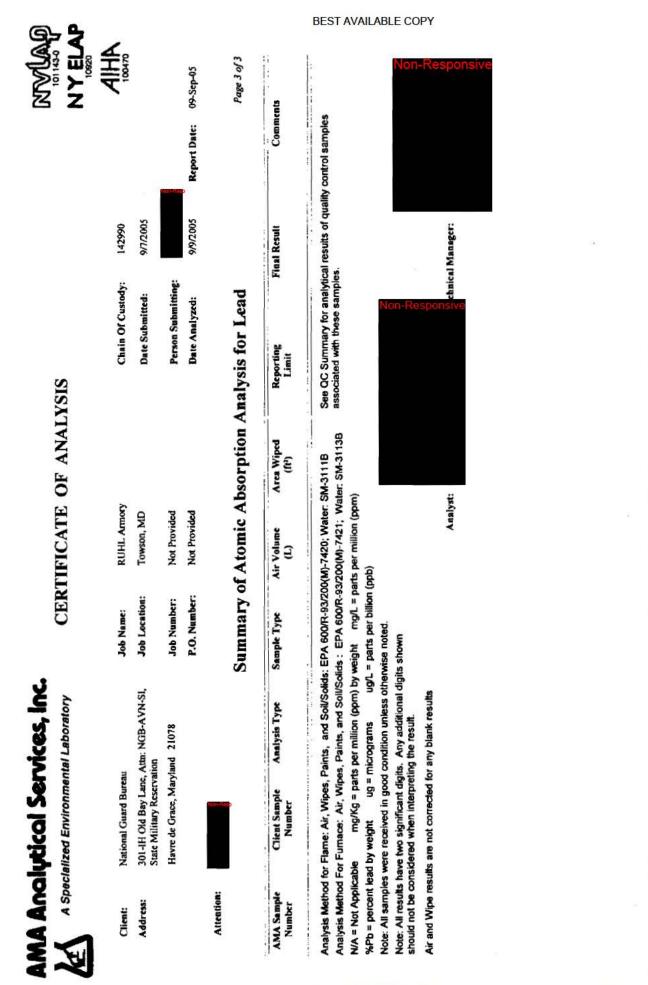
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											AHP
Client:	National Guard Bureau		Job Name:	RUHL Armory	*		Chain Of Custody:	ustody:	142990		100470
Address:	301-IH Old Bay Lane, Attu State Military Reservation	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Job Location:	Towson, MD			Date Submitted:	itted:	9172005		
	Havre de Grace, Maryland 21078	vland 21078	Job Number:	Not Provided			Person Submitting:	mitting:		Not Re	
			P.O. Number:	Not Provided			Date Analyzed:	:paz	9/9/2005	Report Date:	09-Sep-05
Attention:	Not-Re										
			Summary of Atomic Absorption Analysis for Lead	of Atomic A	Absorption	Analys	is for L	ead			Page 2 of 3
AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (A ²)	Rep	Reporting Limit	E.	Final Result	Comments	cuts
0564287	RUHL-W-21	Furnace	Wipe	1	0.111	2.70	ug/ît²	-	4.1 ug/ft ²		
0564288	RUHL-W-22	Fumace	Wipe	:	0.111	2.70	r₩/8n	v	2.7 ug/ñ ²		
0564289	RUHL-W-23	Furnace	Wipe	:	0.111	2.70	"Ugu		3.6 ug/ft ²		
0564290	RUHL-W-24	Furnace	Wipe	:	0.111	135.01	ug/ft-		1100 ug/ft ²		
0564291	RUHL-W-25	Furnace	Wipe	:	0.111	33.75	ug/ft ¹		100 ug/ft3		
0564292	RUHL-W-26	Furnace	Wipe	i	0.111	2.70	₅IJ/ân	v	2.7 ug/ft ²		
0564293	RUHL-W-27	Fumace	Wipe	:	0.111	2.70	±îî∕gu		9.2 ug/ft ²		
0564294	RUHL-W-28	Furnace	Wipe	:	0.111	33.75	tî∕gu		35 ug/ft ¹		
0564295	RUHL-W-29	Furnace	Wipe	:	0.111	2.70	"U/Bn		11 ug/ft²		
0564296	RUHL-W-30	Furnace	Wipe	•	0.111	2.70	"ŋ/gu				
0564297	RUHL-W-31	Furnace	Wipe	:	0.111	2.70	t∄∕₿n	۷			
0564298	RUHL-W-32	Furnace	Wipe	:	0.111	2.70	"Ug/U		3.8 ug/ft ²		
0564299	RUHL-W-33	Furnace	Wipe	:	0.111	2.70	ug/ft²	v			
0564300	RUHL-W-34	Furnace	Wipe	:	0.111	2.70	r₿/₿n	v	2.7 ug/ft ²		
0564301	RUHL-W-35	Fumace	Wipe	ŧ	0.111	2.70	z U∕3 n		4.3 ug/ft ²		
0564302	RUHL-W-36	Fumace	Wipe	:	0.111	2.70	ug/ft1				
0564303	RUHL-W-37	Fumace	Wipe	::	0.111	2.70	ug/ft²		11 ug/ft ²		

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MDARNG IH Baseline Survey, MG Harry C. Ruhl Armory, Towson, MD, Report No. 55-ML-048L-05/07, 26 August 2005

APPENDIX E

LEAD CLEANING GUIDANCE

Posted to NGB FOIA Reading Room May, 2018

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E-1

FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1094 of 5269

CHAPTER 14: CLEANING

*

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Ŀ.	int	roduction
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		2. Worker Inexperience
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		4. Deadlines
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	B.	Equipment Needed for Cleaning
	C.	Weste Disposal
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Step-by-Step Summary



Cleaning: How To Do It

- Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
- 2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
- 3. Have sufficient cleaning equipment and supplies before beginning work.
- 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 perticulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
- Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
- For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
- 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.
- Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contemination, then rinse. Change the cleaning solution after every room is cleaned.
- 10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuum-ing step is usually not needed (see Chapter 11). Other cleaning methods are accepteble, as long as clear-ance criteria are met and workers are not overexposed.
- 11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
- 12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
- 13. Paint or otherwise seal treated surfaces and interior floors.
- 14. Conduct a clearance examination (see Chapter 15).
- 15. If clearance is not achieved, repeat the final cleaning.



- 16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be home 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 baga.
 - Debris containers.
 - Waste water containers.
 - Shovels.
 - Rakes.
 - Water-misting sprayers.
 - 6-mit polyethylene sheeting (or equivalent).

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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 Uh naked eya. 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 stahoards, 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 assential 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 fow clearance standards, worker inexperience, high dust-producing methods, and deadlines.

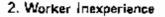
1. Low Clearance Standards

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 heated work is as follows:

- 100 µg/ft² on floors.
- 500 µg/ft⁷ on interior window sills (stools).
- 600 ,g/ft² on window troughs (the area where the sash sits when closed).
- 800 µg/ft² on exterior concrete.

These levels are based on wips sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazand 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.



To understand the level of cleanliness required to meet the established clearance standards for hezard 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 perticularly 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. Estential 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.

Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the and of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hezard 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 hezard control activity:

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

- Have the precisioning, daily, and final cleanings been scheduled property and coordinated with the other perticipents in the hezard 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 criteris to be met fully understood?
- Have all appropriate surfaces been properly painted or otherwise saaled?
- 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, spongen, mops, buckets, 5-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 5-mil polyethytene plastic sheeting (or equivalent).





Regulations governing headroom and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The headrd control contractor and the disposal contractor should work together to enablish 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 agancies, 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 unnecestary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be countarproductive.

A. Containment

Because of the difficulty involved in the removal of line 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).

Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust edheres 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 worken who pais 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 "Atternatives 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 sin 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 then HEPA filters.

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

Operating Instructions

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

Bacause 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 Vecuums

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, walks, 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.

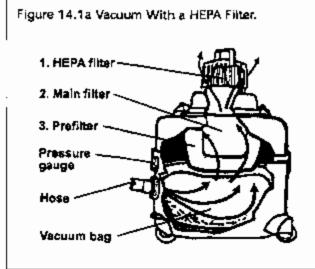
To aid In dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture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

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hatardous 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 seel has been broken and the vacuum's bag is disturbed.





Parts of a HEPA-vacuum

Most HEPA-vecuums 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 officia.

2. Wet Detergent Wash

Several types of detergents have been used. to remove leaded dust. Those with a highphosphate content (containing at teast 5 percent trisodium phosphate, elso known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detargents 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 anvironmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their nausehold detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead fiazard control.

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

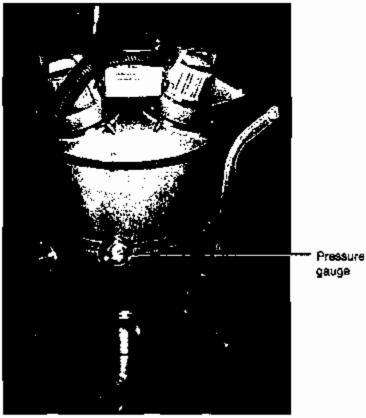
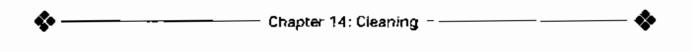
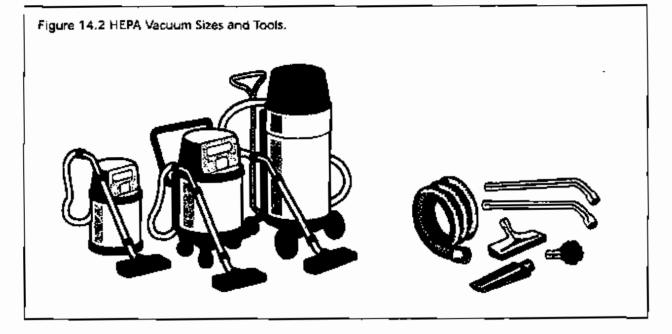


Figure 14.16 Pressure Gauge Indicator Shows When Filters Require Changing.





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

Manufacturer's Dilution Instructions

Users of cleaning agents for feeded 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 aponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wetwash process.

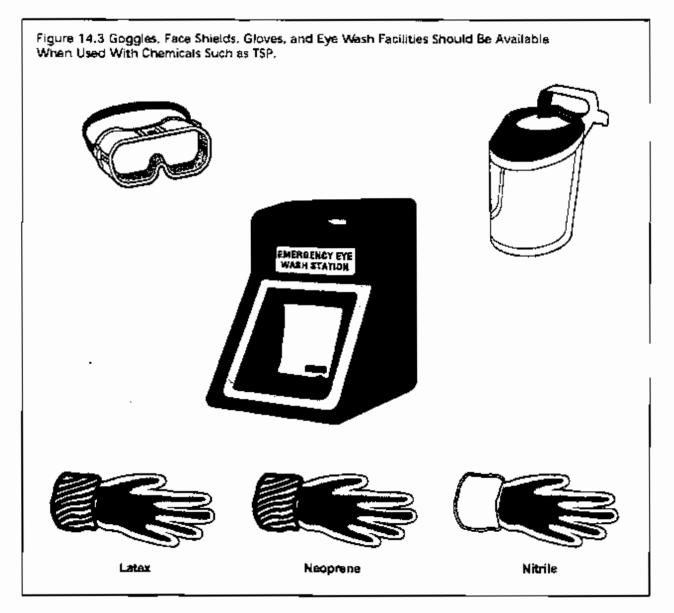
Proper Wet-Cleaning Procedures

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

Changing Cleaning Mixture

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





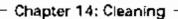
more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet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

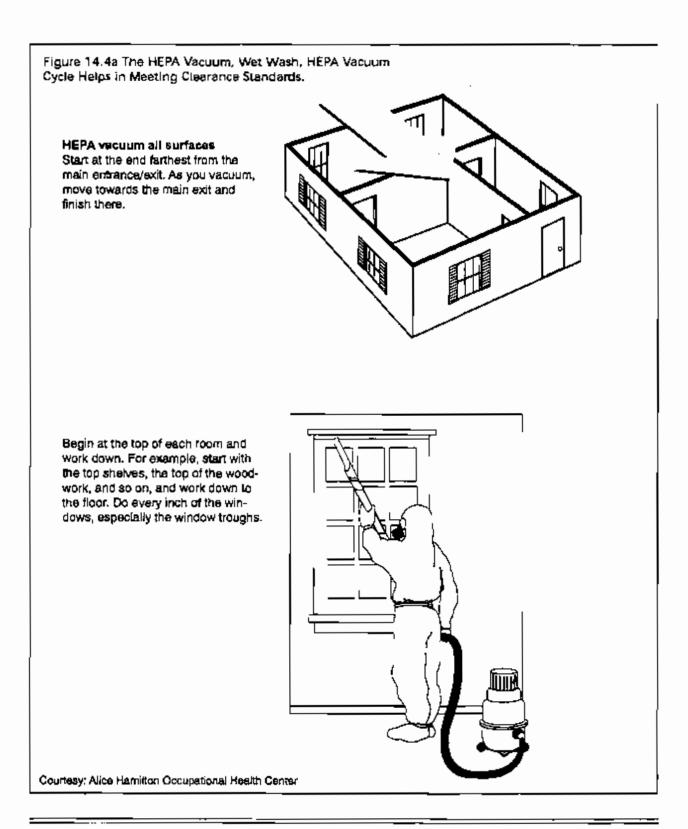
3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

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

First, the area is HEPA vacuumed.







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

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

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

Figure 14.4b (continued)

Use special attachments

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

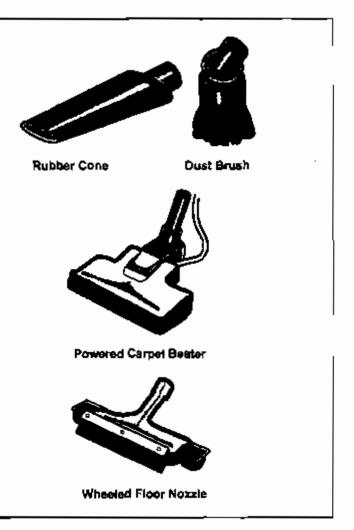
Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

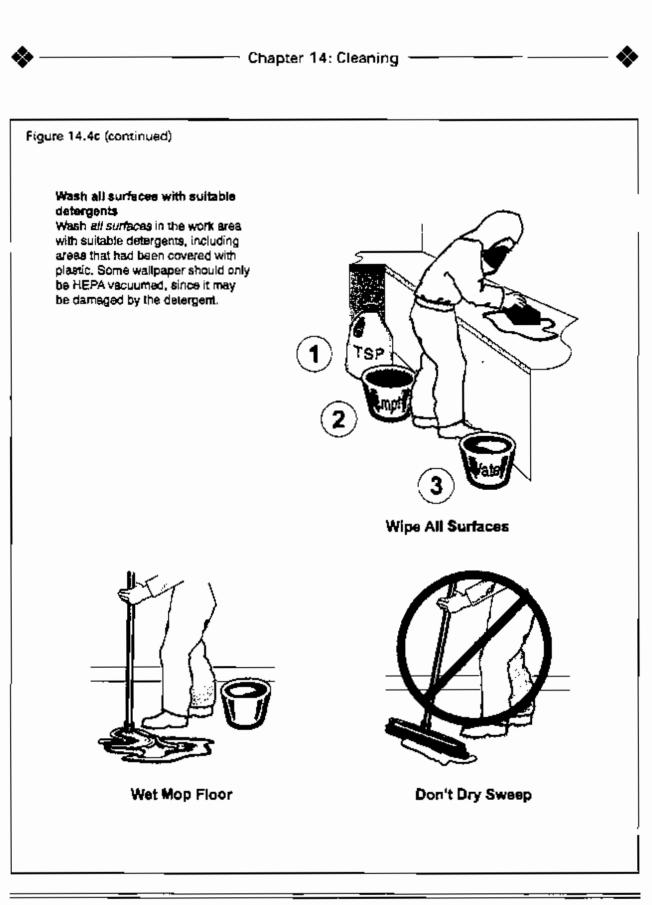
Move slowly

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



Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-paid 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 staps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses. limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.





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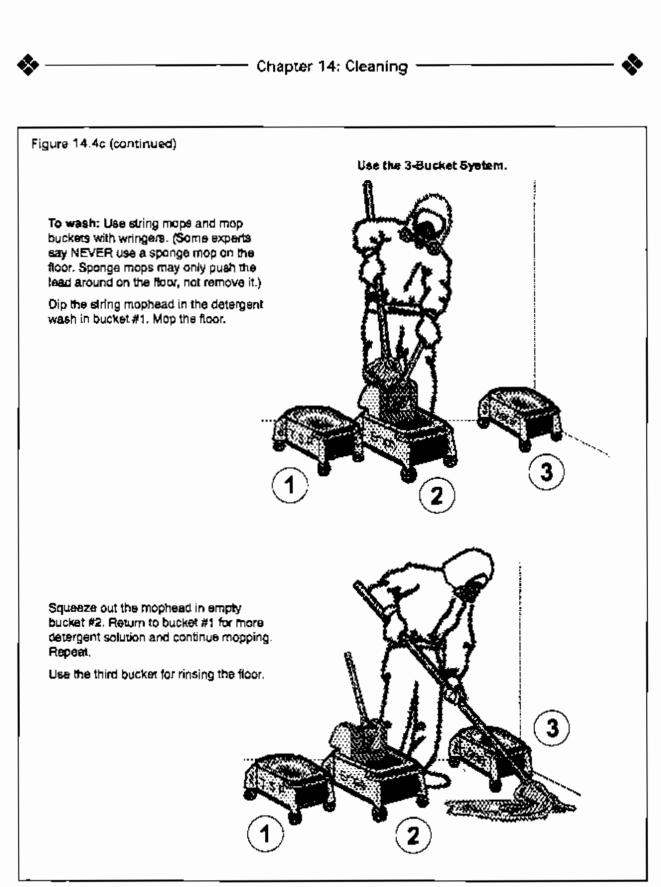


Figure 14.4d (rontinued)

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 floore last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Seating Floors

Before clearance, all floors without an intact, nonporous coating should be costed. 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 virryl tile, sheet viryl, linoleum flooring, or the equivalent to create a more parmanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

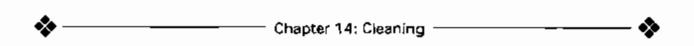
IV. Order of Cleaning Procedures During Lead Hazard Control

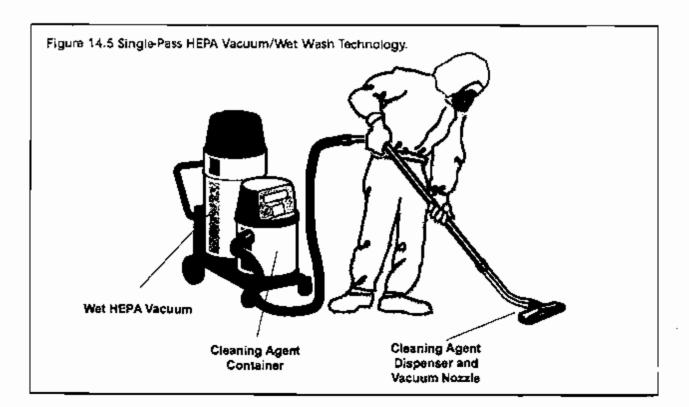
The special cleaning procedures to be followed during a lead-based paint hazard control project, are discussed in chronological order balow. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

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

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Worksite Preparation Lavel 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 precisering 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 managament should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's

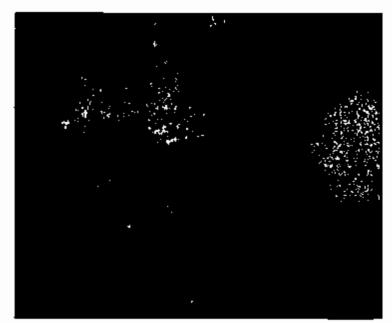


Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.

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

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hatand 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 and 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 halps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will



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

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

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

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mill 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 hemmered 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 (he 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 Lagregation of waste should be enforced et this time (see Chapter 10).

2. Small Debris

After being missed with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mill or single 6-mill polyethylene (or equivalent) plastic bags, properly sealed, aho moved to the designated trash storage srea. 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 edvenely 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 6mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chepter 9. Studies indicate that during daily cleaning activities, especially while wet everying, workers may be exposed to high levels of alrborne 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, workars should monitor the sheeting and immediately repair any holes or rips with δ -mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be peinted 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-toyel 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 comers/ends to the middle to trap any remaining dust. Next, remove both revers of plastic from the floor.

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

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

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

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, othar 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 laundared or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detargent solutions.

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





Figure 14.8a Pick Up Corners of Plastic Sheeting.



Figure 14.8b Fold Plastic Inward.

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

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually avaluate 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 exemination results are unsatiafectory, 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 walk, 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 exampt 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 detact 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 dwalling unit fails the clearance wipe dust tests,

14-20

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 deity and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hezard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rutes.

A. Initial Clearance Test Failure Rates

The tikelihood 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 14.8¢ 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 hearni 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 herdwood floors due to the difficulty of adequately cleaning these surfaces. This

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

VII. Alternative Methods

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

A recent Canadian study (CMHC, 1992) avaiusted the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Viny! flooring and carpsting were cleaned using several wet/dry vacuuming systerns, sweeping, and wet mopping. The study found that regular vacuums with empty bage send a steady stream of fine particles into the sir, 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 hexardous levels of sinborne dust and therefore should be avoided. Externally exhexated vacuum units with adequate dustretaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1925.62 (h) (4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

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

lable 14.1	Initial Cleaning	g Wipe-Jest Failure	Rates for Va	arious Abatement :	Strategies

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floora	28.8%	22.7%	20.0%	13.8%	- 12.5%	18%
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 1981) 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 egents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning egent that results in compliance with clearance criteria is encouraged.

		Mass Removal Effici	ency Percentages	
Cycle Number	··	Cleaning	Method	
	Central Vacuum—Plain Tool	Central Vacuum—Agitator Head	HEPA Vacuum	Portable Vacuum—Plain Tool
1	34.7	71.0	55.4	17.5
2	47.0	80.2	61.2	23.0
3	51.9	85.9	66.3	26.6
4	56.0	87.6	67.0	29.4
5	59.3	66.9	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	87.5	97.7	78.7	40.1
10	67.2	100.0	60.2	41.7
11		102.3	60.2	41.7
12		104.6	64.1	44.8
13		104.6	64.5	46.6
14		103.8	64.5	48.4
15				49.6
15				50.8
17				52,4
18				53.6
19				54.4
20				55.2

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Source: Canada Mongage and Housing Corporation: Saskalchewan Research Council (December 1992) Effectiveness of Clean-up Techniques for Leaded Paint Dust BEST AVAILABLE COPY



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Industrial Hygiene Study

National Guard Facility Towson Ruhl Readiness Center 1035 York Road Towson, MD 21204

Prepared For:

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

Survey Location:

Towson Ruhl Readiness Center 1035 York Road Towson, MD 21204

Prepared By:

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

Survey Date:

June 10-11, 2010

Report Date: July 22, 2010

ALSI Project #: 1006345

Director, Environmental Health & Safety

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2

Section 1.0 Executive Summary

An industrial hygiene survey was conducted June 10-11, 2010, at the Towson Ruhl Readiness Center Facility located at 1035 York Road Towson, Maryland 21204. The survey was performed by Mr Non-Responsive CIH.

- 1. Lead surface, air and bulk samples were collected. Surface levels of lead exceeded 200 ug/ft² in Assembly/Drill Hall on the return vent of the HVAC system. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft².
- 2. Employees were not performing tasks that provided excessive noise levels, as such; noise exposure monitoring was not conducted.
- 3. Lighting levels met the minimum recommended guidelines in all locations except the Garage, Kitchen and Old Firing Range (storage). Lighting should be improved to meet the recommended guideline.
- 4. Indoor air quality parameters of temperature, relative humidity carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment. Temperature, relative humidity, 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).

3

Section 2.0 Operation Description & Observations

The Towson Rubl Readiness Center primarily serves as an office setting and training center with vehicle and equipment storage areas. The facility consists of offices, classrooms, a drill hall, garage, and storage areas. There are approximately 25 full-time employees stationed at the facility. On drill weekends there can be many more occupants.

The Armory building was initially constructed in 1979. The training center was built in 1997. The exterior of the building is brick. The interior walls are primarily concrete block and drywall. The heating, ventilating, and air conditioning system (HVAC) consisted of boilers and roof top units. Outdoor air ventilation is provided via the roof-top units in some areas of the building. The ceilings were generally composed of a metal roof deck. Many areas were finished with a suspended drop ceiling system.

There is an old firing range in the building. It was closed in the 1970's and has been fully abated. It is used for storage. It is full of contents and was difficult to inspect.

Site personnel at the time of the site assessment consisted of approximately 25 administrative personnel. The employees on site were conducting general administrative work.

Overall housekeeping was good. Areas are 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	1 A 1			

Employees were not performing tasks that provided excessive noise levels. No noise exposure monitoring was not conducted.

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Section 4.0 Load Testing				
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At the time of the assessment, no activities were observed which would generate lead exposure. Personnel reportedly clean rifles sometimes during drill weckends. The facility contains an unoccupied room which was once an indoor firing range. It is now a storage area.

Various surfaces within the facility were screened for lead using surface/wipe samples and the collection of air samples. Surface/wipe samples were collected using Ghost WipeTM samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 um 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, Maryland, for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Sample #	Location	Air ug/m³	Surface ug/ft ²	Paint Chip %Pb
1	Drill Hall Classroom	<3.9	[İ
2	Old Firing Range	<4.1]
3	Blank	<3 ug –		
4	HVAC Supply Side		<110	
5	HVAC – Return Side		360	
6	Assembly Hall - Annesty Box		<110	
7	Kitchen – Prep Table		<110	
8	HVAC Supply in Office		<110	
9	Old Firing Range - Floor	-	<110	
10	Old Firing Range Stored Items		<110	
	Old Firing Range Light Fixture		120	
12	Room 121 - Storage Cabinet		<110	
$\frac{12}{13}$	Room 204 - Desk		<110	
14	Room 206 – Desk		<110	
15	Blank		<12 ug	
16	Drill Hall Peeling Paint on Wall		<u>.</u>	<0.01
Criteria	<u> </u>	50	200	0.5

Lead Testing Results Summary

Key: Bolded results exceed listed criteria

Surface levels of lead exceeded 200 ug/ft^2 in the sample collected from the return side of the HVAC system in the assembly hall.

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 levels of lead were identified in the air samples collected.

Deteriorated paint was observed in a few isolated areas throughout the facility most notable the men's locker room and the wall in the drill hall. Delaminated paint is most likely due to age along with prolonged exposure to elevated relative humidity levels. A paint chip sample was collected from the Assembly/Drill Hall wall where paint was peeling. No lead was detected in the sample collected. The result was less than the HUD definition of lead-based paint (0.5%).

Housekeeping and cleaning activities should be improved to maintain surface lead dust concentrations below 200 ug/ft^2 . Emphasis should be placed on any areas where rifle cleaning is performed. Deteriorated and peeling paint should be properly remediated and repaired.

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Section 5.0 Lighting				
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A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400L Precision Light Meter (Serial No. K070003). The light meter was last calibrated on November 26, 2009. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Old Firing Range (Storage)	15.7	30	No
Assembly Hall/Drill Floor	45	30-50	Yes
Kitchen	46.7	50	No
Drill Hall Classroom	67.9	30-50	Yes
Office 201	57.5	30-50	Yes
Conference Room 204	33.5	30-50	Yes
Office 203	49.8	30-50	Yes
Men's Latrine	26.8	5	Yes
Office 206	49.3	30-50	Yes
Fitness Center	36	30	Yes
Classroom 102	63.2	30-50	Yes
Classroom 118	58.5	30-50	Yes
Classroom 121	72.7	30-50	Yes
Garage Bays	44	75	No

Light Survey Assessment Summary

Lighting levels met the minimum recommended guidelines in all locations except the Garage, Kitchen and Old Firing Range (storage). Lighting should be improved in these areas. It should be noted that the old firing range was so full of contents that it was difficult to collect measurements. Illuminance levels could be higher when contents are removed.

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Section 5.0 Indoor Air Quality	<u></u>	·. ·	 <u> </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 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 73.6 to 77.8 degrees F with relative humidity readings ranging from 42.4% to 55.3%. During the survey, earbon dioxide (CO₂) levels ranged from 437 ppm to 843 ppm within the facility compared to an outdoor CO₂ level of 411 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO₂ recommended is 1,111 ppm (411 ppm + 700 ppm). The results of the testing met the ASHRAE guidelines. The following table summarizes the measurements collected.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Old Firing Range (storage)	77	51.6	450	1.0
Drill Hall	76.9	48.6	443	0.6
Kitchen	77.7	45,3	452	0,4
Drill Hall Classroom	77.8	44.6	440	0.7
Office 201	75.7	42.6	843	0.6
Conference Room 204	74.2	42.4	437	0.6
Office 203	73.6	44.5	438	0.6
Office 206	75.9	50.8	478	0.2
Fitness Center	75.0	51.7	446	0.6
Classroom 102	74.5	54	495	0.5
Classroom 118	74.1	55.3	465	0.6
Classroom 121	74.2	41.7	511	1.2
Outdoors (Sunny & Warm)	82.3	38.8	411	0
Criteria	73.0-79.0	30-60	<1,111	<9.0

IAQ Assessment Summary

Key: Bolded results exceed listed criteria

Temperature, relative humidity, carbon dioxide, and carbon monoxide levels 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 roof-top units were inspected as much as possible. However, facility personnel could not open the units for inspection. It was reported that the air-conditioning was not working properly on the day of the survey. The visual inspection revealed the following items that may be potential sources of poor IAQ:

- 1. Supply vents were dirty in some areas. There were also some isolated areas of visible fungal growth on supply vents in a few locations. This is most likely due to condensation on the supply vent.
- 2. Water damage was observed in on the ceiling in Room 107. This is believed to be from a previous roof leak that has been repaired. No current water leaks were noted. A few water damaged ceiling tile were observed in the building.

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

Section 7.0 Suspect Asbestos Containing Building Materials

No suspect asbestos containing materials (ACM) were observed at the time of this survey.

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Section 8.0 Maintenance Bay	1 1 6 A 4	
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There is a garage area present at this facility. The garage was formerly an FMS Shop but is no longer used for vehicle maintenance. It is a storage area for the recruiting office. There is local exhaust ventilation (LEV) present for vehicle exhaust. It was not apparent that any special clean up activity has been performed since it was converted to a parking/storage area.

Section 9.0 Vent	ilation Assessment	· · · ·	· .	ingen er	·	• •
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The facility heating, ventilation, and air conditioning is provided by boilers and roof top units. At the time of this survey the air-conditioning was off and in need of repair. No other issues were identified with the mechanical system components.

In the garage area the LEV previously used for vehicle exhaust during maintenance was evaluated. The LEV from Bay 1 was severely damaged and could not be evaluated. The LEV in Bay 2 consisted of a flex duct with a 7.5" duct diameter. The flow rate was measured and found to be 536 Cubic Feet per Minute (CFM). This flow rate is less than the recommended parameters of the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation Manual; A Manual of Recommended Practice. The ACGIH recommends a total flow rate of 1,480 – 2,200 CFM.

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Section 10.0 Limitations

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

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

Appendix A. Laboratory Analysis Report

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This report applies only to fine samples, investigated and is not accessarily taffeative of the quality or condition of apparently identical or similar products. As a matual production to client, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the other 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 withon automization from as about the section of 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 withon automization from a submitting and accessing and accessing and accessing and the intervention growing the pressual of the exclusion growing and the intervention growing a submitting them and, unsue the intervention from the exclusion growing and the intervention growing and the intervention growing and the provised and approved of the exclusion growing and the exclusion growing and the intervention from a submitting the accuracy and to the extension growing and the intervention. Residentian any heared in accordance with the appropriate regulatory guideline, unitess of the actions from any the extension of all submitting and the supportation from and and the extension of the support and and the extension of a support of the su

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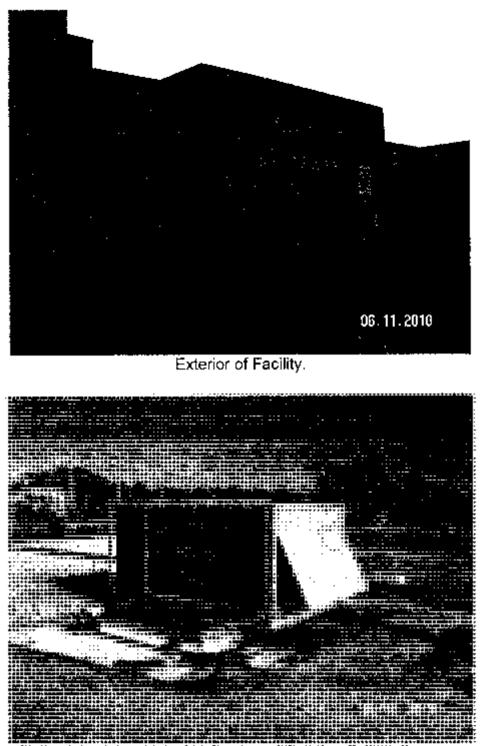
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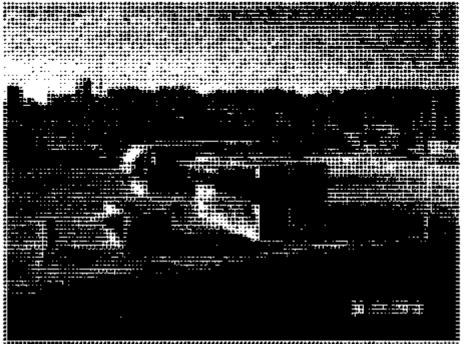
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Appendix B. Photographs	•	· ·



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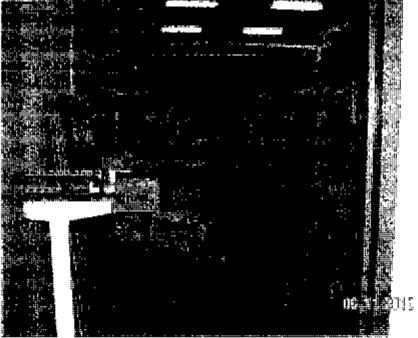


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Drill Hall.

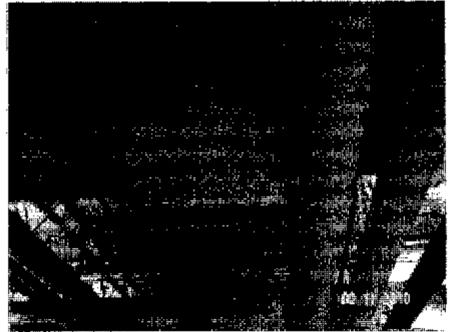
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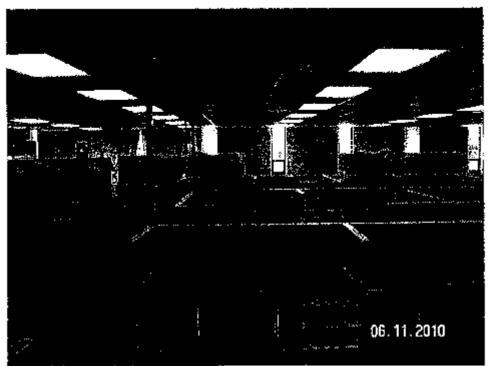
Old Siring Range.



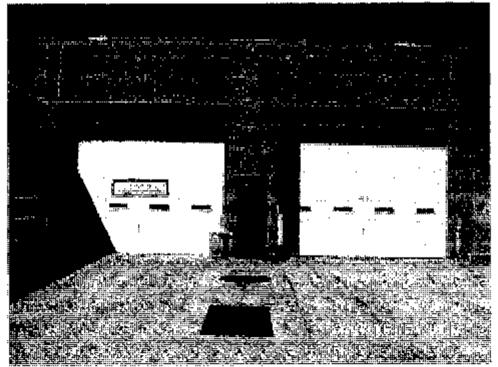
Room 107, Water Damaged Ceiling Tile.



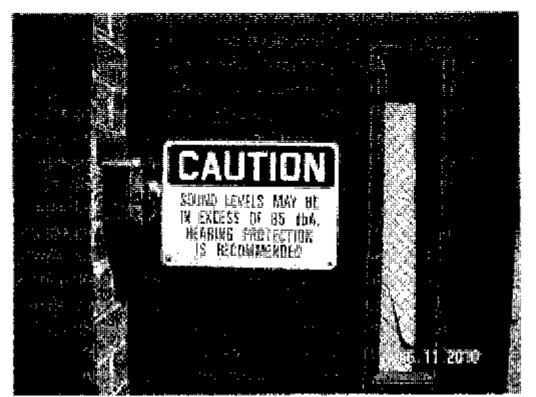
Men's Latrine, Peeting Peint.



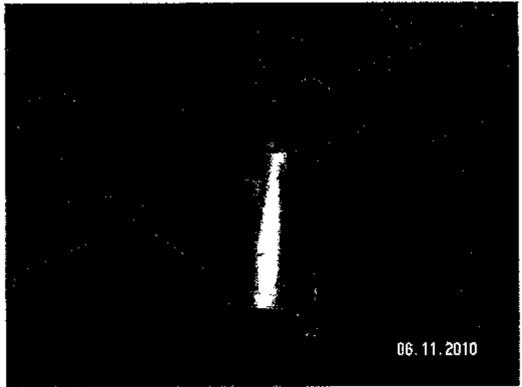
Typical Office Area.



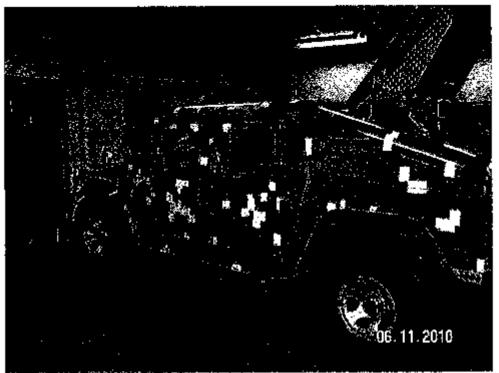
Exterior, Garage Doors.



HP Serine on Garage.



Damaged LEU in garage.



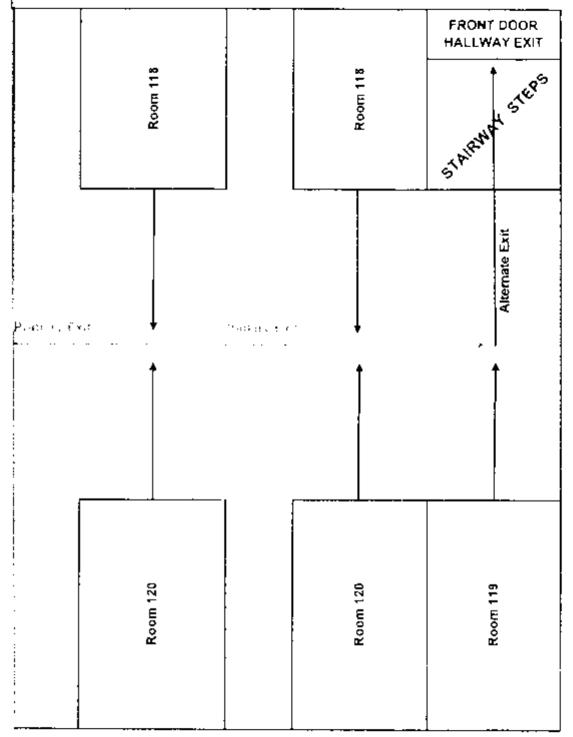
Vehicle in Garage.

Appendix C. Floor Plan	
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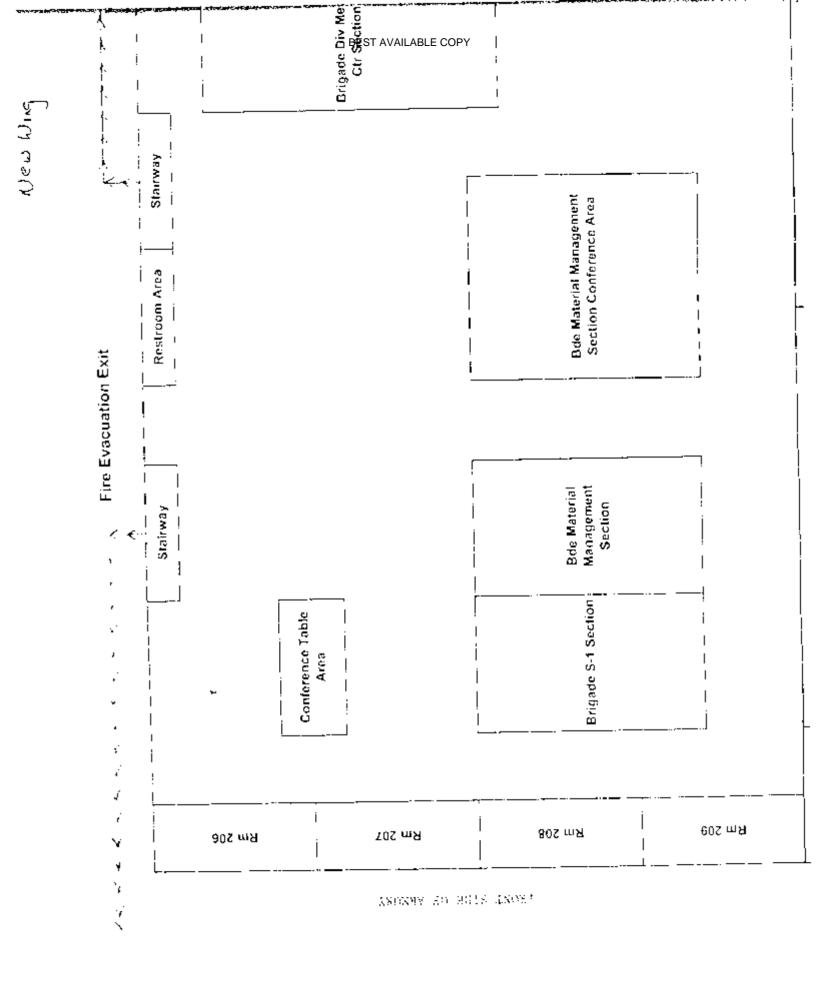
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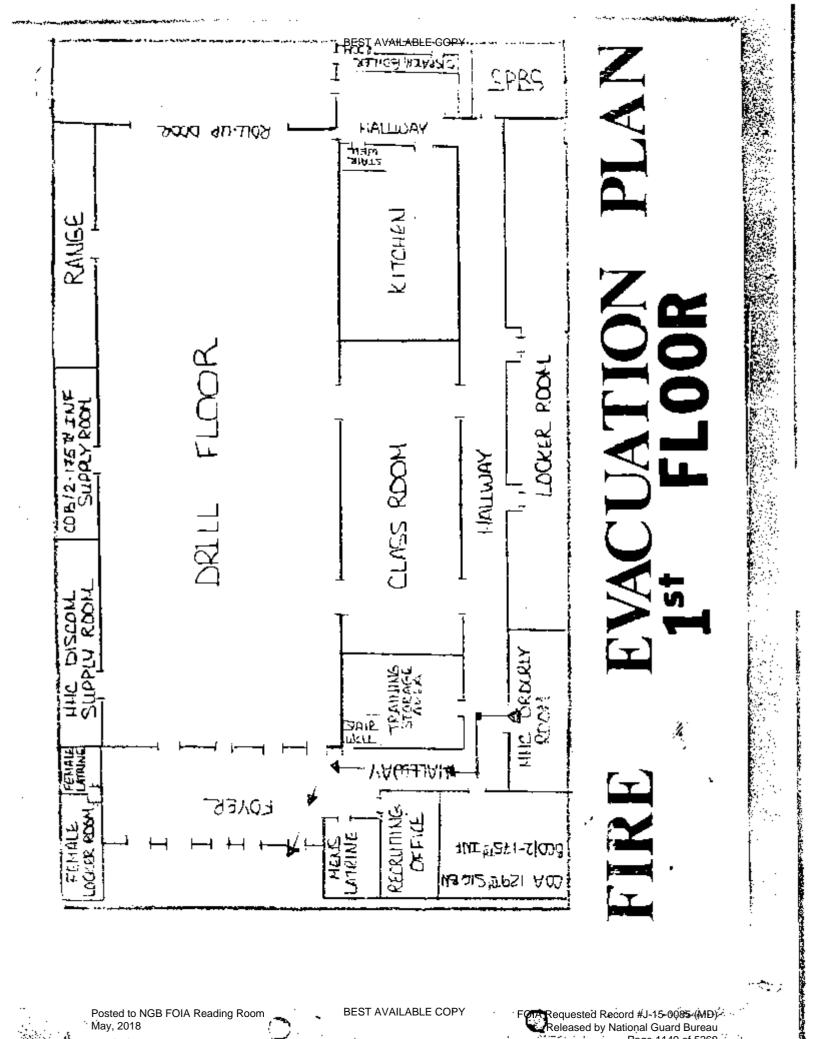


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Appendix D, References	1	•		~	
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- 1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead
- 2. American Conference of Governmental Industrial Hygienists (ACGIH) --Threshold Limit Values and Biological Exposure Indices, 2010 Edition
- Industrial Ventilation: A Manual of Recommended Practice for Design, 25th Edition
- 4. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007
- 5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI
- 6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI
- National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.
- 8. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(h)(3)]
- 9. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)
- 10. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation



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

Industrial Hygiene Survey Report

National Guard Facility Towson Readiness Center

Prepared For:	National Guard Bureau Region North 301-IH Old Bay Lane
	Havre de Grace, MD 21078
Survey Location:	Towson Readiness Center
	1035 York Road
	Towson, MD 21204
Prepared By:	Compliance Management International, Inc.
	1215 Manor Drive
	Suite 205
	Mechanicsburg, PA 17055
Survey Date:	December 20, 2012



Senior Industrial Hygienist

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Section 2.0 Operation Description & Observations
Section 3.0 Lead Testing
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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on December 20, 2012, at the Towson Readiness Center located at 1035 York Road, Towson, MD 21204. The survey was performed by Mr. Non-Responsive.

- 1. Surface, bulk and air samples for lead were collected. Surface levels of lead exceeded 200 micrograms per square foot (ug/ft^2) in one location. Cleaning procedures should be improved and remedial action should be taken to maintain lead levels below 200 ug/ft². See Section 3.0 for sampling results.
- 2. Lighting levels did not meet the American National Standard Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in the Exercise Room, and the 629th Commander's Office. See Section 4.0 for detailed findings.
- 3. Indoor air quality (IAQ) parameters were measured as part of this survey. Relative humidity was less than the recommended guideline in many of the areas. See Section 5.0 for 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.

Section 2.0 Operation Description & Observations

The Towson Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, attached garages and storage areas. There were approximately 30 full-time employees stationed at this facility at the time of this survey.

The building is two stories with a brick exterior. The original construction date was not known. There have been some renovations since its construction. The building has a flat rubber roof with stones. The interior walls are concrete block. The floors are concrete with vinyl floor tile or carpet.

The garages are used as vehicle storage areas. No maintenance or repairs are performed in these areas. Access to the garages was restricted.

There is a hot water heating system and five roof top air conditioning units.

The firing range has been converted into a Physical Fitness/Exercise room. No firing range components remain.

There is no child-care facility in the building.

Overall housekeeping practices were adequate.

No ergonomic concerns were reported.

Section 3.0 Lead Testing

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

Sample #	Location	Bulk (%)	Air ug/m ³	Surface ug/ft ²
1	Orderly Room	*	<6.1	*
2	Drill Hall – Center	*	<5.5	*
3	Blank	*	<3	*
4	Drill Hall Floor	*	*	<110
5	Drill Hall Top of HVAC	*	*	160
6	Kitchen – Top of Freezer	*	*	<110
7	S – 1 Offices Supply Vent	*	*	<110
8	Converted Firing Range - Floor	*	*	<110
9	Converted firing Range - Contents	*	*	<110
10	Converted Firing Range – Light Fixture	*	*	1900
11	Entrance to Converted Firing Range – Floor	*	*	<110
12	Classrooms Main Hallway	*	*	<110
13	Classroom 120	*	*	<110
14	29 th Rear Detachment Conference Room	*	*	<110
15	29 th Rear Detachment Office 202C	*	*	<110
16	Command Section 213 Top of Cabinet	*	*	<110
17	Command Section J. Funk Station	*	*	<110
18	Command Section Col. Office	*	*	<110
19	29 th Supply Office - Bookshelf	*	*	<110
20	29 th Supply Area – Metal Shelf	*	*	<110
21	HHC Storage – Top of Cabinet	*	*	<110
22	HHC Office – Top of Cabinet	*	*	<110
23	629 th Office – Desk	*	*	<110
24	Large Room off HHC – Top of Cabinet	*	*	<110
25	Drill Hall – South Wall	< 0.01	*	*
-	Criteria	0.5	50	200

Lead Testing Results Summary

Table Notes:

- 1. **Bolded** results exceed listed criteria
- 2. **ppm** = parts per million

- 3. ug/ft^2 = micrograms per square foot
- 4. $ug/m^3 = micrograms per cubic meter$
- 5. **ug** = micrograms

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

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

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

 Surface levels of lead were at or above the recommended guideline of 200 ug/ft² in the: Converted Indoor Firing Range on the Light Fixture

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 ug/m³.
- Paint was observed to be peeling in the Drill Hall on the east wall. A bulk sample was collected and determined to contain <0.01% Pb. This is less than the EPA definition of lead based paint = 0.5%. However, all areas of peeling paint should be repaired.

Section 4.0 Lighting

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

Location	Foot Candles	Recommended	Sufficient	
	(FC)	Lighting (FC)	Lighting	
Food Services-Dining	51	10	Yes	
Classroom 120	62	30 - 50	Yes	
Classroom 118	60	30 - 50	Yes	
Command Section Offices				
(Open Plan)	52	30 - 50	Yes	
Command Section Office 208	80	30 - 50	Yes	
Command Section Office 209	70	30 - 50	Yes	
Command Section Office 210	114	30 - 50	Yes	
Command Section Office 207	56	30 - 50	Yes	
Command Section Office 206	81	30 - 50	Yes	
Legal Office	35	30 - 50	Yes	
Office 101	80	30 - 50	Yes	
Food Services - Kitchen	60	50	Yes	
Armory/Assembly - Drill Hall	35	10	Yes	
29 th Supply Office	69	30 - 50	Yes	
29 th Supply Storage	30	30	Yes	
Lobby	50	10	Yes	
Physical Fitness/Exercise	15	30	No	
Women Latrine/Locker Room	18	5	Yes	
29 th Offices	85	30 - 50	Yes	
29 th Rear Detachment Office				
204A	83	30 - 50	Yes	
29 th Rear Detachment				
Conference Room	31	30 - 50	Yes	
Conference Room off HHC	71	30 - 50	Yes	
HHC Offices (Open Plan)	56	30 - 50	Yes	
HHC Storage	33	30	Yes	
Command Office	45	30 - 50	Yes	
629 th Open Offices	35	30 - 50	Yes	
629 th Commander's Office	15	30 - 50	No	

Light Survey Assessment Summary

Table Notes:

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

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

The lighting level did not meet the minimum recommended guideline in the Exercise Room, and the 629th Commander's Office. 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 8554 (Serial #02041015). The IAQ Meter was last calibrated in August 2012.

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

The following table summarizes the measurements collected.

IAQ Assessment Summary				
	Temperature (°F)	Relative	Carbon	Carbon
Location		Humidity	Dioxide	Monoxide
		(%)	(ppm)	(ppm)
Outdoors	46.6	46.6	303	3.0
Food Services – Dining Area	70.7	28.8	591	3.1
Classroom 120	63.7	41.9	534	2.5
Classroom 118	67.1	38.9	558	2.8
Command Section Offices	70.7	28.1	654	2.8
Office 208	71.2	27.5	672	2.6
Office 209	72.0	28.6	675	2.7
Office 210	72.3	27.0	675	2.6
Office 207	72.9	27.5	637	2.7
Office 206	72.7	27.8	663	2.7
Legal Office	72.3	25.2	555	2.6
Office 101	72.9	24.5	593	2.5
Food Services - Kitchen	71.4	25.7	515	2.5
Armory/Assembly-Drill Hall	68.9	26.4	490	2.6
29 th Supply Office	66.9	37.3	510	2.5
29 th Supply Storage	66.9	35.5	528	2.6
Lobby	66.0	29.8	488	2.6
Physical Fitness/Exercise Room	65.5	33.0	490	1.5
Women's Latrine	64.4	49.7	497	1.3
29 th Offices	69.3	31.9	603	1.2
29 th Rear Detachment Office				
204A	70.7	30.0	615	1.3
29 th Rear Detachment				
Conference	70.7	30.1	599	1.2

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
HHC Conference Room	68.7	26.1	531	1.5
HHC Offices	70.2	25.1	601	1.0
HHC Storage	65.8	28.6	456	1.5
Command Office	67.6	25.6	450	1.1
629 th Offices	71.1	28.8	710	1.1
629 th Commander's Office	61.0	31.7	386	1.1
Outdoors	46.9	46.5	306	1.0
Criteria	68.0-79.0	30-60	<1,006	<9.0

Table Notes:

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

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

Summary of findings and recommendations:

- Temperature was <68°F in some areas (criteria of 68-79°F). However, many areas were not occupied during this survey. For comfort, maintain temperature levels between 68-79°F in occupied areas. Relative humidity was <30% (criteria of 30-60%) in many areas. Low relative humidity can cause the drying of the mucous tissues and an increased susceptibility to respiratory infection. Maintain relative humidity levels between 30-60%.</p>
- Carbon dioxide levels measured did not exceed the recommended ceiling of 1,006 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:
 - Numerous roof leaks and associated water damaged ceiling tile were present (e.g. Classroom 118, Physical Fitness/Exercise Room, Lobby, HHC Offices, and 29th Rear Detachment 202A Office). All sources of water infiltration should be identified and repaired. Water stained ceiling tile should be removed and replaced.

- o 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.

Section 6.0 Suspect Asbestos Containing Building Materials

Because the age of the building was unknown, asbestos-containing materials (ACM) could be present in the facility. The following suspect asbestos-containing material was noted:

1. HVAC duct sealant in the Women's Latrine. This material was in good condition.

All suspect asbestos-containing material was observed to be intact and in good condition. Inaccessible areas such as behind walls or crawlspaces were not inspected. No bulk samples were collected.

Section 7.0 Equipment

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

Equipment	Serial #	Calibration Date	Value
TSI Q-Trak IAQ Meter	02041015	8/2012	NA
Cal Light 400 Light Meter	K98364	4/2012	NA
TSI 4100 Series Calibrator	6275	8/2012	NA
SKC Air Sampling Pump	647631	12/20/2012	1.98 LPM
SKC Air Sampling Pump	648349	12/20/2012	1.69 LPM

Section 8.0 Limitations

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

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

AMA Analytical Services, Inc.

Attention:

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HIGHER, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISONEC 9 7905 2005 WWW adhamacedited links.org LAB #100470

Client:	National Guard Bureau	Job Name:	NGB-Towson	Chain Of Custody:	514859		
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	Job Location:	1035 York Road, Towson, MD	Date Submitted:	12/24/2012		
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	Non-Resp	onsive	
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	12/27/2012	Report Date:	12/27/2012

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)		porting Limit	Total ug	Final Res	sult	Comments
13025542	1	Flame	Air	490	N/A	6.1	ug/m³	<3	<6.1	ug/m³	
13025543	2	Flame	Air	547	N/A	5.5	ug/m³	<3	<5.5	ug/m³	
13025544	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13025545	4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft ²	
13025546	5	Flame	Wipe	****	0.108	110	ug/ft²	18	160	ug/ft²	
13025547	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025548	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025549	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/fl²	
13025550	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025551	10	Flame	Wipe	****	0.108	110	ug/ft²	210	1900	ug/ft²	
13025552	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025553	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft ²	
13025554	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025555	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025556	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025557	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025558	17	Flame	Wipe	****	0.108	110	ug/ft ²	<12	<110	ug/ft²	
13025559	18	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025560	19	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	

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

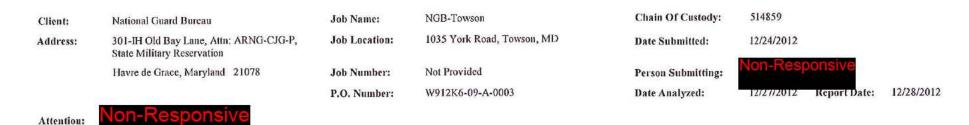
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A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYDERE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY INDUSC 17025-2005 WWW althancored testilatio.org



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)	(1997) - Sec. (1997)	oorting Jimit	Total ug	Final Res	ılt	Comments
13025561	20	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025562	21	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025563	22	Flame	Wipe	****	0,108	110	ug/fl²	<12	<110	ug/ft²	
13025564	23	Flame	Wipe	****	0.108	110	ug/fl²	<12	<110	ug/ft²	
13025565	24	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13025566	25	Flame	Paint Chip	****	N/A	0.01	%Pb		<0.01	%Pb	

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.





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

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4. Address 3: <u>Havre de Grace, Maryland</u> 210	078		4. Contact	Person	n-Res	ponsiv	e @ phone #	(410) 942-0273	
5. Phone #: (410) 942-0273 Fax	#: (410) 942-02	254	5. Submitt	ed by:			gnature: NON-	Responsive	e
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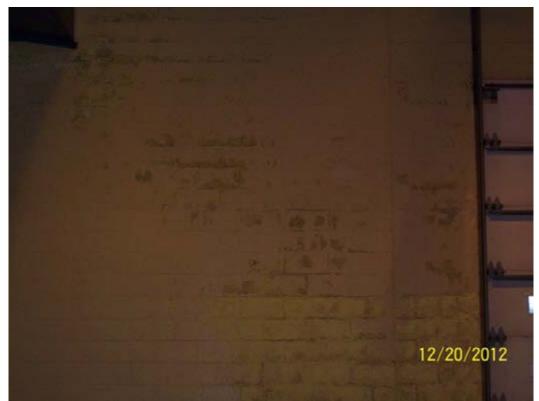
Appendix B. Photographs



ARNG Towson Armory Entrance



Drill Hall



Drill Hall South Wall Water Damage



Command Section Water Damage



Converted Firing Range



Exercise Water Damage

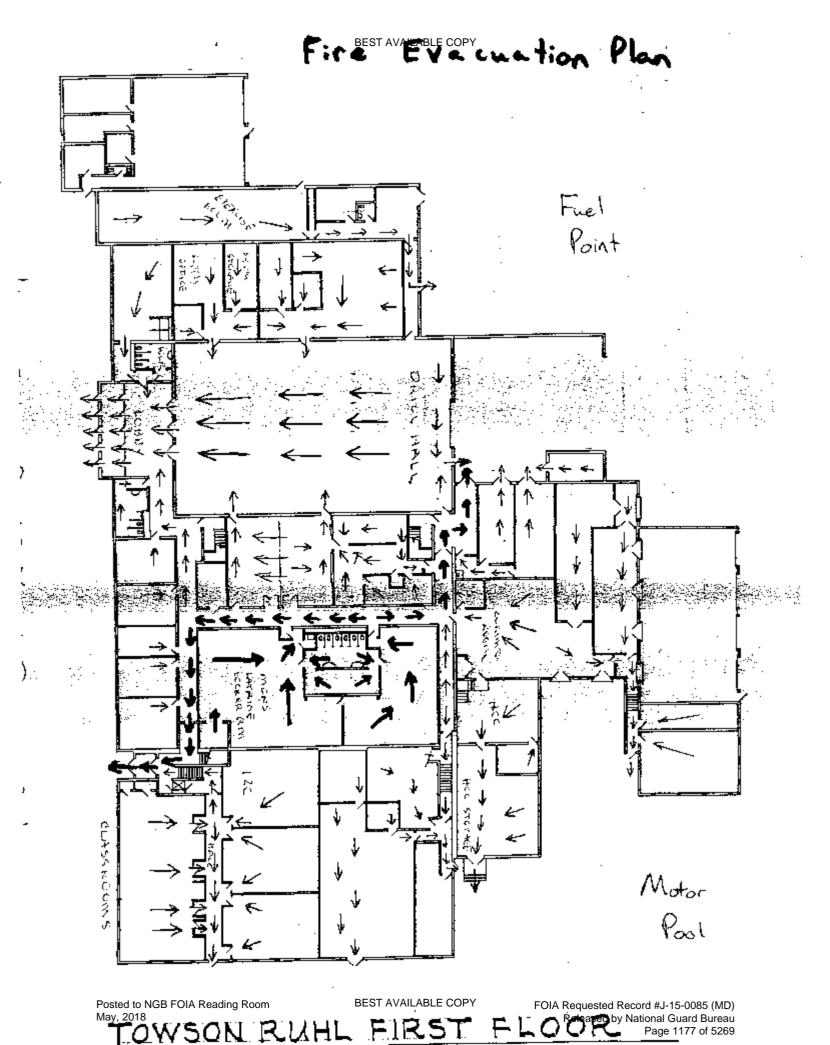


HHC Water Damage



Legal Office Water Damage

Appendix C. Floor Plan



Appendix D. References

- 1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead
- 2. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values and Biological Exposure Indices, 2011 Edition
- 3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition
- 4. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2010
- 5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI
- 6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/American National Standards Institute (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/Non-Responsive, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03 LTC E Leslie Medford Armory, Annapolis, MD

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

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



ENCL

Industrial Hygienist Industrial Hygiene Field Services Program



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



MDARNG FACILITIES IH BASELINE SURVEY LTC E LESLIE MEDFORD ARMORY ANNAPOLIS, MD 55-ML-01ED-03

Approved for public release; distribution unlimited.

May, 2018

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

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1180 of 5269

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

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

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

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

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

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

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

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

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

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

EXECUTIVE SUMMARY MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS, ANNAPOLIS ARMORY ANNAPOLIS, 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 sample results were below the laboratory analytical detection limit for lead in air of 0.005 to 0.006mg/m³ as well as the Occupational Health and Safety Administration (OSHA) standard of 50µg/m³ for lead in air. All three dust-lead wipe sample results were below the USACHPPM recommended decontamination level of 200µg/ft² for dust-lead on frequently contacted surfaces. However, two dust-lead wipe sample results in the locker room (the former indoor firing range) exceeded the EPA lead exposure level for children of 40µg/ft² on floors. There is a potential for personnel using the locker room to track dust-lead out of the area and redistribute it into adjacent rooms in the armory. This can result in lead exposures for children and for the general workforce. One of three deteriorated paint samples is lead-based paint. Deteriorated lead-based paint is hazardous to children. One additional sample was below the Environmental Protection Agency (EPA) definition of lead-based paint, but exceeded the laboratory analytical detection limits of 0.005 %. This sample is referred to as leadcontaminated paint, and is potentially hazardous to children. Army Regulation 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them. Recleaning the areas where dust-lead is present may further prevent exposures for children and for the general workforce.

b. Safety. The sidewalk outside the armory is buckling due to tree root growth. This presents a potential trip hazard for people using the sidewalk.

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.

Readiness thru Health Printed on BRecycled Paper EXSUM, MDARNG Facilities IH Baseline Surveys, LTC E. Leslie Medford Armory Annapolis, MD Project No. 55-ML-01ED-03

a. 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 the presence of dust-lead. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. If children will continue to use this facility, clean surfaces to the EPA dust-lead standard for young children of 40μ g/ft² on floors and clean to 200μ g/ft² for dust-lead on all other surfaces. Recleaning 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. 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.

b. Safety. Address the problem of the concrete sidewalk buckling due to tree root growth. This presents a potential trip hazard for people using the sidewalk.

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MDARNG Facilities IH Baseline Surveys, LTC E. Leslie Medford Armory Annapolis, 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

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

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

LOCATION: LTC E. Leslie Medford Armory Annapolis, MD

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

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

3. BACKGROUND INFORMATION.

- a. Armory Mission. Reconnaissance. First Squadron, 158th Cavalry Regiment.
- b. Date of Construction. Built in 1958. The armory was renovated from 1999-2000.
- c. POC. SGM Non-Responsive: (410) 974-7400.
- d. Survey Date. 13 August 2003.

4. SUMMARY OF ACTIONS.

a. Sampling. Surface dust-lead wipe, air, and bulk paint sampling was conducted to determine the existence of lead-based paint and/or lead-based paint hazards (paint-lead hazards). Sample results and locations are in Table 1 and in Appendix D.

b. Physical Condition of Facilities.

(1) Paint. Staff Sergeant Non-Responsive, Environmental Compliance Assessment Coordinator for the MD NGB, has records that state that lead has been abated in the armory. However, there is still deteriorated lead-based paint in the former indoor firing range.

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MDARNG Facilities IH Baseline Surveys, LTC E. Leslie Medford Armory Annapolis, MD Project No. 55-ML-01ED-03

(2) Asbestos. Staff Sergeant^{Non-Responsive} has records that state that all asbestos was abated in this armory.

(3) Mold. No mold was observed.

(4) Safety Hazards. The POC stated that there are no problems in the interior of the building. The concrete sidewalk outside the armory has buckled due to tree root growth. A contractor was hired to fix this problem. The contractor visited the site in the spring of 2003 but has not returned or contacted the armory (Photograph #s 1499 and 1500).

c. Other Building Concerns. None.

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.

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). The former IFR was converted to a locker room in the early 1990s.

i. Photographs (Appendix C).

j. Site Maps (Appendix B).

k. Facility use by children. The POC stated that the building is often rented for public use and children often use this facility.

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

6. SAMPLING RESULTS. All three dust-lead wipe sample results were below the USACHPPM recommended decontamination level of $200\mu g/ft^2$ for dust-lead on frequently contacted surfaces. However, two dust-lead wipe sample results exceeded the EPA lead exposure level for children of $40\mu g/ft^2$ on floors. One of three deteriorated paint sample results was 0.5 % lead and is lead-based paint. Deteriorated lead-based paint is hazardous to children.

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One additional sample was below the definition of lead-based paint, but exceeded the laboratory analytical detection limits of 0.005 %. This sample is referred to as lead-contaminated paint, and is potentially hazardous to children.

All air samples were below the laboratory analytical detection limit for lead in air of 0.005 to 0.006mg/m^3 as well as the Occupational Health and Safety Administration (OSHA) standard of $50 \mu \text{g/m}^3$ for lead in air.

See Table 1 for dust-lead wipe and bulk paint sample locations, photograph numbers, and analytical results. All sample results that are equal to or exceed $40\mu g/ft^2$ of dust lead and 0.5% for bulk samples are highlighted.

Sample	Type of	Location	Photo	Result
Numbers	Sample			$\mu g/ft^2$
AP W01	Wipe	Baffle of former IFR (now locker room)	<mark>1496</mark>	<mark>45</mark>
AP W02	Wipe	Floor lanes of former IFR	<mark>1497</mark>	<mark>155</mark>
AP W03	Wipe	Top of locker in same area	1498	<23
				Result %
AP BULK01	Bulk	Boiler room floor		0.081
AP BULK02	Bulk	Weight room on wall in basement		< 0.005
AP BULK03	Bulk	Floor of former IFR		0.5

Table 1 Sample Locations, Photograph numbers, and Analytical Results

7. DISCUSSION AND CONCLUSIONS.

a. The building is in good condition. The armory generally observes good housekeeping practices.

b. All air samples were below the laboratory analytical detection limit for lead in air of 0.005 to 0.006mg/m^3 as well as the Occupational Health and Safety Administration (OSHA) standard of $50\mu\text{g/m}^3$ for lead in air.

c. All three dust-lead wipe sample results were below the USACHPPM recommended decontamination level of $200\mu g/ft^2$ for dust-lead on frequently contacted surfaces. However, two dust-lead wipe sample results exceeded the EPA lead exposure level for children of $40\mu g/ft^2$ on floors. Personnel using the locker 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 children and for the general workforce.

MDARNG Facilities IH Baseline Surveys, LTC E. Leslie Medford Armory Annapolis, MD Project No. 55-ML-01ED-03

d. One of three deteriorated paint sample results was 0.5 % lead and is lead-based paint. Deteriorated lead-based paint is hazardous to children. One additional sample was below the definition of lead-based paint, but exceeded the laboratory analytical detection limits of 0.005 %. This sample is referred to as lead-contaminated paint, and is potentially hazardous to children.

e. Army Regulation 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them. Recleaning the areas that showed dust-lead may further prevent exposures for children and for the general workforce.

f. The sidewalk buckling due to tree root growth presents a potential trip hazard to personnel using the sidewalk.

8. RECOMMENDATIONS. Enclosure.

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

Non-Responsive

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

4

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ENCLOSURE

ANNAPOLIS 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 Lead Exposure in the former indoor firing range is classified as 5.

1. Lead Exposure.

a. Clean all areas in and adjacent to the former IFR where sampling results showed the presence 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 children and for the general workforce. Address all potential lead hazards before extending this facility to use for children. If children will continue to use this facility, clean surfaces to the EPA dust-lead standard for young children of $40\mu g/ft^2$ on floors and clean to the USACHPPM decontamination level of $200\mu g/ft^2$ for dust-lead on all other surfaces.

b. 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.

2. Safety. Address the problem of the concrete sidewalk buckling due to tree root growth. This presents a potential trip hazard for people using the sidewalk.

MDARNG Facilities IH Baseline Surveys LTC (MD) E. Leslie Medford Armory, Annapolis, MD Project No. 55-ML-01ED-03

APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

Subject: Proposed Recommendations for Surface Lead in Armories

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

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

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

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

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

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

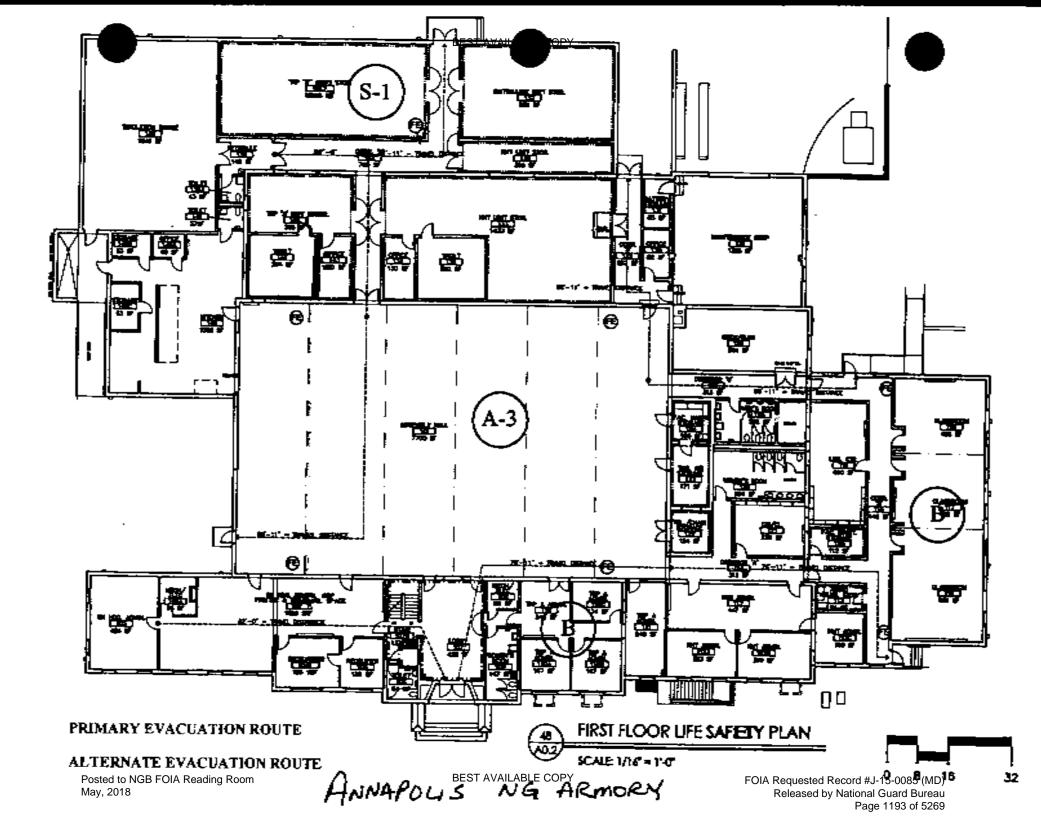
2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All states will receive this guidance when it is completed.

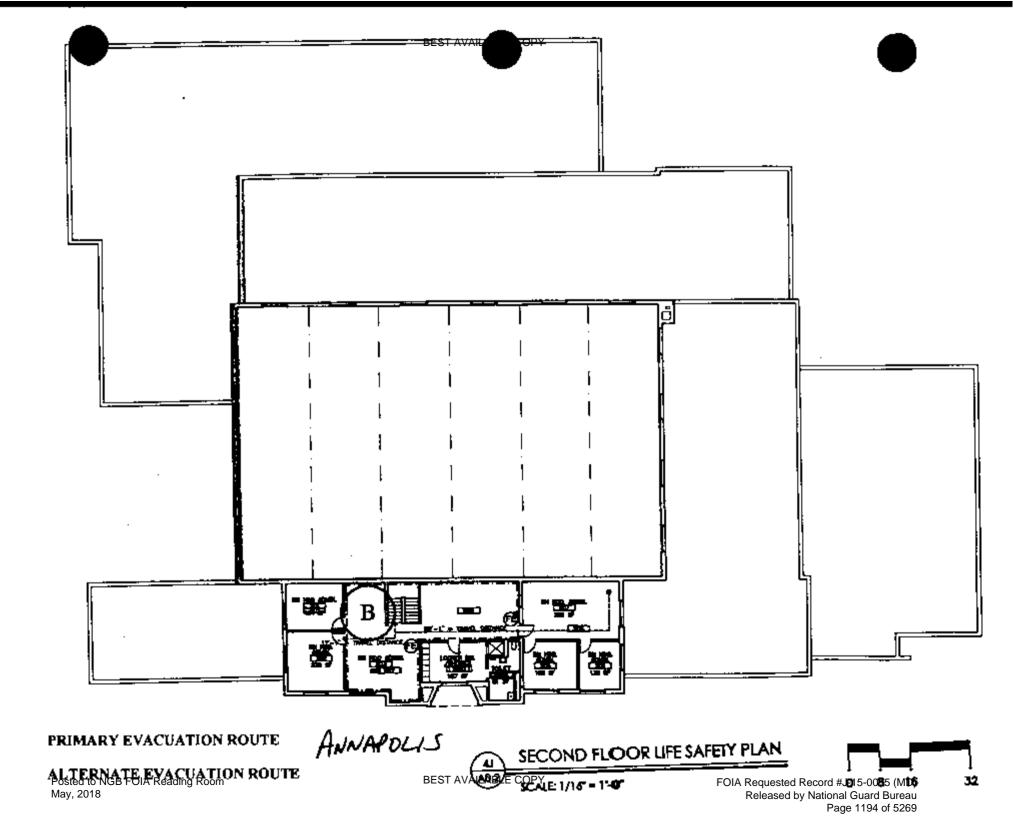
3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m³ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

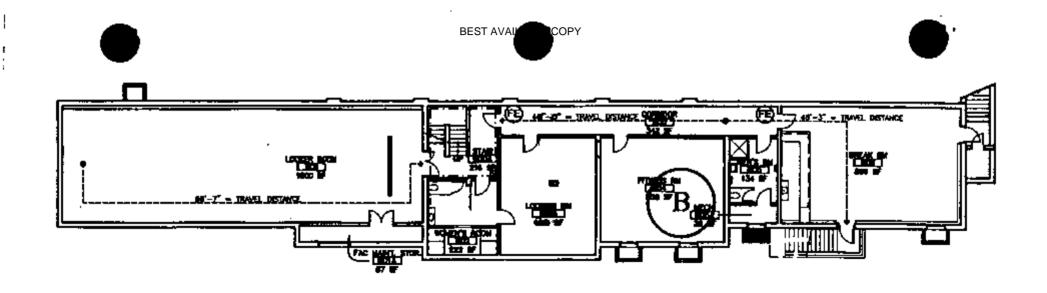
MDARNG Facilities IH Baseline Surveys LTC (MD) E. Leslie Medford Armory, Annapolis, MD Project No. 55-ML-01ED-03

APPENDIX B

SITE MAPS







ANNAPOUS



PRIMARY EVACUATION ROUTE

ALTERNATE EVACUATION ROUTE

MDARNG Facilities IH Baseline Surveys LTC (MD) E. Leslie Medford Armory, Annapolis, MD Project No. 55-ML-01ED-03

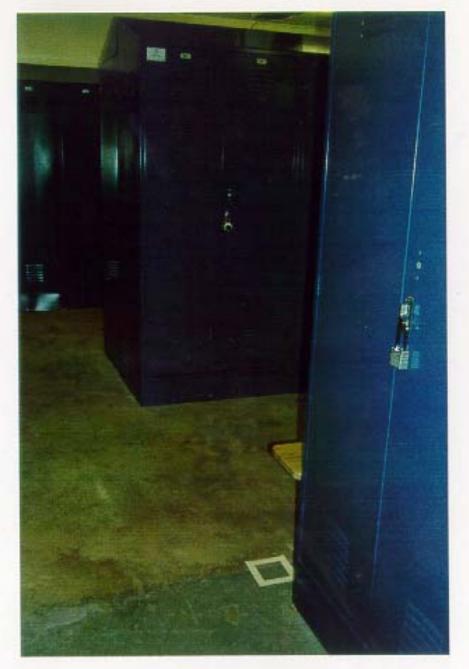
APPENDIX C

PHOTOGRAPHS

ANNAPOLIS ARMORY

Photo Number	Photo Location
1496	Baffle of former IFR (now locker room)
1497	Floor lanes of former IFR
1498	Top of locker in same area
1499/1500	Concrete Sidewalk buckled due to tree roots





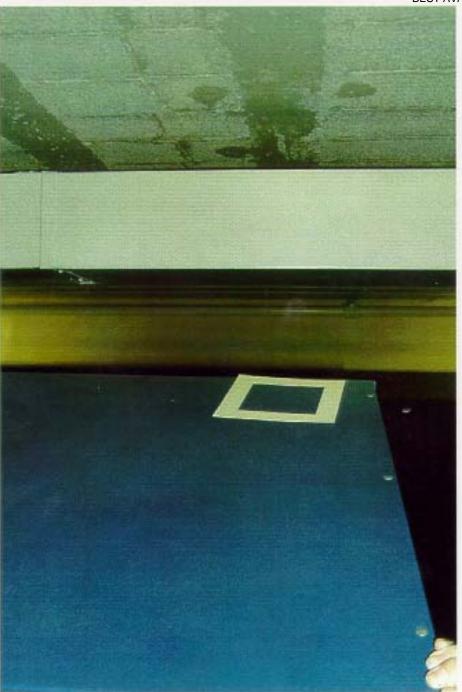
1497

1496 Posted to NGB FOIA Reading Room May, 2018

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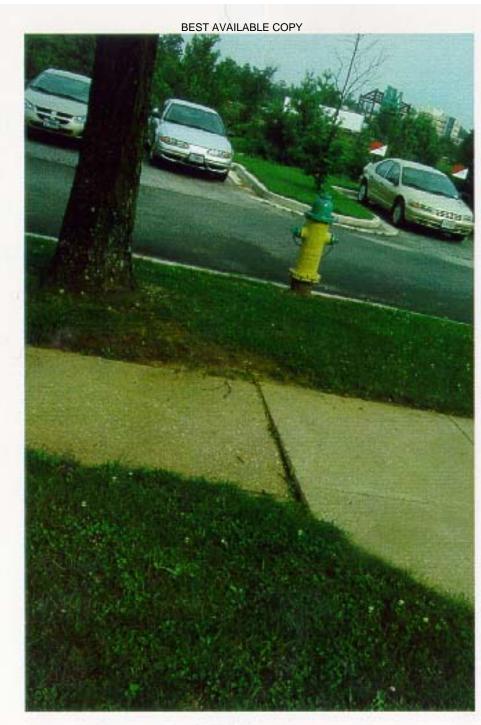




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APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

Indoor Ra	nge fr	ifo					
						 Conc.	

Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (µg/ft ^z)
				Yes		Yes		
AP W01	Ĩ						Baffle of former IFR (now locker room)	45
	Annapolis	Annapolis						
AP W02	Annapolis	Annapolis					Floor lanes of former IFR	155
AP W03	Annapolis	Annapolis					Top of locker in same area	<23

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TEST REPORT Page 1 of 2 8/27/03

Submitted To: Non-Responsive Commander, USACHPPM 5158 Blackhawk Road, Attn: MCHB-TS-OFS APG, MD 21010-5403

Reference Data: Client Sample No.: P.O. No.: Sample Location: Sample Type: Method Reference: DCL Set ID No.: DCL Sample ID No.: Sample Receipt Date: Preparation Date: Analysis Date: Lead APAS01 through APBlank02 Not Available Annapolis NG Armory Filter NIOSH 7300 03-S-4148 03-25422 through 03-25426 8/27/2003 08/27/03 08/27/03

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

The sample condition upon receipt was acceptable except where noted.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.



Analyst



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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TEST REPORT Page 2 of 2 03-S-4148

Results Lead

Client #	DCL #	Sample Volume (L)	µg/sample	mg/m ³
APAS01	03-25422	183.8	ND	<0.005
APAS02	03-25423	173.7	ND	<0.006
APAS03	03-25424	172.9	ND	<0.006
APBlank01	03-25425	0	ND	-
APBlank02	03-25426	0	ND	
	Prep Blank		ND	
<pre>% Recovery</pre>	LCS		101.	
RPL			1.	······································

ND = not detected at or above the reporting limit (RPL).

LCS = laboratory control sample.



Analyst



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From: Non-Responsive [results@resienv.com]

Sent: Tuesday, August 26, 2003 3:26 PM

To: Non-Responsive apg.amedd.army.mil; Non-Responsive

Subject: RES 96610-1; Cascade MD and Anapolis MD

Outgoing mail is certified Virus Free.

Checked by AVG anti-virus system (http://www.grisoft.com). Version: 6.0.512 / Virus Database: 309 - Release Date: 8/19/2003

RESERVOIRS ENVIRONMENTAL, INC.

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

TABLE ANALYSIS: LEAD IN PAINT

RES Job Number:	RES 96610-1
Client:	Army National Guard IH - West
Client Project Number / P.O.:	None Given
Client Project Description:	Cascade MD and Anapolis MD
Date Samples Received:	August 19, 2003
Analysis Type:	USEPA SW846 3050B / AA (7420)
Turnaround:	3-5 Day
Date Samples Analyzed:	August 22, 2003

Client	Lab	Detection	LEAD CONCENTRATION (%)	
ID Number	ID Number	Limit (%)		
APBULKOI	EM 806477	0.005	0.081	
APBULK02	EM 806478	0.005	BOL	
APBULK03	EM 806479	0.005	0.488	



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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 96610-1
Client:	Army National Guard III - West
Client Project Number / P.O.:	None Given
Client Project Description:	Cascade MD and Anapolis MD
Date Samples Received:	August 19, 2003
Analysis Type:	USEPA SW846 3050B / AA(7420)
Turnaround:	3-5 Day
Date Samples Analyzed:	August 22, 2003

Client	Lab	Sample	LEAD	Detection	LEAD	
ID Number	ID Nomber	Area (sq.fl.)	(µg)	Limit (µg/sq.fl.)	CONCENTRATION (µg/¤q.fl.)	
CDBLANK1	EM 806468	0.11	BDL	23	BDL	
CDW01	EM 806469	0.11	320.0	23	2909	
CDW02	EM 806470	0.11	BDL	23	BDL	
CDW03	EM 806471	0.11	BDL	23	BDL	
CDW04	EM 806472	0.11	BDL	23	BDL	
APBLANKI	EM 806473	Q.11	BDL	23	BDL	
APW01	EM 806474	0.11	5.0	23	45	
APW02	EM 806475	0.11	17.0	23	155	
APW03	EM 806476	0.11	BDL	23	BDL	

*Calculations Based On A 1 sq.0. Sample Area Unless Otherwise Noted



BDL = Below Detection Limit

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altent Vie

MDARNG Home

NEES Form

LTC (MD) E. Leslie Medford Armory

18 Willow Street Annapolis, MD 21401-3113 (Directions)

"The Governor's Guard" 1st Squadron, 158th Cavalry Regiment (RECON)

Call 410-974-7617 for info

Local Recruiter: SFC Non-Responsive

Tenant Units:

- 1st Squadron, 158th Cavalry Regiment (RECON) "The Governor's Guard"
 - o Headquarters
 - Headquarters and Headquarters Troop
 - o Troop A
- Organizational Maintenance Shop #11A

UNDER CONSTRUCTION

Last Update: 17 FEB 99 17:01:40 EST



1st Squadron, 158th Cavalry Regiment The Governor's Guard

The 158th Cavalry Regiment is a component of the 29th Aviation Brigade, 29th Infantry Division (Light).

NGRA Parts

MDARNG Home

Established: A.D. 1877 at Annapolis, Maryland

Lineage:

- The Governor's Guard
- Company G, 1st Maryland Infantry Regiment (circa A.D. 1886)
- Company M, 1st Maryland Infantry Regiment [Spanish-American War]
- Company M, 115th Infantry Regiment, 29th Infantry Division (circa A.D. 1917) [France]
- Company M, 115th Infantry Regiment, 29th Infantry Division (circa A.D. 1941)
- 29th Quartermaster Company (circa A.D. 1947)
- Comapny A, 229th Supply & Transp[ortation Battalion (circa A.D. 1963)
- Troop B, 1st Squadron, 223rd Cavalry Regiment, 28th Infantry Division "Keystone Division"(circa A.D. 1968)
- Troop B, 158th Cavalry Squadron, 58th Infantry Brigade (circa A.D. 1975)
- 1st Squadron, 158th Cavalry Regiment, 29th Infantry Division (Light) (circa A.D. 1985)

Campaigns:

Regimental Honors/Awards:

Mission: Support operations of the 29th Infantry Division (Light) through:

- Reconnaissance and Surveillance
- Security
- Screening Operations
- Intelligence and Electronic-warfare
- Facilitation of Command-and-Control

MDARNG Facilities IH Baseline Surveys LTC (MD) E. Leslie Medford Armory, Annapolis, MD Project No. 55-ML-01ED-03

APPENDIX E

REFERENCES

APPENDIX E

REGULATIONS AND STANDARDS

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

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 LTC (MD) E. Leslie Medford Armory, Annapolis, MD Project No. 55-ML-01ED-03

APPENDIX F

LEAD CLEANING GUIDANCE

CHAPTER 14: CLEANING

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Step-by-Step Summary



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



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

I. Introduction

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

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

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

A. Performance Standard

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

B. Small Dust Particles

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

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

C. Difficulties in Cleaning

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

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

1. Low Clearance Standards

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

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

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

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



2. Worker Inexperience

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

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

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

4. Deadlines

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

II. Coordination of Cleaning Activities

A. Checklist

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

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

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

B. Equipment Needed for Cleaning

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



C. Waste Disposal

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

III. Cleaning Methods and Procedures

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

A. Containment

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

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

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

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

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

1. HEPA Vacuuming

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

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



Operating Instructions

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

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

Special Attachments

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

Selecting Appropriate Size(s)

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

Wet-Dry HEPA Vacuums

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

Prefilters

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

HEPA Vacuuming Procedures

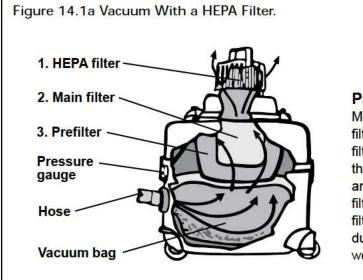
Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

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

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

Emptying the HEPA Vacuum

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



Parts of a HEPA-vacuum

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

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

2. Wet Detergent Wash

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

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

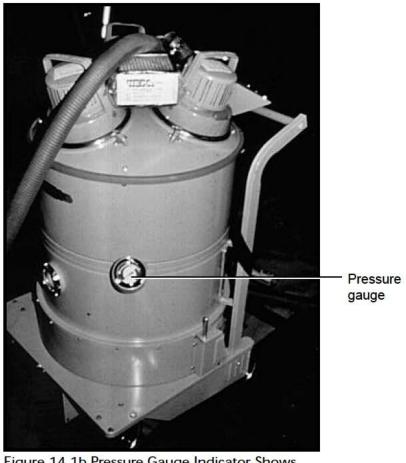
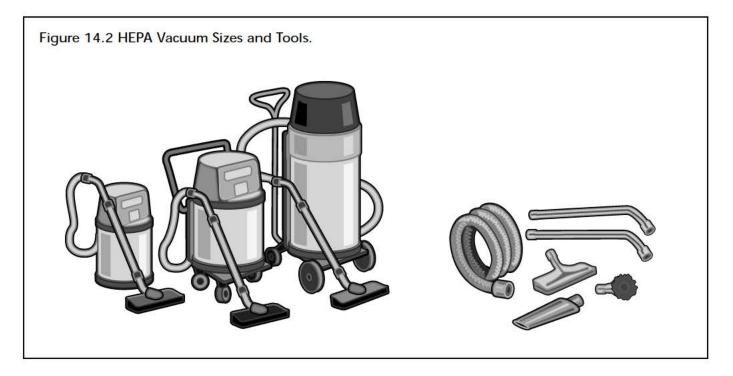


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.



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

Manufacturer's Dilution Instructions

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

Appropriate Cleaning Equipment

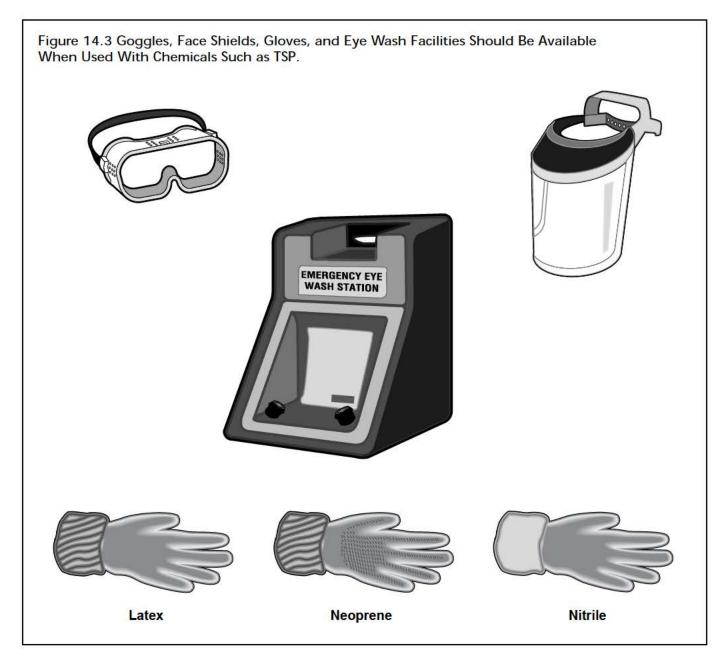
Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential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

Proper Wet-Cleaning Procedures

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

Changing Cleaning Mixture

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



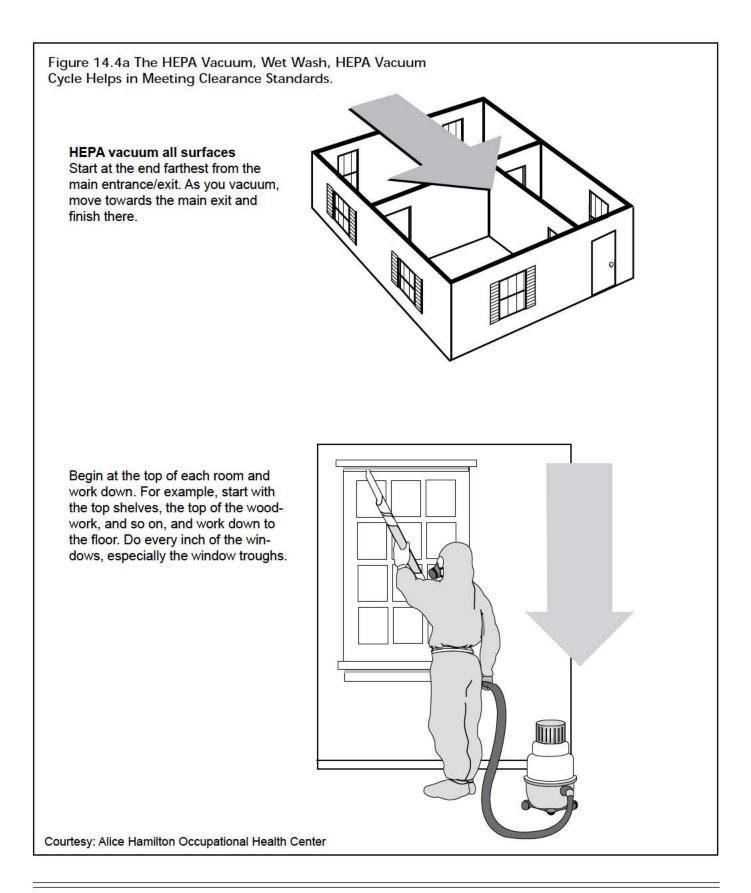
more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet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

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

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

✤ First, the area is HEPA vacuumed.



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Chapter 14: Cleaning

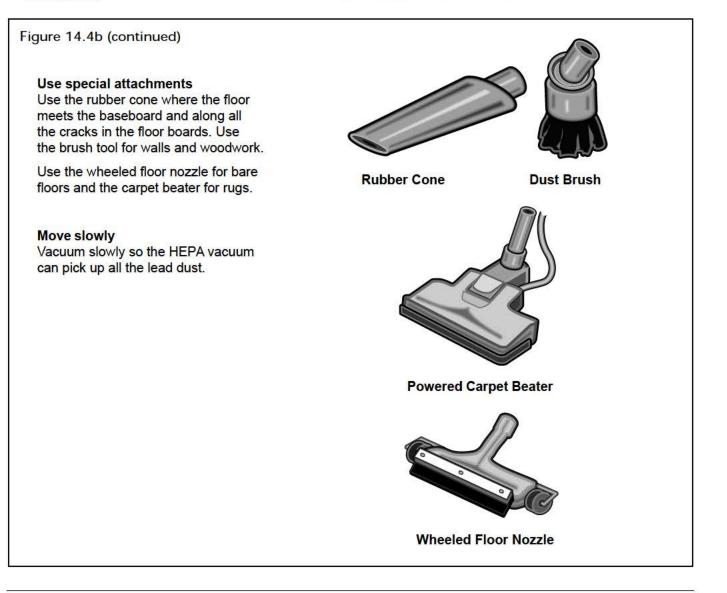
- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

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

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

Single-Pass Wet Wash/HEPA Vacuum

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



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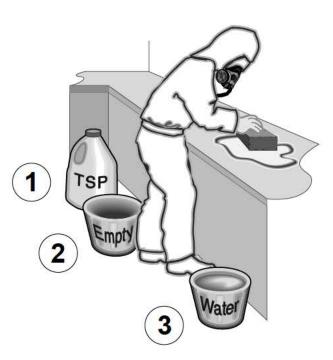
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14-13

Figure 14.4c (continued)

Wash all surfaces with suitable detergents

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



Wipe All Surfaces

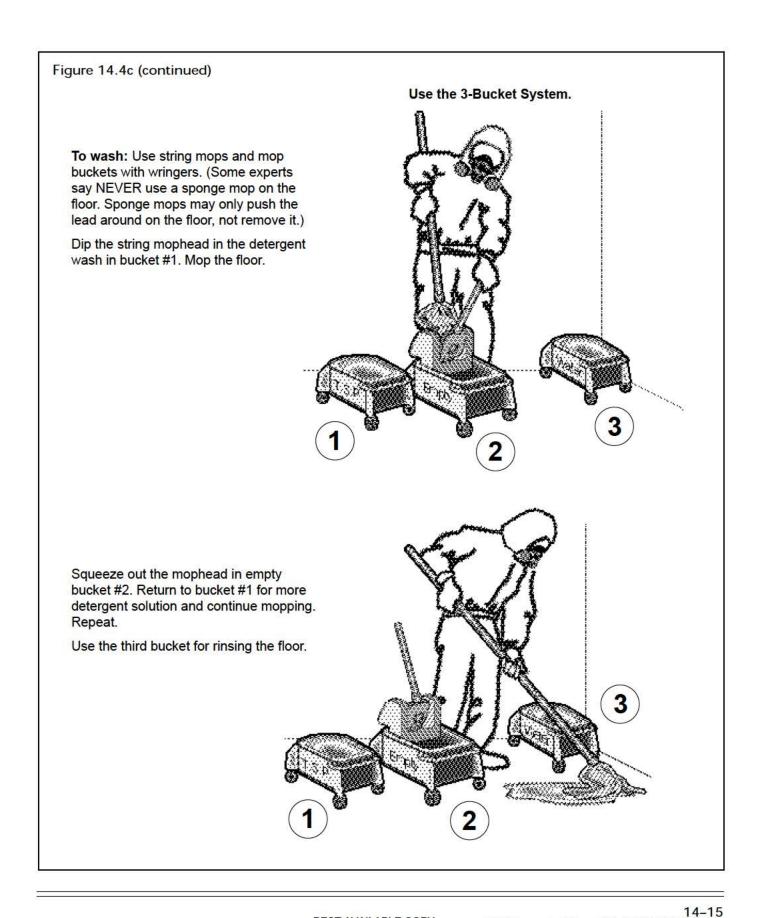


Wet Mop Floor



Don't Dry Sweep

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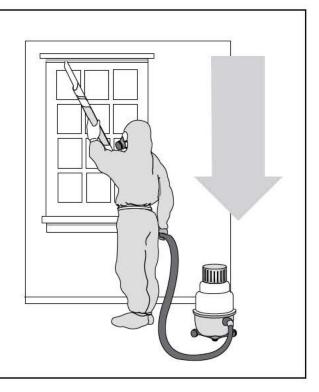
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Figure 14.4d (continued)

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

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



4. Sealing Floors

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

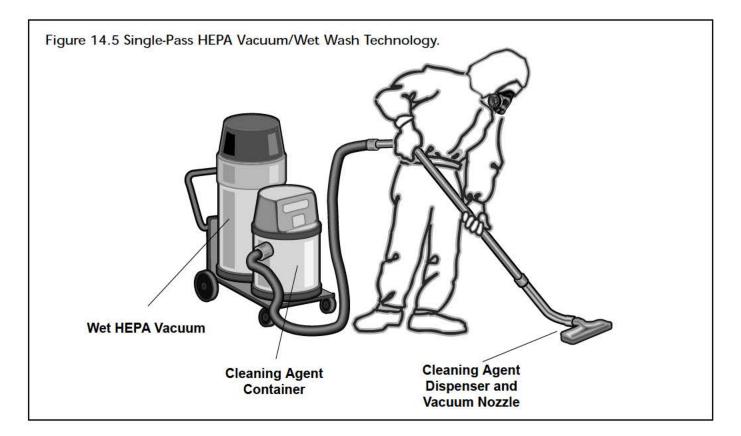
As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

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

A. Precleaning Procedures

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



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

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



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



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

B. Ongoing Cleaning During the Job

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

C. Daily Cleaning Procedures

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



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

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

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

1. Large Debris

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

2. Small Debris

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

3. Exterior Cleaning

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

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

4. Worker Protection Measures

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

5. Maintaining Containment

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

V. Order of Final Cleaning Procedures After Lead Hazard Control

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

A. Final Cleaning

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

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

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

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

1. Decontamination of Workers, Supplies, and Equipment

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

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

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



Figure 14.8a Pick Up Corners of Plastic Sheeting.



Figure 14.8b Fold Plastic Inward.

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

B. Preliminary Visual Examination

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

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

C. Surface Painting or Sealing of Nonfloor Surfaces

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

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

D. Final Inspection

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

E. Recleaning After Clearance Failure

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

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

VI. Cleaning Cost Considerations

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

A. Initial Clearance Test Failure Rates

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

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



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

B. Key Factors In Effective Cleaning

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

C. Special Problems

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

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

Chapter 14: Cleaning



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

VII. Alternative Methods

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

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

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

A. Vacuums

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

B. Trisodium Phosphate and Other Detergents

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

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Table 14.1 Initial (Jeaning wide-lest	Failure Rates for	various Abateme	nt stratedies
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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	<mark>44.5%</mark>	45.7%	23.7%	25.7%	21.0%	33%

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



and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993). These Guidelines do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

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

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

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

14-23

MDARNG Facilities IH Baseline Surveys LTC (MD) E. Leslie Medford Armory, Annapolis, MD Project No. 55-ML-01ED-03

APPENDIX G

MOLD GUIDANCE

Army Facilities Management Information Document on Mold Remediation Issues

TG 277 FEBRUARY 2002



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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

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

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

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

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

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

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

REMEDIATION PLANNING

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

REMEDIATE MOISTURE AND MOLD PROBLEMS

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

REMEDIATION PROCEDURES

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

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

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

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

FOUR REMEDIATION LEVELS

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

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

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

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

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

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

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

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

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

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

The following procedures *at a minimum* are recommended:

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

Refer to Appendix D for Containment procedures.

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

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

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

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

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

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

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

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

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

The following procedures are recommended:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The following procedures are recommended:

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

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

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

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

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

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

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

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

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

HAZARD COMMUNICATION

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

CONCLUSION

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

REFERENCES

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

APPENDIX A

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

Water Damage Cleanup and Mold Prevention

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

Water 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 	

Ξ

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

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

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

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

APPENDIX B

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

Mold Remediation Guidelines

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

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

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

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

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

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

Disposable Protective Clothing

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

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

APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

Containment Tips

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

Limited Containment

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

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

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

Full Containment

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

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278 February 2002



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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

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

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

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

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

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

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

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

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

Routine Investigation and Evaluation of moisture and mold problems³.

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

Assessments Requiring Sampling

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

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

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

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

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

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

References

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

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

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

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

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

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

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

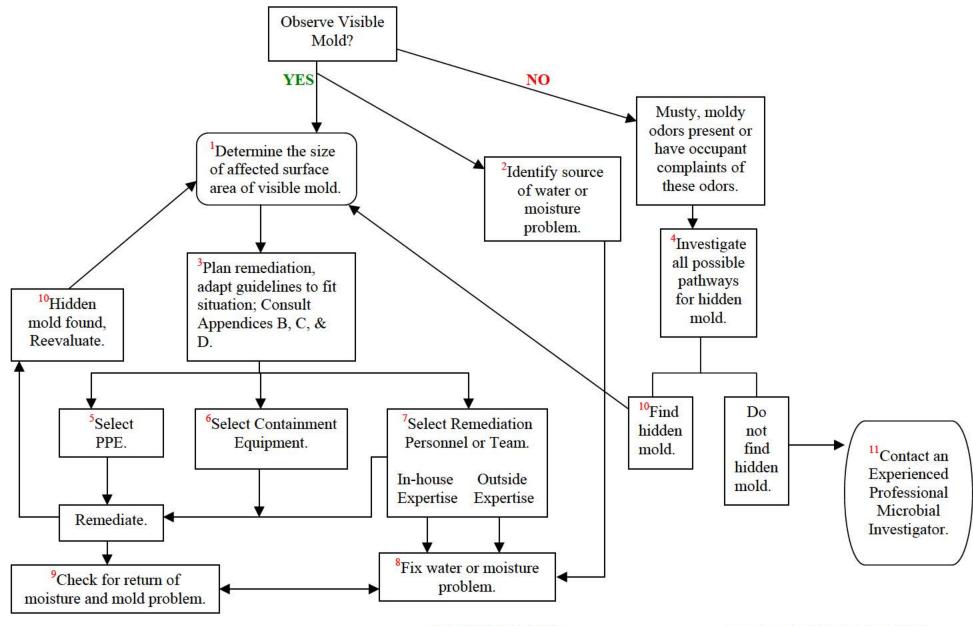
8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force*, AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

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MOLD INVESTIGATION DECISION LOGIC



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MOLD INVESTIGATION DECISION LOGIC NOTES:

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

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

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

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

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

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

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

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

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

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

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

APPENDIX B

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

Mold Remediation Guidelines

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

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

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

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

TG 278

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

Disposable Protective Clothing

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

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

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APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

Containment Tips

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

Limited Containment

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

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

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

Full Containment

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

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Industrial Hygiene Survey

National Guard Facility Annapolis Armory 18 Willow Street Annapolis, MD 21401

Prepared For:	National Guard Bureau Region North IH 301-IH Old Bay Lane Havre de Grace, MD 21078
Survey Location:	Annapolis Armory 18 Willow Street Annapolis, MD 21401
Prepared By:	Analytical Laboratory Services, Inc. 3544 North Progress Avenue Suite 100 Harrisburg, PA 17110
Survey Date:	September 30, 2010
Report Date:	October 25, 2010
ALSI Project #: Non-Responsive	1010634

Director, Environmental Health & Safety

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Section 1.0 Executive Summary

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on September 30, 2010, at the Annapolis Armory located at 18 Willow Street, Annapolis, MD 21401. The survey was performed by Ms. Non-Responsive and Mr. Non-Responsive

- 1. Lead surface and air samples were collected. All sample results were less than recommended guidelines or regulatory standards.
- 2. Lighting levels met the minimum recommended guidelines in all but the following areas: 1) Drill Hall 2) Room 148 3) Attached Garage. 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% in most locations. Relative humidity should be maintained at 30-60%. Low relative humidity can lead to the drying of mucous tissues and an increased susceptibility to respiratory infection. High relative humidity can provide an environment suitable for microbial growth and proliferation.
- 4. Water damaged ceilings 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.
- 5. Possible fungal growth was observed on the supply and return vents. These should be regularly cleaned. Do not permit dirt, debris, microbial growth, etc. to accumulate in any portion of the HVAC system. Supply and return vents should be cleaned.
- 6. The overhead vehicle exhaust ventilation system in the garage does not meet the minimum requirements. This system should be inspected to determine if it is operating as designed and meets the minimum requirements as recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation: A Manual of Recommended Practice for Design (27th Edition).

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Section 2.0 Operation Description & Observations

Section 2.0 Operation Description & Observations

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

The building was initially constructed in 1958. It was renovated in 2000. The exterior is brick. Interior walls are concrete block or drywall. There are concrete floors and some carpeted areas.

There is a central heating, ventilating, and air conditioning (HVAC) system. There are two air-handling units (AHU) present on the roof. These were not accessible for inspection. There is a gas-fired boiler present. Air-conditioning was on during this survey. In addition, many windows and doors were open. Outdoor conditions on the day of survey were cloudy and rain.

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

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

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

Section 3.0 Noise Survey

Section 3.0 Noise Survey

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

Section 4.0 Lead Testing

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Section 4.0 Lead Testing			1
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At the time of the assessment, no activities were observed which would generate lead exposure. The facility contains a gym 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 collulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Sample #	Location	Air ug/m ³	Surface ; ug/ft ²	Paint Chip %Pb
1	Drill Itall	<3.4		I
2	CPT Perez's Office	<3.6		
3	Drill Hall Floor (Center)		<110	
4	Drill Hall - Food Serving Counter		<110	
5	Drill Hall Metal Tabletop		<110	
6	Kitchen - Metal Countertop		<110	I
7	Room 148 Top of Locker		<i 10<="" td=""><td></td></i>	
8	Floor Outside Room 145		<110	
9	Attached Garage Top of Red Toolbox		<110	
10	Room 117 - Supply Vent		<110	
11 1	Room 116 – Top of Computer Desk		<110	
12	Room 112 - Top of Filing Cabinet		<110	
13	Admin. Center - Top of Desk		<110	
[4	Gym, Converted Firing Range Floor		<][0	
15	Gym, Converted Firing Range – Supply Vent		<110	_
l6	Gym. Converted Firing Range		<110	-!
17	Floor Outside Gym, Converted Firing Range		<110	
	Club House – Top of Bar		<110	
19	Second Floor Center Desk Area – Top of Metal Table		<110	
20	Second Floor Center Desk Area - Window Sill		<110	
21	Blank		<12 (ug)	
22	Blank	<3 (ug)		
riteria		50	200	0.5

Lead Testing Results Summary

Critteria

Key: Bolded results exceed listed criteria

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/m³. In fact, no detectable level of lead was identified in the air samples collected.

Deteriorated paint was observed on ductwork in the Drill Hall and Room 148. Peeling and damaged paint should be repaired and properly remediated.

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Section 5.0 Lighting

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Section 5.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 4001. Precision Light Meter (Serial No. K070003). The light meter was last calibrated on November 26, 2009. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Location	Foot Candles	Recommended Lighting	Sufficient
Drill Hall	22,4	30-50	No
Kitchen	70,1	50	Yes
Room 143	66.6	30-50	Yes
Room 148	28.2	30-50	No
Room 118	82.2	30-50	Yes
Room 116	141.6	30-50	Yes
Room 112	126.0	30-50	Yes
Room 102	87.7	30-50	Yes
Room 103	148.8	30-50	Yes
Room 207	8 0.1	30-50	Yes
Second Floor Desk Area	70.4	30-50	Yes
Basement Gym	85.2	30	Yes
B04 Locker Room	41.3	7	Yes
Club House	88.8	30-50	Yes
Attached Garage	31.2	75	No

Light Survey Assessment Summary

Lighting levels met the minimum recommended guidelines in all but the following areas: 1) Drill Hall 2) Room 148-3) Attached Garage. Lighting should be improved in these areas.

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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 69.6 to 78.2 degrees F with relative humidity readings ranging from 44.1% to 89.7%. During the survey, carbon dioxide (CO₂) levels ranged from 344 ppm to 601 ppm within the facility compared to an outdoor CO₂ level of 320 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO₂ recommended is 1,020 ppm (320 ppm -700 ppm). Carbon monoxide (CO) ranged from 0.0 - 0.1 ppm.

The following table summarizes the measurements collected.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	77.2	87.6	318	0.1
Drill Hall	77.4	85.4	344	0.0
Kitchen	78.2	84.5	363	0.0
Room 143	76.9	50,1	593	0.0
Room 148	72.8	55.7	375	0.0
Room 118	75.4	72.0	601	0.1
Room 116	75.3	73.4	408	0.0
Room 112	74.6	61.2	385	0.0
Room 102	71.9	44.1	492	0.1
Room 103	69.6	44.2	441	0.0
Room 207	69.7	67.0	433	0.0
Second Floor Desk Area	70.0	72.2	366	0.0
Basement Gym	72.3	89.1	388	0.0
B04 - Locker Room	73,6	89.6	464	0.0
Club House	74.6	73.4	408	0.0
Attached Garage	77.7	89.7	486	0.0

IAQ Assessment Summary

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	76.3	91.1	321	0.0
Criteria	73.0-79.0	30-60	<1,020	<9.0

Key: Bolded results exceed listed criteria

Relative humidity exceeded the recommended ceiling of 60% in most locations. There is central air conditioning system in the building however, many windows and doors were open at the time of this survey. Outdoor conditions were raining and windy. 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 1,020 ppm. This suggests that outdoor air ventilation is adequate in this area. There is a mechanical ventilation system for this facility which provides outdoor air ventilation.

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. Carpeting is old and stained throughout the facility.
- 2. Water was observed running down the wall in the Drill Hall due to rain. Paint is peeling and chipping.
- 3. In the Clubhouse water was running under the door from a nearby stairwell. Carpeting near the door was wet.
- 4. In Room B04 a small amount of suspected fungal growth was observed on the ductwork.
- 5. Water damaged ceilings and active roof leaks are present.
- 6. Supply vents have condensation present. Possible fungal growth was observed on the supply and return vents. Do not permit dirt, debris, microbial growth, etc. to accumulate in any portion of the HVAC system. Supply and return vents should be cleaned.

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

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

The only suspect ACM noted at the time of this survey was window glazing on the exterior windows of the Drill Hall.

Section 8.0 Maintenance Bay

Section 8.0 Maintenance Bay

There is a garage area at this facility. It is sometimes used for maintenance of vehicles. No maintenance work was being performed on the day of this survey.

A Local Exhaust Ventilation (LEV) system is present to remove vehicle exhaust from the building. The LEV system contains two drops or exhausts. The LEV in each bay consists of a flex duct with an area of 7.5° x 3.5° . The following flow rates were measured:

- 1. Bay 1 133 CFM
- 2. Bay 2 144 CFM

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

Section 9.0 Limitations

Section 9.0 Limitations

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

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

Appendix A Laboratory Analysis Report

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1103042	1010634-1	Flame	ÂŤ	879	VN	3.4	'm'	8	N/X	"m'an		
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1103044	1010634-3	Flame	Wipe	***	0.108	110	"₩¢	212	<110	ng/Br		
1103045	1010634-4	Flame	Wipe	****	0.108	<u>110</u>	₂Ú∕ân	S 12	41 I/0	n C/R ²		
1103046	1010634-5	Flame	Wipe	****	0.108	110	'ff'gu	Ŷ	4110	ug/fi ²		
1103047	1010534-6	Flattee	whe	****	0.108	110	n8/N2	≤12	4110	'tB/BR		
1103048	1010634-7	Piame	Wipe	***	0.108	110	ug/fla	€	<110	ug/fitz		
1103049	1010634-8	Figne	Mipe	****	0.108	011	-U/Sn	42	4110	ng/A ²		
1103050	1010634-9	Flame	Wipe	****	0.108 0.108	010	48/ft2	412	010	115/112 (112		
103052	1010634-10 1010634-11	Pisme Fiame	Wine		0.108	811	10/05.	7		-II/Bin		
1103053	1010634-12	Flame	Wipe	****	0,108	110	ug/A?	å	<110 0115	rg/ft2		
1103054	1010634-13	Fiame	Wipe	****	0.108	011	ug/ft²	<12	Ø17	-Al/Bu		
1102055	1010534-14	Flame	Wipe	****	807.0	110	ng/ 11 2	42	<[1]0	ug/Ua		
1103056	1010634-15	Flame	Wipe	***	0.108	110	"H/Bu	<u>~1</u> 2	⊲110	ug/h2		
1103057	1010634-16	Hante	Wipe	\$2.54	0.108	110	ug/th ²	<u>^12</u>	0112	ug/R ²		
1103058	1010634-17	Flante	Wipe	****	0.108	110	ug/fi ²	≤12	<110	-til/Bu		
1103059	1010634-18	Flame	Wipe	李帝和李	0.168	Ú11	ag/tile	412	<110	≈∭2n		
1103060	1010634-19	Mante	Wipe	***	0.103	011	ug/ff2	<12	<110	ag/fit-		

Posted to NGB FOIA Reading Room May, 2018

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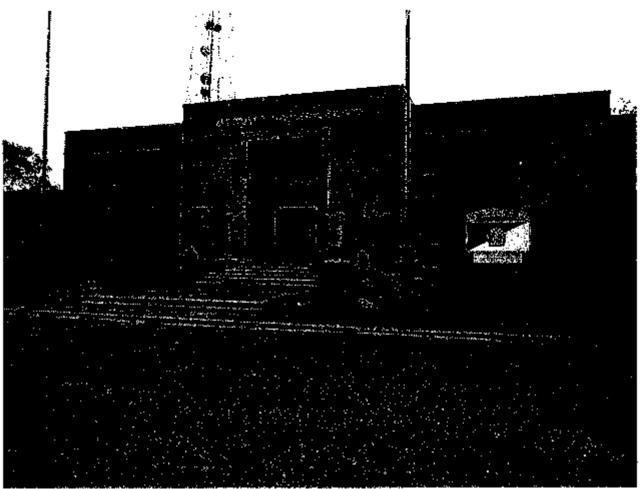
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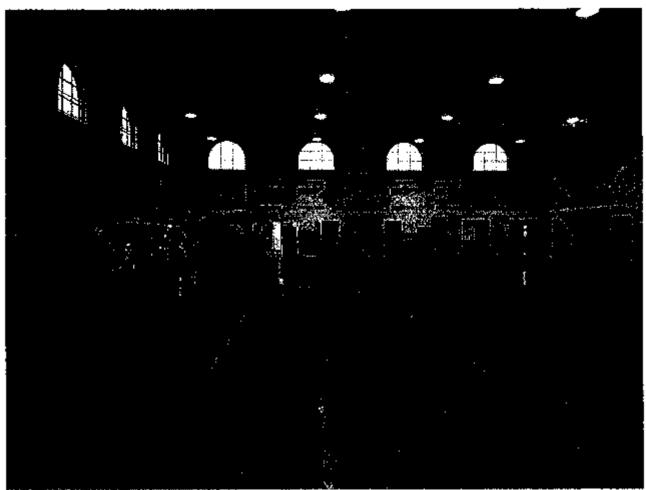
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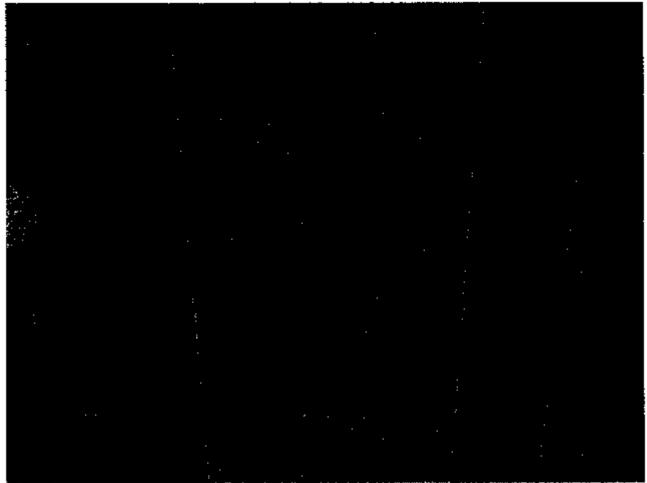
Appendix B Photographs



Annapolis MD Exterior of Building



Annapolis MD Drill Hall



Annapolis MD Drill Hall - Chipping/Peeling Paint on Ductwork



Annapolis MD Room 148 – Chipping/Peeling Paint on Ductwork

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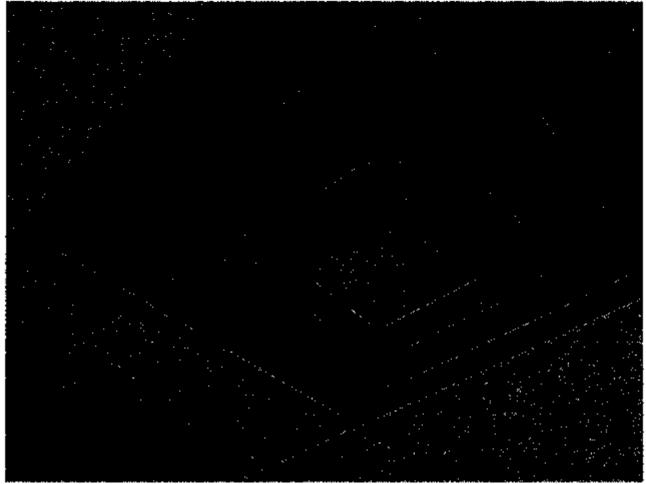
Annapolis MD Attached Garage



Annapolis MD Attached Garage – Exhaust Duct



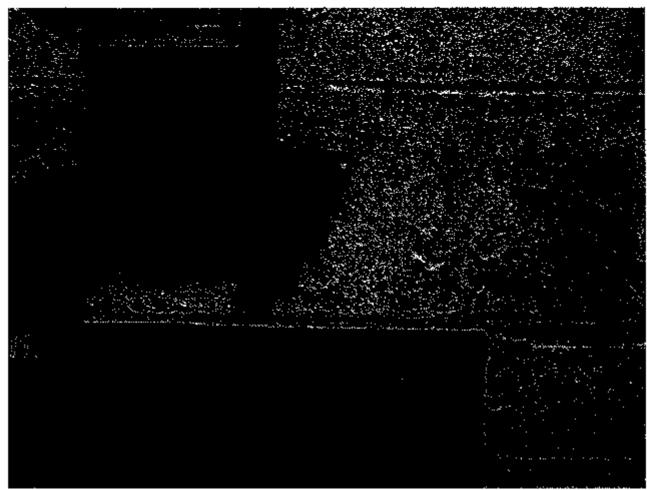
Annapolis MD Newer Part of Building - Hallway - Dirty Return Grill



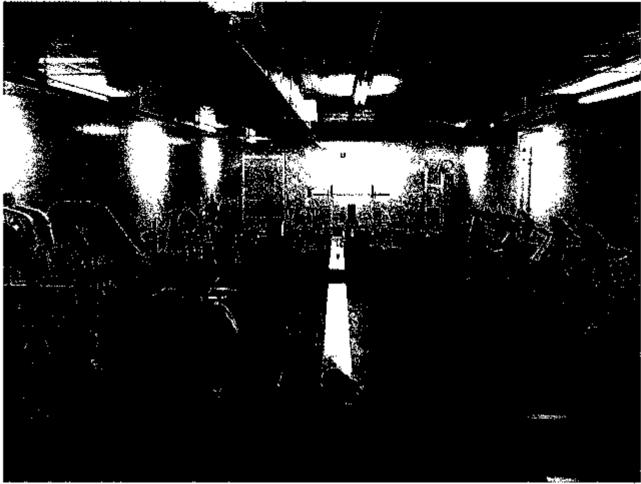
Annapolis MD Room 112 Condensation on Supply Vent



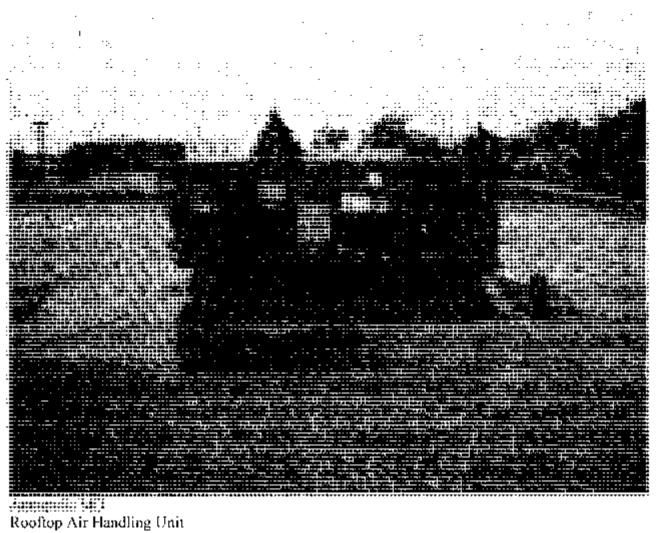
Annapolis MD Room 112 -- Stained and Currently Wet Ceiling Tile

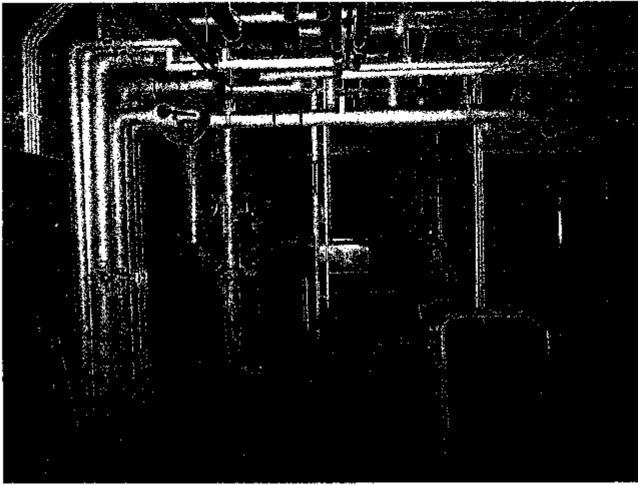


Annapolis MD Drill Hall – Current Water Infiltration through Cement Block Wall, Chipping/Peeling Paint and Efflorescence



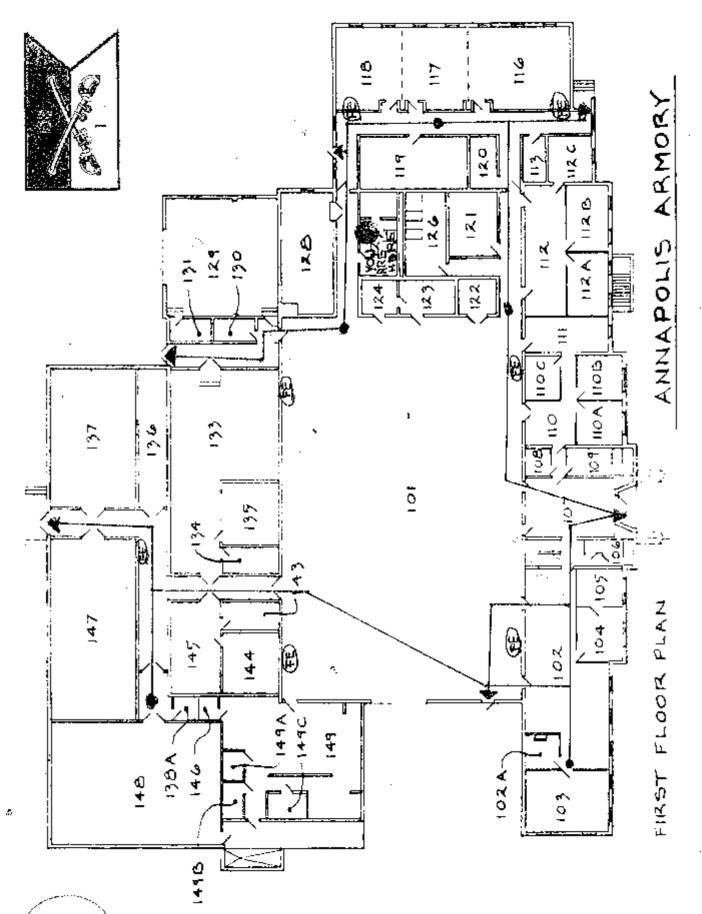
Annapolis MD Gym – Converted Firing Range





Annapolis MD Boiler Room

Appendix C Floor Plan



to NGB FOIA Reading Room

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Appendix D References

Appendix D. References

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

- 2. American Conference of Governmental Industrial Hygienists (ACGII) Threshold Limit Values and Biological Exposure Indices, 2010 Edition
- Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition
- 4. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007
- 5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI
- 6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANS1
- National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.
- Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227(b)(3)]
- 9. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)
- 10. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation

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

Industrial Hygiene Survey Report

National Guard Facility Annapolis Readiness Center

Prepared For:	National Guard Bureau Region North IH 301-IH Old Bay Lane Havre de Grace, MD 21078
Survey Location:	Annapolis Readiness Center
	18 Willow Street
	Annapolis, MD 21401
Prepared By:	Compliance Management International, Inc.
	1215 Manor Drive
	Suite 205
	Mechanicsburg, PA 17055
Survey Date:	June 20, 2013
Report Date:	July 30, 2013



Manager, Industrial Hygiene Services

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on June 20, 2013, at the Annapolis Readiness Center located 18 Willow Street, Annapolis, MD 21401. The survey was performed by Non-Responsive

- 1. Lead surface, bulk, and air samples were collected. All sample results were less than regulatory standards and/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 tested. See Section 4.0 for detailed findings.
- 3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.
 - a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in two areas sampled.
 - b. The relative humidity level was above the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in one occupied area sampled.
 - c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 parts per million (ppm).
 - d. Carbon dioxide (CO_2) levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings.

See Section 5.0 for detailed sampling results.

- 4. Water-damaged walls were observed in the Drill Hall and Gym. See Section 5.0 for detailed findings.
- 5. The ground beneath the 2001 addition to the building is subsiding causing structural damage. See Section 5.0 for detailed sampling results.
- 6. No suspect asbestos containing material (ACM) was observed. See Section 6.0 for detailed sampling results.
- 7. This facility has a vehicle maintenance shop with an overhead vehicle exhaust system. See Section 7.0 for detailed sampling results.

Section 2.0 Operation Description & Observations

The Annapolis Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, attached vehicle maintenance shop and a converted firing range area (currently a Distance Learning Center). There were approximately 10 full-time employees stationed at this facility at the time of this survey.

The building is reported to have been built in 1959. It is a two-story structure with a basement. The exterior is brick and block. The interior walls are brick, block, plaster, and paneling with drywall in some of the offices. The floors are concrete, 12"x12" floor tiles and ceramic tile.

The heating system consists of a gas-fired steam generating unit. There is a roof-mounted central air-conditioning system.

There is no child-care facility in the building.

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

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

This facility has an attached 2-bay vehicle maintenance shop with an over head vehicle exhaust system. The overhead vehicle exhaust system has two connection points, both functional. The only PPE observed were gloves.

The ground beneath the 2001 addition is subsiding causing structural damage to the building walls and floor. It was reported that a local contractor is involved with corrective action.

Chipped and peeling paint was observed in the Drill Hall and Gym. Both areas were sampled for lead content.

Housekeeping seemed adequate.

No suspect asbestos containing material (ACM) was observed.

Section 3.0 Lead Testing

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

Sample #	Location	Bulk (%)	Air ug/m ³	Surface ug/ft ²
1	Drill Hall	*	<5.1	*
2	Office 102	*	<5	*
3	Blank	*	<3 ug	*
4	Blank	*	*	<12 ug
5	Drill Hall Floor Center	*	*	<110
6	Drill Hall Wall Shelf	*	*	<110
7	Kitchen Microwave Top	*	*	<110
8	Kitchen Ice Machine Top	*	*	<110
9	CFR Floor	*	*	130
10	CFR Floor outside Entrance	*	*	<110
11	CFR Locker Top	*	*	<110
12	CFR Duct Top	*	*	<110
13	NCO Club Frig Top	*	*	<110
14	Office 110 Cabinet Top	*	*	<110
15	Office 207 Window Sill	*	*	<110
16	2 nd Floor Cabinet Top	*	*	<110
17	Office 104 Bookshelf Top	*	*	<110
18	Office 102 File Cabinet Top	*	*	<110
19	Drill Hall Wall Paint Door 111	0.097	*	*
20	Gym Wall Paint	0.0072	*	*
-	Criteria	0.5	50	200

Lead Testing Results Summary

Table Notes:

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

Sources:

1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges

2. OSHA 29CFR1910.1025 Lead Standard

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 "Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft² on floors and 250 ug/ft² on windowsills should be observed. There is no child care provided at this facility.

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

- Surface levels of lead were less than the recommended guideline of <200 ug/ft² in all locations sampled.
- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m³).
- Two paint chip samples were collected. One from the Drill Hall wall above door to Office 111 where there is approximately 40 square feet of peeling paint. Another sample was collected from the Gym wall where there is approximately 30 square feet of damage. Both areas seem to be the result of water intrusion. These sample results was less than the EPA/U.S. Department of Housing and Urban Development (HUD) 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 in this facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98011EL). The light meter was last calibrated in November 2012. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Light Survey Assessment Summary									
Location	Foot Candles	Recommended	Sufficient						
	(FC)	Lighting (FC)	Lighting						
158 th Corridor	36.2	5	Yes						
Women's Latrine	21.9	5	Yes						
Lobby	32.2	10	Yes						
Recruiting Office	67.0	30-50	Yes						
Office 102	51.1	30-50	Yes						
Office 104	76.5	30-50	Yes						
Office 103A	78.5	30-50	Yes						
Office 103B	61.0	30-50	Yes						
Men's Latrine 106	34.7	5	Yes						
Office 200	31.9	30-50	Yes						
Conference 207 (meeting)	54.4	30	Yes						
Drill Hall	30.0	10	Yes						
Boiler Room 128	32.7	30	Yes						
Boiler Room Corridor	27.0	5	Yes						
Men's Latrine	41.1	5	Yes						
Maintenance Corridor	18.4	5	Yes						
Bulk Storage 133	23.5	10	Yes						
Storage Corridor	34.1	5	Yes						
Locker Room	18.2	7	Yes						
Latrine 138A	32.3	5	Yes						
Bulk Storage	19.3	10	Yes						
Kitchen (prep)	66.0	50	Yes						
Kitchen Office 149A	38.6	30-50	Yes						
Office 119	37.3	30-50	Yes						
Classroom 1	53.5	30-50	Yes						
Comm. Room (not repair)	36.6	30-50	Yes						
Office 112	33.2	30-50	Yes						
Office 112A	55.7	30-50	Yes						
Office 112C	63.3	30-50	Yes						
Office 202	55.1	30-50	Yes						

Light Survey Assessment Summary

Table Notes:

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

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

The lighting levels met the minimum recommended guideline in all areas measured.

Section 5.0 Indoor Air Quality

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

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

The following table summarizes the measurements collected.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	77.5	55.5	365	0.0
Office 102	77.8	57.4	640	0.6
Office 104	77.9	59.1	493	0.2
Office 205	74.9	50.8	455	0.4
NCO Club	74.4	60.5	507	0.0
Criteria	68-79	30-60	<1,065	<9

IAQ Assessment Summary

Table Notes:

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

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

Summary of findings and recommendations:

- Temperature measurements met the recommended 68-79°F in all occupied areas.
- Relative humidity levels were above the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 177 recommended guideline of 30-60% in one location. Relative humidity should be kept within the recommended guideline.
- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,065 ppm (700 ppm + 365 ppm). This is an indication that outdoor air ventilation is adequate.
- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide
- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. The following observation were noted:
 - 1. Water-damaged walls were observed in the Drill Hall and Gym. This is apparently due to water intrusion from roof leaks above the Drill Hall and below-grade water intrusion in the Gym. Sources should be identified and corrected to ensure no further damage occurs.
 - 2. Structural damage (cracks in walls and floor) has occurred in the 2001 addition. This may provide pathways for air and water intrusion which could affect indoor air quality. A structural engineer or other qualified professional should be retained to identify and provide recommendations for corrective action.

Section 6.0 Suspect Asbestos Containing Building Materials (ACM)

No suspect ACM was noted at the time of this survey.

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

Section 7.0 Ventilation Survey

This facility has a 2 bay attached vehicle maintenance shop with an over head vehicle exhaust system. The overhead vehicle exhaust system has two connection points, both were functional. The maintenance shop was reportedly only used occasionally during the winter months for minor vehicle maintenance such as oil changes. The only PPE observed were gloves.

Measurements were conducted at the face of the exhaust using a Velocicalc Plus Model 9555-P. Measurements were compared to the ACGIH Industrial Ventilation Manual requirements for above floor exhaust systems. The table below details measurement findings.

Location	Location Type of Hood		Measured Flow Rate (CFM)
Exhaust Left	Above Floor	6.0" x 3.5"	131
Exhaust Right	Above Floor	6.0" x 3.5"	125

ABOVE FLOOR EXHAUST VENTILATION RATE SUMMARY

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

Vehicle Nomenclature	Tailpipe Temp. (°F)	Engine Displacement (ft3)	Engine RPM*	Exhaust Flow † (CFM)
M35A2, 2.5 Ton Cargo Truck	300	0.277	2,500	1,192
M1008 CUCV, SUV	267	0.219	3,800	1,370
M923A2, 5 Ton Cargo Truck	300	0.293	1,700	857
M996 HMMWV, All Terrain Vehicle	297	0.219	3,300	1,239

EXAMPLES OF VEHICLE LEV SYSTEM REQUIREMENTS

* Revolutions per Minute

† Includes 20% Safety Factor

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

Section 8.0 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	98082EL	4/2013	NA
Velocicalc Plus	841015	8/12	N/A
SKC Air Sampling Pump	647631	6/17/13	2.47 LPM
SKC Air Sampling Pump	767971	6/17/13	2.48 LPM

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

Appendix A. Laboratory Analysis Report

AMA Analytical Services, Inc.

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CERTIFICATE OF ANALYSIS



Attention:

A Specialized Environmental Laboratory

LAB#100470 National Guard Bureau Job Name: ARNG 4a MD Chain Of Custody: 516192 Client: 301-IH Old Bay Lane, Attn: ARNG-CJG-P, Job Location: Annapolis Address: Date Submitted: 6/25/2013 State Military Reservation Havre de Grace, Maryland 21078 Job Number: Not Provided **Person Submitting:** W912K6-09-A-0003 P.O. Number: Date Analyzed: 7/1/2013 **Report Date:** 7/1/2013

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AIHA LAP, LLC **ACCREDITED LABORATORY**

INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISONEC 17025-2005 www.aihaaccreditediata.org

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)		porting Limit	Total ug	Final Res	ult	Comments
13073160	Г	Flame	Air	593	N/A	5.1	ug/m³	<3	<5.1	ug/m ³	
13073161	2	Flame	Air	595	N/A	5	ug/m³	<3	<5	ug/m³	
13073162	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13073163	4	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13073164	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073165	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073166	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073167	8	Flame	Wipe	****	0,108	110	ug/fl²	<12	<110	ug/ft²	
13073168	9	Flame	Wipe	****	0.108	110	ug/ft²	14	130	ug/ft ²	
13073169	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073170	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073171	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073172	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073173	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073174	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073175	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073176	17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073177	18	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073178	19	Flame	Paint Chip	****	N/A	0.01	%Pb		0.097	%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 Laboratorics, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AIHA, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

An AIHA (#100470) and XTEAVAR (#10220) Accredited Laboratory

May, 2018

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AMA Analytical Services, Inc. BEST AVAILABLE COPY A Specialized Environmental Laboratory CERTIFICATE OF ANALYSIS

Client:	National Guard Bureau	Job Name:	ARNG 4a MD	Chain Of Custody:	516192			
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	Job Location:	Annapolis	Date Submitted:	6/25/2013			
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	Non-Responsi	ve		
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	7/1/2013	Report Date:	7/1/2013	
Attention:	Non-Responsive							

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AIHA LAP, LLC ACCREDITED LABORATORY

NOUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISONEC 17025-2005 www.aihaaccreditedlabs.org LAB #100470

AMA Sample Number	Client Sample Number	Analysis Type	Analysis Type	Analysis Type	Analysis Type	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)		orting imit	Total ug	Final Res	ult	Comments
13073179	20	Flame	Paint Chip	****	N/A	0.0072	%Pb		0.011	%Pb					
Analysis Method Fo MA = Not Applicab %Pb = percent lead Note: All samples v	r Flame: Air, Wipes, or Furnace: Air, Wipe le mg/Kg = par I on a dry weight bas vere received in good ve two significant dig	es, Paints, and So Is per million (ppm is ug = microg I condition unless	il/Solids:EPA 6) on a dry weight rams ug/L: otherwise noted.	00/R-93/200(M)-7	010; Water: SM parts per million	1-3113B		Summary for and led with these S.	alytical result						
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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. 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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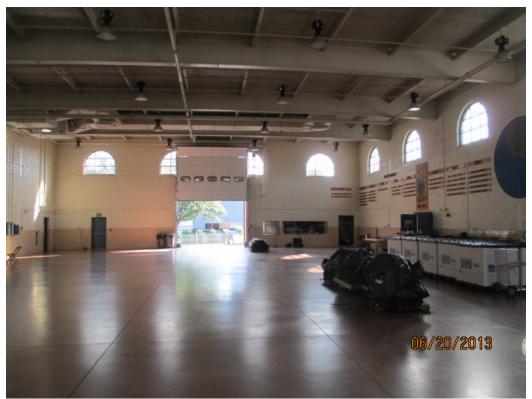
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Appendix B. Photographs

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Annapolis RC



Drill Hall Open Garage Door



Chipped Paint above Door 111 in Drill Hall



Chipped Paint on Gym Wall



Damaged Caulking on Front Steps



Vehicle Exhaust System



Structural Damage to Walls of New Addition



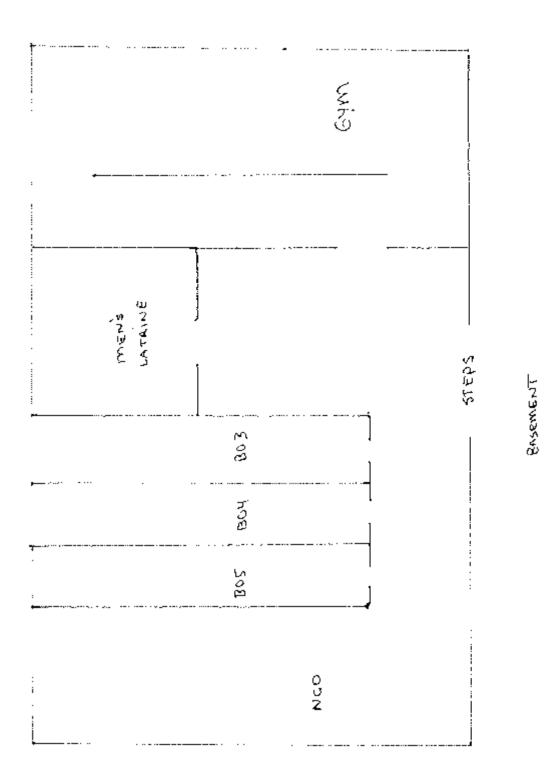
More Structural Damage to Walls of New Addition



Structural Damage to New Addition Floor

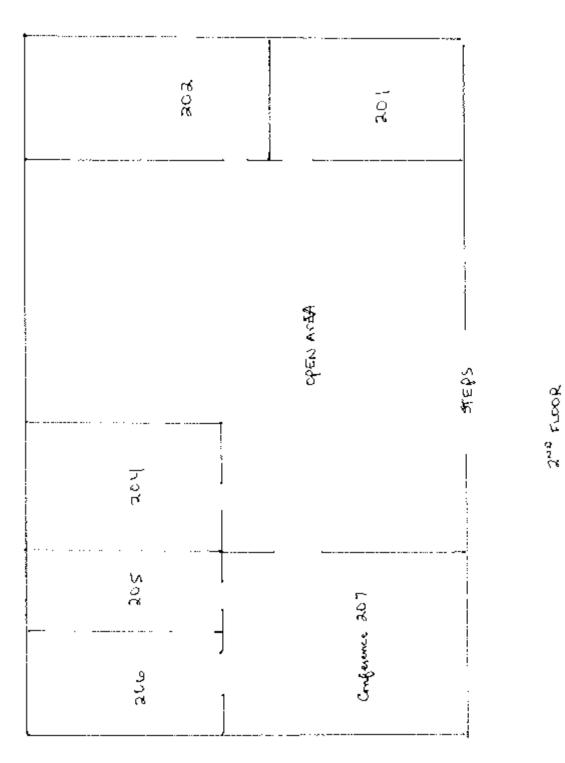
Appendix C. Floor Plan

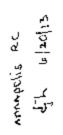
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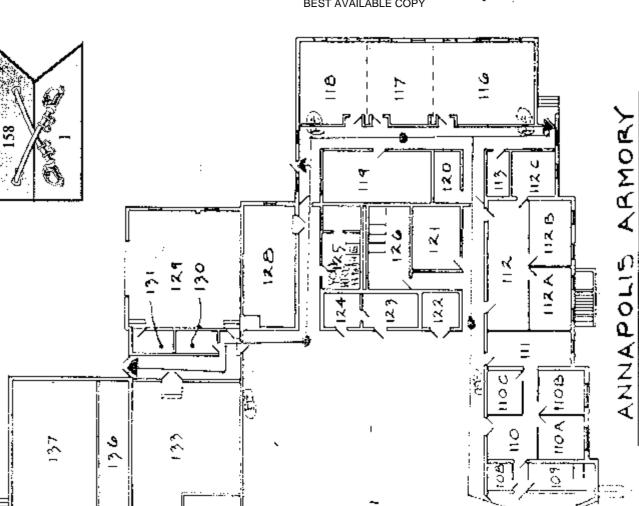
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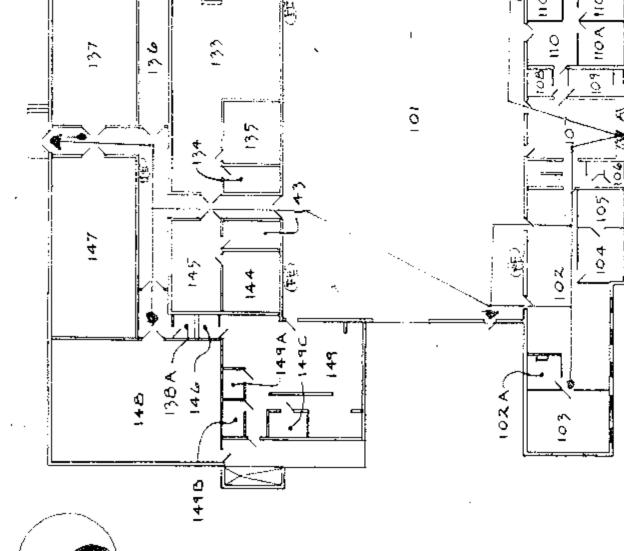
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to NGB FOIA Reading Room 018

FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1348 of 5269

FIRST FLOOR FLAN

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. Non-Responsive, Army National Guard Bureau, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, MG Boyd M Cook Armory, Cascade, MD, Project No. 55-ML-01ED-03/05

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

2. The project number for this service reflects the current fiscal year of dispatch and the actual field work which was completed for fiscal year 2003. The State of Maryland Army National Guard occupational health nurse was immediately notified in writing of findings necessitating immediate corrective action in Maryland armories. In addition, the National Guard Bureau Region North Industrial Hygiene Office has been notified of all the results of lead in dust sampling conducted in all facilities. Draft reports were reviewed by you or other members of the National Guard and members of this Center, including our editorial staff, during drafting stages in report preparation leading up to the final report.

3. Our point of contact is Ms. Non-Responsive at commercial 410-436-5475/3118, DSN 584-5475/3118, or electronic mail: Non-Responsive Qus.army.mil

FOR THE COMMANDER:

Encl

Non-Responsive

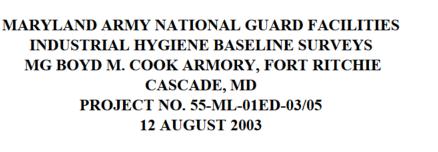
Director, Occupational Health Sciences

Readiness thru Health



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







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May, 2018

Posted to NGB FOIA Reading Room Readiness All Three Health Record #J-15-0085 (MD) Released by National Guard Bureau Page 1351 of 5269

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

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

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

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

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

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

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

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

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



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

MCHB-TS-OFS

EXECUTIVE SUMMARY MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS MG BOYD M. COOK ARMORY, CASCADE, MD PROJECT NO. 55-ML-01ED-03/05 12 AUGUST 2003

1. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard facilities to identify and measure the existence and extent of potentially hazardous operations or conditions. This survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee for the Defense Occupational and Environmental Health Readiness System.

2. CONCLUSIONS.

a. <u>Lead in Dust</u>. Levels of lead in dust that exceeded safe limits for children and adults were found in the armory. These levels may result in health hazards to employees and to children visiting the armory.

b. <u>Safety Hazards</u>. The leaking roof has caused damage to ceiling tiles. Employees are exposed to potential hazards from falling ceiling tiles or a collapsing ceiling, and to slip hazards from water on the floor.

c. <u>Mold Exposure</u>. Excessive moisture in the armory has caused mold growth. Mold exposure may cause illness in armory employees.

d. <u>Ventilation</u>. The exhaust fans were not working in the latrines and the locker rooms, and some exhaust fans may have never been installed. The ventilation may cause indoor air quality complaints.

3. RECOMMENDATIONS. The Department of Defense Instruction 6055.1 provides Risk Assessment Codes (RACs) for health hazards, a procedure which allows assessment of the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and

Readiness thru Health



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combines the hazard severity and accident probability into a single number. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

a. <u>Lead Exposure</u>. Health Hazard RAC 3 for adults. Health Hazard RAC 2 for children.

(1) Develop and implement a Lead Hazard Management Plan for the facility. Sample rooms adjacent to Indoor Firing Range (IFR) bullet trap area. Personnel working in the former IFR area were tracking lead out of the area and redistributing lead into adjacent rooms in the armory

(2) Restrict access to the former IFR (current storage room) by keeping it locked, until the facility can be cleaned. Post a sign warning against use of this room for storage or entry except in an emergency.

(3) If access to the storage room is not restricted, wear disposable gloves and coveralls as extra protection when working in areas identified as having elevated levels of lead.

(4) Discontinue advertising this facility for use by young children. Address all potential lead hazards before continuing to extend use of this facility to children. Clean the floor (s) in areas used by children to the Environmental Protection Agency lead in dust standards for young children, and clean other horizontal surfaces in areas used by children to the National Guard Bureau (NGB) Region North and U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) decontamination level for lead in dust on frequently contacted surfaces. Clean the administrative area horizontal surfaces that have elevated lead levels to the NGB Region North and USACHPPM recommended safe limit for floors and frequently contacted surfaces. See Appendix E for Lead cleaning guidance.

(5) Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements.

b. <u>Safety Hazards</u>. Safety Hazard RAC 3. Repair the roof leak and replace damaged ceiling tiles. The leaks should be inspected and repaired by a professional roofing contractor.

c. <u>Mold Exposure</u>. Health Hazard RAC 4. Remove and replace ceiling tiles with mold growth. Abate all areas of visible mold. For additional guidance on moisture control and mold remediation in the armory refer to USACHPPM TG 278, Industrial Hygiene/Preventive Medicine Mold Assessment Guides, and USACHPPM TG 277, Army Facilities Management Information Document on Mold Remediation Issues in Appendix F.

ES-2

EXSUM, MDARNG Facilities IH Baseline Surveys, MG Boyd M. Cook Armory, Cascade, MD, Project No. 55-ML-01ED-03/05

d. <u>Ventilation</u>. Health Hazard RAC 4. Investigate operating problems with air handling systems. Consider resurveying indoor air conditions in hot weather with system fully operational.

MDARNG Facilities IH Baseline Surveys MG Boyd M. Cook Armory, Cascade, MD, Project No. 55-ML-01ED-03/05

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

MCHB-TS-OFS

MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS MG BOYD M. COOK ARMORY CASCADE, MD PROJECT NO. 55-ML-01ED-03/05 12 AUGUST 2003

1. REFERENCES. See Appendix A.

2. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard facilities to identify and measure the existence and extent of potentially hazardous operations or conditions. This survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee for the Defense Occupational and Environmental Health Readiness System.

3. AUTHORITY. Fax, National Guard Bureau (NGB) Region North Industrial Hygiene Office (NGB-AVS-SI-IH/Ms. Non-Responsive), 28 February 2003, subject: SAB.

4. BACKGROUND INFORMATION.

a. <u>Armory Mission and Units</u>. The armory mission is long range surveillance. The resident units include the Detachment 1, Company B, 129th Signal Battalion; Detachment 1, Company B, 1st Battalion, 115th Infantry Regiment; Company E, 629th Military Intelligence Battalion; and 129th Infantry Detachment.

b. <u>Date of Construction</u>. The date of construction of the building is 1994.

c. <u>Armory Use by Children</u>. The points of contact (POCs) stated that children occupy the armory during family support group activities, including Christmas dinners. The Maryland Military Department is currently advertising MG Boyd M. Cook Armory as available for rental for activities that include young children.

d. <u>POCs</u>. SFC Non-Responsive and SFC MG Boyd M. Cook Armory, 13817 Ritchie Road, Cascade, MD 21719.

Readiness thru Health



MDARNG Facilities IH Baseline Surveys, MG Boyd M. Cook Armory, Cascade, MD, Project No. 55-ML-01ED-03/05

5. PHOTOGRAPHS. See Appendix B.

6. FACILITY EVALUATION.

a. <u>Sampling Locations and Results</u>. Samples were collected for lead on surfaces, (wipe samples), to determine the presence of lead hazards. Lead sample results and locations are shown in Appendix C.

b. <u>Paint</u>. A POC stated that there was no lead-based paint in the facility. The age of the buildings indicated that the presence of lead-based paint was unlikely.

c. <u>Asbestos</u>. A POC stated that there was no asbestos in the facility. The age of the building indicated that the use of asbestos-containing building material was unlikely.

d. <u>Building Physical Condition</u>. There was structural damage on the wall in Room 111 due to the building settling. SFC Agnew said that building engineers and facility managers had evaluated the facility and stated that the building was still settling and this damage did not pose a safety hazard. The armory roof was flat, and a POC reported that it leaked when it rained. At the time of the survey there was leaking water around all the roof drains.

e. <u>Safety Hazards</u>. The facility was aging and the roof had leaked for several years.

f. <u>Mold and Moisture Problems</u> (Photographs 1488 and 1493, Appendix B). There was mold growth on ceiling tiles due to a leaking roof. There were also water damaged ceiling tiles in the office area and hallway near Room 110.

g. <u>Indoor Firing Range</u>. The indoor firing range (IFR) had been converted to a parachute storage room. Lead contamination was reported to have been abated.

h. <u>Safety and Occupational Health Programs</u>. There were no safety or occupational health program documents available in the armory.

i. <u>Heating, Ventilation, and Air-Conditioning Systems</u>. There was central heating and airconditioning. The building was heated with steam heat. At the time of the survey the air conditioning was not working. The exhaust fans in the male and female latrines and the locker rooms were not working. Ventilation measurements were not in the scope of the survey.

j. <u>Indoor Firing Range</u>. The IFR had been closed, all lead abated, and cleaned.

MDARNG Facilities IH Baseline Surveys, MG Boyd M. Cook Armory, Cascade, MD, Project No. 55-ML-01ED-03/05

k. <u>Noise Dosimetry</u>. No operations with the potential to generate hazardous noise levels were identified.

1. Lighting. All areas were visually judged to be adequately lit.

7. ASSESSMENT CRITERIA FOR LEAD. See Appendix D for details.

a. <u>Lead in Air</u>. The Army complies with the Occupational Safety and Health Administration 8-hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter (μ g/m³) of air.

b. <u>Lead in Dust</u>. The Environmental Protection Agency (EPA) and State of Maryland limits for lead in dust are 40 micrograms per square foot $(\mu g/ft^2)$ on floors, 250 $\mu g/ft^2$ on window sills, and 400 $\mu g/ft^2$ in window troughs. These limits apply to pre-1978 Army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The NGB Region North concurs with the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended safe limit of 200 $\mu g/ft^2$ on floors and frequently contacted surfaces, which is more stringent for window sills than the EPA/State standards.

c. <u>Lead in Paint</u>. Paint containing lead levels of 0.5 percent or more by weight in dried solid (also reported as 5000 milligrams per kilogram) is considered to be lead-based paint according to regulations. Paint containing lead levels of more than 0.7 milligrams per square centimeter is considered to be lead-based paint according to Maryland State Regulations. In Army Regulation 420-70, Buildings and Structures, lead-contaminated paint is defined as any paint containing detectable amounts of lead. The Army considers lead-contaminated paint to be potentially hazardous to children if it is disturbed or deteriorating.

d. <u>Lead Carcinogenicity</u>. The Department of Health and Human Services National Toxicology Program (NTP) released the Report on Carcinogens, Eleventh Edition in February 2005. The NTP report lists "lead and lead compounds" as "reasonably anticipated to be human carcinogens".

8. SAMPLING RESULTS, DISCUSSION, AND CONCLUSIONS.

a. <u>Paint.</u> The paint was intact and in good condition.

b. <u>Lead in Dust</u>. Lead in dust sample locations and analytical results are shown in the report Table below. Levels of lead in dust that exceeded safe limits for children and adults were identified in the former IFR bullet trap. One lead in dust wipe sample result had extremely high levels of lead and exceeded the NGB Region North and USACHPPM recommended decontamination levels and the EPA lead exposure level for children, indicating that the IFR had MDARNG Facilities IH Baseline Surveys, MG Boyd M. Cook Armory, Cascade, MD, Project No. 55-ML-01ED-03/05

not been completely cleaned. Personnel in this room are potentially exposed to lead, and are tracking lead out of the area and redistributing lead into adjacent rooms in the armory. This can result in lead exposures for children visiting this facility and for the general workforce.

Wipe Sample #	Locations of Samples	Conc. (µg/ft²)
CDW01	Former IFR bullet trap area	2909
CDW02	Former IFR midway on floor near sleeping area	<23
CDW03	Floor near exit door to outside	<23
CDW04	Floor about one foot from entrance door to new tile floor	<23

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

9. RECOMMENDATIONS. The Department of Defense Instruction 6055.1 provides Risk Assessment Codes (RACs) for health hazards, a procedure which allows assessment of the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and combines the hazard severity and accident probability into a single number. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

a. Lead Exposure. Health Hazard RAC 3 for adults. Health Hazard RAC 2 for children.

(1) Develop and implement a Lead Hazard Management Plan for the facility. Sample areas adjacent to the IFR bullet trap area.

(2) Restrict access to the former IFR (current storage room) by keeping it locked, until the facility can be cleaned. Post a sign warning against use of this room for storage or entry except in an emergency.

(3) If access to the storage room is not restricted, wear disposable gloves and coveralls as extra protection when working in areas identified as having elevated levels of lead.

(4) Discontinue advertising this facility for use by young children. Address all potential lead hazards before continuing to extend use of this facility to children. Clean the floor (s) in areas used by children to the EPA lead in dust standards for young children, and clean other horizontal surfaces in areas used by children to the NGB Region North and USACHPPM decontamination level for lead in dust on frequently contacted surfaces. Clean the administrative area horizontal surfaces that have elevated lead levels to the NGB Region North and

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MDARNG Facilities IH Baseline Surveys, MG Boyd M. Cook Armory, Cascade, MD, Project No. 55-ML-01ED-03/05

USACHPPM recommended safe limit for floors and frequently contacted surfaces. See Appendix E for Lead cleaning guidance.

(5) Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements.

b. <u>Safety Hazards</u>. Safety Hazard RAC 3. Repair the roof leak and replace damaged ceiling tiles. The leaks should be inspected and repaired by a professional roofing contractor.

c. <u>Mold Exposure</u>. Health Hazard RAC 4. Remove and replace ceiling tiles with mold growth. Abate all areas of visible mold. For additional guidance on moisture control and mold remediation in the armory refer to USACHPPM TG 278, Industrial Hygiene/Preventive Medicine Mold Assessment Guides, and USACHPPM TG 277, Army Facilities Management Information Document on Mold Remediation Issues in Appendix F.

d. <u>Ventilation</u>. Health Hazard RAC 4. Investigate operating problems with air handling systems. Consider resurveying indoor air conditions in hot weather with systems fully operational.

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 to: Non-Responsive Jus.army.mil



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

APPROVED:

spor

Technical Program Manager Industrial Hygiene Field Services Program

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APPENDIX A

REFERENCES

A-1

APPENDIX A

REFERENCES

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

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

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

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

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

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

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

8. Illuminating Engineering (February 1, 1993) RP-1-1993, American National Standard Practice for Office Lighting, ANSI/IES RP-1-1993.

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

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

11. U.S. Department of Housing and Urban Development (HUD), Technical Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing 1998. http://www.hud.gov/offices/lead/guidelines/hudguidelines/index.cfm MDARNG Facilities IH Baseline Surveys MG Boyd M. Cook Armory, Cascade, MD Project No. 55-ML-01ED-03/05

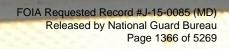
APPENDIX B

PHOTOGRAPHS

B-1

Photograph Number	Location					
1488	Mold growth on ceiling tile					
1489	Former IFR bullet trap/Lead in dust sampling/ high levels of lead					
1490	Former IFR midway on floor near sleeping area/ Lead in dust sampling					
1491	Exit door floor area/ Lead in dust sampling					
1492	Floor one foot from entrance door to new tile floor/ Lead in dust sampling					
1493	Dining area/ Mold on ceiling					
1494	Room 11 structural damage					
1495	Water damaged tiles in office area and hallway near Room 110					

MG Boyd M. Cook Armory, Cascade, MD Armory Photographs



See.



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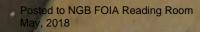
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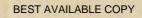
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APPENDIX C

SAMPLING SHEETS AND LAB ANALYSES

C-1

Lead Sample Results for Cascade

			Indoor Range Info						
Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (µg/ft²)	
			No			Yes			
CDW01	Cascade	Ft. Ritchie					Former IFR baffle	2909	
CDW02	Cascade	Ft. Ritchie					Former IFR midway on floor near sleeping area	<23	
CDW03	Cascade	Ft. Ritchie					Floor near Exit Door to outside	<23	
CDW04	Cascade	Ft. Ritchie					Floor about one foot from entrance door to new tile floor	<23	

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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 25, 2003

Laboratory Code: Subcontract Number: Laboratory Report: Project Description: RES NA RES 96610-1 None Given Cascade MD and Anapolis MD

Von-Responsive

Army National Guard IH - West 3401 Quebec Street, Suite 7200 Denver CO 80207

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association, Lab ID 101533 - Accreditation Certificate #480. The laboratory is currently proficient in both PAT & ELPAT programs respectively.

Reservoirs has analyzed the following sample(s) using Atomic Emission Spectroscopy - Inductively Coupled Plasma (AES-ICP) per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the analysis table. Results have been sent to your office.

RES 96610-1 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,

President

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RESERVOIRS ENVIRONMENTAL, INC.

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

TABLE ANALYSIS:

LEAD BY WIPE SAMPLING

RES Job Number:	RES 96610-1
Client:	Army National Guard IH - West
Client Project Number / P.O.:	None Given
Client Project Description:	Cascade MD and Anapolis MD
Date Samples Received:	August 19, 2003
Analysis Type:	USEPA SW846 3050B / AA(7420)
Turnaround:	3-5 Day
Date Samples Analyzed:	August 22, 2003

Client	Lab	Sample	LEAD	Detection	LEAD CONCENTRATION	
ID Number	ID Number	Area	(µg)	Limit		
		(sq.ft.)		(µg/sq.ft.)	(µg/sq.ft.)	
CDBLANK1	EM 806468	0.11	BDL	23	BDL	
CDW01	EM 806469	0.11	320.0	23	2909	
CDW02	EM 806470	0.11	BDL	23	BDL	
CDW03	EM 806471	0.11	BDL	23	BDL	
CDW04	EM 806472	0.11	BDL	23	BDL	
APBLANK1	EM 806473	0.11	BDL	23	BDL	
APW01	EM 806474	0.11	5.0	23	45	
APW02	EM 806475	0.11	17.0	23	155	
APW03	EM 806476	0.11	BDL	23	BDL	

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

BDL = Below Detection Limit

Data Qa =

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Reservoirs Environmental, Inc.

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

August 25, 2003

Laboratory Code: Subcontract Number: Laboratory Report: Project Description: RES NA RES 96610-1 None Given Cascade MD and Anapolis MD

Von-Responsive

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President

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APPENDIX D

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE

ASSESSMENT CRITERIA FOR LEAD

D-1

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

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

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

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

c. The OSHA cites a level of $200 \ \mu g/ft^2$ 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 μ g/ft² is a safe surface contamination level for adult exposures. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

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

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

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of $50 \mu g/m^3$ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

MDARNG Facilities IH Baseline Surveys MG Boyd M. Cook Armory, Cascade, MD Project No. 55-ML-01ED-03/05

APPENDIX E

LEAD CLEANING GUIDANCE

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

E-1

CHAPTER 14: CLEANING

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Step-by-Step Summary



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



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

I. Introduction

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

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

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

A. Performance Standard

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

B. Small Dust Particles

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

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

C. Difficulties in Cleaning

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

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

1. Low Clearance Standards

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

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

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

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



2. Worker Inexperience

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

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

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

4. Deadlines

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

II. Coordination of Cleaning Activities

A. Checklist

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

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

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

B. Equipment Needed for Cleaning

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



C. Waste Disposal

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

III. Cleaning Methods and Procedures

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

A. Containment

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

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

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

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

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

1. HEPA Vacuuming

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

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



Operating Instructions

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

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

Special Attachments

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

Selecting Appropriate Size(s)

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

Wet-Dry HEPA Vacuums

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

Prefilters

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

HEPA Vacuuming Procedures

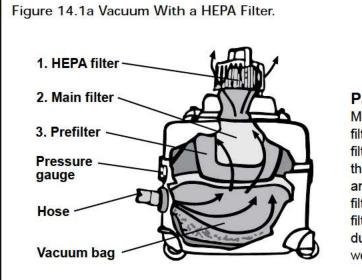
Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

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

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

Emptying the HEPA Vacuum

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



Parts of a HEPA-vacuum

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

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

2. Wet Detergent Wash

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

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

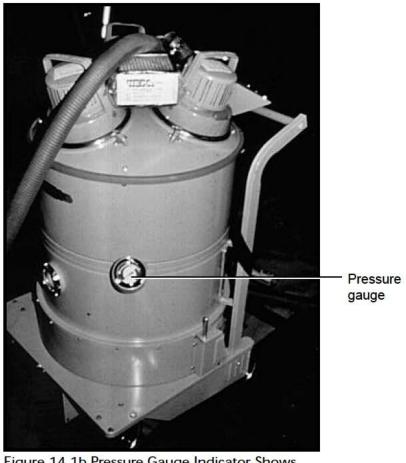
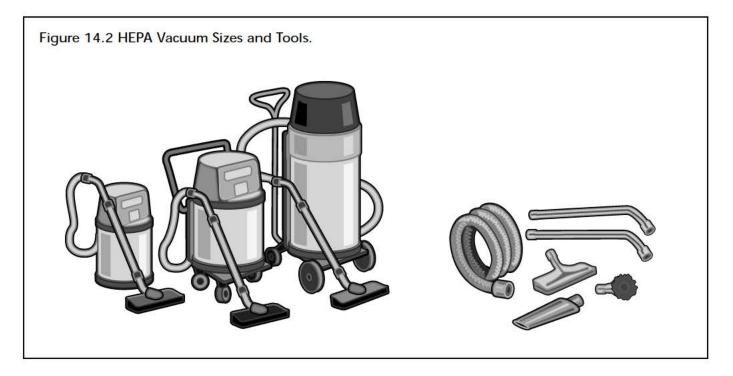


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.



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

Manufacturer's Dilution Instructions

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

Appropriate Cleaning Equipment

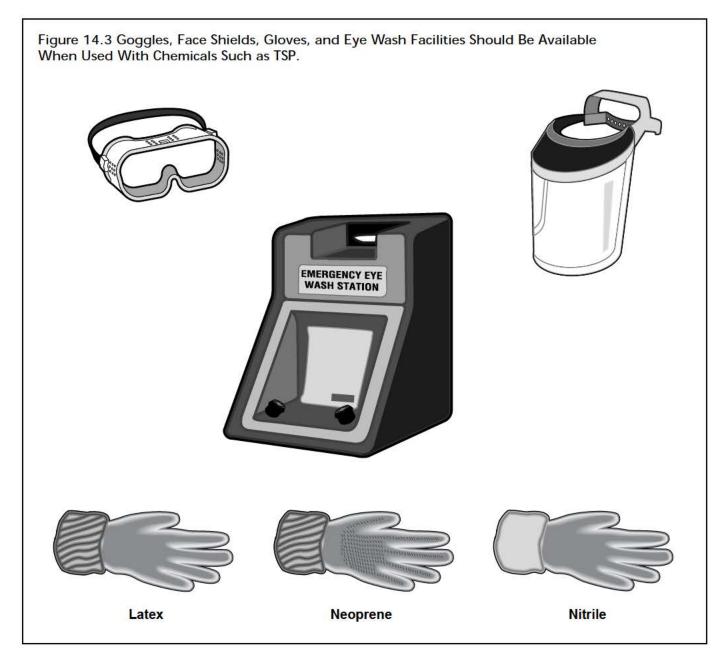
Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential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

Proper Wet-Cleaning Procedures

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

Changing Cleaning Mixture

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



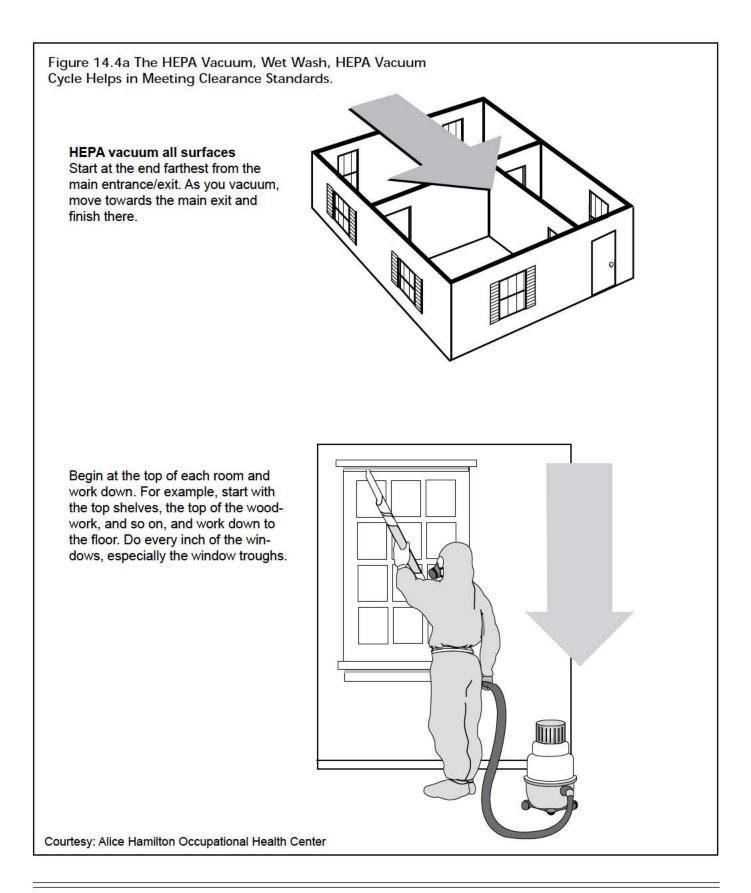
more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet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

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

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

✤ First, the area is HEPA vacuumed.



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Chapter 14: Cleaning

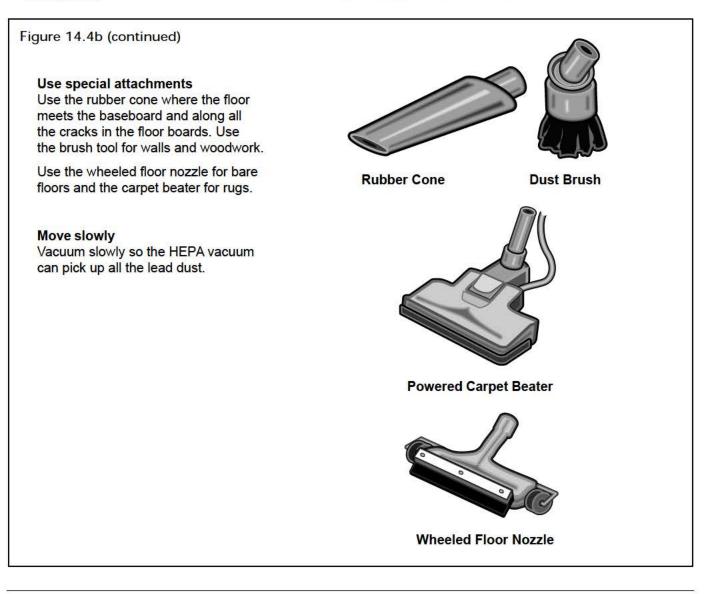
- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

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

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

Single-Pass Wet Wash/HEPA Vacuum

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



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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

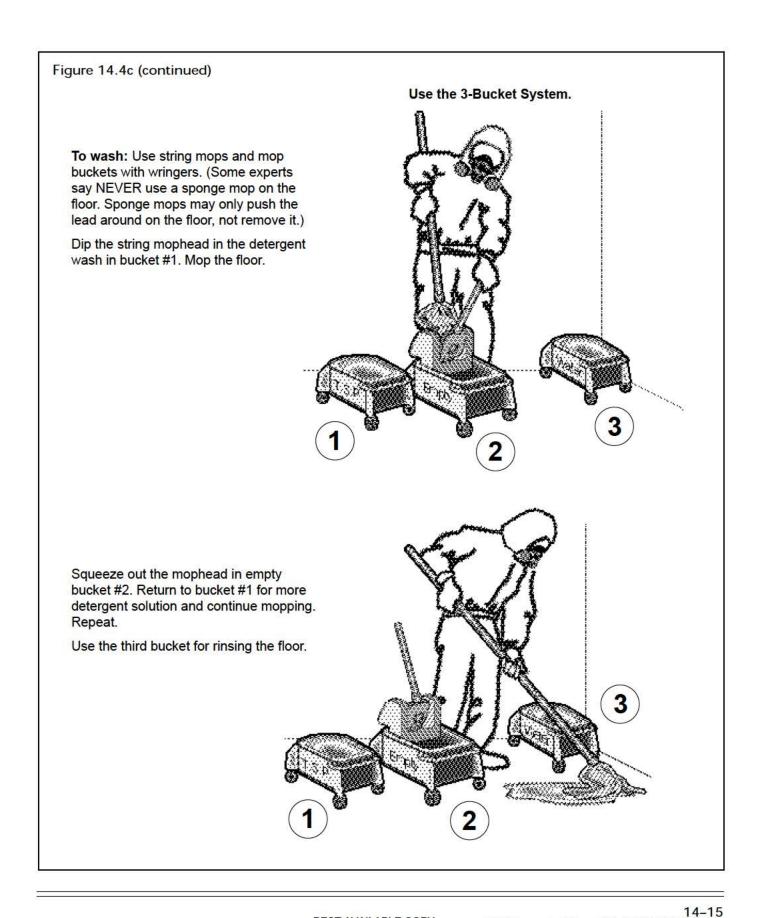


Wet Mop Floor



Don't Dry Sweep

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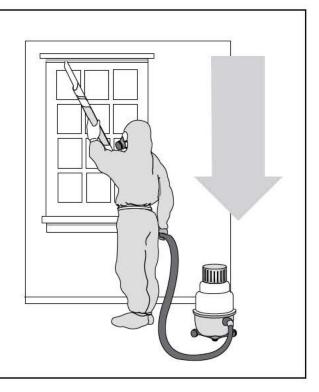


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Figure 14.4d (continued)

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

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



4. Sealing Floors

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

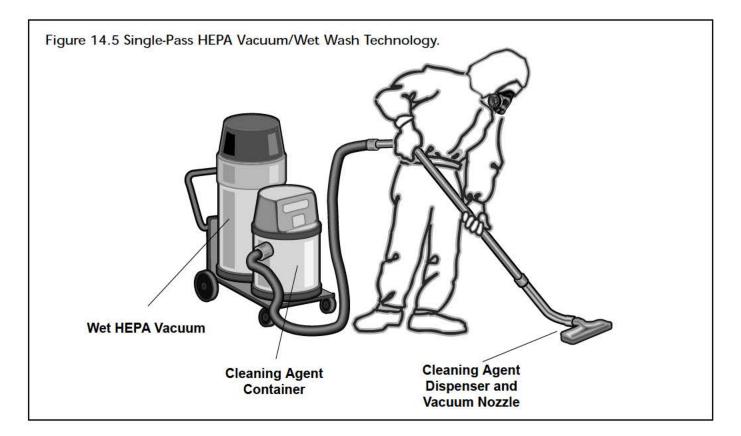
As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

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

A. Precleaning Procedures

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



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

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



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



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

B. Ongoing Cleaning During the Job

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

C. Daily Cleaning Procedures

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



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

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

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

1. Large Debris

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

2. Small Debris

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

3. Exterior Cleaning

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

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

4. Worker Protection Measures

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

5. Maintaining Containment

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

V. Order of Final Cleaning Procedures After Lead Hazard Control

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

A. Final Cleaning

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

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

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

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

1. Decontamination of Workers, Supplies, and Equipment

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

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

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



Figure 14.8a Pick Up Corners of Plastic Sheeting.



Figure 14.8b Fold Plastic Inward.

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

B. Preliminary Visual Examination

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

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

C. Surface Painting or Sealing of Nonfloor Surfaces

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

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

D. Final Inspection

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

E. Recleaning After Clearance Failure

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

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

VI. Cleaning Cost Considerations

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

A. Initial Clearance Test Failure Rates

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

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



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

B. Key Factors In Effective Cleaning

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

C. Special Problems

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

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



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

VII. Alternative Methods

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

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

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

A. Vacuums

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

B. Trisodium Phosphate and Other Detergents

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

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Table 14 1 Initial	Cleaning Wine Test	Failure Rates for	Various Abatement Strateg	ioc
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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 <mark>%</mark>	21.0%	33%

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



and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993). These Guidelines do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

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

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

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

14-23

MDARNG Facilities IH Baseline Surveys MG Boyd M. Cook Armory, Cascade, MD Project No. 55-ML-01ED-03/05

APPENDIX F

MOLD GUIDANCE

F-1

Army Facilities Management Information Document on Mold Remediation Issues

TG 277 FEBRUARY 2002



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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

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

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

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

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

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

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

REMEDIATION PLANNING

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

REMEDIATE MOISTURE AND MOLD PROBLEMS

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

REMEDIATION PROCEDURES

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

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

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

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

FOUR REMEDIATION LEVELS

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

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

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

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

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

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

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

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

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

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

The following procedures *at a minimum* are recommended:

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

Refer to Appendix D for Containment procedures.

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

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

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

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

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

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

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

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

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

The following procedures are recommended:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The following procedures are recommended:

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

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

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

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

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

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

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

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

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

HAZARD COMMUNICATION

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

CONCLUSION

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

REFERENCES

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

APPENDIX A

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

Water Damage Cleanup and Mold Prevention

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

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

Ξ

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

Ξ

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

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

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

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

APPENDIX B

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

Mold Remediation Guidelines

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

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

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

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

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

Disposable Protective Clothing

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

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

APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

Containment Tips

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

Limited Containment

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

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

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

Full Containment

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

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278 February 2002



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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

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

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

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

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

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

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

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

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

Routine Investigation and Evaluation of moisture and mold problems³.

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

Assessments Requiring Sampling

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

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

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

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

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

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

References

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

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

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

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

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

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

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

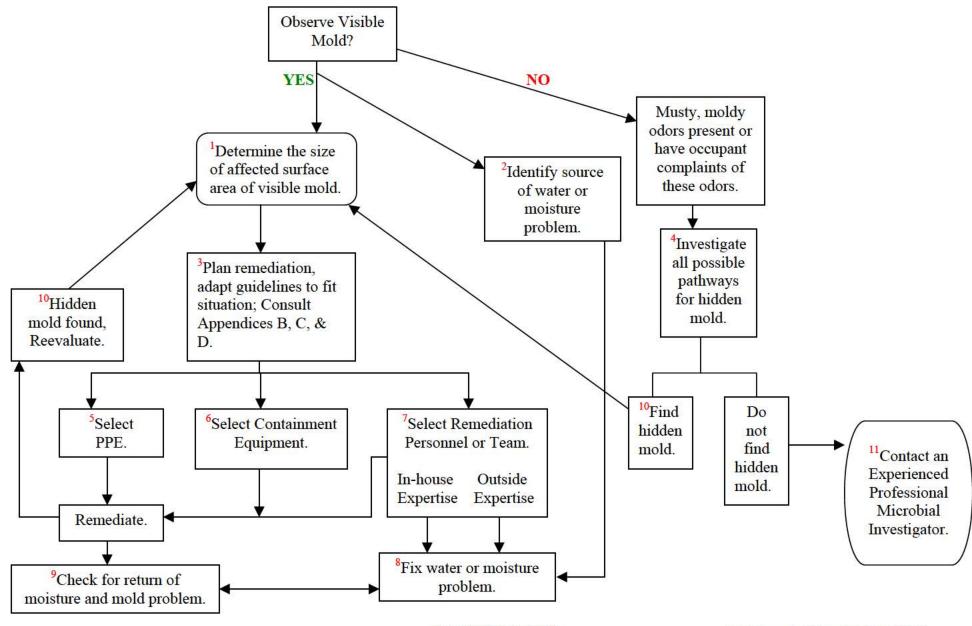
8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force*, AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

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MOLD INVESTIGATION DECISION LOGIC



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MOLD INVESTIGATION DECISION LOGIC NOTES:

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

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

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

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

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

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

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

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

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

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

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

APPENDIX B

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

Mold Remediation Guidelines

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

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

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

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

TG 278

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

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

Cleanup Methods

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

Personal Protective Equipment (PPE)

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

Containment

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

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

APPENDIX C

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

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

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

Respiratory Protection

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

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

Disposable Protective Clothing

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

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

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

Feb 02

APPENDIX D

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

CONTAINMENT GUIDANCE

Containment

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

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

Containment Tips

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

Limited Containment

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

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

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

Full Containment

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

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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 Cascade City Readiness Center

Prepared For:	National Guard Bureau Region North IH 301-IH Old Bay Lane Havre de Grace, MD 21078
Survey Location:	Cascade Readiness Center
	13817 Ritchie Road
	Cascade, MD 21719
Prepared By:	Compliance Management International, Inc.
	1215 Manor Drive
	Suite 205
	Mechanicsburg, PA 17055
Survey Date:	June 21, 2013

July 31, 2013



Manager, Industrial Hygiene Services

Report Date:

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Section 1.0 Executive Summary

An industrial hygiene survey was conducted on June 21, 2013, at the Cascade Readiness Center located at 13817 Ritchie Road, Cascade, MD 21719. The survey was performed by Mr. Non-Responsive

- 1. Lead surface and air samples were collected. Sample results were below recommended guidelines and/or regulator standards. See Section 3.0 for detailed sampling results.
- 2. Lighting levels did not meet the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in two locations measured. See Section 4.0 for detailed findings.
- 3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.
 - a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in two areas sampled.
 - b. The relative humidity levels did not meet the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in any occupied areas sampled.
 - c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 ppm.
 - d. Carbon dioxide (CO_2) levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings.

See Section 5.0 for detailed sampling results.

- 4. Drill Hall doors were propped open during the survey. See Section 5.0 for detailed findings.
- 5. No suspect asbestos containing materials (ACM) were observed. See Section 6.0 for detailed sampling results.

Section 2.0 Operation Description & Observations

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

The 18,400 square foot building is reported to have been built in 1994. It is a single story structure. The exterior is brick and block. The interior walls are block and drywall. The floors are concrete, 12"x12" floor tiles, and carpet.

The heating system is a switchable (oil/gas) forced hot water unit. There appears to be two air conditioning (A/C) systems employed: three roof-top units and room unit ventilators.

There is no child-care facility in the building.

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

This facility has a converted firing range (CFR) that is now used as the Parachute Packing Room. There was no access to the room at the time of this survey.

No suspect asbestos containing material (ACM) was observed.

No chipped or peeling paint were observed.

Housekeeping is adequate.

It was reported that the building has a history of roof leaks.

Several water-stained ceiling tiles were observed in four areas: Kitchen Corridor, Administration Corridor, Drill Hall Entranceway, and the Dining Room (fungal growth was observed on these tiles).

Several areas of chipped floor tiles were observed in the Kitchen Corridor.

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

Section 3.0 Lead Testing

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

Sample #	Location	Air ug/m ³	Surface ug/ft ²
1	Drill Hall	<6.8	*
2	Orderly Room	<6.7	*
3	Blank	<3 ug	*
4	Blank	*	<12 ug
5	Drill Hall Floor Center	*	<110
6	Drill Hall Cabinet Top	*	<110
7	Drill Hall Electrical Panel Top	*	<110
8	Kitchen Microwave Top	*	<110
9	Kitchen Floor	*	<110
10	Dining Area Window Sill	*	<110
11	Storage 106 Cabinet Top	*	<110
12	Lobby Floor	*	<110
13	Office 113 Window Sill	*	<110
14	Office 111 Window Sill	*	<110
15	Office 108 Cabinet Top	*	<110
16	Office 141 Window Sill	*	<110
-	Criteria	50	200

Lead Testing Results Summary

Table Notes:

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

Sources:

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

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in

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NG PAM 420-15 "Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft² on floors and 250 ug/ft² on windowsills should be observed. There is no child care provided at this facility.

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

- Surface levels for lead were less than the recommended guideline of 200 ug/ft² in all locations sampled.
- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m³).

Section 4.0 Lighting

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

Location	Foot Candles	Recommended	Sufficient
Location	(FC)	Lighting (FC)	Lighting
Drill Hall	30.8	10	Yes
Bulk Storage 106	21.3	10	Yes
Supply Room	22.2	30	No
Office 113	92.5	30-50	Yes
Office 111	130.1	30-50	Yes
Office 112	78.9	30-50	Yes
Office 115	82.1	30-50	Yes
Administrative Corridor	19.8	5	Yes
Classroom 108	64.8	30-50	Yes
Lobby	32.1	10	Yes
Kitchen Corridor	24.7	5	Yes
Mechanical Room	46.1	30	Yes
Latrine	42.2	5	Yes
CFR Corridor	27.5	5	Yes
Kitchen (prep)	148.4	50	Yes
Dining Room/Classroom	30.3	30-50	Yes
Men's Latrine 123	48.2	5	Yes
Women's Latrine	49.7	5	Yes
Gym	39.1	30	Yes
Office 118	16.5	30-50	No
Office 139	49.8	30-50	Yes
Office 141	53.7	30-50	Yes
Office 105	69.3	30-50	Yes

Light Survey Assessment Summary

Table Notes:

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

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

The lighting levels did not meet the minimum recommended guideline in Office 118 and the Supply Room.

Section 5.0 Indoor Air Quality

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

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

The following table summarizes the measurements collected.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	73.2	48.4	342	0.0
Office 111	72.8	53.5	448	0.0
Criteria	68-79	30-60	<1,042	<9

IAQ Assessment Summary

Table Notes:

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

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

Summary of findings and recommendations:

- Temperature measurements met the recommended 68-79°F in all sampled areas.
- Relative humidity levels met the recommended guideline of 30 60 % in all sampled areas.
- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level. For this survey, carbon dioxide levels did not exceed the recommended ceiling of

1,042 ppm (700 ppm + 342 ppm). This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide
- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. The following observation were noted:
 - 1. Structural damage to walls in Office 111 was observed. This type of damage can be the source of water intrusion and elevated humidity.
 - 2. Water-stained ceiling tiles were observed in the Kitchen Corridor, Administration Corridor, Drill Hall Entrance, and Dining Room. Visible growth was observed on the water-stained tiles in the Dining Room.
 - 3. Drill Hall doors were propped open during the site survey allowing warm, moist air to infiltrate the facility. This practice allows warm moist air and potentially degraded air (mower exhaust, dust, etc.) to enter the building.
 - 4. It was reported that the roof leaks in several places.
 - 5. Several floor tiles in the Kitchen Corridor are cracked and loose. These should be repaired.

Section 6.0 Suspect Asbestos Containing Building Materials (ACM)

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

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

Section 7.0 Equipment

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

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98002EL	4/2013	NA
SKC Air Sampling Pump	647631	6/21/13	2.46 LPM
SKC Air Sampling Pump	767926	6/21/13	2.47 LPM

Section 8.0 Limitations

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

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

Appendix A. Laboratory Analysis Report

AMA Analytical Services, Inc.

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A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY BODIEG 17025 2005 Www.ahaaserediteditaba.org

Client:	National Guard Bureau	Job Name:	ARNG 4a MD	Chain Of Custody:	516189	
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	Job Location:	Cascade	Date Submitted:	6/25/2013	
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	Non-Responsive	
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	7/2/2013 Report l	Date: 7/2/2013

Attention:

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)		oorting Jimit	Total ug	Final Res	ult	Comments
13073125	1	Flame	Air	443	N/A	6.8	ug/m³	<3	<6.8	ug/m³	
13073126	2	Flame	Air	445	N/A	6.7	ug/m³	<3	<6.7	ug/m ³	
13073127	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
13073128	4	Flame	Wipe Blank	***	N/A	12	ug		<12	ug	
13073129	5	Flame	Wipe	***	0.108	110	ug/ft²	<12	<110	ug/fl²	
13073130	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073131	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/fl²	
13073132	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073133	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073134	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073135	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073136	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073137	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073138	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073139	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13073140	16	Flame	Wipe	***	0.108	110	ug/ft²	<12	<110	ug/ft²	

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

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CERTIFICATE OF ANALYSIS

Client: National Guard Bureau Job Name: ARNG 4a MD Chain Of Custody: 516189 Address: 301-IH Old Bay Lane, Attn: ARNG-CJG-P, Job Location: Cascade Date Submitted: 6/25/2013 State Military Reservation Havre de Grace, Maryland 21078 Job Number: Not Provided **Person Submitting:** P.O. Number: W912K6-09-A-0003 Date Analyzed: 7/2/2013 Report Date: 7/2/2013 Attention:

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AIHA LAP, LLC ACCREDITED LABORATOR

NOUSTRIAL HYGIENE, ENVIRONMENTAL LEA **& ENVIRONMENTAL MICROBIOLOGI** ISOJEC 17025-2005 www.aihaaccreditediabs.org LAB #100470

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments
	or Flame: Air, Wipes, or Furnace: Air, Wipe ble mo/Kg = part		il/Solids : EPA 6	00/R-93/200(M)-7		3113B ass	QC Summary for an ociated with these nples.	alytical results of quality	control samples

ug/L = parts per billion (ppb)

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

ug = micrograms

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.

%Pb = percent lead on a dry weight basis

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

Analyst: Nida McGarvey

Technical Manager: G Edward Carney

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

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Appendix B. Photographs



Cascade RC



Structural Wall Damage in Office 111



Water Stained Ceiling Tile



Ceiling Tile Visible Fungal Growth



Drill Hall Open Door



Boiler Room

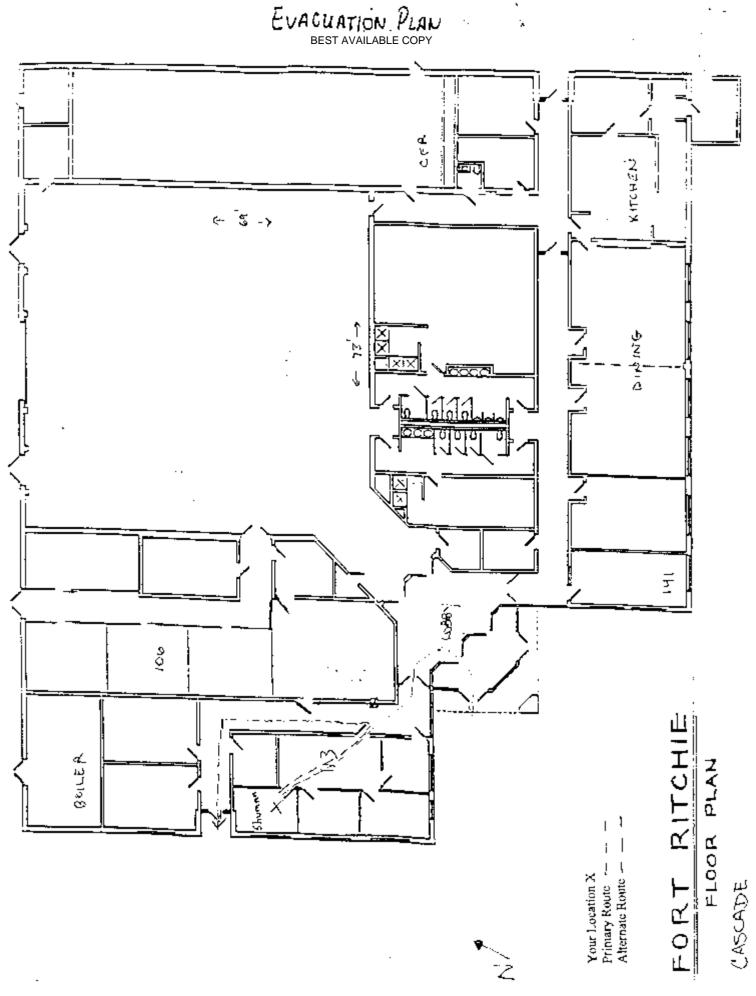


No Access to Converted Firing Range



Damaged Floor Tiles in Corridor

Appendix C. Floor Plan



Posted to NGB FOIA Reading Room May, 2018 BEST AVAILABLE COPY

FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1467 of 5269

Appendix D. References

- 1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead.
- 2. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values and Biological Exposure Indices, 2011 Edition.
- 3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition.
- 4. American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2010.
- 5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.
- 6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.
- 7. National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.
- 8. National Ambient Air Quality Standards (NAAQS) National primary ambient air quality standards for carbon monoxide 40 CFR 50.8.
- 9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227 (h) (3)].
- 10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM).
- 11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.
- 12. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.
- 13. ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.

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

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

SUBJECT: Maryland Army National Guard Facilities, Industrial Hygiene Baseline Survey, MG William J. Witte Armory, Catonsville, MD, Report No. 55-ML-01ED-03/07, 24 July 2003

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

2. Our point of contact is Ms. Non-Responsive, at commercial (410) 436-5475/3118, DSN 584-5475/3118 or electronic mail: Non-Responsive <u>@us.army.mil</u>

FOR THE COMMANDER:



Encl

Director, Occupational Health Sciences

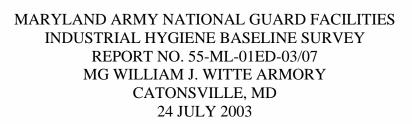
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U.S. Army Center for Health Promotion and Preventive Medicine





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

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

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

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

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

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

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

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

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

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

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EXECUTIVE SUMMARY MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEY REPORT NO. 55-ML-01ED-03/07 MG WILLIAM J. WITTE ARMORY CATONSVILLE, MD 24 JULY 2003

1. PURPOSE. To perform an industrial hygiene survey to identify and measure the existence and extent of potentially hazardous operations or conditions at the Maryland Army National Guard MG William J. Witte Armory, Catonsville, MD. This survey will serve as an update to the baseline so that an occupational exposure history can be compiled for each civilian or military employee.

2. CONCLUSIONS. Significant health and safety concerns were: high levels of lead in dust in several areas; the lack of a site Asbestos Management Plan (AMP); a leaking roof creating safety hazards and supporting mold growth; a non-operational heating, ventilation, and air conditioning system; and the lack of a written Hazard Communication (HAZCOM) Program.

3. RECOMMENDATIONS.

a. <u>Lead Exposure</u>. Health Risk Assessment Codes (RAC) 3 for adults. Health RAC 2 for children.

(1) Develop and implement a written Lead Hazard Management Plan for the Armory. Ensure that the Armory complies with the Occupational Safety and Health Assessment Lead Standard, Title 29 Code of Federal Regulation (CFR) 1910.1025, and the Occupational Safety and Health Administration Lead in Construction Standard, Title 29 CFR 1926.62.

(2) Repair and stabilize deteriorated paint.

(3) Address all potential lead hazards before continuing to extend the use of this facility to children.

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(4) Clean horizontal surfaces in all areas that children may visit to the Environmental Protection Agency and State of MD lead in dust standard for children. Clean horizontal surfaces in the administrative areas to the National Guard Bureau Region North Industrial Hygiene Office and United States Army Center for Health Promotion and Preventive Medicine recommended levels. Clean all areas where sampling results showed elevated levels of lead. At a minimum, if only adults use this facility, clean to the recommended maximum levels for adults. Follow the comprehensive guidelines for cleaning in Appendix E and the decontamination requirements for the former Indoor Firing Range (IFR) provided in National Guard Pamphlet 420-15. Consult with the Maryland Armory Environmental Coordinator concerning disposal requirements after cleanup.

(5) Pending cleanup, restrict access to the former IFR (current storage room and classroom) by keeping it locked. Post a sign warning against entry into the room except in an emergency, and against storing any material. Ensure that personnel wear disposable gloves, disposable coveralls, and booties to prevent tracking lead to other areas of the Armory when cleaning the former IFR.

b. <u>Asbestos Exposure</u>. Health RAC 3. Continue the asbestos abatement in the Armory in accordance with Federal, state, and local regulations. Develop and implement an AMP.

c. <u>Safety Hazards</u>. Safety RAC 4. Continue to repair roof leaks and damaged building materials. Replace loose ceiling tiles.

d. <u>Mold Exposure</u>. Health RAC 4. Repair the Orderly Room roof leak. Remove and replace ceiling tiles contaminated with mold growth after determining whether they contain asbestos. Abate all areas of visible mold. For additional guidance on moisture control and mold remediation refer to Appendix F.

e. <u>Heating, Ventilation, and Air Conditioning Systems</u>. No RAC can be assigned. Repair heating system problems. Purchase and install more air conditioning units.

f. <u>Occupational Safety and Health Programs</u>. Health RAC 3. Develop and implement a written HAZCOM Program for the facility. Maintain HAZCOM documentation and file it in an accessible area.

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MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEY REPORT NO. 55-ML-01ED-03/07 MG WILLIAM J. WITTE ARMORY CATONSVILLE MD 24 JULY 2003

1. REFERENCES. See Appendix A.

2. PURPOSE. To identify and measure the existence and extent of potentially hazardous operations or conditions at the Maryland Army National Guard MG William J. Witte Armory, Catonsville, MD. This survey will serve as an update to the baseline so that an occupational exposure history can be compiled for each civilian or military employee.

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

4. GENERAL.

a. <u>Personnel Contacted</u>. Staff Sergeant (SSG) ^{Non-Responsive}, Manager, (410) 788-7080. SSG^{Non-Responsive}, Environmental Compliance Assessment Coordinator for the MD Environmental Office, provided additional information.

b. <u>Survey Personnel</u>. This survey was conducted on 23 July 2003 by Ms. <u>Non-Responsive</u>, Industrial Hygienist, United States Army Center for Health Promotion and Preventive Medicine (USACHPPM).

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

d. <u>Background</u>. The MG William J. Witte Armory was located at 130 Mellor Avenue, Catonsville, MD 21228-5142. The Armory was built in 1940 and rehabilitated at a later date. Its mission was administration. It was being offered for rental, so could host activities that include children. No floor plan could be located for this report.

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

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5. METHODOLOGY.

a. <u>Assessment Criteria</u>. Army Regulation 40-5 contains the requirement that airborne chemical exposures in Army facilities must comply with the lower of the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit or the American Conference of Governmental Industrial Hygienists Threshold Limit Value®. The NGB Region North Industrial Hygiene Office criterion for lead in surface dust is discussed in Appendix B.

b. <u>Calibration</u>. All instruments were calibrated in accordance with manufacturers' instructions using National Institute of Standards and Testing traceable method.

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

6. FINDINGS AND DISCUSSION.

a. <u>Description of Operations</u>. The Armory had a drill hall, classroom spaces, weapons vaults, and offices. There were no industrial operations.

b. <u>Occupational Safety and Health Programs</u>. No written Hazard Communication (HAZCOM) Program was found. The OSHA requires employers to provide information to their employees concerning hazardous chemicals to which they are exposed. This is accomplished by establishing a HAZCOM Program for Armory employees. Program elements include the use of labels and other forms of warning, Material Safety Data Sheets and information and training addressing protective measures for employees.

c. Building Condition.

(1) Safety Hazards. The roof was leaking, damaging ceiling tiles in the Orderly Room. There was a potential hazard of tiles falling and of slips and falls on wet floor surfaces. As discussed below, there were several areas with deteriorating paint.

(2) Indoor Firing Range (IFR). The former IFR was being used as a storage room and a classroom. There were no records of cleaning or lead abatement ever having occurred in the IFR.

d. Indoor Environmental Quality.

(1) Heating, Ventilation, and Air Conditioning Systems. The building was heated with steam. The heat was reportedly working on only one side of the building. Cooling was provided

by several window-type air conditioners mounted in regularly used offices, and by the manual operation of windows. The Armory management had requested more air conditioning units.

(2) Temperature, Humidity Control, and Air Exchange Rate. Measurements could not be located for this report.

(3) Mold and Moisture Problems. The Orderly Room roof leak had caused mold growth on a portion of the ceiling. Water may have damaged the insulation and may have resulted in further mold growth. Mold exposure may cause illness in Armory employees.

e. <u>Water Quality</u>. There were no concerns expressed by Armory personnel about water quality. No samples were collected.

f. <u>Lead Hazards</u>. The age of the building indicated that the presence of lead-based paint was likely. Some rooms in the Armory had extensive areas of deteriorated paint. SSG McCuen stated that there were no records of any lead abatement ever having occurred in this facility. No Lead Hazard Management Plan (LHMP) was found.

(1) Criteria for lead in dust. The Environmental Protection Agency (EPA) and State of MD limits for lead in dust are 40 micrograms per square foot $(\mu g/ft^2)$ on floors, 250 $\mu g/ft^2$ on windowsills, and 400 $\mu g/ft^2$ in window troughs. These limits apply to pre-1978 Army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The NGB Region North Industrial Hygiene Office concurs with the USACHPPM recommended maximum level of 200 $\mu g/ft^2$ on floors and frequently contacted surfaces, which is more stringent for windowsills than the EPA and State of MD standards. This level was adopted from OSHA Compliance Letter 02-02-58. Further information is provided in Appendix D.

(2) Results for lead in dust. Sampling locations are shown in Appendix C. Laboratory reports are in Appendix B. Samples were collected in 10 locations. Results are shown in the Table. Results exceeding any of the criteria are highlighted. The results confirm that the former IFR was never adequately decontaminated. The high levels in the arms vaults could have been produced either by tracking from the former IFR or weapons cleaning. There was a risk of tracking lead to other areas of the Armory.

Wipe Sample #	Location of Samples	Result, µg/ft ²
CAW01	Vault 119, munitions area on floor	350
CAW02	Kitchen 106, floor near stove	<23
CAW03	Room B-2 (Basement) (SFC	<23
CAW04	Room B-3 (Basement), floor at corner	<23
CAW05	Former IFR, floor at bullet trap location	9,200
CAW06	Former IFR, floor behind firing line	240
CAW07	Corridor, floor one foot from door to former IFR	59
CAW08	Room 122, window sill	41
CAW09	Vault 120, arms area	150
CAW10	Room 112 (Recruiter's Office) wall near door to other offices	<23

TABLE Lead Levels in Dust.

g. <u>Asbestos</u>. SSG **Meterson** stated that asbestos abatement was ongoing and was nearly complete at the time of the site visit. A site Asbestos Management Plan (AMP) was not found. If there were still asbestos in the facility and damage occurred in the future, the asbestos could become friable and asbestos fibers could be released. Army policy requires the Armory to establish and execute an AMP for all asbestos in the facility, and to take immediate corrective action where a possible asbestos hazard has been identified.

h. <u>Noise Hazards</u>. No operations with the potential to generate hazardous noise levels were identified.

7. CONCLUSIONS. Significant health and safety concerns were: high levels of lead in dust in several areas; the lack of a site AMP; a leaking roof creating safety hazards and supporting mold growth; a nonoperational Heating Ventilating and Air Conditioning system; and the lack of a written HAZCOM Program.

8. RECOMMENDATIONS.

a. Lead Exposure. Health RAC 3 for adults. Health RAC 2 for children.

(1) Develop and implement a written LHMP for the Armory. Ensure that the Armory complies with the OSHA Lead Standard, Title 29 Code of Federal Regulations (CFR) 1910.1025, and the OSHA Lead in Construction Standard, Title 29 CFR 1926.62.

(2) Repair and stabilize deteriorated paint.

(3) Address all potential lead hazards before continuing to extend the use of this facility to children.

(4) Clean horizontal surfaces in all areas that children may visit to the EPA and State of MD lead in dust standard for children. Clean horizontal surfaces in the administrative areas to the NGB Region North Industrial Hygiene Office and USACHPPM recommended levels. Clean all areas where sampling results showed elevated levels of lead. At a minimum, if only adults use this facility, clean to the recommended maximum levels for adults. Follow the comprehensive guidelines for cleaning in Appendix E and the decontamination requirements for the former IFR provided in National Guard Pamphlet 420-15. Consult with the Maryland Armory Environmental Coordinator concerning disposal requirements after cleanup.

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f. <u>Occupational Safety and Health Programs</u>. Health RAC 3. Develop and implement a written HAZCOM Program for the facility. Maintain HAZCOM documentation and file it in an accessible area.

9. ADDITIONAL ASSISTANCE. For additional assistance or questions concerning this report, please contact the undersigned at commercial (410) 436-3118/5475, DSN 584-5475/3118 or electronic mail Non-Responsive it@us.army.mil



Industrial Hygienist Industrial Hygiene Field Services Program

APPROVED:



MAJ, MS Program Manager Industrial Hygiene Field Services Program BEST AVAILABLE COPY

MDARNG Facilities, Industrial Hygiene Baseline Survey, MG William Witte Armory, Catonsville, MD, Report No. 55-ML-01ED-03/07, 24 July 2003

APPENDIX A

REFERENCES

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

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APPENDIX B

LABORATORY REPORT

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MDARNG Facilities, Industrial Hygiene Baseline Survey, MG William Witte Armory, Catonsville, MD, Report No. 55-ML-01ED-03/07, 24 July 2003

RESERVOIRS ENVIRONMENTAL, INC.

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

TABLE ANALYSIS: LEAD BY WIPE SAMPLING

RES Job Number:	RES 96062-1
Client:	Army National Guard IH - West
Client Project Number / P.O.:	None Given
Client Project Description:	None Given
Date Samples Received:	August 7, 2003
Analysis Type:	USEPA SW846 3050B / AA(7420)
Turnaround:	3-5 Day
Date Samples Analyzed:	August 4, 2003

Client ID Number	Lab ID Number	Sample Area (sq.ft.)	LEAD (µg)	Detection Limit (µg/sq.ft.)	LEAD CONCENTRATION (µg/sq.ft.)
CA Blank 01	EM 800617	0.11	BDL	23	BDL
CA W01	EM 800618	0:11	38.0	23	345
CA W02	EM 800619	0.11	BDL	23	BDL
CA W03	EM 800620	0.11	BDL	23	BDL
CA W04	EM 800621	0.11	BDL	23	BDL
CA W05	EM 800622	0.11	1011.0	23	9191
CA Blank 02	EM 800623	0.11	BDL	23	BDL
CA W06	EM 800624	0.11	26.4	23	240
CA W07	EM 800625	0.11	6.5	23	59
CA W08	EM 800626	0.11	4.5	23	41
CA W09	EM 800627	0.11	16.1	23	146
CA W10	EM 800629	0.11	BDL	23	BDL
CA Blank 03	EM 800630	0.11	BDL	23	BDL

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

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APPENDIX C PHOTOGRAPHS

Photo No.	Location
1	Vault 119, floor in munitions area (Wipe sample)
2	Kitchen 1206, floor near stove (Wipe sample)
3	Kitchen Storage Area (Deteriorated paint)
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11	Room 122, window sill (Wipe sample)
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13	Room 112 (Recruiter's Office), wall near door to other offices (Wipe sample)
14	Room 112 wall (Deteriorated paint)
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TABLE D-1. Photographs.



Photograph 1



Photograph 2



Photograph 3



Photograph 4

C-2



Photograph 5

Photograph 6



Photograph 7



Photograph 8

C-3



Photograph 9



Photograph 10



Photograph 11



Photograph 12

C-5



Photograph 13



Photograph 14



Photograph 15

C-5

APPENDIX D

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE

ASSESSMENT CRITERIA FOR LEAD

Subject: Recommendations for Surface Lead Dust in Armories

1. In armories that do not contain childcare facilities, the National Guard Bureau (NGB) Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 micrograms per square foot (μ g/ft²). If a special function will be held in which children will be present in this facility, consider thoroughly cleaning the areas that will be accessible to children prior to the function. This guidance is based on professional judgment, risk assessments, adaptation of Occupational Safety and Health Administration (OSHA) guidance, and feasibility of cleaning to a certain level.

a. Environmental Protection Agency (EPA) standards (40 Code of Federal Regulations (CFR) 745.227(h)(3)) are not directly applicable because they are criteria for dust-lead hazards developed for floors (40 μ g/ft²) and windowsills (250 μ g/ft²) in residential dwellings and child occupied facilities. A child occupied facility is defined as a building, or portion of a building, constructed prior to 1978, visited regularly by the same child, 6 years of age or under, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hours and the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60 hours. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

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

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

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

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

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precautionary measure.

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

a. Clean all areas that will be accessible to children to the EPA dust-lead standard for children 6 years of age or under (40 μ g/ft² on floors and 250 μ g/ft² on windowsills).

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

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

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

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

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

APPENDIX E

LEAD CLEANING GUIDANCE

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

E-1

CHAPTER 14: CLEANING

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Step-by-Step Summary



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



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

I. Introduction

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

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

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

A. Performance Standard

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

B. Small Dust Particles

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

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

C. Difficulties in Cleaning

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

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

1. Low Clearance Standards

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

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

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

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



2. Worker Inexperience

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

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

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

4. Deadlines

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

II. Coordination of Cleaning Activities

A. Checklist

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

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

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

B. Equipment Needed for Cleaning

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



C. Waste Disposal

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

III. Cleaning Methods and Procedures

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

A. Containment

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

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

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

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

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

1. HEPA Vacuuming

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

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



Operating Instructions

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

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

Special Attachments

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

Selecting Appropriate Size(s)

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

Wet-Dry HEPA Vacuums

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

Prefilters

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

HEPA Vacuuming Procedures

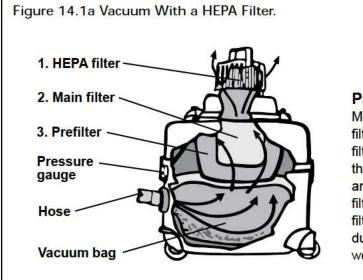
Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

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

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

Emptying the HEPA Vacuum

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



Parts of a HEPA-vacuum

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

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

2. Wet Detergent Wash

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

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

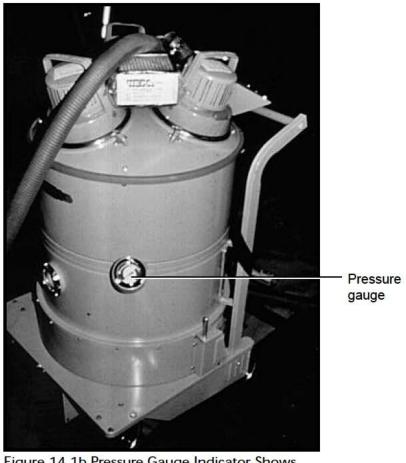
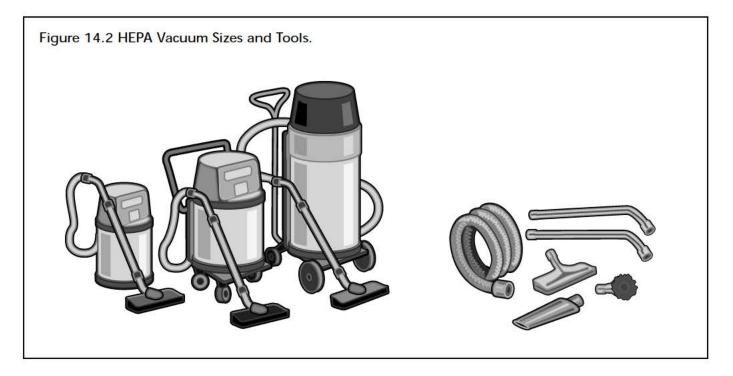


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.



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

Manufacturer's Dilution Instructions

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

Appropriate Cleaning Equipment

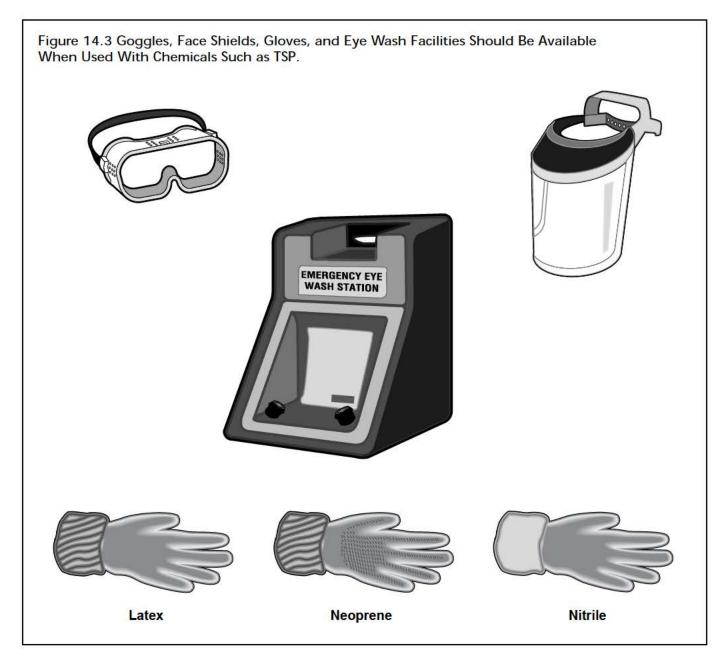
Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential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

Proper Wet-Cleaning Procedures

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

Changing Cleaning Mixture

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



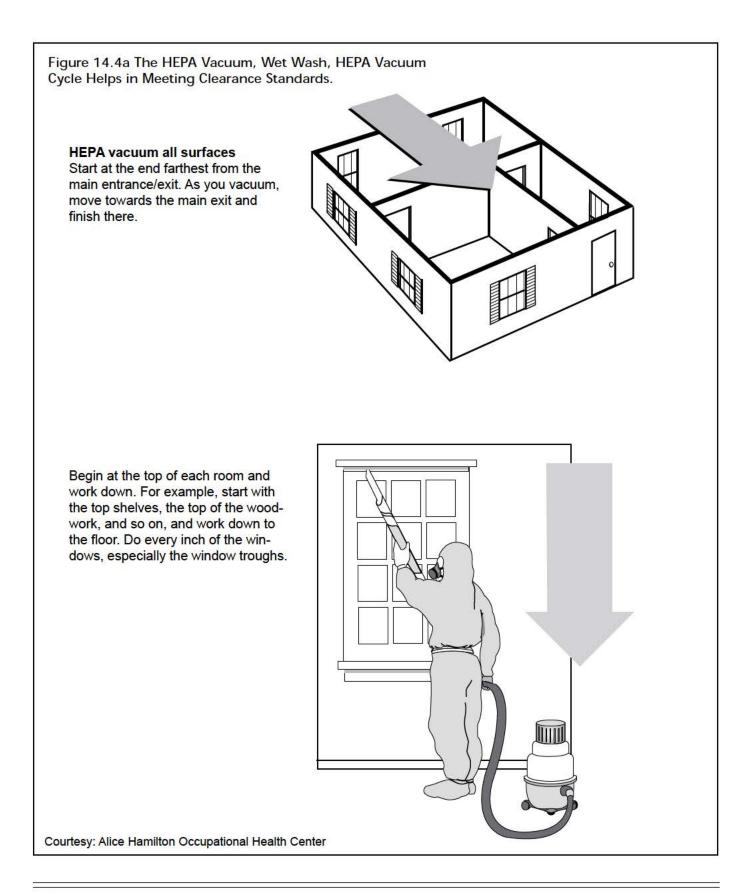
more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet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

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

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

✤ First, the area is HEPA vacuumed.



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Chapter 14: Cleaning

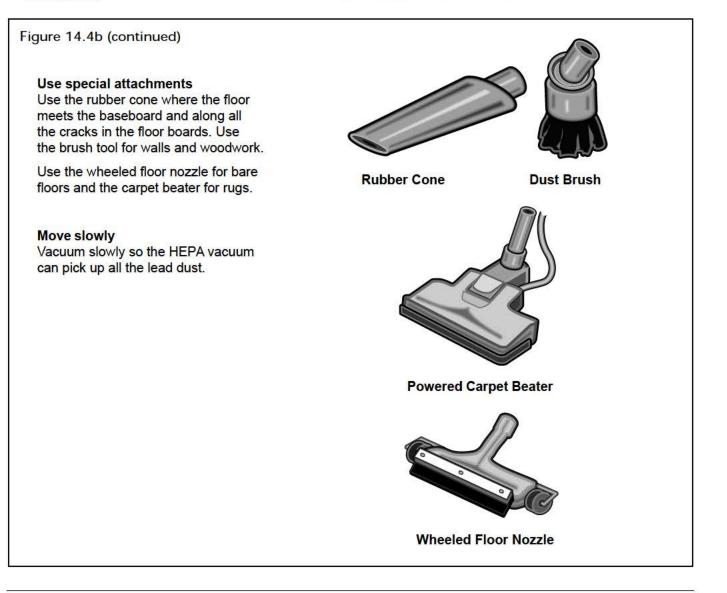
- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

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

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.



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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

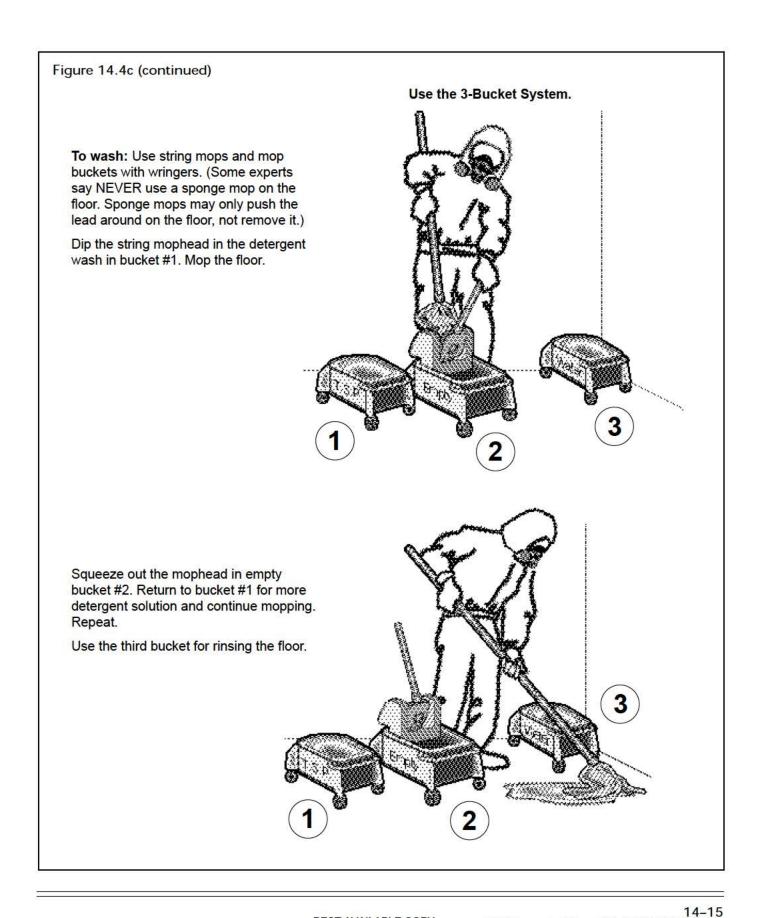


Wet Mop Floor



Don't Dry Sweep

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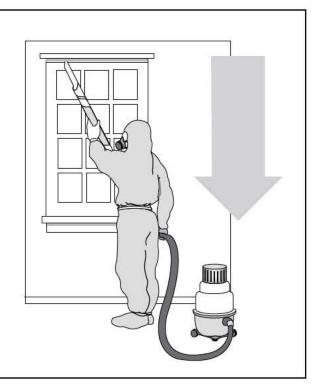


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Figure 14.4d (continued)

HEPA vacuum all surfaces a final time HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

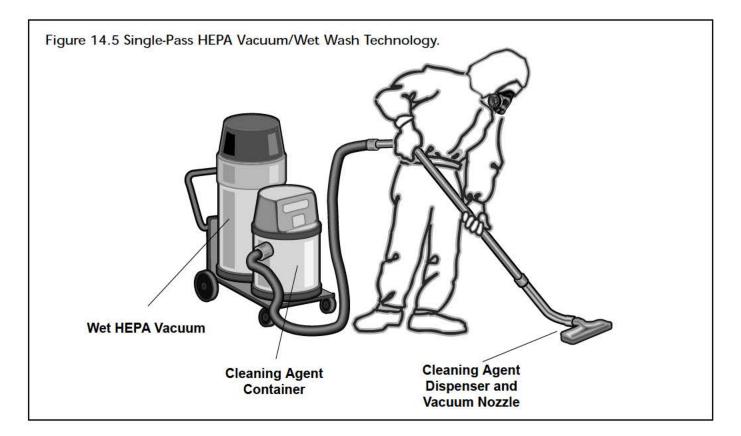
As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the



Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's



Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.



belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will



Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- ♦ Securing debris/plastic.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water and cleaned. All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plasticremoval process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).



Figure 14.8a Pick Up Corners of Plastic Sheeting.



Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).



Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This



option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dustretaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

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Table 14 1 Initial	Cleaning Wine Test	Failure Rates for	Various Abatement Strateg	ioc
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Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)



and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993). These Guidelines do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Mass Removal Efficiency Percentages Cycle Number **Cleaning Method** Central Central **HEPA Vacuum** Portable Vacuum—Plain Vacuum—Agitator Vacuum—Plain Tool Head Tool 1 34.7 71.0 17.5 55.4 2 47.0 80.2 61.2 23.0 3 51.9 85.9 66.3 26.6 87.8 67.0 4 56.0 29.4 59.3 88.9 5 72.1 32.5 6 61.6 91.2 74.4 34.9 7 63.8 93.1 76.4 36.5 67.5 95.4 38.1 8 77.5 9 67.5 97.7 78.7 40.1 67.2 80.2 10 100.0 41.7 11 102.3 80.2 41.7 44.8 12 104.6 84.1 84.5 13 104.6 46.8 14 103.8 84.5 48.4 15 49.6 50.8 16 17 52.4 18 53.6 54.4 19 20 55.2

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) Effectiveness of Clean-up Techniques for Leaded Paint Dust

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APPENDIX F

MOLD CLEANING GUIDANCE

F-1

Army Facilities Management Information Document on Mold Remediation Issues

TG 277 FEBRUARY 2002



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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

Concern about indoor exposure to mold has been increasing as the public becomes more aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions.

This document provides the best and most current guidance for remediation of clean water damage (<48 hours) and mold contamination (>48 hours) into one resourceful Army guide. This guide has been designed to provide information to facilities management individuals who have little or no experience with mold remediation. It will assist them in making a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to develop or evaluate an in-house remediation plan or evaluate a remediation plan submitted by an outside contractor. If an outside contractor is employed, they must have experience cleaning up mold. Check their references, and have them follow the recommendations presented in this document, EPA guidelines, and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). A multi-disciplinary team approach to mold concerns is best. A health and safety professional, such as an industrial hygienist, should be consulted prior to any remediation activities to assist in the project.

Molds produce tiny spores to reproduce. Mold spores float through the indoor and outdoor air continually. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or uncorrected. There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.(1)

In all situations, the underlying cause of water accumulation must be rectified or mold growth will recur. Any initial water infiltration should be stopped and clean up began immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth. (Refer to Appendix A for detailed guidance on clean water damage response). If the source of water is elevated humidity, actions to maintain the relative humidity levels below 60% to inhibit mold growth should be taken (2). Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilating, and air-conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide adequate drainage and slope the ground away from the foundation.

REMEDIATION PLANNING

- Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Select cleanup methods for moldy items (Appendix B)
- Select Personal Protection Equipment (PPE)- protect remediators (Appendix B)
- Select containment equipment protect building occupants (Appendix B)
- Select remediation personnel who have the experience and training needed to implement the remediation plan and use PPE and containment as appropriate

REMEDIATE MOISTURE AND MOLD PROBLEMS

- Fix moisture problem, implement repair plan and/or maintenance plan
- Dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Clean and dry moldy materials (Appendix B)
- Discard moldy porous items that can't be cleaned (Appendix B)

REMEDIATION PROCEDURES

Four levels of abatement are described below. The size of the area impacted by mold contamination primarily determines the type of remediation. The sizing levels below are based on professional judgment and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of mold and preventing dust contaminated with mold from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement. The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. (3)

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be discarded if possible. All materials to be reused should be dry and visibly free from mold. Routine inspections should be conducted to confirm the effectiveness of remediation work. (1 and 3)

The use of bleach or other biocides is questionable in most cases (8). The effectiveness of bleach in reducing living mold is dependent on concentration, residual chlorine levels, and contact time on the surface (8). All of these factors are difficult to control during remediation. Removal of all mold growth can generally be accomplished by physical removal of materials supporting active growth and thorough cleaning of non-porous materials (4). Therefore, application of a biocide serves no purpose that could not be accomplished with a detergent or cleaning agent (4).

The use of gaseous ozone or chlorine dioxide for remedial purposes is **not** recommended. Both compounds are highly toxic and contamination of occupied space may pose a health threat. Furthermore, the effectiveness of these treatments is unproven. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."(4)

FOUR REMEDIATION LEVELS

[Adapted from NYCDOH Guidelines on Assessment and Remediation of Fungi in Indoor Environments (3) and EPA (1)]

Level I: Small Isolated Areas – Total surface area affected less than 10 square feet - e.g., ceiling tiles, small areas on walls. Refer to Appendix B for detailed guidance.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and doublebagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas used by remediation workers for egress should be cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Level II: Medium – Total Surface Area affected between 10 and 100 square feet - e.g., several wallboard panels. (See Appendix B for detailed guidance).

The following procedures *at a minimum* are recommended:

Refer to Appendix C for proper PPE selection. Limited or Full protection may be required depending on the situation.

Refer to Appendix D for Containment procedures.

The work area and areas directly adjacent should be covered with a single layer of 6 mil fire-retardant polyethylene sheet(s) and taped before remediation, to contain dust/debris.

Seal ventilation ducts/grills in the work area and areas directly adjacent with 6 mil polyethylene sheeting. Use an exhaust fan with a High Efficiency Particulate Air (HEPA) filter to generate negative pressurization.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and doublebagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and surrounding areas should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level III be followed.

Level III: Large Area – Total Surface Area affected greater than 100 square feet or potential for increased occupant or remediator exposure during remediation is estimated to be significant. (See Appendix B for detailed guidance).

The following procedures are recommended:

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from occupied spaces using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

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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 doublebagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft²) follow Level I guidance for PPE and containment and for a areas (>10 ft²) follow Medium (Level II) or when greater than 100 ft² follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended (7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and removed in double-bagged 6-mil plastic. When a decontamination room is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

All areas should be left dry and visibly free from contamination and debris.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air (4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If remediation sampling is necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HAZARD COMMUNICATION

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

- 1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.
- 2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.
- New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.
- 4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.
- 5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.
- 6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.
- 7. Occupational Safety & Health Administration. *Respiratory Protection Standard*, 29 *Code of Federal Regulations 1910.134*. 63 FR 1152. January 8, 1998.
- 8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force*, AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water D	amage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£		
Water-Damaged Material†	Actions	
Books and papers	 For non-valuable items, discard books and papers. Photocopy valuable/important items, discard originals. Freeze (in frost-free freezer or meat locker) or freeze-dry. 	
Carpet and backing - dry within 24-48 hours§	 Remove water with water extraction vacuum. Reduce ambient humidity levels with dehumidifier. Accelerate drying process with fans. 	
Ceiling tiles	Discard and replace.	
Cellulose insulation	Discard and replace.	
Concrete or cinder block surfaces	 Remove water with water extraction vacuum. Accelerate drying process with dehumidifiers, fans, and/or heaters. 	
Fiberglass insulation	Discard and replace.	

Ξ

Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	 Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	 Remove water with water extraction vacuum. Accelerate drying process with dehumidifiers, fans, and/or heaters. May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	 May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	 Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. Wet paneling should be pried away from wall for drying

Ξ

£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.

These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

[†] If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

		for Remediating Building Mater Growth Caused by Clean Wate	
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
ł	SMALL - Total S	urface Area Affected Less Than 10 square	feet (ft ²)
Books and papers	3		
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3	Minimum None require N-95 respirator, gloves, and goggles	
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		None required
Upholstered furniture & drapes	1,3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

	MEDIUM - To	tal Surface Area Affected Between 10 and 1	100 ft ²
Books and papers	3		
Carpet and backing	1,3,4		
Concrete or cinder block	1,3	potential for remediator exposure and size potential for remediator/occupa	
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		Use professional judgment, consider
Non-porous, hard surfaces (plastics, metals)	1,2,3		potential for remediator/occupant exposure and size of contaminated area
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
		nce Area Affected Greater Than 100 ft ² or F	
Books and papers	3	iator Exposure During Remediation Estim	ated to be Significant
	<u> </u>	iator Exposure During Remediation Estim	ated to be Significant
Books and papers	3	iator Exposure During Remediation Estim	ated to be Significant Full
Books and papers Carpet and backing	3 1,3,4	Full Use professional judgment, consider	Full Use professional judgment, consider
Books and papers Carpet and backing Concrete or cinder block Hard surface, porous flooring	3 1,3,4 1,3	Full	Full
Books and papers Carpet and backing Concrete or cinder block Hard surface, porous flooring (linoleum, ceramic tile, vinyl) Non-porous, hard surfaces	3 1,3,4 1,3 1,2,3,4	Full Use professional judgment, consider potential for remediator/occupant exposure	Full Use professional judgment, consider potential for remediator exposure and
Books and papers Carpet and backing Concrete or cinder block Hard surface, porous flooring (linoleum, ceramic tile, vinyl) Non-porous, hard surfaces (plastics, metals)	3 1,3,4 1,3 1,2,3,4 1,2,3	Full Use professional judgment, consider potential for remediator/occupant exposure	Full Use professional judgment, consider potential for remediator exposure and

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

*Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips

- Always maintain the containment area under negative pressure.
- Exhaust fans to outdoors and ensure that adequate makeup air is provided.
- If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278 February 2002



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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*¹ will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination².

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate¹.

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems³.

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination².

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air⁴. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control⁴."

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program. For further mold assistance, contact USACHPPM, Industrial Hygiene Field Services Program, DSN 584-3118 or (410) 436-3118.

References

1. USACHPPM Technical Guide 277, Army Facilities Management Information Document on Mold Remediation Issues, February 2002.

2. New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.

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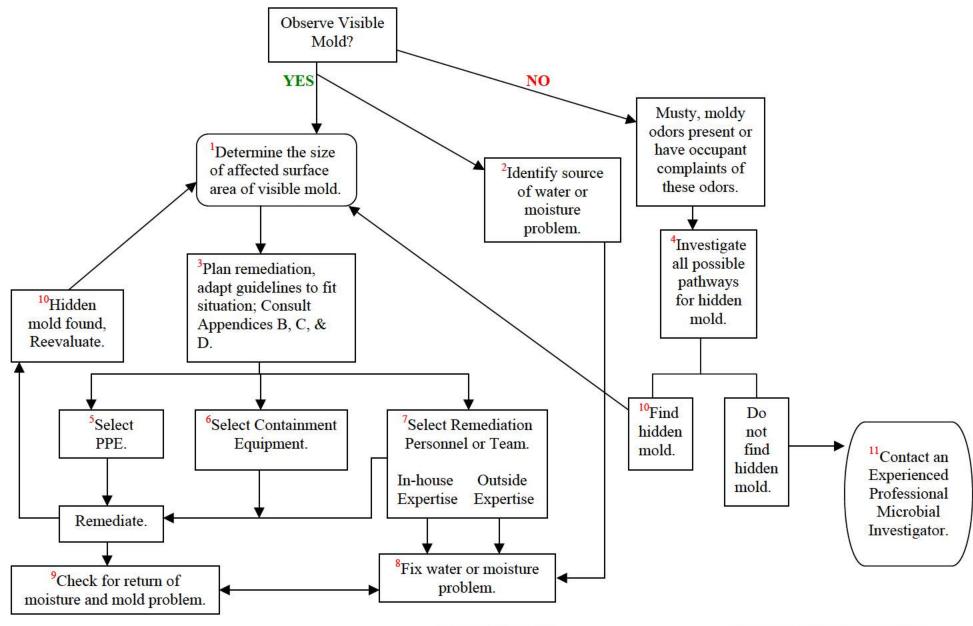
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APPENDIX A

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 activities³. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

		s for Remediating Building Mate d Growth Caused by Clean Wat	
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
	SMALL - Total	Surface Area Affected Less Than 10 squar	re feet (ft ²)
Books and papers	3		
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3	Minimum	
Non-porous, hard surfaces (plastics, metals)	1, 2, 3	N-95 respirator, gloves, and goggles	None required
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3]	
	MEDIUM - T	otal Surface Area Affected Between 10 and	l 100 ft ²
Books and papers	3		
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	potential for remediator exposure and size potential for remediator/occ	Use professional judgment, consider
Non-porous, hard surfaces (plastics, metals)	1,2,3		potential for remediator/occupant exposure and size of contaminated area
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
		face Area Affected Greater Than 100 ft ² or diator Exposure During Remediation Esti	
Books and papers	3		
Carpet and backing	1,3,4		
Concrete or cinder block	1,3	Full	Full
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Use professional judgment, consider
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)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

®TYVEK, DuPont de Nemours, E.I., & Co., Wilmington, DE.

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APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips

- Always maintain the containment area under negative pressure.
- Exhaust fans to outdoors and ensure that adequate makeup air is provided.
- If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1553 of 5269



Industrial Hygiene Study

National Guard Facility Catonsville Readiness Center 130 Mellor Avenue Catonsville, MD 21228

Prepared for:

National Guard Bureau Region North IH Office 301-IH Old Bay Lane Havre de Grace, Maryland 21078

Prepared by:

The El Group, Inc. 2101 Gateway Centre Blvd. Morrisville, North Carolina 27560

Report Date: December 30, 2008

Project ID: IHMO080101.03



Senior Industrial Hygienist



Manager, Charlotte Operations

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List of Appendices

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Appendix B:	Laboratory Analysis Report

2

EXECUTIVE SUMMARY

An industrial hygiene survey was conducted July 31, 2008 at the Readiness Center Facility located in Catonsville, Maryland. The study was performed by Mr. Mon-Responsive, CIH.

Employees were not performing tasks that provided excessive noise levels, as such; noise exposure monitoring was not conducted.

Lighting within the facility was also evaluated. Lighting was found to be within applicable recommended levels.

Various surfaces within the HVAC system and throughout the facility were screened for lead. The screening was completed using surface/wipe and air samples. None of the air samples collected were found to have detectable levels of the respective lead contaminant, and five (5) 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 gym, but could have contributed to lead exposure to building occupants. If not addressed, these may provide sources of poor indoor air quality.

During the assessment, written programs for Health and Safety, NESHAP Operations and Maintenance Asbestos Survey, and the Hazard Communication Program were requested for review, however, the onsite personnel was not able to locate the documents.

Operation Description

The Catonsville 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 bay, office spaces, classrooms, a kitchen area, an assembly hall, boiler room, lower level exercise room, 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 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 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 three (3) 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 gym area. An unused kitchen will be renovated in 2009 was found to have damaged and sloughing paint which was found to be lead containing. Reportedly, a fire in the kitchen occurred several years ago. Elevated lead concentrations were also identified on a wall mounted exhaust fan (fan blades).

Various surfaces within the facility were screened for lead using surface/wipe samples and the collection of air samples. Surface/wipe samples were collected using Ghost WipeTM samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 μ m MCE cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, MD for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix B.

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Load Tecting Peculte Summary

Location	Air ug/m ³	Surface ug/ft ²	Bulk	Chip %Pb
Range	ND			
Office	ND			
Blank	ND			
Room B1 Closet Wall				ND
Room 106 Kit Wall				0.34%
Room 105 Storage Wall				0.021 %
Drill Hall @ Room 119 Floor		160		
Room 106 Top of Refrigerator		2600		
Room B1 Closet Wall		ND		
Room 111 Cabinet Top		110		
Room B2A Cabinet Top		11		
Room B1 Range Exhaust Fan		33000		
Blank		ND		
Criteria	50	200	5,000	0.5
Key: ND – None Detected				

Key: ND – None Detected PB – Lead

Deteriorated paint was identified in the kitchen, inside a closet located in the basement level gym and storage room 105 located adjacent to the vehicle maintenance bay. Surface lead was detected in the exhaust fan of the gym/firing range, Drill Hall floor outside of Arms vault 119, Office 111 cabinet and kitchen. The National Guard Bureau currently utilizes 200 ug/ft² as a benchmark for identifying contaminated surfaces. In the" Derivation of Wipe Surface Screening Levels for Environmental Chemicals", the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft² is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, HUD levels of 40 μ g/ft² on floors and 250 μ g/ft² on windowsills should be observed.

No detectable levels of lead were identified in those air samples collected. Currently, OSHA observed an 8-hour time weighted average of 50 ug/m³.

<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					
Kitchen Room 106	45-68	50	Yes					
Restroom Room 107	33-50	5	Yes					
Lounge 108	78-96	30	Yes					
Office Room 110	83-106	30-50	Yes					
Office Room 111	81-109	30-50	Yes					
Office Room 112	58-117	30-50	Yes					
Office Room 112A	58-73	30-50	Yes					
Class Room 116	95-120	30-50	Yes					
Storage Room 117	32-51	30-50	Yes					
Latrine Room 118	82-111	5	Yes					
Locker Room 118A	41-52	7	Yes					
Locker Room 121	10-35	7	Yes					
Storage Room 122	45-50	30	Yes					
Storage Room 124	89-103	30	Yes					
Gym Room B1	119-135	30	Yes					
Office Room B2	76-105	30-50	Yes					
Office Room B2A	10-109	30-50	Yes					
Drill Hall 101	33-42	30-50	Yes					

Lighting was found to be sufficient throughout the facility.

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

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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 74.3 F to 84.2 F with relative humidity readings ranging from 41.1% to 79.2%. The results of the testing for relative humidity exceeded the US Army guidelines in ten (10) of the sixteen (16) locations tested.

During the survey, CO_2 levels ranged from 373 ppm to 931 ppm within the facility compared to an outdoor CO_2 level of 395 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO_2 recommended is 1,095 ppm (395 ppm + 700 ppm). The results of the testing met the ASHRAE guidelines.

		-	•	
Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Restroom 107	84.2	59.2	497	0
Office 110	76.1	46.6	682	0
Lounge 108	84.2	59.2	580	0
Office 112	77.9	62.5	470	0
Office 112A	74.3	58.6	505	0
Latrine 115	78.8	61.4	439	0
Office 116	77.0	48.1	378	0
Office 117	79.7	68.0	513	0
Locker Room 118A	78.8	69.7	497	0
Latrine 118	78.8	79.2	435	0
Locker Room 121	77.0	74.8	373	0
Storage Room 122	76.1	73.0	931	0
Office 124	78.8	65.7	584	0
Kitchen 106	84.2	60.7	430	0
Gym B1	77.9	69.5	450	0
Office B2A	77.0	71.6	421	0
Criteria	73.0-79.0	30-50	<1,095	<9.0

IAQ Assessment Summary

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:

The kitchen has incurred damage, reportedly by fire. Damaged paint is located on the refrigerator top and floor of adjacent storage room.

Elevated humidity levels due to absence of exhaust fans have produced condensation/elevated humidity conditions throughout both first floor latrines/locker rooms. Elevated humidity in other areas of the building due to a combination of insufficient exhaust in locker rooms as well as open windows for control of comfort parameters rather than use of window unit air conditioning.

The sub-grade wall located in the closet of Room B1 (Gym) contains significant efflorescence.

Suspect Asbestos Containing Building Materials

Suspect asbestos containing materials include sheetrock/joint compound, plaster wall and ceiling systems, floor tiles and associated mastic, and vinyl covebase. Thermal system insulation was found to be a combination of paper wrapped fiberglass with PVC elbows as well as some canvas wrapped fiberglass TSI in the mechanical room.

Room 122 was found to contain of 9"x9" floor tile in poor condition.

No Management Plan was identified.

Maintenance Bay

The maintenance bay/garage was not found to contain a local exhaust ventilation system. The Maintenance Bay is used for vehicle storage and facility storage.

The maintenance bay was found to contain custodial items, tools, waste motor oil, ladders and flammable storage cabinet. The flammable storage cabinet contained various paints and cleaning solvents.

No PPE was identified in the Maintenance Bay

Items for the kitchen renovation are currently stored throughout the bay.

Ventilation System Assessment

The facility was found to contain a direct expansion package servicing the drill floor. Filters, supply side and interior components were found to contain dust loading.

Individual offices and classrooms were found to have window unit air conditioners and radiator heating. Individual units were found to be clean.

No LEV system was present in the garage.

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Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicated within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and The El Group, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

References

Title 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration.

Lead - (29 CFR 1910.1025(h))

American Conference of Governmental Industrial Hygienists (ACGIH) – Threshold Limit Values and Biological Exposure Indices, 2008 Edition

Industrial Ventilation: A Manual of Recommended Practice for Design, 25th Edition

Georgia Army National Guard: Standard Army Safety and Occupational Health Inspection Checklist; 1 October 1999 Edition

ANSI Z358.1 – 2004, Emergency Eye Wash and Shower Equipment

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007.

RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI

National Emission Standard Hazardous Air Pollutants (NESHAP) - The standards for asbestos are contained in 40 CFR 61.140 through 61.157.

Environmental Protection Agency (EPA) standards (40 Code of Federal Regulations (CFR) 745.227(h)(3))

Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation

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Appendix A

Photographs



Exterior view of facility



Water intrusion through subgrade wall (Room B1)





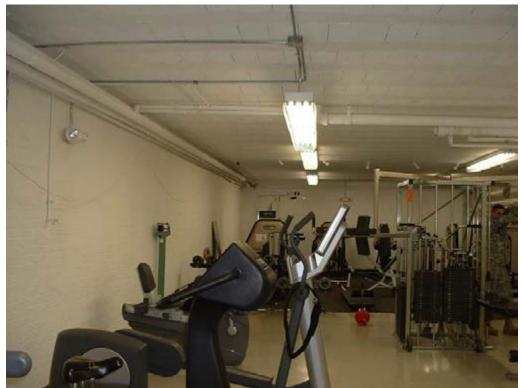
9" x 9" Floor tile located in Room 123 and 123A



Deteriorated paint in kitchen area

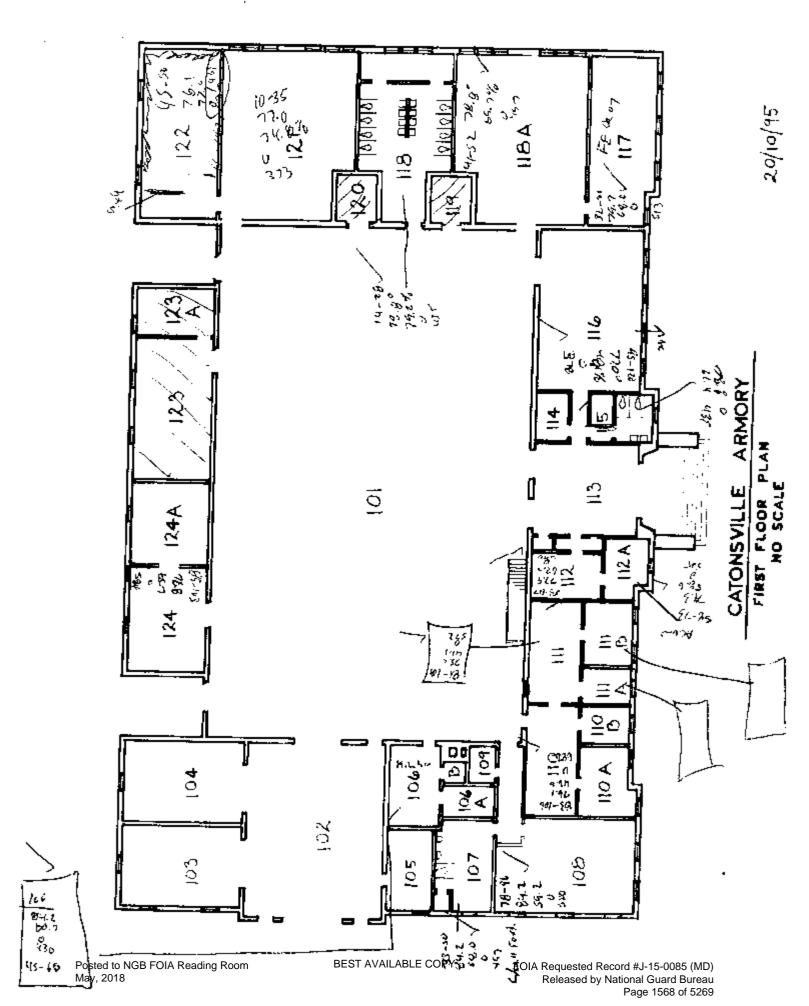


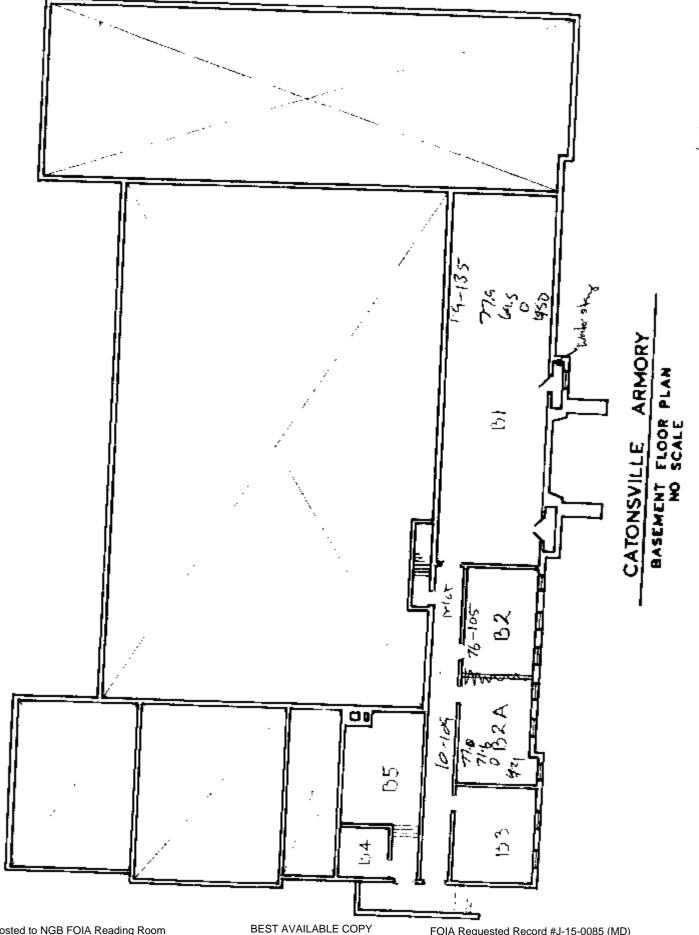
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View of basement level gym (B1). Formerly firing range.

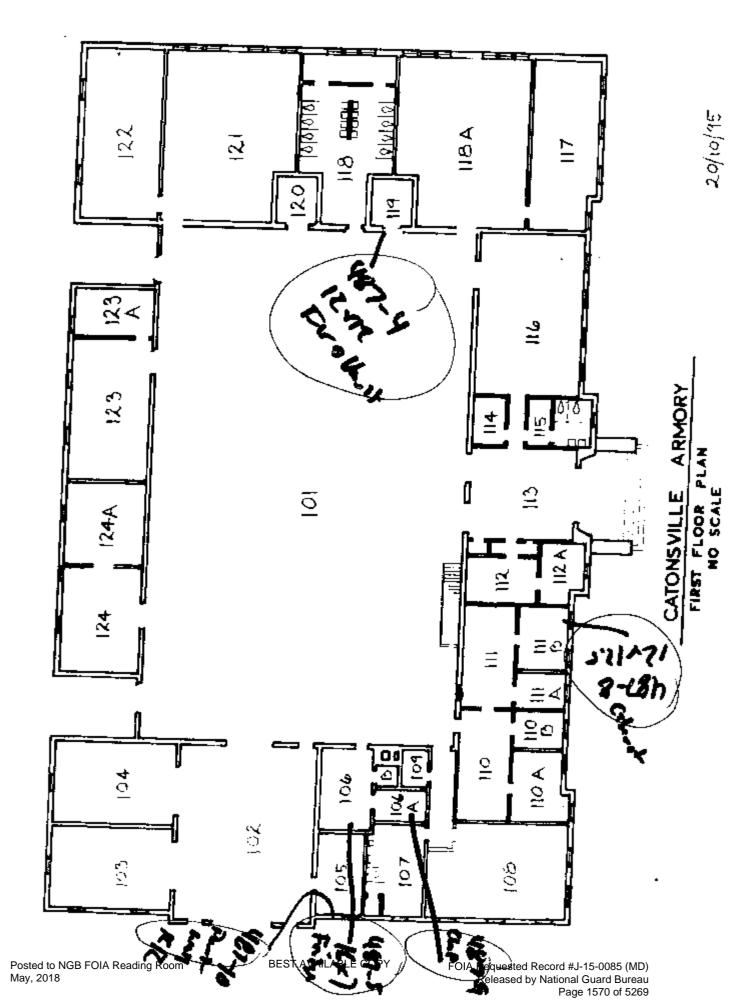


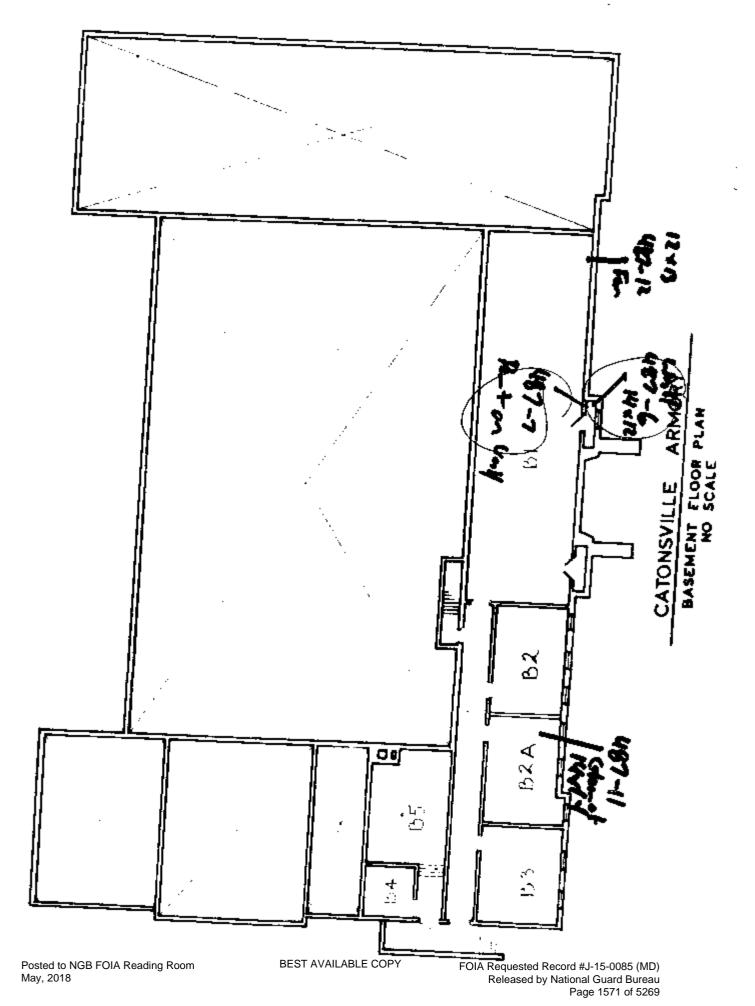




Posted to NGB FOIA Reading Room May, 2018

FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1569 of 5269





Appendix B

Laboratory Analysis Report





Attention:

AMA Analytical Services, Inc.



				Invoice:	95261
Client:	National Guard Bureau	Job Name:	RC 487 Catonsville, MD	Chain Of Custody:	181404
Address:	301-IH Old Bay Lane, Attn: NGB-AVN-SI	Job Location:	Not Provided	Date Submitted:	9/4/2008
	State Military Reservation	Job Number:	Not Provided	Date Analyzed:	9/9/2008
	Havre de Grace, Maryland	P.O. Number:	Not Provided	Date Invoiced:	9/9/2008
	21078			Person Submitting:	Non-Responsive

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
			5 Day 4	£0.00				\$8.00
0882232	487-1	AA Lead Air	5 Day +	\$8.00				\$8.00
0882233	487-2	AA Lead Air	5 Day +	\$8.00				•
0882234	487-3	AA Lead Air	5 Day +	\$8.00				\$8.00
0882235	487-7	AA Lead Paint	5 Day +	\$9.00				\$9.00
0882236	487-9	AA Lead Paint	5 Day +	\$9.00				\$9.00
0882237	487-10	AA Lead Paint	5 Day +	\$9.00				\$9.00
0882238	487-4	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882239	487-5	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882240	487-6	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882241	487-8	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882242	487-11	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882243	487-12	AA Lead Wipe	5 Day +	\$8.00				\$8.00
0882244	487-13	AA Lead Wipe	5 Day +	\$8.00				\$8.00

Sub-Total:	\$107.00
Additional Charge:	\$0.00
Total:	\$107.00

Note: Payment Due Upon Receipt.

May, 2018

Note: All Accounts over 30 days are subject to a 11/2% per month service charge.

Only apply if additional analysis was performed on the sample(s)

Account Code: NATLG

 Remit to: P.O. Box
 646, Hanover, Maryland
 21076,
 410-684-3327

 Posted to NGB FOIA Reading Room
 BEST AVAILABLE COPY
 FOIA Requested F

FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1573 of 5269

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175 Forbes Blvd. • Lanham, MD, 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (301) 459-264.	
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The report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicly matter without prior written authorization provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and hability for the accuracy and completenties the public, and these Laboratories, we expressly disclaim any knowledge and hability for the accuracy and completenties of the information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NYLAP accreditation applies only to the samples and completenties of the samples and completenties of the samples and completenties of the samples and to chain, and does not imply product certification, approval, or endorsement by NYLAP, NIST, or any agency of the Federal Covernment. All materials of the reset of the federal Covernment. All materials applies only to the Federal Covernment. All materials and the samples are constrained by the person of the federal Covernment. All materials applies and the samples are constrained by the person of the federal Covernment. All materials applies applies applies only to the Federal Covernment. All materials approximations applies approximation applies approximation applies approximation applies and to approximate accuracy and completenties approximations.

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0882242	0882241	0882240	0882239	0882238	0882237	0882236	0882235	0882234	0882233	0882232	AMA Sample Number		Attention:			Address:	Client:
487-11	487-8	487-6	487-5	487-4	487-10	487-9	487-7	487-3	487-2	487-1	Client Sample Number		NorteR		Havre de Grace, Mary	301-IH Old Bay Lane, State Military Reserva	National Guard Bureau
Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Analysis Type				dand 21078	Attn: NGB-AVN-SI, tion	2
Wipe	Wipe	Wipe	Wipe	Wipe	Paint Chip	Paint Chip	Paint Chip	Air Blank	Air	Air	Sample Type	Summary o		P.O. Number:	Job Number:	Job Location:	Job Name:
	***	****	***	****	****	****	***	0	1027	1055	Air Volume (L)	of Atomic .		Not Provided	Not Provided	Not Provided	RC 487 Catonsville, MD
1.361	1.042	1.167	0.108	1.000	N/A	N/A	N/A	N/A	N/A	N/A	Area Wiped (ft ²)	Absorption		-	-	_	nsville, MD
8.82	11.52	10.29	111.52	12.00	0.01	0.01	0.01	3.00	2.92	2.84	Repo	Analysi					
ug/ft=	ug/ft ²	ug/tt²	ug/tt²	ug/ft²	%Ph	%Ph	%Pb	ug∕m,	ug/m³	P		is for Le		Date Analyz	Person Subn	Date Submit	Chain Of Custody;
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II I	110	10	2600	160	0.021	0.34	0.011	ىرا	2.9	2.8	inal Rest			9/9/2	Non-Re	9/4/2	181404
ug/ft²	ug/ft²	ug/ft²	ug/ft²	ug/ft²	%Pb	%ԻՆ	%Pb	0g	ug/ពា³	ug/m³				800		800	04
											: :			Report Date:			
												Page 1 of 2		9/9/2008			1(10470
	487-11 Flame Wipe **** 1.361 8.82 ug/ft ² 11	487-8 Flame Wipe **** 1.042 11.52 ug/ft ² 110 487-11 Flame Wipe **** 1.361 8.82 ug/ft ² 11	487-6 Flame Wipe **** 1.167 10.29 ug/ft ² < 10 487-8 Flame Wipe **** 1.042 11.52 ug/ft ² 110 487-11 Flame Wipe **** 1.361 8.82 ug/ft ² 11	487-5 Flame Wipe **** 0.108 111.52 ug/ft ² 2600 487-6 Flame Wipe **** 1.167 10.29 ug/ft ² 10 487-8 Flame Wipe **** 1.042 11.52 ug/ft ² 10 487-11 Flame Wipe **** 1.361 8.82 ug/ft ² 11	487-4 Flame Wipe **** 1.000 12.00 ug/ft? 160 487-5 Flame Wipe **** 0.108 111.52 ug/ft? 2600 487-6 Flame Wipe **** 1.467 10.29 ug/ft? 2600 487-8 Flame Wipe **** 1.467 10.29 ug/ft? 10 487-11 Flame Wipe **** 1.042 11.52 ug/ft? 110 487-11 Flame Wipe **** 1.361 8.82 ug/ft? 110	487-10 Flame Paint Chip **** N/A 0.01 %Pb ().021 487-4 Flame Wipe **** 1.000 12.00 ug/ft ² 160 487-5 Flame Wipe **** 0.108 111.52 ug/ft ² 160 487-6 Flame Wipe **** 0.108 111.52 ug/ft ² 2600 487-8 Flame Wipe **** 1.167 10.29 ug/ft ² 10 487-11 Flame Wipe **** 1.042 11.52 ug/ft ² 110 487-11 Flame Wipe **** 1.361 8.82 ug/ft ² 11	487-9 Flame Paint Chip **** N/A 0.01 %Ph 0.34 487-10 Flame Paint Chip **** N/A 0.01 %Ph 0.34 487-10 Flame Paint Chip **** N/A 0.01 %Ph 0.34 487-10 Flame Wipe **** N/A 0.01 %Ph 0.34 487-5 Flame Wipe **** 1.000 12.00 ug/ft ² 160 487-6 Flame Wipe **** 0.108 111.52 ug/ft ² 2600 487-8 Flame Wipe **** 1.042 11.52 ug/ft ² 10 487-11 Flame Wipe **** 1.361 8.82 ug/ft ² 11	487-7 Flame Paint Chip **** N/A 0.01 %Pb < 0.01 487-9 Flame Paint Chip **** N/A 0.01 %Pb <	487-3 Flame Air Blank 0 N/A 3.00 ug/m ³ $<$ 3 487-7 Flame Paint Chip **** N/A 0.01 %27b $<$ 3 487-7 Flame Paint Chip **** N/A 0.01 %27b $<$ 0.011 487-9 Flame Paint Chip **** N/A 0.01 %27b $<$ 0.011 487-10 Flame Paint Chip **** N/A 0.01 %27b $<$ 0.34 487-10 Flame Paint Chip **** N/A 0.01 %27b $<$ 0.34 487-4 Flame Wipe **** 1.000 12.00 ug/ft ² 0.021 487-5 Flame Wipe **** 0.108 111.52 ug/ft ² 160 487-11 Flame Wipe **** 1.361 8.82 ug/ft ² 110	487-2 Flame Air 1027 N/A 2.92 ug/m^3 < 2.9 487-3 Flame Air Blank 0 N/A 3.00 ug/m^3 < 2.9 487-3 Flame Paint Chip **** N/A 0.01 g/m^3 < 3 487-7 Flame Paint Chip **** N/A 0.01 g/m^3 < 3 487-9 Flame Paint Chip **** N/A 0.01 g/ph < 0.011 487-10 Flame Paint Chip **** N/A 0.01 g/ph < 0.01 487-6 Flame Wipe **** 1.000 12.00 ug/ft^2 1.60 487-11 Flame Wipe **** 0.108 111.52 ug/ft^2 2600 487-11 Flame Wipe **** 1.361 8.82 ug/ft^2 110	487-1 Flame Air 1055 N/A 2.84 ug/m^3 < 2.8 ug/m^3 < 2.8 ug/m^3 < 2.8 ug/m^3 < 2.8 ug/m^3 2.84 ug/m^3 2.84 ug/m^3 2.8 ug/m^3 2.8 ug/m^3 2.8 ug/m^3 2.8 ug/m^3 2.84 ug/m^3 2.8 ug/m^3 2.92 ug/m^3 2.92 ug/m^3 2.92 ug/m^3 2.92 ug/m^3 2.92 ug/m^3 2.92 ug/m^3 2.92 ug/m^3 ug ug/m^3 ug ug/m^3 ug ug/m^3 ug ug/m^3 ug ug/m^3 ug ug/m^3 ug ug/m^3 ug ug/m^3 ug ug/m^3 ug ug/m^3 ug ug/m^3 ug ug/m^3 ug ug/m^3		Client SampleAnlysis TypeNir VolumeReportingReportingFinal ResultCountent487-1FinneAir1055N/A2.84ug/m²C2.8ug/m²CountentCountent487-2FinneAir1027N/A2.94ug/m²C2.8ug/m²2.94ug/m²2.94ug/m²Countent487-3FinneAir1027N/A2.92ug/m²2.92ug/m²2.93ug/m²Countent487-5FinnePaint Chip••••N/A0.01%Pb<0.011%Pb2.94%PmCountent487-6FinnePaint Chip••••N/A0.01%Pb<0.011%PbCountent487-6FinnePaint Chip••••N/A0.01%Pb<0.01%Pb487-6FinneWipe••••1.16710.29ug/th?1.60ug/th?1.60ug/th?487-1FinneWipe••••1.16710.29ug/th?1.10ug/th?1.10Ug/th?487-1FinneWipe••••1.16710.29ug/th?1.10ug/th?1.10Ug/th?487-1FinneWipe••••1.16710.29ug/th?1.10Ug/th?1.10 <t< td=""><td>Summary of Atomic Absorption Analysis for LeadClient Sample TypeAir VolumeAir VolumeReportingFinal ResultCouncenting487-1FinneAir1055N/A2.84ug/m²CouncentCouncent487-2FinneAir1027N/A2.92ug/m²2.93ug/m²Councent487-3FinneAir1027N/A0.013.00ug/m²3.00ug/m²Councent487-3FinnePaint ChipIIII1027N/A0.013.00ug/m²3.00ug/m²Councent487-4FinnePaint ChipIIII1027N/A0.013.09ug/m²Councent487-5FinneWipeIIIIN/A0.013.09ug/m²Councent487-5FinneWipeIIII1.16710.29ug/m²<!--</td--><td>P.O. 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AMA Analytical Services, Inc.

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CERTIFICATE OF ANALYSIS

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This report sppiles only to the sample, 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 spatial and collecting protocols are based upon the thiformation provided by the persons submitting them and, unless collected by personnel of these Laboratories, the authorization form us. Sample types the information, Residual samples an introduced the appropriate regulatory graduates, unless collected by personnel of these Laboratories, the public, and these Laboratories, this reports this information. Residual samples are tracked in accordance with the appropriate regulatory graduation in these collected by personnel of these Laboratories, we expressely disclaim any home-ledge and lability for the accordance with the appropriate regulatory graduations, unless collected by personnel of these Laboratories, the reports disclaim any home-ledge and lability for the accordance with the appropriate regulatory graduations approvable to these Laboratories, the reports of the transmission electron microscopy of AltERA air samples. This report must not be used to claim, and does not imply product certification, approvab, or endorstanent by NUAP, NIST, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, lac.

Analysis Method for Flame: Air Analysis Method For Furnace: N/A = Not Applicable mg %Pb = percent lead by weight Note: All samples were receive Note: All results have two sign should not be considered when Air and Wipe results are not co	AMA Sample Number	Attention:			Address:	Client:	Ľ
Furr Furr rere are i	Client Sample Number		3 0	Havre de Grace, Maryland 21078	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	National Guard Bureau	
<pre>fipes, Paints, and Soil/Solic , Wipes, Paints, and Soil/S = parts per million (ppm) b ug = micrograms ug n good condition unless oth n good condition unless oth terpreting the result. cted for any blank results</pre>	Analysis Type			and 21078	Attn: NGB-AVN-SI, ion		
e: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: St ace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Wate mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm) eight ug = micrograms ug/L = parts per billion (ppb) ceived in good condition unless otherwise noted. significant digits. Any additional digits shown when interpreting the result. not corrected for any blank results Aualyst:	Sample Type	Summary o	P.O. Number:	Job Number:	Job Location:	Job Name:	
0(M)-7420; Water: St 3/200(M)-7421; Wate arts per million (ppm) (ppb) Analyst:	Air Volume (L)	of Atomic Al	Not Provided	Not Provided	Not Provided	RC 487 Catonsville, MD	
SM-3111B ter: SM-3113B	Area Wiped (ft ²)	bsorption A				ille, MD	
See QC Summary for associated with these VY ELAP accrediation amples.	Reporting Limit	Summary of Atomic Absorption Analysis for Lead	Date Analyzed:	Person Submitting:	Date Submitted:	Chain Of Custody:	
analytical results of quali sampes n applies only to paint chi Technical Manager: G	Final Result	: :	9/9/2008	Non-Rea	9/4/2008	181404	
raility control sample chip, wipe, and wat chip of the	Com		Report Date:				
BEST AVAILABLE COPY	Comments	Page 2 of 2 FOIA Requ	9/9/2008 ested ased b	Reco y Na	10920 Drd #JT tional (Page	> 15-008	See allocation for details 35 (MD) Bureau of 5269

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ACCREDITED LA



AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 16547

	Analysis Type	e Flame		
	Sample T ype :	Air		
	Analysis Date	9/8/2008		
	Result	Percent Recovery	RPD	Comment
Preparation Blank	-0.103 pp	m		Acceptable
Report Lumit Verification Sample	0.2194 ppc	nt 87.895		Accoptable
Expected Spike Level (ppm) 0.25				
Duplicate Sample 1	•Num' rog	Xg		
Duplicate Sample 2	≏Num' rag	Xε	Witness	#J÷rror
Metrix Spike Analysis				
Spiked Sample		106-15%		Acceptable
Spike Duplicate		104.70%×	1.38%	Acceptable
Laboratory Control Sample 1	I10.689 д g	105.18%		Acceptable
Laboratory Control Sample 2	113.155 µg	103.75%	1 38%	Acceptable

Calibration Information

Correlation of Calibration Curve

All calibration verification samples are within acceptance limits.

Notes:

Samples	included in	n this	Sample	Delivery	Group	(SDG)
---------	-------------	--------	--------	----------	-------	-------

Chain Of Custo	dy AMA Sample Number	Client Sample Number
189767	82077	N0276-01
180767	82078	N0276-02
SDG Number:	16547	

0.99991

Page 1 of 2

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
180767	82079	N0276-03
181402	\$2217	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	\$2245	492-2
181417	82246	492-1
181417	82247	492-3
503172	82261	9408LBP-1
503172	82262	9408LBP-2
503173	\$2263	9208LBP-1
503173	82264	9208LBP-2
503174	82265	9508LBP-1
503174	82266	9508LBP-2
503175	82267	9308LBP-1
503175	82268	93081.BP-2

SDG Number: 16547

Page 2 of 2 $\,$



AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 16552

	Analysis	Турс:	Flame			
	Sample Type. Analysis Date:		Paint Chip	Paint Chip		
			9/8/2008	9/8/2008		
	Яc	şulı	Percent Recovery	RPD	Comment	
Preparation Blank	-0.031	ррт			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	жg	110 78**		Acceptable	
Laboratory Control Sample 2	429 110	μg	94 52%	15.84° p	Acceptable	

Calibration Information

Correlation of Calibration Curve:

All calibration verification samples are within acceptance limits.

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181397	81909	486-11
181397	\$1910	486-12
SDG Number: 1	6552	

0.999853

Page 1 of 2

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181397	81911	486-13
181397	81912	486-34
181430	82200	495-14
181430	\$2201	495-1-6
181430	¥2202	495-17
181430	£2203	495-1-10
181430	82204	495-L-11
181404	82235	487-7
181404	82236	487-9
181404	82237	487-10
181417	\$2254	ต
181417	R2255	C2
176586	82328	CBC080908-10
176586	82329	CBC080908-11

SDG Number: 16553

Page 2 of Z

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AMA Analytical Services, Inc.



QC Summary

Sample Delivery Group: 16554

	Anelysis Type: Sample Type: Anelysis Date:		Flame Wipe 9/9:2008			
	-	sult	Percent Recovery	RPD	Comment	
Preparation Blank	-0.041	ppm			Acceptable	
Report Limit Verification Sample	0.2835	ppm	85 1%		Acceptable	
Expected Spike Level (ppm) 0.3333						
Duplicate Sample 1	#Nom!	mg/Kg				
Duplicate Sample 2	#Num'	mg/Kg		*Error	÷Нтог	
Matrix Spike Analysis						
Spiked Sample			98 87%		Acceptable	
Spike Duplicate					Acceptable	
Laboratory Control Sample 1	286.769	μg	102.00° e		Acceptable	
Laboratory Control Sample 2	315.385	μġ	102.18%	0.18%	Acceptable	

Calibration Information

Correlation of Calibration Curve: 0 999874

All calibration verification samples are within acceptance limits.

Notes:

Chain Of Custo	dy AMA Sample Number	Client Sample Number
181404	82238	487-4
8 404	82239	487-5
SDG Number:	16554	

Page 1 of 2

Samples included in this Sample Delivery Group (SDG)

Chain Of Custody	AMA Sample Number	Client Sample Number
181404	82240	487-6
181404	82241	487-8
181404	82242	467-11
183404	R 22 4 3	467-12
181404	R 22 4 4	487-13
182423	82268	DE080818-01
182423	\$2289	DE080818-02
182423	82290	DE080819-01
182423	82291	DE080819-02
182423	82292	DE080820-07
182423	82293	DE080826-01
182423	82294	DE 080826-02
182423	82295	DE080826-03
182423	82296	DE080826-04
182423	82297	DE080826-05

SDG Number: 16554

Page 2 of 2



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SAMPLE CHAIN OF CUSTODY

DATE SHIPPED # OF SAME	LES	SAMPLE MEDIA		
. 3		· ·	TELEPHONE NUMBER	
CONTACT		·	TELEPHONE NUMBER	7
			; ;	4
SAMPLE # OR AREA	BAMPLE DATE		ANALYSIS REQUESTED	-
487-1	7/3/00	1055.36	Lad-Air	 -1
487-2		1027.53		
487-3	 - -	0	/	
487 - 7		ļ_ <u></u> -	Lord -Clip	
487-9		<u> </u>		
487-10	· · · · · · · · · · · · · · · · · · ·		¥	
487-4		1441,2	Led - wipe	_
407-5	i	100002	· · · · · · · · · · · · · · · · · · ·	_
487-6	l 	168.2	i di	
487-8		150.2	· · · · · · · · · · · · · · · · · · ·	-
487-11		196	ļ	
487 - 12	ļ ·	156 :-	· · · · · · · · · · · · · · · · · · ·	
407 - 13	/	0	<u>V</u>	
-467	· · · ·			
				.
Samples Relinquished B	Y: S:gnate	Jan	<u>8/82/</u> 08 	
Samples Received By:	Signatu	ne	/ Date	
Samples Analyzed By:			Dute]

Posted to NGB FOIA Reading Room May, 2018

I.ABORATORY I. Date/Time RCVD: STAFF ONLY: (CUSTODY) . CUSTODY)	Sec		CLENT ID SAMPLE INFORMATION NUMBER IDENTIFICATION D/	Asbestne Analysis PCM Afr Please indicate Filter Type: PC MCE Porosity	APS Forbes Blvd Lanham, MD 20706 (301) A59-2640 • (800) 346-0961 • Fax (301) A59-2643 www.amalab.com Mailing/Billing Information: 1. Client Name: National Grazie 2. Address 1: 301-1H 0H 3. Address 3: Harre de Grazie 4. Address 3: Harre de Grazie Mathematical Strenge 5. Phone #: 33 445 2538 Fax # 70 4. Address 3: Harre de Grazie Mathematical Strenge 5. Phone #: 33 445 2538 Fax # 70 6. Immediate Date Due: D Immediate 0. Immediate Date Due: 0 Immediate 0. Comments: Time Due: 0 2.0	Focused on Results
ed: <u>14100 @ Outor UPS</u> By (Print): M ed: <u>1900</u> @ By (Print): M Po: Via: Date:		J Harch och	DATE ALTERS) AREA R. ANALYSIS DATE ALTERS) AREA R. A. ANALYSIS DATE ALTERS) AREA R. A. ANALYSIS DATE ALTERS) AREA R. A. ANALYSIS DATE ALTERS AREA R. C. A. M. A.	TEM Bulk TEM Bulk Cl ELAP 198, 4/Charfield (QTY) Cl NY State PLM/TEM (QTY) Cl Qual. (QTY) Cl Qual. (presishs) Vacuum/Dest Cl Qual. (presishs) Vacuum/Dest Cl Quan. (xince)) Dast D6480-99 Cl Qual. (presishs) Cl Quan. (xince)) Dast D6480-99 Cl Qual. (presishs) Cl Qual. (presishes) Cl PA 100.1 (QTY) Cl PAN Waker samples Y) Cl PAN Waker samples Y)	n Dertha	
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National Guard Region North

National Guard Readiness Center Industrial Hygiene Evaluation Catonsville Army National Guard Armory Catonsville, MD 21228-5142

Prepared for:

National Guard Region North Industrial Hygiene Office 301 Old Bay Lane Havre De Grace, MD 21078

Attn:

n-Responsive

Prepared by:

Bonus Environmental, LLC P.O. Box 121 Mt. Pleasant, Michigan 48804

> Project No. 1061-03 August 4, 2010

Bonus Environmental, LLC

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APPENDICES

Appendix A	Shop Diagram
Appendix B	Lead Sample Results
Appendix C	Photographs
Appendix D	References



August 4, 2010 Project No. 1061-03

National Guard Region North Industrial Hygiene Office 301 Old Bay Lane Havre De Grace, MD 21078-4003

Attn: Non-Responsive

Project: Army National Guard Readiness Center, Industrial Hygiene Evaluation Catonsville 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 Catonsville Army National Guard Readiness Center located at 130 Mellor Avenue in Catonsville, Maryland. The purpose of this evaluation was to generate or to update a previous baseline evaluation so that employee exposure history can be provided to each civilian and military employee. The following industrial hygiene and safety programs were evaluated during this industrial hygiene evaluation performed by Bonus Environmental, LLC representative Non-Responsive on May 14, 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 Catonsville Readiness Center is an Army National Guard armory comprised of offices, a drill hall, a kitchen, a classroom, locker rooms, storage rooms, and a fitness room. The point of contact for this facility was SFC David Dubois. Four (4) full-time administrative personnel are employed in the approximately 25,900 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 National Guard Bureau Region North Industrial Hygiene Office has established/interpreted a threshold of 200 μ g/ft² of lead concentration for surface cleanliness. The following table outlines the locations and analytical results for the lead wipe samples collected during this project

Army National Guard – Catonsville Readiness Center Lead Wipe Sample Results					
Sample #Sample DateSample Location		Sample Area (ft ²)	Sample Result (µg/ft ²)		
CV-W-1	5-14-10	Field Blank		< 12	
CV-W-2	5-14-10	Drill hall, SE corner, on podium outside of room 111	0.111	< 110	
CV-W-3	5-14-10	Drill hall, east wall, top of drinking fountain	0.111	< 110	
CV-W-4	5-14-10	Drill hall, north wall, top of basketball hoop retractor box	0.111	< 110	
CV-W-5	5-14-10	Drill hall, floor, north "free throw" line	0.111	< 110	
CV-W-6	5-14-10	Drill hall, floor, south "free throw" line	0.111	< 110	
CV-W-7	5-14-10	Kitchen room 106, east wall, top of "Panel F" control box	0.111	< 110	
CV-W-8	5-14-10	Room B3, SW corner, desk surface	0.111	< 110	
CV-W-9	5-14-10	Room B1 (Fitness room, former indoor firing range), NE corner, east wall, exhaust ventilation fan blade	0.111	10,000	
CV-W-10	5-14-10	Room B1 (Fitness room, former indoor firing range), west side- center of room, on light fixture	0.111	< 110	
CV-W-11	5-14-10	Room B1 (Fitness room, former indoor firing range), south side, top of "speed bag" fixture	0.111	< 110	
CV-W-12	5-14-10	Room B1 (Fitness room, former indoor firing range), center of room, floor	0.111	< 110	
CV-W-13	5-14-10	Hallway outside of room B1, NW corner of hallway, top of "Panel B" box	0.111	< 110	
CV-W-14	5-14-10	Room 108, west side, on bar counter top	0.111	< 110	
CV-W-15	5-14-10	Lobby area 113, NE corner, NE corner, top of heating register	0.111	< 110	
CV-W-16	5-14-10	Room 118A, west side, top of locker 176	0.111	140	
CV-W-17	5-14-10	Room 121, along north wall, desk surface	0.111	< 110	
CV-W-18	5-14-10	Room 102, SW corner, top of "Diesel pump" circuit breaker box $d = \langle 200 \ \mu \sigma/ft^2 \rangle$	0.111	560	

Surface cleanliness threshold = $< 200 \ \mu g/ft^2$

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Project No. 1061-03	

2.2 – Lead Air Sampling

The purpose of lead air monitoring was to document task-specific activities and corresponding exposures to lead. Occupational Safety and Health Administration (OSHA) 29 CFR 1926.62 requires employers whose employees are exposed to lead in the work place, in any quantity, make a determination whether any employee's exposure exceeds the action level (AL) of 30 μ g/m³ or the maximum permissible exposure limit (PEL) of 50 μ g/m³ as 8-hour time weighted averages (TWAs). If employee exposures are less than 30 μ g/m³, training is required under the Hazard Communication 29 CFR 1926.59. Exposures that exceed the AL or PEL require the employer to comply with additional requirements, including air monitoring, additional training, and restricted work practices as outlined in OSHA 29 CFR 1926.62.

Representative fixed area sampling was conducted for potential airborne concentrations of lead in accordance with accepted Industrial Hygiene methods recognized by the National Institute for Occupational Safety and Health (NIOSH) and OSHA.

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 – Catonsville 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/m ³)
May 14, 2010									
CV-A- 1	FB	Field Blank				0	3	< 3	N/A
CV-A- 2	IWA	Drill hall, SE corner, outside of room 110	2.0	0853	1538	810	3.7	< 3.7	N/A
CV-A- 3	IWA	Room B1 (Fitness room, former indoor firing range), north end, east side along wall	2.0	0854	1539	810	3.7	< 3.7	N/A

PS = Personal sample, **IWA** = Inside work area, **N/A** = Not Applicable **Note**: The OSHA PEL of 50 μ g/m³ is averaged over an 8 hr work shift



3.0 - PHYSICAL CONDITION OF FACILITY / PERSONNEL CONCERNS

3.1 - Lead Based Paint

During the industrial hygiene evaluation of the Army National Guard Catonsville 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 Catonsville 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 Catonsville 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 Catonsville 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 Catonsville 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 concerns or employee complaints were identified.

3.6 – Indoor Air Quality

During the industrial hygiene evaluation of the Army National Guard Catonsville Readiness Center, Bonus Environmental, LLC measured temperature, relative humidity, carbon monoxide (CO), and carbon dioxide (CO₂) throughout the facility. A calibrated TSI Q-Trak Model 7565 Indoor Air Quality Monitor equipped with a Q-Trak Probe 982 was utilized to record indoor air quality measurements.

Carbon dioxide is a natural component of air and the amount of CO_2 in a given air sample is commonly expressed as parts per million (ppm). The outdoor air in most locations contains about 380 ppm carbon dioxide. Higher outdoor CO_2 concentrations can be found near vehicle traffic areas, industry and sources of combustion. The concentrations of CO_2 found in most offices are well below the OSHA Permissible Exposure Limit (PEL) of 5,000 ppm when averaged over an 8-hour time period for an industrial workplace. While levels below 5,000 ppm are considered to pose no serious health threat, studies have indicated that individuals in offices with elevated CO_2 concentrations tend to report drowsiness, lethargy and a general sense that the air is stale. Ventilation rates for office spaces are

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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 406 ppm to 679 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 1.6 ppm. CO levels were well below the OSHA PEL during this industrial hygiene evaluation.

During the industrial hygiene evaluation of the Army National Guard Catonsville Readiness Center, Bonus Environmental, LLC collected temperature measurements. Temperature measurements throughout the facility ranged from 65.7°F to 71.5°F and are considered to be within an acceptable range.

During the industrial hygiene evaluation of the Army National Guard Catonsville Readiness Center, Bonus Environmental, LLC collected relative humidity measurements. Relative humidity measurements throughout the facility ranged from 58.6% to 78.7% 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 – Catonsville Readiness Center Indoor Air Quality Measurements					
Location	CO ₂ (ppm)	CO (ppm)	Relative Humidity (%)	Temperature (°F)	
Outdoors, east side of building	388	1.8	80.5	65.5	
Lobby area 113	416	1.5	78.7	66.8	
Boiler room B5	415	1.6	72.8	71.5	
Fitness room B1	439	0.9	58.6	68.1	
Room 108	430	1.2	65.6	67.9	
Room 110	679	1.1	60.7	68.6	
Drill hall room 101	417	1.3	69.8	68.1	
Room 116	414	1.4	70.5	67.8	
Room 121	428	1.2	63.2	66.4	

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Army National Guard – Catonsville Readiness Center Indoor Air Quality Measurements						
Location	CO ₂ (ppm)	CO (ppm)	Relative Humidity (%)	Temperature (°F)		
Room 104	406	1.2	71.3	65.7		
Kitchen room 106	461	1.3	74.8	66.4		

Required/Recommended Values

 CO_2 - OSHA PEL = 5,000 ppm and ASHRAE Standard 62.1-2007 = no greater than 700 ppm above outdoor CO - OSHA PEL = 50 ppm and OSHA Ceiling Limit = 200 ppm Temperature - ASHRAE Standard 55-2004 = between approximately 67 and 82 °F.

RH – ANSI/ASHRAE Standard 62.1-2007 = <65%

4.0 – LIGHTING

Utilizing a properly calibrated Cooke Corporation cal-Light 400 light meter, Bonus Environmental, LLC collected illumination readings throughout the facility. Illumination measurements recorded during this industrial hygiene evaluation are summarized in the table below.

Army National Guard – Catonsville Readiness Center Lighting Survey						
Location	Measurement in	Requirement in Foot	Requirement Met?			
	Foot Candles	Candles				
Room B5 – Boiler room	23.1	30	NO			
Room B4 – Storage	7.6	30	NO			
Room B3 – Lounge	44.9	10	YES			
Room B2A – Lounge	152.4	10	YES			
Room B2 – Lounge	122.6	10	YES			
Room B1 – Fitness room	110.4	30	YES			
Room 103 – Office	16.3	50	NO			
Room 104 – Storage	8.5	30	NO			
Room 102 – Storage	5.9	30	NO			
Room 105/106 – Kitchen	61.7	10	YES			
Room 106A – Storage	108.0	30	YES			
Room 109 – Storage	24.8	30	NO			
Room 107 – Restroom	15.9	5	YES			
Room 108 – Lounge	69.4	10	YES			
Room 110 – Office	100.8	50	YES			
Room 110A – Office	52.2	50	YES			
Room 110B – Office	49.5	50	NO			
Room 111 – Office	116.4	50	YES			
Room 111A – Office	46.1	50	NO			
Room 111B – Office	153.1	50	YES			
Room 112 – Recruiter's office	61.4	50	YES			
Room 112A – Recruiter's office	54.9	50	YES			
Room 113 – Lobby	27.7	5	YES			
Room 114 – Storage	5.9	30	NO			
Room 115 – Restroom	35.1	5	YES			
Room 116 – Classroom	130.9	30	YES			

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Army National Guard – Catonsville Readiness Center Lighting Survey						
Location	Measurement in Foot Candles	Requirement in Foot Candles	Requirement Met?			
Room 117 – Storage	96.6	30	YES			
Room 118A – Locker room	7.8	7	YES			
Room 119 & 120 – Vaults Inaccessible						
Room 118 – Restroom	12.8	12.8 5 YES				
Room 122 – Storage	10.8	30	NO			
Room 121 – Storage	29.7	30	NO			
Room 123A – Storage	55.0	30	YES			
Room 123 – Storage	18.1	30	NO			
Room 124/124A – Storage	67.6	30	YES			
Room 101 – Drill hall	28.4	30	NO			

Lighting levels were compared to the levels outlined within the ANSI/IESNA RP-1-04 Office Lighting Handbook, and the ANSI/IESI RP-7-01 Lighting Industrial Facilities Handbook. Areas within the facility which did not meet the foot candle requirements are identified with a "NO" within the Requirement Met? column. It is recommended that illumination be improved in all the areas that did not meet the requirements. Improving illumination can be achieved by replacing burned-out lamps/bulbs, cleaning fixtures, relocating detailed work activities to more illuminated areas, and using supplemental task lighting.

5.0 - CONCLUSION

Bonus Environmental, LLC was contracted by the National Guard Bureau Region North to identify and measure the existence and extent of potentially hazardous operations or conditions at the Catonsville Army National Guard Readiness Center located at 130 Mellor Avenue in Catonsville, Maryland. The purpose of this evaluation was to generate or to update a previous baseline evaluation so that employee exposure history can be provided to each civilian and military employee. An industrial hygiene evaluation of the facility was performed by Bonus Environmental, LLC representative Non-Responsive on May 14, 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
- Housekeeping

- Lead Air Samples
- Ergonomics
- Temperature
- Relative Humidity

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It has been a pleasure to be of assistance to you. Please contact us if you have any questions concerning this report or if we can be of any further assistance in any other environmental or occupational health matter.

Sincerely,



Principal Bonus Environmental, LLC



Principal Bonus Environmental, LLC

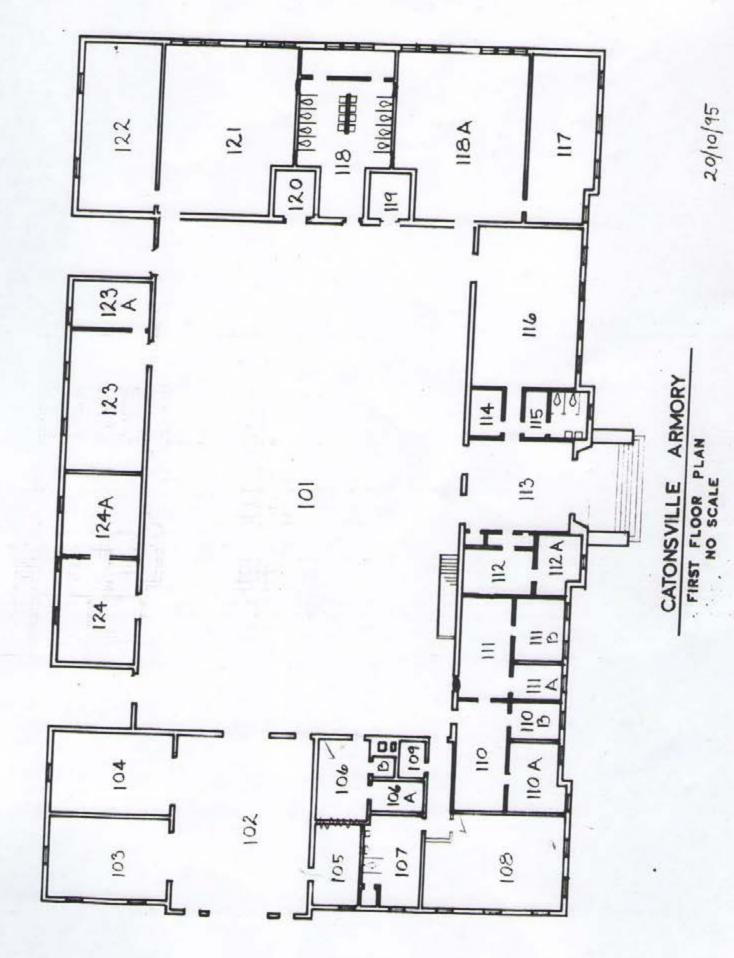
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<u>Appendix A</u>

Shop Diagram

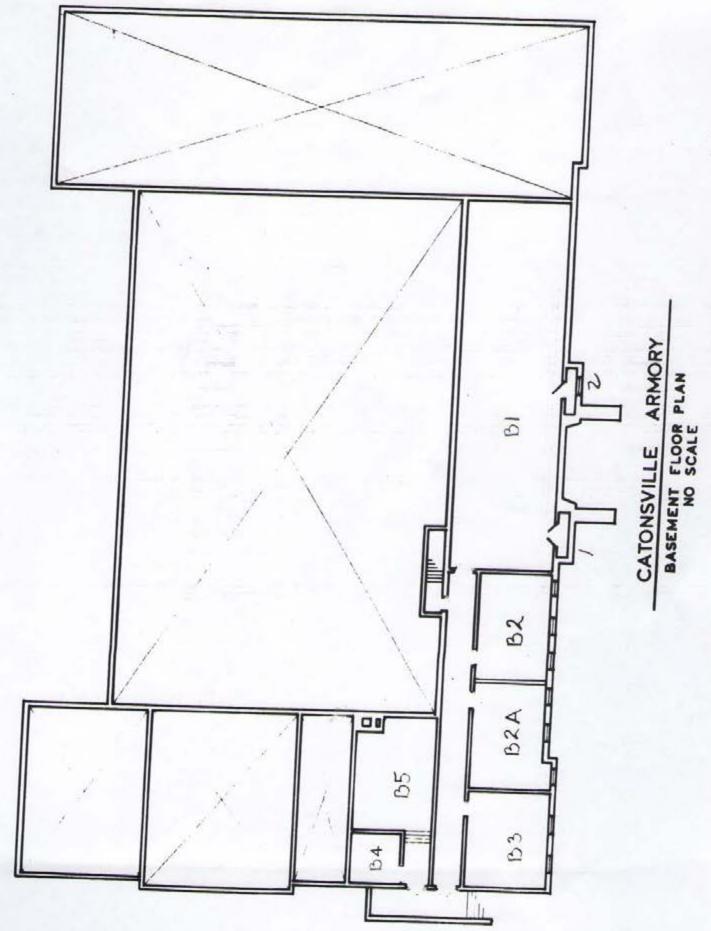
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<u>Appendix B</u>

Lead Sample Results

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Attention:		Non-re	P.O. Number:		W912K6-09-A-0003			Date Analyzed:		5/28/2010 Report Date:	te: 6/1/2010
		Ĩ	Summary		of Atomic Absorption Analysis for Lead	ption ,	Analysi	is for Lead			Page 1 of 2
AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft ²)	Repo Lin	Reporting Limit	Total ug	Final Result		Comments
1047824	CV-A-I	Flame	Air Blank	0	N/A	~	un len3				er en en en en en en en en en en en en en
1047825	CV-A-2	Flame	Air	810	N/A	3.7	ug/m ³	5	2 7	ug 	
1047826	CV-A-3	Flame	Air	810	N/A	3.7	ug/m ³	2 4	2 5	ug/m²	
1047827	CV-W-1	Flame	Wipe Blank	***	N/A	12	- dn)	12 ∆	ug/III ⁻	
1047828	CV-W-2	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/fi ²	
1047829	CV-W-3	Flame	Wipe	***	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047830	CV-W-4	Flame	Wipe	***	0.111	110	ug/ft²	<12	<110	ug/ft²	
104/831	CV-W-5	Flame	Wipe	* *	0.111	110	ug/ft²	<12	<110	ug/ft²	
707401	CV-W-0	Flame	Wipe	**	0.111	110	ug/ft²	<12	<110	ug/ft²	
0017834	CV-W-/	Flame	Wipe	****	0.111	110	ug/ft²	<12	<110	ug/ft²	
1047835	CV-W-9	Flame	Wipe		0.111	110	ug/ft²	<12	<110	ug/ft²	
1047836	CV-W-10	Hame	Wine	***	0.111	110	ug/ft²	1200	10000	ug/ft²	
1047837	CV-W-11	Flame	Wine	****	111.0	110	ug/ft²	<u>4</u> 12	<110	ug/ft²	
1047838	CV-W-12	Flame	Wine	****	1110	011	-ш/ân	77	<110	ug/ft²	
1047839	CV-W-13	Flame	Wipe	****	111.0	011	ug/11 ⁻	21 5	<110	ug/ft²	
1047840	CV-W-14	Flame	Wine	****	111.0		-11/ân	71~	011>	ug/ft²	
1047841	CV-W-15	Flame	Wine	****	111.0		ug/11 ²	<12	<110	ug/ft²	
1047842	CV-W-16	Flame	Wine	****	111.0		-11/Bn	21>	<110	ug/ft²	
	Σ 110 ug/f ² 12 140 ug/f ²				111.0	110	-11/Bn	cI	140	ue/ft²	

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CERTIFICATE OF ANALYSIS	Catonsville Armory Chain Of Custoda: 507187 100470	5/21/2010 NY	Catonsville Armory Person Submitting.		of Atomic Absorption Analysis for Lead	Area Wiped Reporting Total ug Final Result Comments (ft ²) Limit	0.111 110 ug/ft ² <12 <110 ug/ft ² 0.111 110 ug/ft ² <2 560 ug/ft ² 0.111 110 ug/ft ² 62 560 ug/ft ² 21; Water: SM-3113B See OC Summary for analytical results of quality control samples 21; Water: SM-3113B See OC Summary for analytical results of quality control samples 21; Water: SM-3113B See OC Summary for analytical results of quality control samples 21; Water: SM-3113B See OC Summary for analytical results of quality control samples 21; Water: SM-3113B associated with these sampes. 0n (ppm) See OC Summary for analytical results of quality control samples no (ppm) See OC Summary for analytical results of quality control samples NY ELAP accreditation applies only to paint chip, wipe, and soil Samples. N Analyst: Nida McGarvey Aualyst: Nida McGarvey Aualyst: Nida McGarvey Aualyst: Nida McGarvey
-	Job Name: Catons	Job Location: Catons	Job Number: Catons	P.O. Number: W912K	Summary of Atom	Sample Type Air Volume (L)	Wipe **** 0.11 Wipe **** 0.11 Wipe **** 0.11 Wile EPA 600/R-93/200(M)-7420; Water: S Il'Solids : EPA 600/R-93/200(M)-7421; Wat by weight mg/L = parts per million (ppm) ug/L = parts per billion (ppb) ug/L = parts per billion (ppb) digits shown fights sh
AMA Analytical Services, Inc.	National Guard Bureau	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Havre de Grace, Maryland 21078		17(00)	Client Sample Analysis Type Sa Number	 17 Flame 18 Flame 18 Flame Vipes, Paints, and Soil/S Wipes, Paints, and Soil/S Air, Wipes, Paints, and So Air, Wipes, Paints, and So Kg = parts per million (ppm ug = micrograms d in good condition unless
	Client:	Address:			ttention:	AMA Sample Number	I047843 CV-W I047844 CV-W I047844 CV-W Analysis Method for Flame: Air, Analysis Method for Flame: Air, Analysis Method For Furnace: M/A = Not Applicable mg/ N/A = Not Applicable mg/ mg/ N/A = Not Applicable mg/ mg/ Note: All samples were receive mg/ mg/ Note: All results have two signif should not be considered when Air and Wipe results are not cor Air and Wipe results for air and wipe sat supplied information nor verified

May, 2018

Bis 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 Laboratorics, this report is administed and use the sample or the submeter 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, administed 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, administed and accepted for the exclusive use of the client to whom it is addressed and upon the advertising or publicity matter without prior written authorization from us. Sample types, administed and scenest advertising or publicity for the excuracy and completeness of destinany to collection protocols are based upon the information provided by the persons unless collected by the client. NVLAP accreditation and knowledge and institution applies on the discarded in accordance with the appropriate regulation; sultas otherwise requested by the client. NVLAP accreditation applies only to polarized light microscopy of bulk samples and the information is report must not be used to clain, and does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government. All rights reserved.

An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

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AMA Analytical Services, Inc.

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QC Summary

Sample Delivery Group: 19394

Analysis Type:	Flame
Sample Type:	Wipe
Analysis Date:	5/28/2010

		R	esult	Percent Recovery	RPD	Comment
Preparation Blank		0.037	ppm			Acceptable
Report Limit Verification Sample		0,317	- ppm	95.1%		Acceptable
Expected Spike Level (ppm)	0.3333					
Duplicate Sample 1			mg/Kg			· -
Duplicate Sample 2		·	mg/Kg			Acceptable
Matrix Spike Analysis		· -		-		Acceptator
Spiked Sample	- ·			· ·		
Spike Duplicate	·	-				Acceptable
						Acceptable
Laboratory Control Sample 1		259.328	μe	103.3.3%a		Acceptable
Laboratory Control Sample 2		222.761	μg	102.94%	0.38%	Acceptable

Calibration Information

Correlation of Calibration Curve: 0.999698

All calibration verification samples are within acceptance limits.

Notes:

Samples included in	ples included in this Sample Delivery Group (SDG)					
Chain Of Custody	AMA Sample Number	Client Sample Number				
507188	47799	FR-W-21				
507186	47823	11-W-21				

Page 1 of 2

Samples included in	this Sample Delivery Gro	ap (SDG)
Chain Of Custody	AMA Sample Number	Client Sami

Chain Of Custody	AMA Sample Number	Client Sample Number
507187	47827	CV-W-t
507187	47828	CV-W-2
507187	47829	CV-W-3
507187	47830	CV-W-4
507187	47831	CV-W-5
507187	47832	CV-W-6
507187	47833	CV-W-7
507187	47834	CV-W-8
507187	47835	CV-₩-¥
507187	47836	CV-W-10
507187	47837	CV-W-t1
507187	47838	CV-W-12
507187	47839	CV-W-13
507187	47840	CV-W-14
507187	47841	CV-W-15
507187	47842	CV-W-16
507187	47843	CV-W-[7
507187	47844	CV-W-18

SDG Number: 19394

Page 2 of 2

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AMA Analytical Services, Inc.

Focused on Results!!



Submitting Samples for National Guard Jobs

- 1) All samples shall be submitted to AMA Analytical Services, Attn: Sample Receiving, utilizing the enclosed Chain-of-Custody Form. The highlighted areas must be completed by the Subcontractor, however, the Sample Information/Analysis/Matrix section will not need to be completed if field date sheets are submitted with the samples. Please be sure to include a contact phone number for the person submitting the samples.
- 2) Results shall be reported via email to the following pers
 - National Guard Subcontractor a. @bonusenvironmental.com
 - b. Non-Responsive_{tiv NGB:} @us.army.mil
 - С. CIV NGB .army.mil
- 3) Hard Copy Reports & Invoices shall be handled in the following manner:
 - a. Original Invoices and Copies of Reports shall be sent to the National Guard National Guard Bureau Attn:Non-Res 301-IH Old Bay Lane

Attn: NGB-AVN-SI, State Military Reservation Havre de Grace, Maryland 21078

b. Original Reports shall be sent the National Guard Subcontractor

Attn: Non-R	esponsive
OFFice!	989-779-7686
(ell:	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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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1605 of 5269

<u>Appendix C</u>

Photographs



NGB / Catonsville Army National Guard Readiness Center Project No. 1061-03

August 4, 2010 Page 12



Building exterior, east side entrance



Drill Hall



Rm. 102, PPE board

Bonus Environmental, LLC Work 989 7776 767691A Reading Room May, 2018 P.O. Box 121 BESTAN VARABLE 76894 *Mt. Pleasant, MI* 48804 FOIA Requested Record #1715-0085 (MH), com Released by National Guard Bureau Page 1607 of 5269



Rm. B1, current fitness room, former indoor firing range



Rm. 104 Storage of chemicals





NGB / Catonsville Army National Guard Readiness Center Project No. 1061-03

August 4, 2010 Page 13



Boiler room



Inside of P.O.L. building



Exterior of P.O.L. building

Bonus Environmental, LLC Work 989 7779 7660 A Reading Room May, 2018 P.O. Box 121 BESTAVALABLE 76894 *Mt. Pleasant, MI* 48804 FOIA Requested Recold #9-15-0085 (MD) com Released by National Guard Bureau Page 1608 of 5269

Austrite Flammable Nelammable

Rm. 102, flammable cabinet

<u>Appendix D</u>

References



- 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.

P.O. Box 121 BESTAN VALABLE COPY



- 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



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 Catonsville Readiness Center

Prepared For:	National Guard Bureau Region North IH 301-IH Old Bay Lane Havre de Grace, MD 21078
Survey Location:	Catonsville Readiness Center
in the second of the local second on the field of	130 Mellor Avenue
	Catonsville, MD 21228
Prepared By:	Compliance Management International, Inc.
	1215 Manor Drive
	Suite 205
	Mechanicsburg, PA 17055
Survey Date:	July 26, 2013
Report Date:	September 3, 2013
Ion-Respons	sive

Senior Industrial Hygienist

Table of Contents

Section 1.0 Executive Summary
Section 2.0 Operation Description & Observations
Section 3.0 Lead Testing
Section 4.0 Lighting
Section 5.0 Indoor Air Quality
Section 6.0 Suspect Asbestos Containing Building Materials (ACM) 10
Section 7.0 Equipment
Section 8.0 Limitations
Appendix A. Laboratory Analysis Report
Appendix B. Photographs
Appendix C. Floor Plan
Appendix D. References

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on July 26, 2013, at the Catonsville Readiness Center located at 130 Mellor Avenue, Catonsville, MD 21228. The survey was performed by Mr.^{Non-Responsive}.

- 1. Lead surface and air samples were collected. Two sample results were above recommended guidelines and/or regulator standards and lead was detected in a third sample. 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 measured. See Section 4.0 for detailed findings.
- 3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.
 - a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in all areas sampled.
 - b. The relative humidity levels exceeded the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in two locations.
 - c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 parts per million (ppm).
 - d. Carbon dioxide (CO_2) levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings.

See Section 5.0 for detailed sampling results.

4. Suspect asbestos containing materials (ACM) floor tile and black mastic was observed to be intact and in good condition.

Section 2.0 Operation Description & Observations

The Catonsville Readiness Center is mainly an administrative facility with a drill hall, offices, classrooms, and a converted firing range area (currently the weight room). There were approximately 3 full-time employees stationed at this facility at the time of this survey. There are no maintenance personnel assigned to the building.

The 25,900 square foot building is reported to have been built in 1952. It is a single story structure with a basement. The exterior is brick and block. The interior walls are block, wood paneling, plaster and drywall. The floors are concrete, wood, 9"X9" and 12"x12" floor tiles.

The heating system is oil forced hot water unit. There are window air conditioners present in the facility.

Room 122 NBC storage room has a significant fungal growth problem. There is visible fungal growth on the ceiling and contents in this room total more than 100 square feet of fungal growth. A strong fungal odor is present. It was reported that there is a roof leak in the caged storage area in this room. Relative humidity in this room was 79.8%.

There is an attached garage at this facility however no over head vehicle exhaust system is present. It was reported that no vehicle maintenance is preformed at this facility. One vehicle was parked in the garage at the time of the survey.

There is no child-care facility in the building.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared to be properly designed. Personnel had supportive chairs.

This facility has a converted firing range (CFR) that is now used as a weight room.

Suspect asbestos containing material (ACM) 9"X9" floor tile and black mastic was observed to be intact and in good condition.

No chipped or peeling paint were observed.

Housekeeping is adequate.

Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 micrometer (um) mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Sample #	Location	Air ug/m ³	Surface ug/ft ²
1	Drill Hall	<17	*
2	Converted Firing Range/Weight Room	<17	*
3	Drill Hall – Floor	*	<110
4	Drill Hall – Top of Coke Machine	*	<110
5	Drill Hall – Top of Wall Locker	*	<110
6	Kitchen – Top of Wall Locker	*	<110
7	Kitchen – Top of Metal Table	*	<110
8	Hallway – Floor Outside of Converted Firing Range/Weight Room	*	<110
9	Converted Firing Range/Gym - Floor	*	<110
10	Converted Firing Range/Gym – Top of Light Fixture	*	1500
11	Converted Firing Range/Gym – Top of Table	*	150
12	Garage – Top of Electrical Panel	*	390
13	Office 116 – Top of Desk	*	<110
14	Office 111 – Top of Wall Locker	*	<110
15	Room 108 – Top of Book Shelf	*	<110
16	Office B-02 – Top of Wall Locker	*	<110
17	Office B-03 – Top of Desk	*	<110
18	Blank - Wipe	*	<12
19	Blank - Air	<3	*
-	Criteria	50	200

Lead Testing Results Summary

Table Notes:

- 1. Bolded results exceed listed criteria
- 2. **ppm** = parts per million
- 3. ug/ft^2 = micrograms per square foot
- 4. $ug/m^3 = micrograms per cubic meter$
- 5. **ug** = micrograms

Sources:

- 1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges
- 2. OSHA 29CFR1910.1025 Lead Standard

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 "Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft² on floors and 250 ug/ft² on windowsills should be observed. There is no child care provided at this facility.

Lead surface and air samples were collected. The following is a summary of the sample results from this survey.

- Two of the sample locations exceed the recommended limit of 200 ug/ft². Lead was also found at one other sample location. Cleaning procedures should be improved to maintain lead levels on surfaces below the analytical detection limit.
- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m³).

Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98082EL). The light meter was last calibrated in April 2013. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
NBC Storage Room 122	54.1	30	Yes
Office 116	92.5	30-50	Yes
Attached Garage	43.2	75	NO
Room 121 Wall Locker			Yes
Storage	37.2	10	
Room 118-A Wall Locker			Yes
Storage	35.1	10	
Room 117 Supply Room	68.1	30	Yes
Office 111	88.9	30-50	Yes
Office 111-A	95.4	30-50	Yes
Office 110	106.1	30-50	Yes
Classroom 108	92.3	30-50	Yes
Kitchen	222.3	50	Yes
Converted Firing Range/Gym	145.8	30	Yes
Office B-02	101.3	30-50	Yes
Office B-03	70.1	30-50	Yes

Light Survey Assessment Summary

Table Notes:

1. FC = Foot Candles

2. **Bolded** results did not meet listed criteria

Source: ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

The lighting levels did not meet the minimum recommended guideline in the garage.

Section 5.0 Indoor Air Quality

Survey measurements were made for comfort parameters and ventilation (temperature, relative humidity, carbon dioxide, and carbon monoxide). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7575-X (Serial #1228008). The IAQ Meter was last calibrated in July 2012.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2010). ASHRAE specifies temperature ranges for human comfort (ASHRAE 55-2010). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60%.

The following table summarizes the measurements collected.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	84.5	45.6	360	0.0
Room 122 NBC Storage	74.3	79.8	682	0.0
Room 116	72.7	56.0	417	0.0
Attached Garage	75.0	61.0	360	0.0
Criteria	68-79	30-60	<1,060	<9

IAQ Assessment Summary

Table Notes:

- 1. **Bolded** results exceed listed criteria
- 2. **ppm** = parts per million
- 3. (%) = percent relative humidity
- 4. $^{\circ}\mathbf{F} = \text{degrees Fahrenheit}$

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements met the recommended 68-79°F in all sampled areas.
- Relative humidity levels exceeded the recommended guideline of 30 60 % in room 122 NBC storage area and the attached garage.
- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is

obtained by adding 700 ppm to the measured outdoor carbon dioxide level. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,060 ppm (700 ppm + 360 ppm). This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide
- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. The following observation were noted:
- 1. Room 122 NBC storage room has a significant fugal growth problem. There is visible fungal growth on the ceiling and contents in this room > 100 square feet. A strong fungal odor is present. It was reported that there is a roof leak in the caged storage area in this room. Relative humidity in this room was 79.8%.

Section 6.0 Suspect Asbestos Containing Building Materials (ACM)

Suspect (ACM) (asbestos containing material) was noted at the time of this survey:

9"X9" floor tile and black mastic was observed to be intact and in good condition. Exposed black mastic should be covered over.

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228008	7/2012	NA
Cal Light 400 Light Meter	98002EL	4/2013	NA
SKC Air Sampling Pump	LVP06	7/26/13	2.50 LPM
SKC Air Sampling Pump	767926	7/26/13	2.50 LPM

Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

Appendix A. Laboratory Analysis Report

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYDIENE, ENVIRONMENTAL LEAL & ENVIRONMENTAL MICROBIOLOGY ISOLIEG 17025/2005 Www.athaaccreditedlabs.org

Client:	National Guard Bureau	Job Name:	ARNG-MD	Chain Of Custody:	516446			
Address:	301-IH Old Bay Lane, Attn: ARNG-CJG-P, State Military Reservation	Job Location:	Catonsville-RC	Date Submitted:	7/29/2013			
	Havre de Grace, Maryland 21078	Job Number:	Not Provided	Person Submitting:	Non-Responsi	ve		
		P.O. Number:	W912K6-09-A-0003	Date Analyzed:	7/30/2013	Report Date:	7/31/2013	
Attention:	Non-Responsive							

Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AMA Sample Number 13080956	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	0.000	porting Limit	Total ug	Final Res	ult	Comments
	1	Flame	Air	180	N/A	17	ug/m³	<3	<17	ug/m³	
13080957	2	Flame	Air	180	N/A	17	ug/m³	<3	<17	ug/m³	
13080958	3	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080959	4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080960	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080961	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080962	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/fl²	
13080963	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080964	9	Flame	Wipe	***	0.108	110	ug/ft²	<12	<110	ug/fl²	
13080965	10	Flame	Wipe	****	0.108	110	ug/ft²	160	1500	ug/ft ²	
13080966	11	Flame	Wipe	***	0.108	110	ug/ft²	16	150	ug/ft²	
13080967	12	Flame	Wipe	****	0.108	110	ug/fl ²	42	390	ug/ft ²	
13080968	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080969	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/fl²	
13080970	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080971	16	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080972	17	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13080973	18	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13080974	19	Flame	Air Blank	0	N/A	3	ug/m ³		<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 Laboratorics, 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

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CERTIFICATE OF ANALYSIS

Chain Of Custody: 516446 Job Name: ARNG-MD National Guard Bureau Client: Catonsville-RC Address: 301-IH Old Bay Lane, Attn: ARNG-CJG-P, Job Location: Date Submitted: 7/29/2013 State Military Reservation Havre de Grace, Maryland 21078 Job Number: Not Provided **Person Submitting:** W912K6-09-A-0003 **Report Date:** 7/31/2013 P.O. Number: Date Analyzed: 7/30/2013 Attention:

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AIHA LAP, LLC ACCREDITED LABORATORY

INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAI **& ENVIRONMENTAL MICROBIOLOGY** ISOIEC 17025:2005 www.albancoreditedlabs.org LAB #100470

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments
Analysis Method fr	r Flame: Air Wines	Paints and Soil/S	Solids' EPA 600/F	-93/200(M)-7000	B: Water: SM-311	1B See Q	C Summary for an	alytical results of quality	control samples

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm) N/A = Not Applicable

ug/L = parts per billion (ppb) %Pb = percent lead on a dry weight basis ug = micrograms

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.

associated with these

samples.

Analyst: Nida McGarvey //Kim Shipe

Technical Manager:

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types. locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP, AIHA, or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

An AIHA (#100470) an BEST AVAR ABI (920) piccredited Laboratory

May, 2018

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G Edward Carney

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AMA Analytical Services, Inc. Focused on Results AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)

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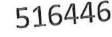
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4. Comments:

4475 Forbes Blvd. . Lanham, MD 20706

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Submittal Information: Mailing/Billing Information: ARNG-MD I. Job Name: 1. Client Name: National Guard Bureau CATONSVILLE - RC 2. Job Location: 2. Address 1: 301-IH Old Bay Lane 3. Job #: PO. #: W912K6-09-A-0003 3. Address 2: ____Attn: NGB-ARS-IHNE @ phone # (410) 942-0273 Contact Pers 4. 4. Address 3: Havre de Grace, Maryland 21078 5. Submitted b nature: Fax #: (410) 942-0254 5. Phone #: (410) 942-0273 Reporting Information (Results will be provided as soon as technically feasible): NORMAL BUSINESS HOURS REPORT TO: AFTER HOURS (must be pre-scheduled) with Report 3 Day C Results Required By Noon □ Immediate Immediate Date Due:_ Pus.army.mil 80 Q Next Day 5 Day + (EveryAttempt Will Be Time Due: 24 Hours Made to Accomodate) 2 Day Date Due: Comments: ous.army.mil Metals Analysis 10 Ashestos Analysis TEM Bulk D Pb Paint Chip, (QTY) PCM Air - Please Indicate Filter Type: GELAP 198.4/Chatfield (QTY) Pb Dust Wipe (wipe type S-ho) ((QTY) **NIOSH 7400** (OTY) □ NY State PLM/TEM_ (QTY) Zh (QTY) Pb Air_ G Fiberglass_ (OTY) C Residual Ash____ (OTY) D Pb Soil/Solid _(QTY) TEM Air - Please Indicate Filter Type: TEM Dust D Pb TCLP_ (OTY) O AHERA (QTY) _(QTY) Qual. (pres/abs) Vacuum/Dust____ Drinking Water D Pb____(QTY) D Cu____(QTY) D As____(QTY) Q NIOSH 7402. (OTY) Quan. (s/area) Vacuum D5755-95 _____ __(QTY) Waste Water D Pb_____ $(QTY) \Box Cu (QTY) \Box As (QTY)$ (QTY) Other (specify_ Quan. (s/area)Dust D6480-99____ (QTY) (QTY)D Pb Furnace (Media)____ PLM Bulk TEM Water EPA 600 - Visual Estimate_ (QTY) **Fungal Analysis** Qual. (pres/abs)____ (QTY) DEPA Point Count_ (QTY) Collection Apparatus for Spore Traps/Air Samples:__ GELAP 198.2/EPA 100.2_ (OTY) ONY State Friable 198.1 (OTY) Collection Media_ G EPA 100.1_ (QTY) (OTY) Grav. Reduction ELAP 198.6. Q Surface Vacuum Dust (QTY) Spore-Trap _(OTY) (QTY) Other (specify_ All samples received in good condition unless otherwise noted. Surface Swab (OTY) Culturable ID Genus (Media (QTY) MISC _°C) Culturable ID Species (Media (TEM Water samples _____ □ Surface Tape____ (QTY) (OTY) U Vermiculite Other (Specify____) ____(QTY) Asbestos Soil PLM_(Qaal) PLM_(Qaan) PLM/TEM_(Qual) PLM/TEM_(Quan) MATRIX CLIENT CONTACT SAMPLE INFORMATION TOLD VOLUME WIPE N CLIENT ID SAMPLE LOCATION/ N (LABORATORY STAFF ONLY) AREA **IDENTIFICATION** DATE (LITERS) NUMBER × Date/Time: Contact: By: 7.26 180 Dr.h Hell × 180 × RANG 2 100 043 × 3 Drul HALL lost X × Dr.II HALLoke machin × Date/Time: Contact: By: × Drill Hall lociser IIau × X locke 6 Kitchen Unil x × Kitchen metal tabk × R 8 Hall floor outside RANSE X X Date/Time: Contact: By: floor x fixture 10 10 RANSS . × Table 11 RANSE. 12 GATAG. Ele, PANEL @ Via: 1 By (Print) 1. Date/Time RCVD: LABORATORY Sign: 2. Date/Time Analyzed: Postedito NSDFOIA Reading Room May. 2018 ported To @ BEST AVAILABLE COPY FOIA Requested Record #115.0085 (MD) Released by National Guard Bureau Date: May (2018DY)

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Mailing/Billing Information: 1. Client Name: <u>National Guard Bureau</u> 2. Address 1: <u>301-IH Old Bay Lane</u> 3. Address 2: <u>Attn: NGB-ARS-IHNE</u> 4. Address 3: <u>Havre de Grace, Marylar</u> 5. Phone #: <u>(410) 942-0273</u>	d 2107	7 <u>8</u> :(410)	942-0254			Submitt 1. Job 2. Job 3. Job 4. Con 5. Sub	Name: Locati #: tact Pe mitted	on: r <mark>NO</mark> t	Cato		nsi	KC We #:@ph gnature:	(6-09-A-00	03	
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CLIENT ID SAMPLE INFORMAT NUMBER IDENTIFICATION	DATE	VOLUME (LITERS)	AREA	EM	ANAT	NSIS	MOLD	AIR	Mana Mana	ATRIX	TAPE			T CONTACT	
13 Office 116 - Deal 14 Office 111- locket 15 Room 105 - Boois Shelf	7.22		1005			××			X	_		Date/Time:		Contact:	By:
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Appendix B. Photographs

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Exterior of facility



Drill Hall



Garage area



PPE station



N95 Respirator



Right-to-know station



Spill station



Room 122 visible fungal growth on ceiling this room has a strong mold odor

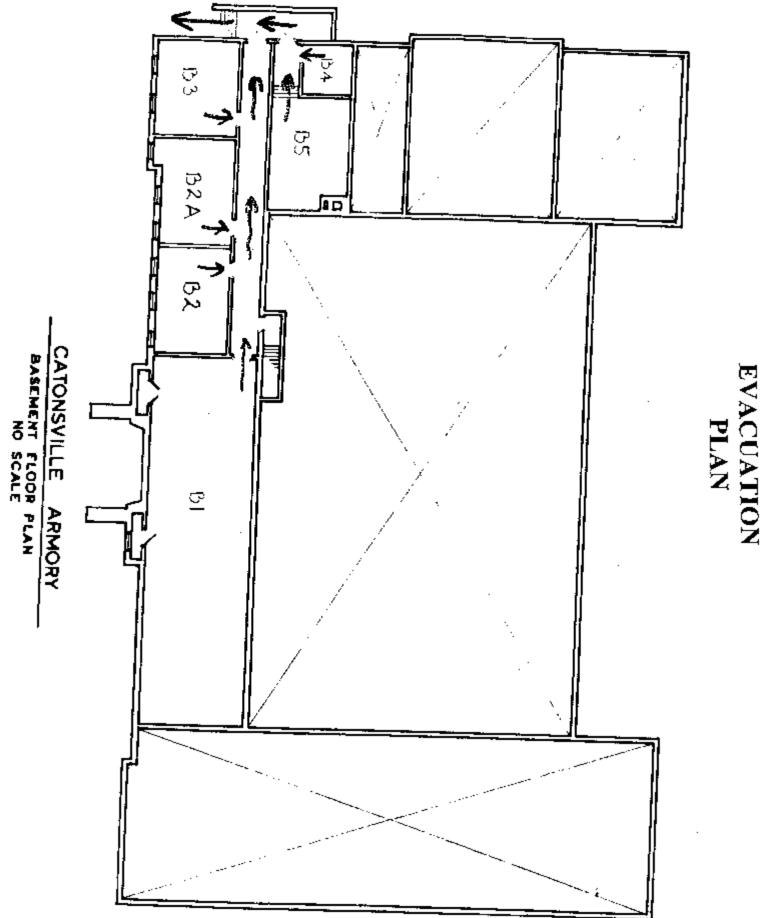


Converted firing range/weight room



Suspect asbestos floor tile in good condition

Appendix C. Floor Plan



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Appendix D. References

- 1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead.
- 2. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values and Biological Exposure Indices, 2011 Edition.
- 3. Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition.
- 4. American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2010.
- 5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.
- 6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.
- 7. National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.
- 8. National Ambient Air Quality Standards (NAAQS) National primary ambient air quality standards for carbon monoxide 40 CFR 50.8.
- 9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227 (h) (3)].
- 10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM).
- 11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.
- 12. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.
- 13. ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.

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DEPARTMENT OF THE ARMY US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

MAY 1 1 20071

MEMORANDUM FOR National Guard Bureau Region North Industrial Hygiene Office (NGB-ARS-IHNE/Ms. Non-Responsive), 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities, Industrial Hygiene Baseline Survey, Congressman Steny Hoyer Armory & Field Maintenance Shop #8A, Cheltenham, MD, Report No. 55-ML-01ED-03/07, 21 August and 30 September 2003

1. Enclosed is the final copy of the subject report and two CD-ROMs.

2. Our point of contact is Ms. Non-Responsive at commercial (410) 436-5475/3118, DSN 584-5475/3118, or electronic mail.

FOR THE COMMANDER:

Encl



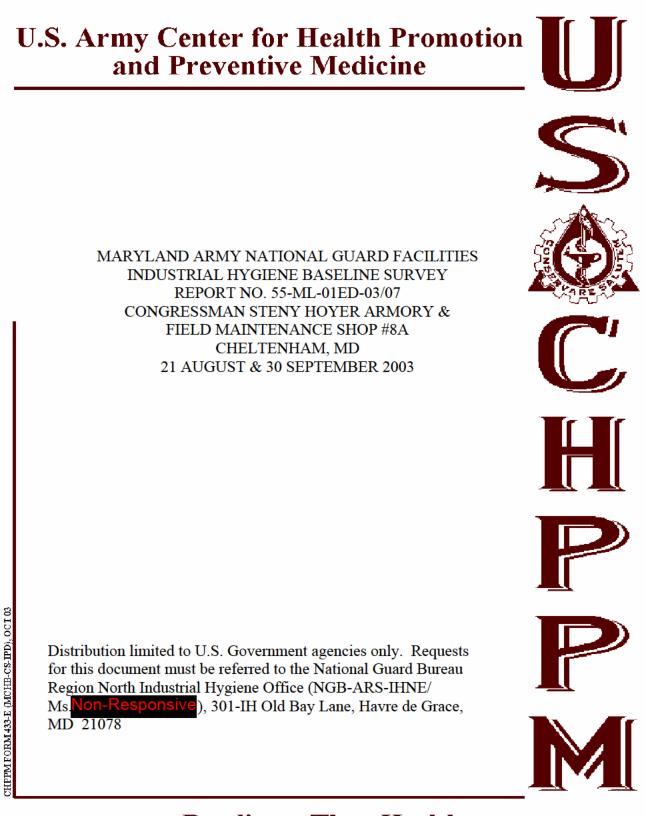
Director, Occupational Health Sciences

CF: (wo/CD-ROMs) USACHPPM-NORTH (MCHB-AN-IH/MR. Non-Responsiv

Readiness thru Health



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Readiness Thru Health

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U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed \$3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- Integrity is the foundation
- Excellence is the standard
- Customer satisfaction is the focus
- Its people are the most valued resource
- Continuous quality improvement is its pathway

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

CHPPM FORM 433-E (MCHB-CS-IPD), OCT 03 (neverse)

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DEPARTMENT OF THE ARMY US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

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EXECUTIVE SUMMARY MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEY REPORT NO. 55-ML-01ED-03/07 CONGRESSMAN STENY HOYER ARMORY & FIELD MAINTENANCE SHOP #8A CHELTENHAM, MD 21 AUGUST & 30 SEPTEMBER 2003

1. PURPOSE OF EVALUATION. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) Congressman Steny Hoyer Armory and Field Maintenance Shop (FMS) #8A, Cheltenham, MD, to identify and measure the existence and extent of potentially hazardous operations or conditions at MDARNG facilities. The survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee.

2. CONCLUSIONS.

a. <u>Lead Hazards</u>. The former IFR (indoor firing rang) had been used but not completely decontaminated. Very high levels of lead in surface dust were found inside an enclosure around the bullet trap. These could lead to an inadvertent spread of lead contamination to other parts of the Armory.

b. <u>Occupational Safety and Health Programs</u>. Written Hazard Communication and Hearing Conservation Programs should be provided and implemented. Records of training, audiograms and other activities must be maintained.

c. <u>Ventilation Deficiencies</u>. The rooftop heating and ventilation units serving both buildings were unreliable. The washroom fan in the FMS #8A was not operating. The Vehicle Bay had severe air stratification in cold weather. The vehicle tailpipe and Battery Room exhaust systems had inadequate airflows, and the fan for the former was excessively noisy. One tailpipe hose was torn.

d. <u>Other Deficiencies</u>. The FMS #8A Vehicle Bay and Tool Crib desktop were inadequately lit. There were two active rain leaks in the FMS #8A. Ergonomic and noise hazards needed to be evaluated and mitigated. The CO (carbon monoxide) monitor in the Vehicle Bay was broken.

Readiness thru Health



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3. RECOMMENDATIONS.

a. <u>Lead Exposure</u>. Health RAC (Risk Assessment Codes) 4.

(1) Restrict access to the bullet trap enclosure in the former IFR by keeping it locked. Post a sign warning against use of the enclosure for entry except in an emergency, or for storing of any material.

(2) If the enclosure area is renovated, clean all surfaces to the maximum level recommended by the National Guard Bureau Region North Industrial Hygiene Office and United States Army Center for Health Promotion and Preventive Medicine. Comprehensive guidelines are in Appendix E. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. Apply a sealant to the area after decontaminating the enclosure.

b. <u>Occupational Safety and Health Programs</u>. Health RAC 4. Develop and implement written Hazard Communication and Hearing Conservation Programs. Maintain records of training, audiograms, and other activities.

c. <u>General Heating, Ventilating and Air Conditioning Systems</u>. Health RAC 4. Investigate rooftop unit operating problems and repair or replace units as necessary. In FMS #8A Vehicle Bay 151, at minimum, install ceiling fans to reduce stratification. Investigate the potential replacement of the existing system by an infrared radiant system. Repair or replace the FMS #8A washroom fan.

d. <u>Vehicle Tailpipe Exhaust System</u>. Health RAC 3. Repair or disconnect the leaking hose. Modify or upgrade the system to provide at least 1,500 cubic feet per minute (cfm) per drop. One possibility is to reduce the number of connection points. Investigate the excessive fan noise and repair as needed.

e. <u>Battery Room Exhaust System</u>. Safety RAC 4. Adjust or replace the fan to provide at least 2 cfm per square foot of floor area.

f. <u>Building Physical Condition</u>. Health RAC 4. Repair the two active roof leaks in the FMS #8A and replace any damaged building materials.

g. <u>Lighting</u>. Health RAC 4. Provide additional task lighting in FMS #8A Vehicle Bay 151 and Tool Crib to meet illumination standards.

h. <u>Noise Hazards</u>. No RAC can be assigned. Assess noise hazards and implement control measures as appropriate.

i. <u>Other Hazards</u>. Safety RAC 3. Ensure that the CO monitor in FMS #8A Vehicle Bay 151 is repaired and calibrated.

MDARNG IH Baseline Survey, Report No. 55-ML-01ED-03/07, Congressman Steny Hoyer Armory & FMS #8A, Cheltenham, MD, 21 August & 30 September 2003

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INDUSTRIAL HYGIENE BASELINE SURVEY REPORT NO. 55-ML-01ED-03/07 MARYLAND ARMY NATIONAL GUARD FACILITIES CONGRESSMAN STENY HOYER ARMORY FIELD MAINTENANCE SHOP (FMS) #8A CHELTENHAM, MD 21 AUGUST AND 30 SEPTEMBER 2003

1. REFERENCES. See Appendix A.

2. PURPOSE. To conduct an industrial hygiene survey at the Maryland Army National Guard (MDARNG) Congressman Steny Hoyer Armory and Field Maintenance Shop (FMS) #8A, Cheltenham, MD, to identify and measure the existence and extent of potentially hazardous operations or conditions at MDARNG facilities. The survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee.

3. AUTHORITY. E-mail, National Guard Bureau Region North Industrial Hygiene Office (NGB-ARS-IHNE/Ms. Non-Responsive), 28 February 2003, subject: SAB.

4. GENERAL.

a. <u>Personnel Contacted</u>. SSG Non-Responsive, Environmental Compliance Assessment Coordinator for the MDARNG, 410-576-6132.

b. Survey Personnel. This survey was conducted on 21 August and 30 September 2003 by Mr. Non-Responsive, Industrial Hygienist, United States Army Center for Health Promotion and Preventive Medicine (USACHPPM).

c. <u>Risk Assessment Codes (RACs)</u>. The Department of Defense Instruction (DODI) 6055.1 provides a method for assigning RACs to health hazards that are based on the magnitude of exposures to physical, chemical, and biological agents and the possible medical effects. The DODI 6055.1 also provides RACs for safety and ergonomic hazards. A RAC is an expression of the risk associated with a hazard that combines the hazard severity and accident probability into a single numeral. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

d. <u>Background</u>. The Armory and FMS #8A were built in approximately 1995. Floor plans could not be located for this report. The facilities supported Company A, 129th Signal Battalion. The indoor firing range (IFR) had reportedly never been used for its intended purpose. The bullet trap and a short section of the floor in front of it had been enclosed by a partition accessible through a door from the main floor area. Nothing was observed to be stored inside this enclosure. The main floor area was reportedly used for storage, although a multiple-exercise weight machine was set up in the room.

Use of trademarked name(s) does not imply endorsement by the US Army but is intended only to assist in the identification of a specific product.

5. METHODOLOGY.

a. <u>Assessment Criteria</u>. Army Regulation 40-5 contains the requirement that airborne chemical exposures in Army facilities must comply with the lower of the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) or the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value®. The National Guard Bureau (NGB) criterion for lead in surface dust is discussed in Appendix B. The ACGIH provides criteria for industrial ventilation systems. The American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) publishes criteria for indoor air quality. The National Fire Protection Association National Fire Codes provides standards for fire and life safety. The Illumination Engineering Society – North America (IESNA) provides standards for minimum light levels.

b. <u>Calibration</u>. All instruments were calibrated in accordance with manufacturers' instructions using National Institute of Standards and Testing-traceable methods.

c. <u>Methodology</u>. The survey consisted of the collection of indoor air quality (IAQ) and ventilation measurements, sampling surface dust and air for lead, observation of work practices and procedures, and employee interviews.

6. FINDINGS AND DISCUSSION.

a. <u>Description of Operations</u>. The Armory contained a Drill Hall, classrooms, offices, and storage space. The FMS #8A had one vehicle bay, offices, and small shops.

b. <u>Occupational Safety and Health Programs</u>. There was no written Hazard Communication Program on site. The FMS #8A had a Material Safety Data Sheet binder that was being reorganized at the time of the site visit. There were no written Hearing Conservation Program or records on site, although the foreman reported that personnel were provided audiograms annually.

c. Building Condition.

(1) Physical Condition. The buildings were in good physical condition with the exception of two active rain leaks in the FMS #8A, discussed below.

(2) Housekeeping. The standard of housekeeping was very high.

d. Indoor Environmental Quality.

(1) Heating, Ventilation, and Air-Conditioning Systems .

(a) Armory. The Armory building had two roof-mounted heating and ventilating units, one serving the Drill Hall and the other serving the rest of the building. These were reported to be unreliable. The ventilation system for the former IFR was reportedly still operable.

(b) The FMS #8A. The FMS #8A was served by two rooftop heating and ventilating units, one serving the Vehicle Bay 151 and the other serving the rest of the building. The FMS #8A personnel reported that both units had a history of failing to start. They also reported that the bay experienced severe stratification in the winter when the air handling unit (AHU) was running. The Shop Office 152, Electronics Room 153, and Lunch Room 154 were also served by through-wall cooling units. There was no exhaust flow from the washrooms, indicating that the washroom exhaust fan was not working.

(2) IAQ parameters. The IAQ quality measurements were collected during the initial site visit of 21 August 03. The results are shown in Table 1. The range of outdoor conditions at nearby Andrews Air Force Base during IAQ measurements was 86-89 degrees Fahrenheit (° F) dry-bulb temperature with a 70-73° F dewpoint temperature and a clear sky. The approximate relative humidity (RH) was 54-65 percent. These conditions are not expected to be exceeded more than approximately 2 percent of the year.

Building	Location	Time	Dry bulb	Relative	CO ₂ ,	Note
			temp,	humidity,	ppm	
			° F	%		
Armory	Drill Hall 103	1007	80.5	68	344	Vehicle door open
	Orderly Room 108	1012	80.2	59	418	2 occupants, several windows open, AC unit running
FMS #8A	Vehicle Bay 151	1155	84.2	69	NR	All vehicle doors open
	Shop Office 152	1353	77	50	390	Occupied occasionally

TABLE 1.	Indoor A	Air Quality	Measurements.
----------	----------	-------------	---------------

(3) Temperature and Humidity Control. The ASHRAE recommends a dry-bulb temperature between 71° and 81° F in the summer at 50 percent RH, and a RH maintained in the range of 30 to 60 percent. The RH exceeded the ASHRAE recommended range in the Drill Hall and Vehicle Bay, and the temperature exceeded the recommended range in the Vehicle Bay. This was to be expected given the open doors and the weather. The reported severe winter temperature stratification is typical of high bays that are supplied with air from the ceiling level. These systems must attempt to force heated air down against its natural buoyancy. Operation of the bay doors exacerbates the problem by injecting large masses of cold outside air near the floor which persist there under the layer of hot air near the roof. A minimal solution would be the installation of ceiling fans, although the unreliable operation of the rooftop unit would also have to be addressed. The best solution for occupant comfort is the replacement of the existing system by an infrared radiant system. These can be designed for either oil or gas. They offer potential energy savings to offset their cost by providing comfort at a lower air temperature than is required for a forced-air vehicle garage heating system because they heat personnel and surfaces directly without heating the air.

(4) Air Exchange Rate. To provide adequate fresh air ventilation, ASHRAE recommends an air exchange rate that prevents the Carbon Dioxide (CO_2) concentration in the room from exceeding 700 parts per million (ppm) more than the outdoor ambient concentration, which is generally about 380 ppm. Indoor CO_2 levels were well within the guidelines in all locations.

(5) Mold. No mold or water damage was observed or reported in the Armory building. A substantial leak was reported in the corner of FMS #8A Tool Crib 160 at the back corner of the wall to Vehicle Bay 151. A small rain leak from the roof-mounted AHU in the same bay was also reported. No mold or major surface damage was observed. However, insulation was probably becoming soaked, and the leaks could result in future mold growth.

e. <u>Water Quality</u>. No concerns were expressed about water quality. No samples were collected.

f. <u>Lead Hazards</u>. The age of the buildings indicated that the presence of lead-based paint was unlikely. No significant deterioration of paint was observed.

(1) Lead Criteria.

(a) Lead in air. The Army has adopted the OSHA 8-hour time-weighted average PEL of 50 milligrams per cubic meter ($\mu g/m^3$).

(b) Lead in surface dust. The Environmental Protection Agency (EPA) and State of Maryland limits for lead in dust are 40 micrograms per square foot $(\mu g/ft^2)$ on floors, 250 $\mu g/ft^2$ on windowsills, and 400 $\mu g/ft^2$ in window troughs. These limits apply to pre-1978 Army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The NGB Region North Industrial Hygiene Office concurs with the USACHPPM recommended maximum level of 200 $\mu g/ft^2$ on floors and frequently contacted surfaces, which is more stringent for windowsills than the EPA/State standards. This level was adopted from OSHA Compliance Letter 02-02-58. Further information is provided in Appendix B.

(2) Lead Results.

(a) Lead in air. All air samples were below the laboratory analytical detection limit for lead in air of 3.0 to $15.0 \,\mu\text{g/m}^3$ as well as the exposure limit.

(b) Lead in surface dust. Samples were collected in the Armory building. Lead dust wipes sample locations, photograph numbers, and analytical results are shown in Table 2. All sample results that were equal to or exceeded 40 μ g/ft² for floors or 200 μ g/ft² for other surfaces are highlighted. Two sample results from the bullet trap enclosure in the former IFR exceeded the recommended maximum level of 200 μ g/ft² for lead dust on frequently contacted surfaces (the maximum was 290,000 μ g/ft²). A result from the top of a ceiling baffle above the main IFR floor area was 73 μ g/ft². Results from other floor surfaces in the former IFR were slightly elevated compared to those in the rest of the Armory building, but not above any of the criteria. The results inside the trap enclosure show that, unknown to the building occupants, the IFR was indeed used for firing at some time. The presence of these high levels appeared not to have produced hazardous levels in the rest of the IFR or in other parts of the building. However, it is possible that occupants who are unaware of the contamination could inadvertently spread it and create hazardous levels elsewhere by cleaning this enclosure using improper methods, using it for storage, and/or tracking the lead to other parts of the building.

Sample No.	Type of	Location	Photo	Result,
	Sample		No.	µg/ft²
CH W01	Wipe	Drill Hall 103 floor at center	0006	29
CH W02	Wipe	Drill Hall 103 floor near doors to Rooms 130 and 132	0007	8.6
CH W03	Wipe	Drill Hall 103 floor along wall to Arms Room 104	0008	12
CH W04	Wipe	Drill Hall 103 floor at entrance to Latrines 135-136	0009	<2.8
CH W05	Wipe	Drill Hall 103 floor between center and wall to Latrine 136	0010	6.9
CH W06	Wipe	Former IFR 126 floor behind bullet trap (inside enclosure)	0011	<mark>290,000</mark>
CH W07	Wipe	Former IFR 126 floor in front of bullet trap (inside enclosure)	0012	<mark>2,200</mark>
CH W08	Wipe	Former IFR 126 top of table along exterior wall	0013	5.6
CH W09	Wipe	Former IFR 126 floor behind firing line	0014	34
CH W10	Wipe	Former IFR 126 floor in front of firing line	0015	33
CH W11	Wipe	Former IFR 126 floor at midpoint near wall to Corridor 127	0016	9.6
CH W12	Wipe	Corridor 127 floor at door to Former IFR 126	0017	5.2
CH W13	Wipe	Former IFR 126 seat of multi gym machine	0018	5.2
CH W14	Wipe	Former IFR 126 top of baffle near bullet trap	0019	73
CH W15	Wipe	Classroom 117 floor near wall to Corridor 128	0020	3.5
CH W16	Wipe	Lobby 101 floor at center	0021	3.8

TABLE 2. Dust-Lead Wipe Locations, Photograph Numbers, and Analytical Results.
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g. Other Chemical Hazards.

(1) Asbestos. The site Asbestos Management Program listed ceiling tiles in the Armory building as asbestos-containing materials. The ceiling tiles that were observed in the Armory were intact. The FMS #8A performed asbestos brake shoe and clutch work. SSG was reported to have the FMS #8A personnel training records for this task. Personnel reported using a wet method for this work. They had turned in the respirators originally supplied for this work after being advised that they were not necessary.

(2) Carbon Monoxide (CO). The wall-mounted CO monitor in FMS #8A Vehicle Bay 151 was reportedly not working, and a work order had been submitted.

h. <u>Vehicle Tailpipe Exhaust System</u>. A single fan served four drops in the Vehicle Bay. Calculated airflows and hose velocities are shown in Table 3. The system should provide at least 1,500 cubic feet per minute (cfm) exhaust at each drop in accordance with the ACGIH Industrial Ventilation Manual recommendation for 9 liter displacement turbocharged diesel engines run at 1,000 revolutions per minute. This exhaust rate is intended to accommodate large turbocharged diesel engines that are, or may be, maintained at this FMS #8A. None of the drops met the ACGIH criterion.

Location	Airflow, cfm	Velocity in hose, ft/min	Note
VE-1	430	2,200	
VE-2	420	2,100	
VE-3	330	1,700	Tear in hose
VE-4	350	1,800	

 TABLE 3.
 Vehicle Tailpipe Exhaust System Performance.

i. <u>Battery Shop Exhaust System</u>. The Battery Shop fan belt was discovered to be off its pulleys during the initial visit, unknown to shop personnel. The belt was replaced and a total airflow of 200 cfm was measured. The NGB Design Guide 415-2 specifies a minimum airflow of 2 cfm per square foot (ft^2) floor area; other design criteria require an estimate of the maximum number and capacity of batteries present, which was not available. The room was considerably larger than 100 ft², so the airflow was less than required.

j. <u>Kitchen Ventilation System, Armory Room 109</u>. The kitchen was equipped with three hoods over a grill surface, a dishwasher, and a sink. The grill hood had a horizontal surface area of 32 ft^2 and was enclosed at the back and one side. Measured airflow was 3,800 cfm, which exceeded the International Conference of Building Officials (ICBO) International Building Code 2000 criterion of 100 times the surface area for kitchen hoods enclosed on one or more sides that serves medium-temperature cooking equipment. The dishwasher hood had a horizontal surface area of 15.8 ft^2 and was enclosed at the back. Measured airflow was 1,400 cfm, which exceeded the ICBO criterion of 50 times the surface area for kitchen hoods enclosed on one or more sides that serve low-temperature cooking equipment. The sink hood had a horizontal surface area of 14 ft^2 and a measured airflow of 1,420 cfm, which also exceeded the criterion. The kitchen was supplied with 2,470 cfm of makeup air and also drew air from the adjoining cafeteria and corridor. The system did not produce an excessive negative pressure that would make door operation difficult and unsafe.

k. <u>Noise Hazards</u>. The FMS #8A performed vehicle repair operations, such as the use of air tools to remove truck wheels that could exceed occupational exposure limits.

(1) Noise Criteria. The Army-adopted criterion for steady-state noise is an 8-hour timeweighted average of 85 decibels A-weighted, with a 3 dBA exchange rate.

(2) Noise Measurements. Dosimetry was performed while air-powered tools were used to replace truck tires, but the readings were subsequently lost when the dosimeters were accidentally reset. Personnel in the shop were observed to use protective earmuffs while performing this operation.

1. <u>Lighting</u>. Illumination levels were measured in frequently-used offices, Drill Floor 103, FMS #8A Vehicle Bay 151, Armory Supply Room 106, and FMS #8A Tool Crib 160. The results are shown in Table 4. The IESNA recommends a minimum illumination level of 11 to 30 foot-candles (fc) for occasional visual tasks (such as locating tools and supplies), 31 to 50 fc for performing large-scale tasks (such as major vehicle repair operations), and 51 to100 fc for tasks of medium contrast and small size (such as general office work). Lighting levels in the rear of FMS #8A Vehicle Bay 151 did not meet the 31 to 50 fc criterion, even with the sun shining in the open front door. In inclement weather or at night, similarly low levels could be expected throughout much of the bay. The desktop in FMS #8A Tool Crib 160 was also inadequately lit.

Building	Room	Location	Illumination, fc	Note
Armory	Drill Floor 103	Rear corner next to Room 133	40	Vehicle door open, sunny
	Drill Floor 103	Rear center	27	Vehicle door open
	Drill Floor 103	Rear corner near Foyer 101	12	Vehicle door open
	Orderly Room 108	Desktop	54	
	Orderly Room 108	Desktop	78	
	Orderly Room 108	Work table	57	
	Supply Room 106	Corridor between shelves	12	
	Supply Room 106	Corridor between shelves	20	
	Classroom 117	Chair near window	85	
	Classroom 117	Chair in center	72	
	Classroom 117	Chair near door	44	
	Classroom 117	Desktop in center	54	
	Kitchen 120	Grill surface	25	
	Kitchen 120	Work table	92	
	Pantry 119	Counter by window	59	
FMS #8A	Vehicle Bay 151	Rear (north)	23-27	South vehicle doors open, bright sun shining in
		4 th row of columns from front	26-36	Ditto
		3rd row of columns from front	49-76	Ditto
		2nd row of columns from front	101-147	Ditto
		1st row of columns from front	280-330	Ditto
	Shop Office 152	Desktop	211	
	Tool Crib 160	Shelves	13-20	
		Desktop	26	

TABLE 4. Illumination Levels.

m. <u>Safety Observations</u>. The vehicle tailpipe exhaust system was extremely noisy, posing a potential accident hazard by limiting communication. No other hazards were observed.

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7. CONCLUSIONS.

a. <u>Lead Hazards</u>. The former IFR had been used but not completely decontaminated. Very high levels of lead in surface dust were found inside an enclosure around the bullet trap. These could lead to an inadvertent spread of lead contamination to other parts of the Armory.

b. <u>Occupational Safety and Health Programs</u>. Written Hazard Communication and Hearing Conservation Programs should be provided and implemented. Records of training, audiograms and other activities must be maintained.

c. <u>Ventilation Deficiencies</u>. The rooftop heating and ventilation units serving both buildings were unreliable. The washroom fan in the FMS #8A was not operating. The Vehicle Bay had severe air stratification in cold weather. The vehicle tailpipe and Battery Room exhaust systems had inadequate airflows, and the fan for the former was excessively noisy. One tailpipe hose was torn.

d. <u>Other Deficiencies</u>. The FMS #8A Vehicle Bay and Tool Crib desktop were inadequately lit. There were two active rain leaks in the FMS #8A. Ergonomic and noise hazards needed to be evaluated and mitigated. The CO monitor in the Vehicle Bay was broken.

8. RECOMMENDATIONS.

a. <u>Lead Exposure</u>. Health RAC 4.

(1) Restrict access to the bullet trap enclosure in the former IFR by keeping it locked. Post a sign warning against use of the enclosure for entry except in an emergency, or for storing of any material.

(2) If the enclosure area is renovated, clean all surfaces to the maximum level recommended by the NGB Region North Industrial Hygiene Office and USACHPPM. Comprehensive guidelines are in Appendix E. Consult with the MDARNG Environmental Coordinator concerning waste disposal requirements after cleanup. Apply a sealant to the area after decontaminating the enclosure.

b. <u>Occupational Safety and Health Programs</u>. Health RAC 4. Develop and implement written Hazard Communication and Hearing Conservation Programs. Maintain records of training, audiograms, and other activities.

c. <u>General HVAC Systems</u>. Health RAC 4. Investigate rooftop unit operating problems and repair or replace units as necessary. In FMS #8A Vehicle Bay 151, at minimum, install ceiling

fans to reduce stratification. Investigate the potential replacement of the existing system by an infrared radiant system. Repair or replace the FMS #8A washroom fan.

d. <u>Vehicle Tailpipe Exhaust System</u>. Health RAC 3. Repair or disconnect the leaking hose. Modify or upgrade the system to provide at least 1,500 cfm per drop. One possibility is to reduce the number of connection points. Investigate the excessive fan noise and repair as needed.

e. <u>Battery Room Exhaust System</u>. Safety RAC 4. Adjust or replace the fan to provide at least 2 cfm per square foot of floor area.

f. <u>Building Physical Condition</u>. Health RAC 4. Repair the two active roof leaks in the FMS #8A and replace any damaged building materials.

g. <u>Lighting</u>. Health RAC 4. Provide additional task lighting in FMS #8A Vehicle Bay 151 and Tool Crib to meet illumination standards.

h. <u>Noise Hazards</u>. No RAC can be assigned. Assess noise hazards and implement control measures as appropriate.

i. <u>Other Hazards</u>. Safety RAC 3. Ensure that the CO monitor in FMS #8A Vehicle Bay 151 is repaired and calibrated.

9. ADDITIONAL ASSISTANCE. For additional assistance, or questions concerning this report, please contact the undersigned at commercial 410-436-3118, DSN 584-3118, or by e-mail Non-Responsive @us.army.mil.



Industrial Hygienist USACHPPM Lead and Asbestos Team Leader Industrial Hygiene Field Services Program

APPROVED:



Program Manager Industrial Hygiene Field Services Program

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APPENDIX A

REFERENCES

1. Occupational Safety and Health Administration, Title 29, Code of Federal Regulations (CFR), Part 1910, current ed. 1910.1025 (Lead). <u>http://www.osha.gov/comp-links.html</u>

2. Occupational Safety and Health Administration, Title 29, Code of Federal Regulations (CFR), Part 1910 for General Industry and current ed. 1910.1200 (Hazard Communication). http://www.osha.gov/comp-links.html

3 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 62.1-2004, Ventilation for Acceptable Indoor Air Quality. <u>http://www.ashrae.org</u>

4. DA PAM 40-501, Medical Services, Hearing Conservation Program, 10 December 1998. <u>http://www.usapaarmy.mil/pdffiles/p40-501.pdf</u>

5. Illuminating Engineering Society of North America, ANSI/IESNA RP-1-04, Office Lighting.

6. IESNA RP-7-01, Lighting Industrial Facilities.

7. EPA 40 CFR Part 745, Lead; Identification of Dangerous Levels of Lead; Final Rule, 5 Jan 2001.

8. Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program, 19 August 1998. http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf

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APPENDIX B

PROPOSED LEAD CRITERIA

Subject: Recommendations for Surface Lead Dust in Armories

1. In armories that do not contain childcare facilities, the National Guard Bureau (NGB) Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than 200 micrograms per square foot (μ g/ft²). If a special function will be held in which children will be present in this facility, consider thoroughly cleaning the areas that will be accessible to children prior to the function. This guidance is based on professional judgment, risk assessments, adaptation of Occupational Safety and Health Administration (OSHA) guidance, and feasibility of cleaning to a certain level.

a. Environmental Protection Agency (EPA) standards (40 Code of Federal Regulations (CFR) 745.227(h)(3)) are not directly applicable because they are criteria for dust-lead hazards developed for floors (40 μ g/ft²) and windowsills (250 μ g/ft²) in residential dwellings and child occupied facilities. A child occupied facility is defined as a building, or portion of a building, constructed prior to 1978, visited regularly by the same child, 6 years of age or under, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hours and the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60 hours. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. OSHA has no specific requirement for work area surfaces. The lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead dust. In workplaces where lead dust is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. OSHA used to cite a level of 200 μ g/ft² in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 μ g/ft² is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

B-1

e. It should be noted that levels above these recommendations do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All states will receive this guidance when it is completed. In the interim, we recommend the following actions:

a. Clean all areas that will be accessible to children to the EPA dust-lead standard for children 6 years of age or under (40 μ g/ft² on floors and 250 μ g/ft² on windowsills).

b. Refer to the local authorities' regulations since they can be more stringent than Federal regulations.

c. Post signs in the area to inform people of the presence of lead dust and its effects.

d. If Soldiers clean weapons in the facility change the policy so that they cannot clean their weapons in the facility, or if they are allowed to clean their weapons indoors, they must clean the area by wet wiping and mopping the area when they are done.

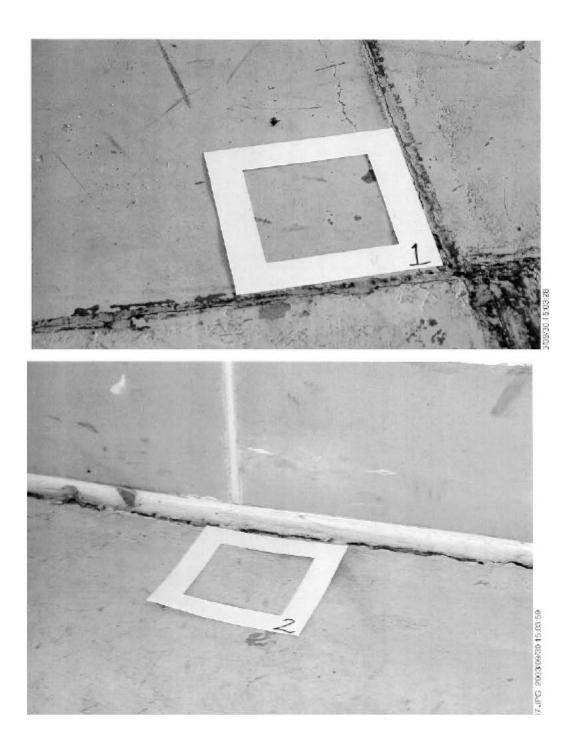
e. If the paint is peeling, contact the state Environmental Office to test for lead content and provide recommendations.1

3. Air samples collected on individuals in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m^3 averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead dust in this building.

APPENDIX C

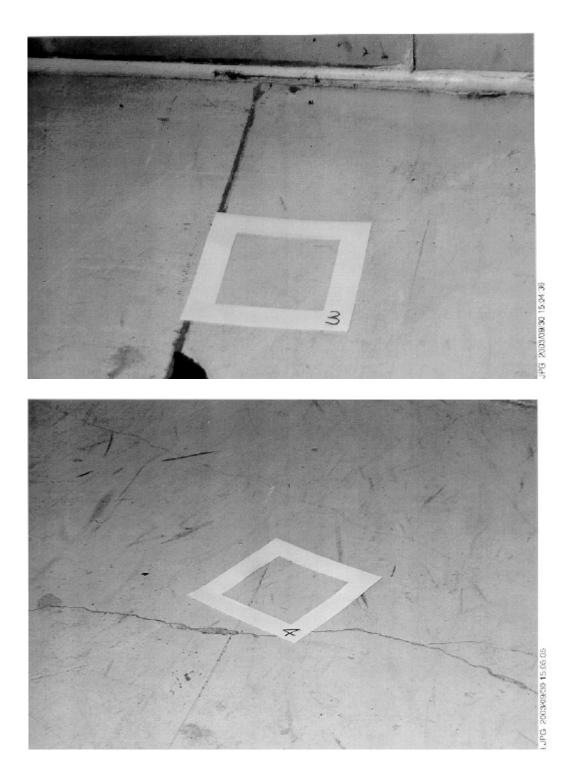
PHOTOGRAPHS

Photograph No.	Sample Location
1	Drill Hall 103, floor at center
2	Drill Hall 103, floor near doors to Rooms #8A 130 and 132
3	Drill Hall 103, floor along wall to Arms Room 104
4	Drill Hall 103, floor at entrance to Latrines 135-136
5	Drill Hall 103, floor between center and wall to Latrine 136
6	Former IFR 126, floor behind bullet trap (inside enclosure)
7	Former IFR 126, floor in front of bullet trap (inside enclosure)
8	Former IFR 126, top of table along exterior wall
9	Former IFR 126, floor behind firing line
10	Former IFR 126, floor in front of firing line
11	Former IFR 126, floor at midpoint near wall to Corridor 127
12	Corridor 127, floor at door to Former IFR 126
13	Former IFR 126, seat of multi gym machine
14	Former IFR 126, top of baffle near bullet trap
15	Classroom,117 floor near wall to Corridor 128
16	Lobby 101, floor at center



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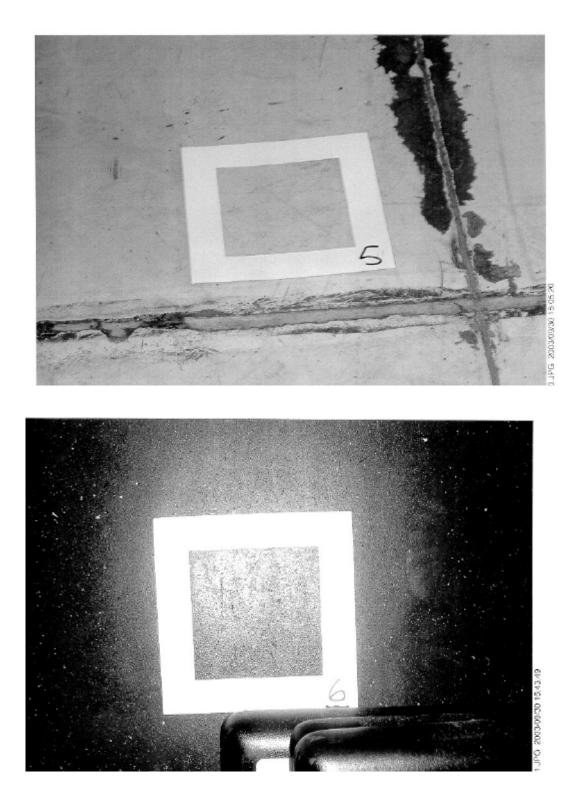


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Posted to NGB FOIA Reading Room May, 2018

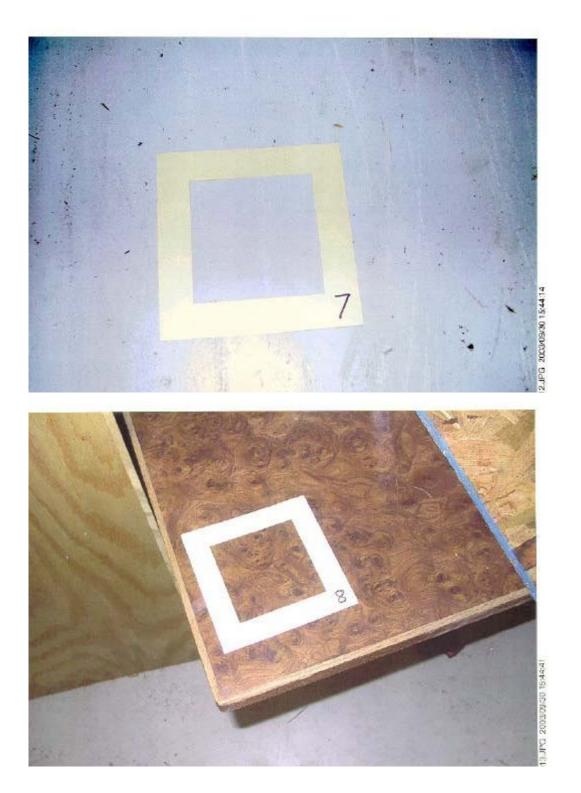
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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1661 of 5269



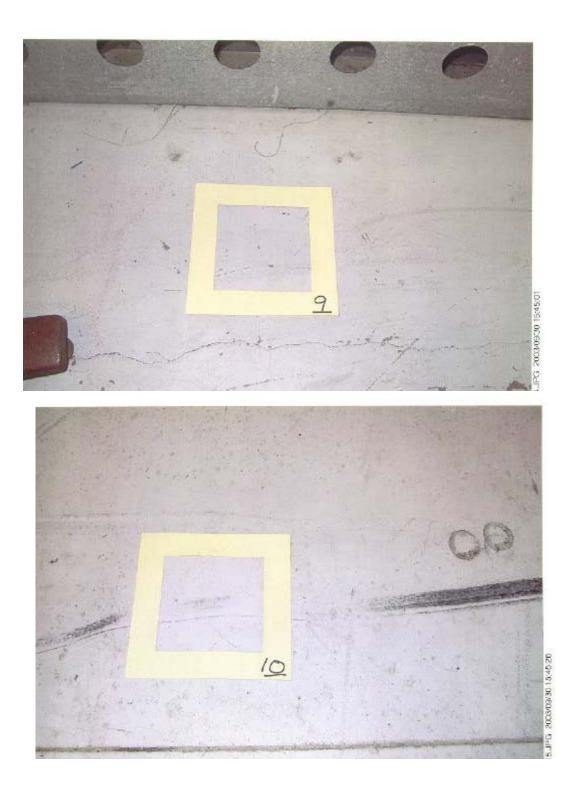
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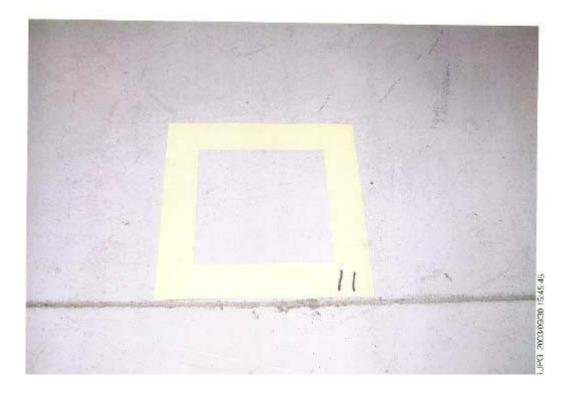


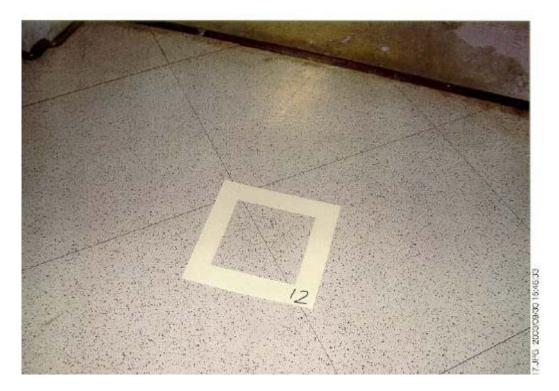
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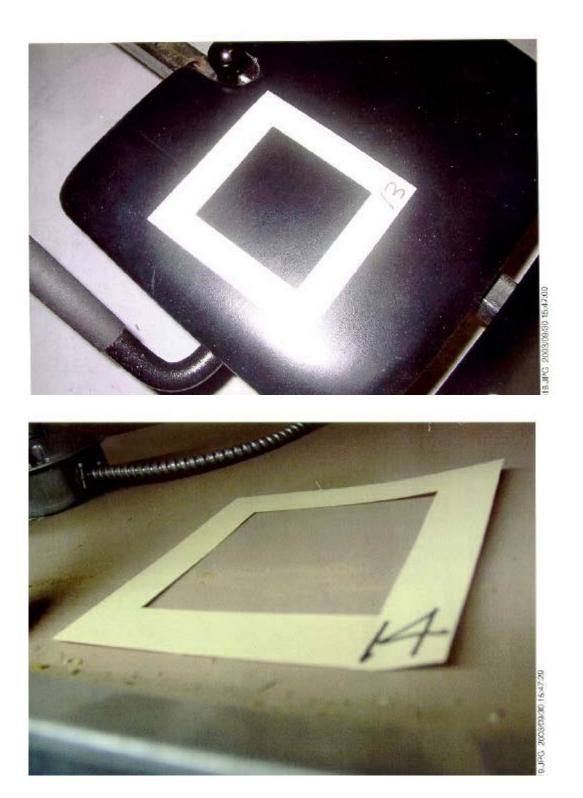




C-7

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MDARNG IH Baseline Survey, Congressman Steny Hoyer Armory & FMS #8A, Cheltenham, MD, Report No. 55-ML-01ED-03/07, 21 August & 30 September 2003



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MDARNG IH Baseline Survey, Congressman Steny Hoyer Armory & FMS #8A, Cheltenham, MD, Report No. 55-ML-01ED-03/07, 21 August & 30 September 2003



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MDARNG IH Baseline Survey, Congressman Steny Hoyer Armory & FMS #8A, Cheltenham, MD, Report No. 55-ML-01ED-03/07, 21 August & 30 September 2003

APPENDIX D

LABORATORY REPORTS

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MDARNG IH Baseline Survey, Congressman Steny Hoyer Armory & FMS #8A, Cheltenham, MD, Report No. 55-ML-01ED-03/07, 21 August & 30 September 2003

APPENDIX E LEAD CLEANING GUIDANCE

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CHAPTER 14: CLEANING

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Step-by-Step Summary



- 1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
- 2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
- 3. Have sufficient cleaning equipment and supplies before beginning work.
- 4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
- 5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
- 6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
- 7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
- 8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
- 9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
- 10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
- 11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
- 12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
- 13. Paint or otherwise seal treated surfaces and interior floors.
- 14. Conduct a clearance examination (see Chapter 15).
- 15. If clearance is not achieved, repeat the final cleaning.



- 16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.
- 17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.
- 18. Cleaning equipment list:
 - HEPA vacuums.
 - Detergent.
 - Waterproof gloves.
 - Rags.
 - Sponges.
 - Mops.
 - Buckets.
 - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
 - 6-mil plastic bags.
 - Debris containers.
 - Waste water containers.
 - Shovels.
 - Rakes.
 - Water-misting sprayers.
 - ✤ 6-mil polyethylene sheeting (or equivalent).

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris and dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning

procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 µg/ft² on floors.
- 500 μg/ft² on interior window sills (stools).
- 800 µg/ft² on window troughs (the area where the sash sits when closed).
- 800 μg/ft² on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.



2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?

- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).



C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that finedust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.



Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

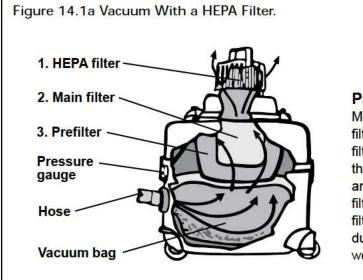
Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards and were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and prefilter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the prefilter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a highphosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

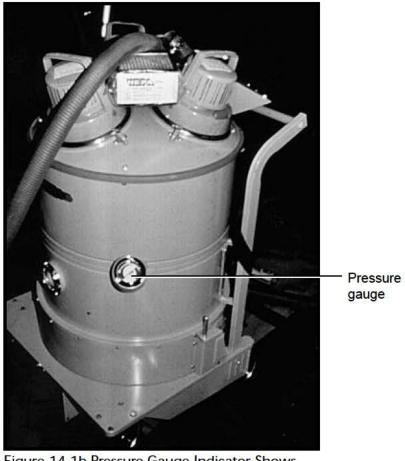
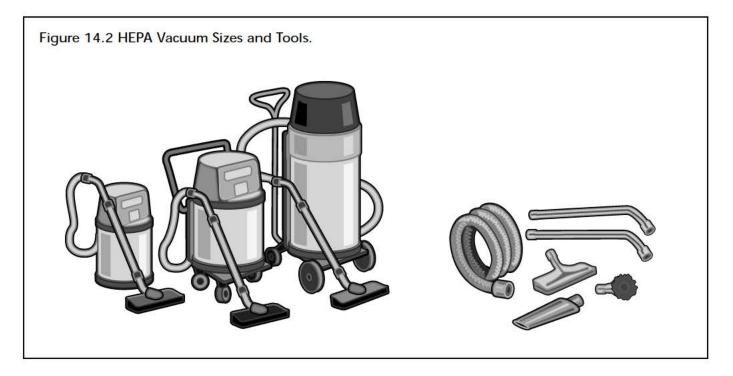


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

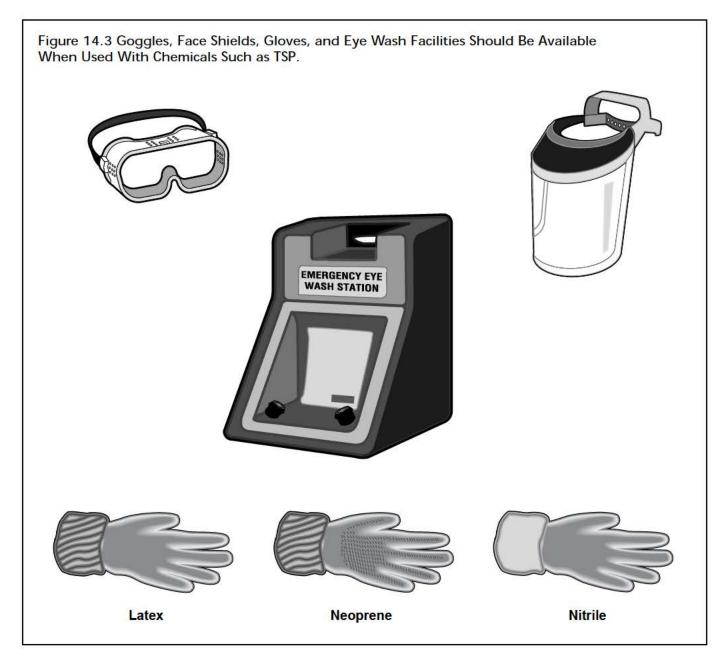
Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wetwash process.

Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no



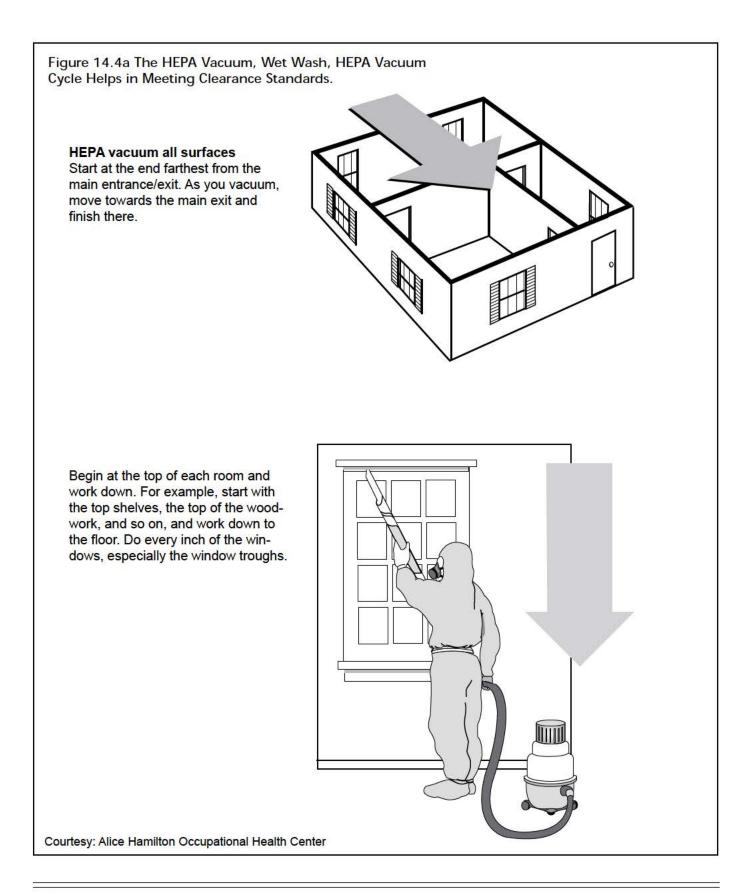
more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

✤ First, the area is HEPA vacuumed.



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Chapter 14: Cleaning

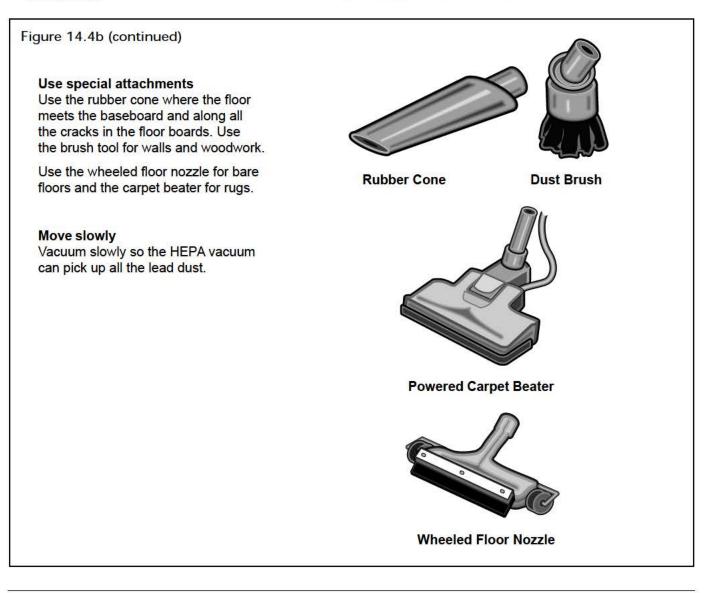
- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.



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14-13

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

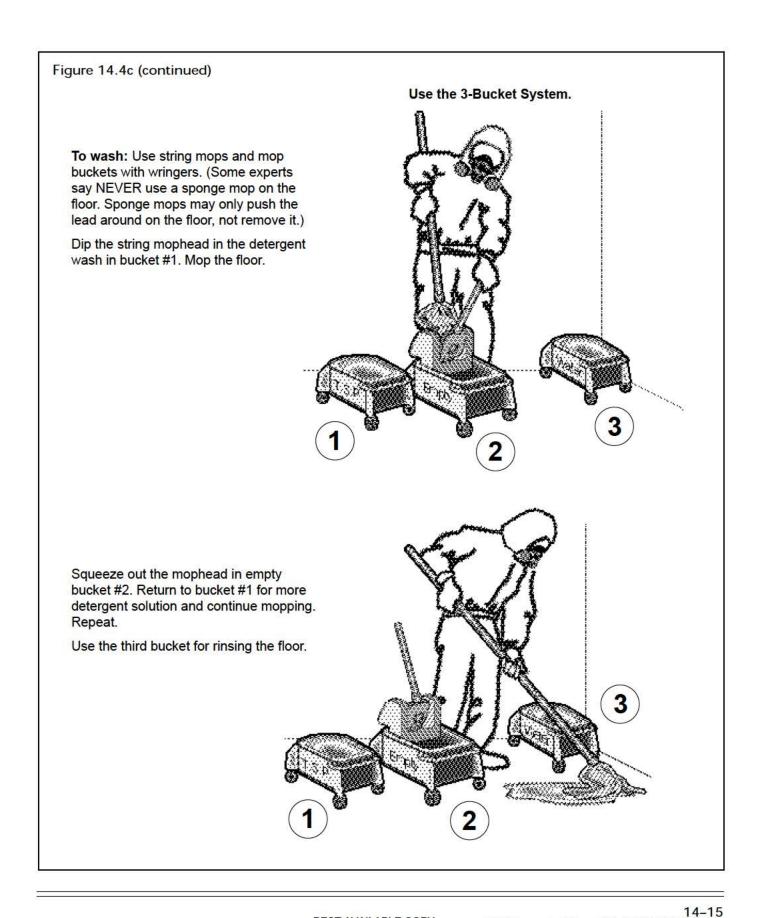


Wet Mop Floor



Don't Dry Sweep

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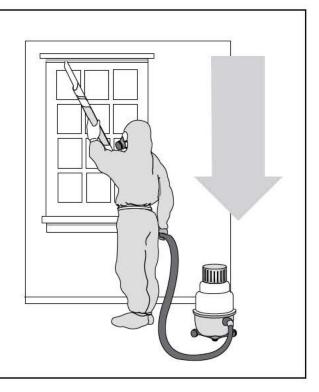


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Figure 14.4d (continued)

HEPA vacuum all surfaces a final time HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

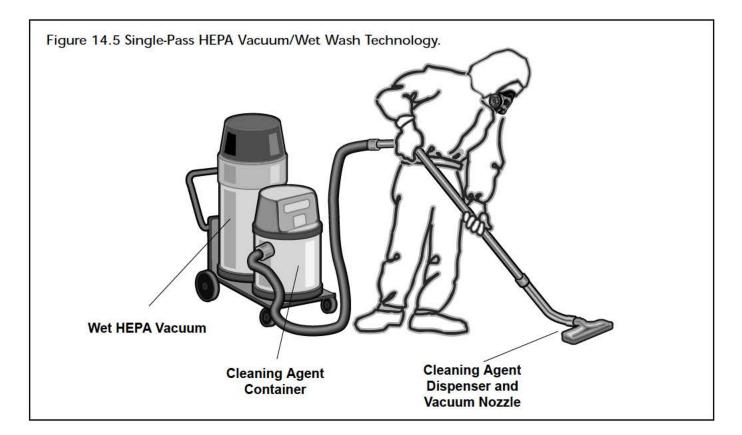
As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the



Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's



Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.



belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will



Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- ♦ Securing debris/plastic.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water and cleaned. All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plasticremoval process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).



Figure 14.8a Pick Up Corners of Plastic Sheeting.



Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).



Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This



option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dustretaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

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Table 14 1 Initial	Cleaning Wine Test	Failure Rates for	Various Abatement Stra	adinate
	cicaring wiperest	ranuic Rates for	various Abatement stra	iccyics

Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)



and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993). These Guidelines do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Mass Removal Efficiency Percentages Cycle Number **Cleaning Method** Central Central **HEPA Vacuum** Portable Vacuum—Plain Vacuum—Agitator Vacuum—Plain Tool Head Tool 1 34.7 71.0 17.5 55.4 2 47.0 80.2 61.2 23.0 3 51.9 85.9 66.3 26.6 87.8 67.0 4 56.0 29.4 59.3 88.9 5 72.1 32.5 6 61.6 91.2 74.4 34.9 7 63.8 93.1 76.4 36.5 67.5 95.4 38.1 8 77.5 9 67.5 97.7 78.7 40.1 67.2 80.2 10 100.0 41.7 11 102.3 80.2 41.7 44.8 12 104.6 84.1 84.5 13 104.6 46.8 14 103.8 84.5 48.4 15 49.6 50.8 16 17 52.4 18 53.6 54.4 19 20 55.2

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) Effectiveness of Clean-up Techniques for Leaded Paint Dust

14-23



1720 Walton Road Blue Bell, PA 19422 610-828-3078 Fax 610-828-7842

February 9, 2009

<u>E-MAIL</u> Ms. Non-Responsive

NGB Regional Industrial Hygienist Army National Guard ATTN: NGB-ARS-IHNE 301-IH Old Bay Lane Havre de Grace, MD 21078

Subject: Draft Industrial Hygiene Assessment Report Cheltenham Readiness Center, Cheltenham, Maryland 20623 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 Readiness Center facility located in Cheltenham, Maryland. Thank you for the opportunity to perform this assessment. Should you have any questions, please contact Non-Responsive or me.

Sincerely,

ponsi e/ on-Responsive, CIH Senior Manager, Health, Safety & Industrial Hygiene Services





NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE HAVRE DE GRACE, MARYLAND

FINAL INDUSTRIAL HYGIENE ASSESSMENT CHELTENHAM READINESS CENTER 9900 SURRATTS ROAD, CHELTENHAM, MD 20623 SURVEY DATE: JULY 25, 2008

IES PROJECT NO. EHS08794.02 REPORT DATE: FEBRUARY 9, 2009

Prepared and submitted by:

Non-Responsive

Industrial Hygienist

Certified Industrial Hygienist review by:

CIH

Senior Manager, Health, Safety & Industrial Hygiene Services



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Table 6 - Sampling Equipment Calibration Data

APPENDIX

- Appendix A Readiness Center Photographs
- Appendix B -- Indoor Air Quality Sample Location Map
- Appendix C Air and Wipe Sampling Results
- Appendix D Lead Wipe Sample Location Map
- Appendix E Illuminance Readings Map



1.0 EXECUTIVE SUMMARY

1.1 Introduction

Assessment Date: July 25, 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 9900 Surratt Road in Cheltenham,
Maryland. The purpose of the Industrial Hygiene survey was to identify and
measure the existence and extent of potentially hazardous operations or
conditions at the ARNG facility. Mr. Non-Responsive, Industrial Hygienist, of
IES, performed the assessment under the direction of Mr Non-Responsive,
CIH, Senior Manager, Health, Safety & Industrial Hygiene Services, of IES.
The assessment included: evaluations of operations, including engineering,
work practice, administrative, and/or personal protective equipment (PPE)
controls; ventilation system evaluations, including visual observations of
airflow and quantitative assessments of general ventilation systems; illumination
measurements and observations of the facility and conditions.

Conferred With: SFC Non-Responsive, Supervisor, Cheltenham Readiness Center

1.2 Facility Description

Cheltenham Armory/RC, located at 9900 Surratts Road, Cheltenham, Maryland is a 6,600-square foot training facility constructed of an exterior of brick and block masonry on a concrete slab. The interior construction is mostly painted block wall. The facility has a built up roof top atop corrugated metal decking. The facility contains offices, training rooms, a drill hall, kitchen and a former Indoor Firing Range (IFR) that was converted into a fitness center. Photographs of the facility are located in Appendix A of this report.

The RC is a one story training facility that was built around 1995. The interior walls of the multiroom facility are of block construction. A majority of ceilings within the facility are drop ceilings. The facility is not ventilated through a single system, but a majority of the offices have floormounted units to cool the space in the warmer months of the year. Normal working hours for the four full time personnel are generally Tuesday through Friday from 0630 to 1700. Training at the facility occurs once a month for a weekend in duration. On the day of the IH assessment, the shop was maintained by one administration personnel and one maintenance personnel.



1.3 Findings and Conclusions

The main findings and conclusions of the assessment are:

- On the day of the assessment there were two on-site personnel, who work directly with the Readiness Center. During a normal 10-hour day, the supervisors performed logistical work. Care of the facility is maintained by an outside contractor.
- Airborne lead was not detected in either of the two general area air samples collected on the day of the assessment. The airborne lead concentrations in each of the air samples were reported at less than 4.6 micrograms of lead per cubic meter of air ($\mu g/m^3$), which is well below the OSHA Action Level of 40 $\mu g/m^3$ for lead over a 10-hour workday.
- Wipe samples for lead that were collected from various horizontal surfaces throughout the Readiness Center indicated that the surface lead concentrations in certain areas exceeded the recommended precautionary level of 200 micrograms of lead per square foot of surface sampled (µg/ft²). Additional cleaning using HEPA filtered vacuum systems and/or wet methods is recommended for these areas to help further reduce the potential for personnel exposure to lead.
- The air temperatures within the facility ranged from 78.6°F to 81.5°F, as compared to an outdoor temperature of 79.3°F. A majority of the temperatures collected inside the building exceeded what is considered comfortable, as recommended by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). These areas were occupied sporadically throughout the day of the assessment. All occupied areas assessed were ventilated by floor-mounted air conditioning units that condition outdoor air. IES was informed that the facility has a roof-top air-handling unit, but it has not worked for six years. Indoor relative humidity ranged from 42.9% to 51.4% in the facility, as compared to an outdoor level of 51.5%. These levels are within the recognized comfort range of 30 to 60%.
- The average illuminance levels in several areas throughout the facility were below the recommended values. Although the lower-than-recommended lighting levels are not expected to present an imminent hazard, safety and ergonomic improvements could result from enhanced lighting in these areas.
- All building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. IES observed all presumed asbestos-containing materials (PACM) and facility paint were in good condition. IES did not observe any mold growth, nor were there indications of mold and bacteria growth. No building materials samples were collected on the day of the survey.
- Various health and safety items were identified during the comprehensive survey. These violations included:



- Numerous fire extinguishers throughout the facility were blocked
- Emergency lights did not work when tested

1.4 Recommendations

IES' recommendations resulting from this assessment are included in a separate document entitled, are included in a separate document entitled, "Cheltenham_RC_08_Recommendations."



2.0 **OPERATION DESCRIPTION**

INSTALLATION: RC Army National Guard BUILDING: 9900 Surratts Road, Cheltenham, Maryland 20623 LOCATION: Site wide

OPERATION DESCRIPTION: On the day of the assessment, IES witnessed routine operations for the RC. Supervisors were preparing for a recruitment activity that occurred later that day at an offsite location. Training at the RC occurs once a month, a weekend at a time.

CHEMICAL AND PHYSICAL AGENTS SAMPLED: Personal and area sampling for lead was performed on the day of the assessment during what is considered routine operations when training is not taking place at the facility. General IAQ measurements were made throughout the facility to evaluate ambient conditions on the day of the assessment.

LIGHTING: The average illuminance levels in several areas throughout the shop were below the recommended values. Refer to Section 3.3 of this report for a summary of the lighting measurements.

INTERPRETATION OF RESULTS: The personal and general area lead sample results suggest that the likelihood of personnel exposure to airborne lead dust is low. Wipe samples for lead that were collected from various horizontal surfaces throughout the Readiness Center indicated that the surface lead concentrations in certain areas exceeded the recommended precautionary level of $200 \mu g/ft^2$. Although there is limited correlation between surface lead contamination and airborne lead exposures, it is recommended that the affected areas be thoroughly cleaned using HEPA filtered vacuum systems and/or wet methods. The average illuminance levels in several areas throughout the facility were below the recommended values. Although the lower-than-recommended lighting levels are not expected to present an imminent hazard, safety and ergonomic improvements could result from enhanced lighting in these areas. A majority of temperatures within the facility exceeded the comfort levels set forth by ASHRAE. All building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. IES observed all presumed asbestoscontaining materials (PACM) and facility paint were in good condition. IES did not observe any mold growth, nor were there indications of mold and bacteria growth.



3.0 SAMPLE RESULTS AND MEASUREMENTS

3.1 Air Sampling

3.1.1 Indoor Air Quality

Measurements of air temperature, relative humidity, and CO₂ and CO concentrations were made using a calibrated direct reading hand-held TSI Q-Trak Indoor Air Quality instrument. The carbon monoxide sample results were compared with the Threshold Limit Values (TLVs) for exposure assessment purposes. TLVs are established by the American Conference of Governmental Industrial Hygienists (ACGIH) and are published annually in ACGIH's *TLVs and BEIs*. They refer to airborne exposure concentrations and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. However, because of wide variations in individual susceptibility, a small percentage of workers may experience discomfort from or be affected by some substances at concentrations below the recommended threshold limit.⁽¹⁾

Table 1 details the air temperature, relative humidity, CO₂, and CO measurements collected throughout the building during the assessment. Refer to the Indoor Air Quality maps in Appendix B for the IAQ measurements at each location throughout the facility.

TABLE 1

AIR TEMPERATURE, RELATIVE HUMIDITY, CO2, AND CO MEASUREMENTS

Date of Assessment:	July 25, 2008
Location:	National Guard RC, Cheltenham, Maryland
Analyte(s):	CO ₂ , CO, Temperature, and Relative Humidity
Exposure Guidelines:	CO ₂ : Indoor CO ₂ concentrations should be maintained at less than 700 ppm
_	above outdoor air levels (ASHRAE 62.1-2007) ⁽²⁾
	CO: 25 ppm (ACGIH TLV-TWA)
	Temperature: 68 °F to 79 °F (ASHRAE 55-2004) ⁽³⁾
	Relative Humidity: 30% to 60% (ASHRAE 55-2004) ⁽³⁾

Sample ID	Sample Description	Start - End Time (hh:mm)	Sample Time	CO ₂ (ppm)	CO (ppm)	Measured Temperature (°F)	Measured Relative Humidity (%)
A	Outdoor - Area Sample (AS) – Approximately four feet above the ground outside of the RC.	1015 - 1019	4 Min.	350	0	79.3	51.5
В	B Assembly Hall – AS – Approximately four feet above the floor at the center of the Assembly Hall.		4 Min.	436	0	79.8	51.4
С	Orderly Office – AS – Approximately four feet above the floor at the center the Orderly Office.	1023 - 1027	4 Min.	761	0	81.5	44.5
D	four feet above the floor at the center of Office.	1027 - 1031	4 Min.	755	0	81.4	42.9



Sample ID	Sample Description	Start - End Time (hh:mm)	Sample Time	CO2 (ppm)	CO (ppm)	Measured Temperature (°F)	Measured Relative Humidity (%)
E	four feet above the floor at the center of Notice of Office.	1031 - 1035	4 Min.	713	0	81.4	42.9
F	Kitchen – AS – Approximately four feet above the floor at the center of kitchen.	1035 - 1039	4 Min.	802	0	78.9	43.3
G	Hallway – AS – Approximately four feet above the floor in the middle of Hallway 127.	1039 - 1043	4 Min.	792	0	80.2	43.3
Н	Hallway – AS – Approximately four feet above the floor in the middle of Hallway 128.	1043 - 1047	4 Min.	788	0	80.4	43.1
I	Hallway – AS – Approximately four feet above the floor in the middle of Hallway 129.	1047 - 1051	4 Min.	822	0	78.6	43.1
J	Fitness Center - AS – Approximately four feet above the floor in the center of the Fitness Center	1051 – 1055	4 Min.	809	0	78.7	43.2

Note: - All airborne CO2 and CO concentrations are expressed in parts of contaminant per million parts of air (ppm)

Refer to Section 6.0, Equipment and Calibration Data, for the calibration data for the equipment used to perform the IAQ survey.

3.1.2 Airborne Lead Sampling

Air samples for lead were collected with personal air sampling pumps on 0.8 μ m mixed cellulose ester (MCE) filters. All sampling pumps were calibrated before and after the sampling period with a primary gas flow standard. Area samples were collected as a part of this assessment. Following the assessment, the air samples and an appropriate number of field blanks were shipped via overnight courier to AMA Analytical (AMA) in Lanham, Maryland, which is accredited by the American Industrial Hygiene Association (AIHA) for analysis and participates in the Environmental Lead Accreditation Program (ELAP). The air samples were analyzed for lead using the EPA 600/R-93/200 Flame Atomic Absorption Spectroscopy (FAAS) method. All air sample results were reported in micrograms of lead cubic per meters of air sample (μ g/m³) for the purposes of this assessment.

Air sample results for lead were compared to the Action Level and Permissible Exposure Limits (PELs) published in OSHA 1910.1025, the expanded health standard for lead. Action Levels and PELs are promulgated through the OSHA rule-making process and act as legal limits for exposure in the work place. They are intended to provide protection to employees who are potentially exposed to airborne contaminants. The Action Level for lead is expressed in terms of an 8-hour time-weighted average (TWA) contaminant concentration. The PELs for lead are expressed in terms of 8-hour TWAs. Copies of the OSHA regulations are available through the local OSHA Area Office, in the Federal Register, or on the OSHA website at *www.osha.gov*.⁽⁴⁾



This report's findings are based on the lead samples collected during the assessment, which are summarized in Table 2. Refer to Appendix C for the complete laboratory air sample analysis results. Worksite Sampling Data Records are included in a separate document entitled, "Cheltenham_RC_08_Medical."

TABLE 2 AIRBORNE LEAD SAMPLING RESULTS SUMMARY

Date of Monitoring:	July 25, 2008
Location:	Army National Guard RC, Cheltenham, Maryland
Analyte(s):	Lead
Occupational Exposure Limits:	Lead: OSHA PEL-TWA = 50 μ g/m ³
	OSHA Action Level (TWA) = $30 \mu g/m^3$

Sample ID	Equipment ID	Sample Description	Start Time	End Time	Sample Time (Min.)	Flow Rate (lpm)	Air Volume (l)	Measured Airborne Contaminant Concentration
072508- A001	103	SGT – Personal Sample - Operator Breathing Zone (PS-OBH) – During normal operations within the Cheltenham Armory.	0705	1230	325	2.01	653.3	<4.6 μg/m ³
072508- A002	104	SGT Office – Area Sample - Operator Breathing Zone (AS-OBH) – During normal operations within in the Readiness Center.	0705	1230	325	1.99	646.8	<4.6 μg/m³

Note: - Sample results for lead are expressed as micrograms of contaminant per cubic meter of air $(\mu g/m^3)$

- PEL-TWA = OSHA Permissible Exposure Level, 8-Hour TWA

3.2 Lead Dust Sampling

IES performed wipe sampling in the Drill Hall, converted IFR and in select areas throughout the facility. All wipe sampling was performed in accordance with: best Industrial Hygiene practices and the guidelines published in Section II: Chapter 2, Sampling for Surface Contamination, of the OSHA Technical Manual. The wipe samples were collected over 100 square centimeter areas using prewetted Ghost Wipes. The wipe samples collected as a part of this assessment, along with appropriate field blanks, were shipped to AMA for analysis and were analyzed using the NIOSH 7082 flame atomic absorption spectrophotometer (FAAS) method. All wipe sample results were reported in micrograms of lead per square foot of surface sampled (μ g/ft²) for the purposes of this assessment.

This report's findings are based on the lead samples collected during the assessment, which are summarized in Table 3. Refer to Appendix D for sample locations and Appendix C for the complete laboratory wipe sample analysis results. Worksite Sampling Data Records are included in a separate document entitled, "Cheltenham_RC_08_Medical."



TABLE 3 – WIPE SAMPLE RESULTS SUMMARY

Date of Monitoring:	July 25, 2008
Location:	Army National Guard RC, Cheltenham, Maryland
Analyte(s):	Lead
Occupational Exposure Limits:	ARNG Recommended Cleaning Level = $200 \ \mu g/ft^2$

Sample ID	Sample ID	Location	Area of Surface Sampled	Measured Lead Surface Contamination (µg/cm ²)
Α	072508-SW001	Drill Hall -Wipe Sample (WS)- Horizontal surface of Coke Machine	100 cm^2	<110
В	072508-SW002	Drill Hall -WS- Horizontal surface of storage cabinet	100 cm^2	<110
С	072508-SW003	Drill Hall -WS- Center of Drill Hall floor surface	100 cm^2	<110
D	072508-SW004	Kitchen -WS-Top of Continental Refrigerator	100 cm^2	<110
E	072508-SW005	Non-Responsive Office - WS-Surface of file cabinet	100 cm^2	<110
F	072508-SW006	Converted Rifle Range -WS-Surface ventilation exhaust at entrance	100 cm^2	<110
G	072508-SW007	Converted Rifle Range -WS-Surface ventilation exhaust at back	100 cm^2	<110
Н	072508-SW008	Converted Rifle Range -WS-Surface of floor at side entrance	100 cm^2	300
I	072508-SW009	Converted Rifle Range -WS-Surface of floor at rear stage	100 cm^2	980
J	072508-SW010	Converted Rifle Range -WS-Surface of hallway floor outside of range	100 cm^2	<110
K	072508-SW011	Orderly Office -WS-Surface of Retention file cabinet	100 cm^2	<110
L	072508-SW012	Orderly Office -WS-Surface of CPT desk	100 cm^2	<110
М	072508-SW013	Orderly Office -WS-Surface of refrigerator	100 cm^2	<110
N	072508-SW014	Orderly Office -WS-Surface of desk in SGT NOT RESOURCE	100 cm^2	<110
0	072508-SW015	Orderly Office -WS-Surface of hallway floor outside of Orderly Office	100 cm^2	<110
Р	072508-SW016	Non-Responsive Office -WS-Top surface of desk	100 cm^2	<110

3.3 Illuminance Survey

The illumination survey was performed pursuant to best Industrial Hygiene practices and the guidelines found in the ARNG document entitled, "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," dated November 17, 2007.⁽⁵⁾ All measurements were made in slow response mode and were expressed in foot candles (fc). The measurements were used to calculate average illuminance levels for each workspace. Based on the activities conducted in each workspace, the calculated average illuminance level was compared to the ARNG recommended illuminance values. This report's findings are based on the illuminance readings collected during the survey, which are summarized in Table 4. The data reported in this table represent the average illuminance readings from the accessible locations of the commonly occupied work areas of the facility. Refer to the Illuminance Readings maps in Appendix F for sample locations.



TABLE 4 ILLUMINANCE READINGS SUMMARY

Survey Dates:July 25, 2008Location:Army National Guard RC, Cheltenham, Maryland

Sample ID	Sample Description	Average Illuminance Measurements (fc)	ARNG Recommended Illuminance Value (fc)
Α	Assembly Hall – Center of Hall	16.2	50
В	Hallway – Center of Hallway 127	25.2	50
С	Fitness Center - Center of Center	21.0	30
D	Men's Locker Room - Center of Locker Room	15.6	7
E	Kitchen - Center of kitchen	60.1	50
F	Class Room – Center of Room	80.8	75
G	Hallway – Center of Hallway 128	25.8	30
Н	Latrine - Center of latrine	23.8	7
I	Lobby - Center of Lobby	47.1	10
J	Orderly Offices - Center of Offices	48.3	50
K	SGT Office – Center of Office	56.8	50
L	Non-Responsive – Center of Office	57.2	50
Μ	Hallway – Center of Hallway 129	34.5	30

Notes: - All illuminance measurements and recommended values are expressed in foot candles (fc)

Refer to Section 6.0, Equipment and Calibration Data, for the calibration data for the equipment used during the illumination survey.

4.0 ONSITE OBSERVATIONS

A copy of IES' field notes from this assessment is included in a separate document entitled, "Cheltenham_RC_08_Field_Notes."

4.1 Physical Condition of RC

All building materials present within the RC were in good condition on the day of the Industrial Hygiene Assessment. IES observed all presumed asbestos-containing materials (PACM) and facility paint were in good condition. IES did not observe any mold growth, nor were there indications of mold and bacteria growth. No building materials samples were collected on the day of the survey.

4.2 Housekeeping

Housekeeping within the facility was generally good. IES observed no imminent slip, trip and fall hazards on the day of the assessment. All furniture within the offices and training areas were properly maintained within the rooms.



5.0 EQUIPMENT AND CALIBRATION DATA

5.1 Sampling Equipment List

Table 5 lists the sampling equipment that was used as a part of the assessment.

Equipment Type	Make/Model	Equipment/Serial Number	Equipment Identification		
Personal Sampling Pump	MSA Escort ELF	103	103		
Personal Sampling Pump	MSA Escort ELF	104	104		
Primary Gas Flow Calibrator (Electronic Frictionless Piston)	Bios DryCal DC-Lite Model DCL-HM; S/N 101785	DryCal-ML	DryCal-ML		
Light Meter	Extech Light Meter	401025	401025		
Indoor Air Quality Monitor	TSI Model 8551 Q-Trak	51885	Q-Trak		

TABLE 5 SAMPLING EQUIPMENT LIST

5.2 Sampling Equipment Calibration Data

Table 6 details the calibration data for each piece of sampling equipment used during the assessment.

Equipment ID	Calibrator Used	Date of Pre- Sampling Calibration	Pre- Sampling Calibration Value (lpm)	Date of Post- Sampling Calibration	Post- Sampling Calibration Value (lpm)	Average Calibration Value (lpm)
103	DryCal-ML	7/25/08	2.01	7/25/08	2.00	2.01
104	DryCal-ML	7/25/08	1.99	7/25/08	1.99	1.99
DryCal-ML	Bench Calibrated 02/07/08	N/A	N/A	N/A	N/A	N/A
401025	NA	NA	NA	NA	NA	NA
Q-Trak	Zero Gas/ Span Gas	7/25/08	Zero Gas: 0 ppm CO ₂ ; 0 ppm CO Span Gas 1,000 ppm CO ₂ ; 35 ppm CO	7/25/08	Zero Gas: 0 ppm CO ₂ ; 0 ppm CO Span Gas 1,000 ppm CO ₂ ; 35 ppm CO	Zero Gas: 0 ppm CO ₂ ; 0 ppm CO Span Gas 1,000 ppm CO ₂ ; 35 ppm CO

TABLE 6SAMPLING EQUIPMENT CALIBRATION DATA



6.0 **REFERENCES**

- 1. ACGIH, 2008 TLVs and BEIs.
- 2. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), Standard 62.1-2007, "Ventilation for Acceptable Indoor Air Quality," ASHRAE, Atlanta, Georgia, 2004.
- 3. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), Standard 55-2004, "Thermal Environmental Conditions for Human Occupancy," ASHRAE, Atlanta, Georgia, 2004.
- 4. Occupational Safety and Health Administration, 29 CFR 1910.1025, Lead.
- 5. "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," ARNG, 17 November 2007.



APPENDIX A

FACILITY PHOTOGRAPHS





Photograph #1 – RC Exterior



Photograph #2 – Readiness Center Drill Hall





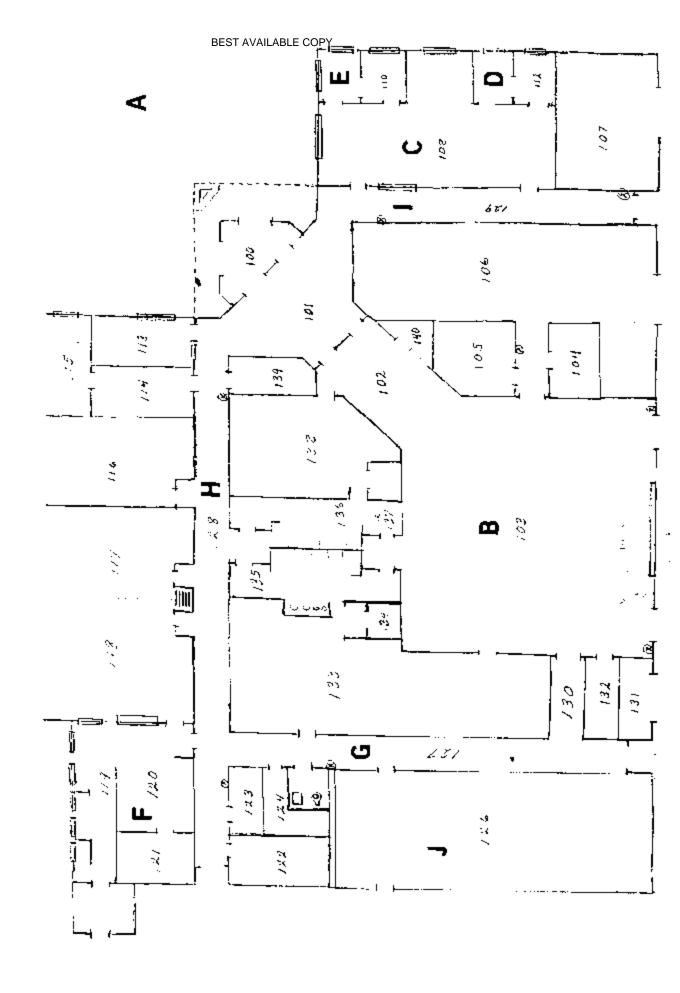
Photograph #3 – Converted Rifle Range



APPENDIX B

INDOOR AIR QUALITY SAMPLE LOCATION MAP





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APPENDIX C

AIR AND WIPE SAMPLING RESULTS

4475 Forbes Blvd. • Lanham, MD, 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (301) 459-2643 An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory AMA Analytical Services, Inc.

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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 be defined by the information. Revealed for the exclusive use of the client to whom it is addressed and upon the condition that it is not accessed in whole or in pars, in may adversing or publicly matter witten automation from the standard provided by the personal of the standard provided by the personal of the standard personal of the standard in accordance with the appropriate regulatory guidefines, unless other without prior witten automation from any samples, and these Laboratories, we expressive disching any laboratories for the scalar with the appropriate regulatory guidefines, unless other with the formation for the scalar standard personal of the standard by the dist. WVLAP accreditation any knowledge and liability for the accredition any knowledge and liability for the accuration for the scalar standard by polarized light microscopy of the based to chin, and does not inply product certification, approval, or endorsement by NVLAP, NIST, or any agarest of the before field in increasely of the based of the information. The report must not be used to chain, and does not inply product certification, approval, or endorsement by NVLAP, NIST, or any agarest of the before light microscopy of built samples and does not inply product certification, approval, or endorsement by NVLAP, NIST, or any agarest of the before light microscopy of built appropriate regulatory and computing the standard by the dist. NVLAP (101143-0), and NV reserve the based of the information. BEST AVAILABLE COPY should not be considered when interpreting the result. Note: All samples were received in good condition unless otherwise noted Analysis Method For Furnace: Air, Wipes, Paints, and Soli/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B Air and Wipe results are not corrected for any blank results Note: All results have two significant digits. Any additional digits shown Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B %Pb = percent lead by weight N/A = Not Applicable AMA Sample Number 0874044 0874043 Address: Client: Attention: State Military Reservation 301-IH Old Bay Lane, Attn: NGB-AVN-SI, National Guard Bureau Havre de Grace, Maryland 21078 Client Sample Number 022508-A03 022508-A02 mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm) ug = micrograms Analysis Type Flame Flame ug/L = parts per billion (ppb) Summary of Atomic Absorption Analysis for Lead Sample Type Air Blank P.O. Number: Job Number: Job Location: Job Name: Ą Air Volume Not Provided EH508749.02 Cheltenham, MD Not Provided 649 Ē 0 Analyst: Area Wiped Melissa Samp\$ N/A N/A Ē NY ELAP accrediation applies only to paint chip, wipe, and water samples associated with these sampes See QC Summary for analytical results of quality control samples 3.00 4.62 Reporting Limit ug/m³ Date Analyzed: Person Submitting: Date Submitted: Chain Of Custody: ut/gu **Technical Manager:** ٨ ٨ Final Result 4.6 8/1/2008 503006 7/29/2008 ug∕m³ gu G Edward Carney Report Date: Comments R 8/1/2008 FOIA Requested Record #505-0085 (ND) Released by National Guard Bureau Page 1717 of 526 ST AVAILABLE COPY BĖ

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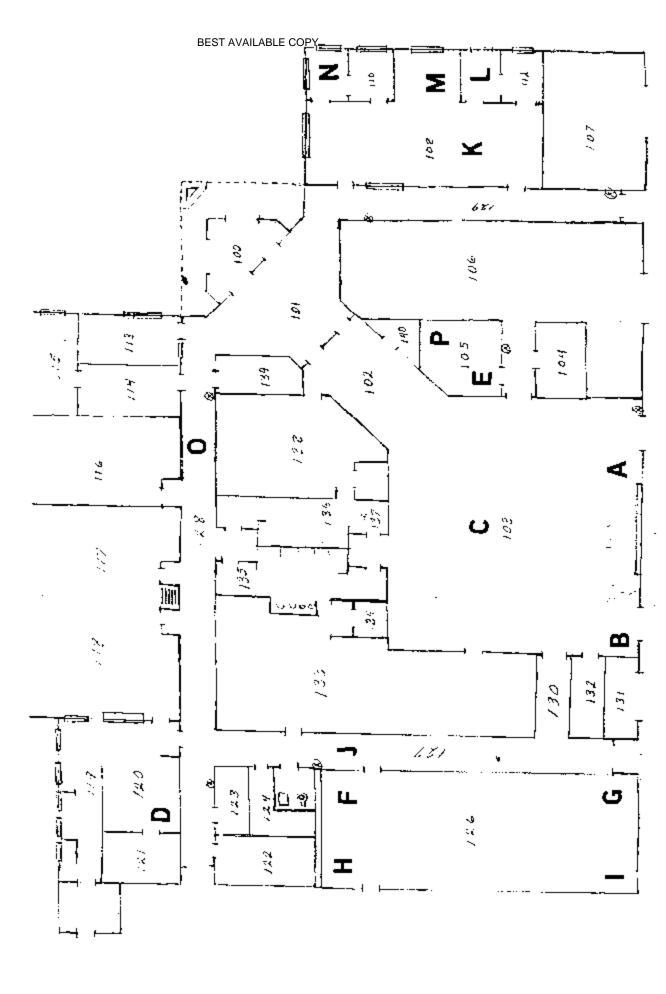
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APPENDIX D

WIPE SAMPLING LOCATION MAP





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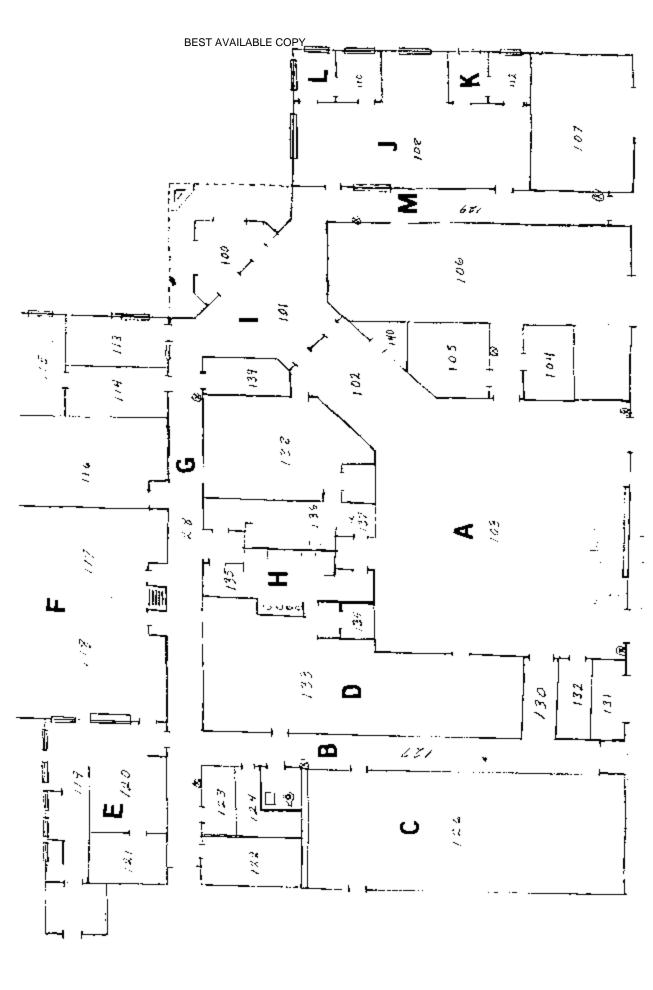


APPENDIX E

ILLUMINATION SURVEY MAP

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Industrial Hygiene Survey

National Guard Facility Cheltenham Armory 9900 Surratts Road Cheltenham, MD 20623

Prepared For:National Guard Bureau Region North IH
301-IH Old Bay Lane
Havre de Grace, MD 21078Survey Location:Cheltenham Armory
9900 Surratts Road

Prepared By:

Analytical Laboratory Services, Inc. 3544 North Progress Avenue Suite 100 Harrisburg, PA 17110

Cheltenham, MD 20623

Survey Date:

Report Date:

November 8, 2010

October 7, 2010

ALSI Project #: 1010666
Non-Responsive

Director, Environmental Health & Safety

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Section 8.0 Maintenance Bay	
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Section 1.0 Executive Summary

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1728 of 5269

Section 1.0 Executive Summary

On October 7, 2010, Analytical Laboratory Services, Inc. (ALSI) personnel Ms.

- 1. Surface levels of lead exceeded 200 ug/ft² in the Men's Locker Room. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft². Peeling and damaged paint should be repaired and properly remediated.
- 2. Lighting within the facility was evaluated. Lighting levels met the minimum recommended guidelines in all areas but the Drill Hall. Lighting should be improved in this area.
- 3. Temperature levels were slightly lower than the recommended guideline in a few locations. Individual comfort due to temperature varies greatly within a population. Relative humidity, carbon dioxide (ventilation) and carbon monoxide levels were within recommended guidelines.
- 4. Active water leaks are present in a few areas. All sources of water infiltration should be identified and repaired. Water damaged ceiling tile should be removed and replaced.
- 5. Return vents were dirty with some areas of possible fungal growth. Do not permit dirt, debris, microbial growth, etc. to accumulate in any portion of the HVAC system including the supply and return vents. Supply and return vents should be properly cleaned.

Section 2.0 Operation Description & Observations

Section 2.0 Operation Description & Observations

The Cheltenham Armory serves primarily as an office setting and equipment storage facility. The facility consists of offices, a drill hall, and storage areas. There is no garage area.

The building was initially constructed in 1996. There are eight employees. The interior walls are primarily concrete block with finished drywall in some areas. The floors were composed of a poured concrete slab with floor tile and carpeting. The ceilings were generally composed of a roof deck with a suspended drop ceiling system in some areas.

There is a central heating, ventilating, and air conditioning system (HVAC) present. At the time of this survey it was in operation but facility staff stated that it was not working properly and inaccessible for inspection. Doors and windows were open. There are unit ventilators in the offices.

There is an old firing range in the building. It has been fully abated. It is now used for gym facility.

Overall housekeeping was 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 Noise Survey

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Section 3.0 Noise Survey

Employees were not performing tasks that provided excessive noise levels. Therefore, noise exposure monitoring was not conducted.

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Section 4.0 Lead Testing

Section 4.0 Lead Testing

At the time of the assessment, no activities were observed which would generate lead exposure. At one time the facility contained an indoor firing range. It is now a gym area.

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected using Ghost WipeTM samples and were collected in accordance with the ASTM E 1792 protocols. Air samples were collected using 0.8 um mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services. Inc., in Lanham, Maryland, for lead analysis using EPA Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Sample #	Location	Air ug/m ³	Surface ug/ft ²
I	Dill Hall	7.1	
2	Room 108	<6.8	
3	Blank	<3 (ug)	
4	Drill Hall Floor (Center)		<110
5	Drill Hall - Top of Soda Machine		<110
6	Drill Hall - Tabletop		<110
7	Room 106 - Supply Room Floor		<110
8	Room 108 - UV Grill		<110
9	Room [11] Top of Filing Cabinet		<110
10	Room 113 - Widow Sill	·	<110
 [Hallway Floor Outside Room 117		<110
	Room 120 Kitchen -		<110
12	Top of Ceramic Wall		:
13	Gym, Converted Firing Range -		<110
13	Floor		i
	Gym, Converted Firing Range		<110
14	Exhaust Vent Fin		!
	Gym, Converted Firing Range		<110
15	Exercise Seat		
	Floor Outside Gym, Converted		<110
16	Firing Range		
	Room 133 Men's Locker Room-		400
17	Floor		100
18	Blank		<12 (ug)
Criteria		50	200

Lead Testing Results Summary

Key: Bolded results exceed listed criteria

Source: Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)

Surface levels of lead exceeded 200 ug/ft^2 in the Men's Locker Room. Housekeeping and cleaning should be improved to maintain lead levels below 200 ug/ft^2 . Peeling and damaged paint should be repaired and properly remediated.

The National Guard Bureau currently utilizes 200 ug/ft^2 as a benchmark for identifying lead-contaminated surfaces. In the "Derivation of Wipe Surface Screening Levels for Environmental Chemicals," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) has determined that 200 ug/ft^2 is a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft^2 on floors and 250 ug/ft^2 on windowsills should be observed. There is no child care provided at this facility.

Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 ug/m^3 .

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.

Location	Foot Candles	Recommended Lighting	Sufficient Lighting
Room 108	122.2	30-50	Yes
Room III	93.3	30-50	Yes
Room 113	74.0	30-50	Yes
Room 117/118	133.5	30-50	Yes
Room 120 Kitchen	111.4	50	Yes
Room 133 Men's Locker Room	63.2	i ⁷	Yes
Room 129 Gym. Converted Firing Range	75.1	30	Yes
Drill Hall	17.9	30-50	No
Room 105	75.5	30-50	Yes

Light Survey Assessment Summary

Lighting levels met the minimum recommended guidelines in all but the Drill Hall. Lighting should be improved in this area.

Section 6.0 Indoor Air Quality

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Section 6.0 Indoor Air Quality

Survey measurements were made for ventilation and comfort parameters (carbon dioxide, temperature, and relative humidity). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7565X (Serial # 0839020). The IAQ Meter was last calibrated in March 2010.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE) standard 62.1-2007). ASHRAE specifies temperature and relative humidity ranges for human comfort (ASHRAE 55-2004). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60% in occupied areas.

The recommendations for temperature and humidity are based on seasonal and regional influences to allow comfort for 80% of a building's population. The temperature readings from the interior of the structure ranged from 70.1 to 73.3 degrees F with relative humidity readings ranging from 46.6% to 52.3%. During the survey, carbon dioxide (CO₂) levels ranged from 356 ppm to 750 ppm within the facility compared to an outdoor CO₂ level of 326 ppm. Based on the outdoor levels observed at the time of the testing, the maximum indoor concentration of CO₂ recommended is 1,026 ppm (326 ppm \sim 700 ppm). The following table summarizes the measurements collected.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Outdoors	64.5	55.3	328	0.0
Room 108	71.2	52.1	513	0.0
Room 111	72.8	51.0	750	0.1
Room 113	73.3	50.8	481	0.0
Room 117/118	73.0	49.3	396	0.0
Room 120 Kitchen	; 72.5	49,4	374	. 0.0
Room 133 Men's Locker Room	72.8	52.3	368	0.0
Room 129 Gym. Converted Firing Range	72.7	46.9	413	0.1
Drill Hall	70.1	46.6	356	0.0
Room 105	71.1	50.7	728	0.0
Outdoors	65.1	49.7	324	0.1
Criteria	73.0-79.0	30-60	<1.026	<9.0

IAQ Assessment Summary

Key: Bolded results were outside listed criteria

Temperature levels were slightly lower than the recommended guideline in a few locations. Individual comfort due to temperature varies greatly within a population. Relative humidity, carbon dioxide (ventilation) and carbon monoxide levels 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. Room 132 Efflorescence on the block wall. This is an indication of water infiltration.
- 2. Kitchen:
 - o Return vents were dirty
 - Small area of chipping and peeling paint.
- 3. Room 117/118:
 - o Missing and water stained ceiling tile.
 - Water leak present under the unit ventilator.
- 4. Room 105 Current roof leak. Suspected fungal growth on ceiling tile where roof leak was present.
- 5. Hallway Floor tile are loose and popping up.

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Section 7.0 Suspect Asbestos Contain Building Materials

Section 7.0 Suspect Asbestos Containing Building Materials

No suspect asbestos containing materials (ACM) were identified. Hidden or inaccessible areas were not inspected. No samples were collected.

Section 8.0 Maintenance Bay

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Section 8.0 Maintenance Bay

There is no garage or maintenance area at this facility.

Section 9.0 Limitations

Section 9.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Analytical Laboratory Services, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

Appendix A Laboratory Analysis Report

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		Summary of Atomic Absorption Analysis for Lead	of Aton	tomic Absor	ption	Analys	bate Analyzed: is for Lead		10/19/2010 Report Date	10/13/2810 Page I of 2
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-J uli t	Hame	Wipe	****	0.108	110	ng/A ^z	43	400	ng/ft²	
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An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Arcredited Laboratory

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Appendix B Photographs

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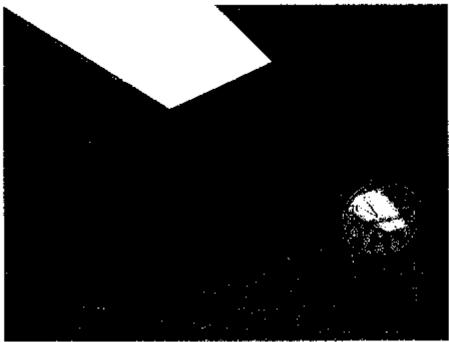
FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1753 of 5269



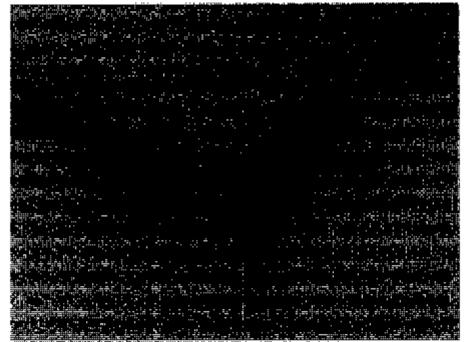
Exterior



Drill Hall



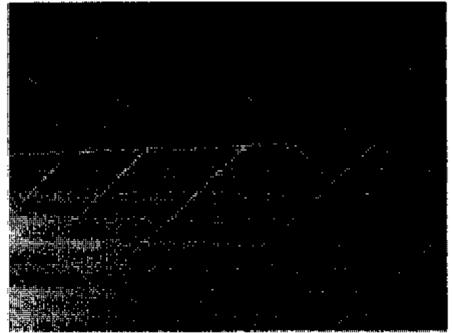
Room 105 current roof leak.



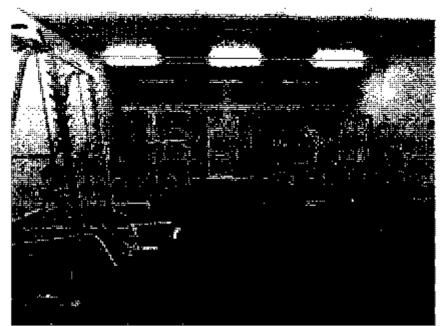
Room 105 possible fungal growth on ceiling tile.



Effloresces on block wall in drill hall, from moisture.



Loose floor tile in hallway from moisture.



Converted firing range.



Kitchen ceiling, peeling paint from moisture.

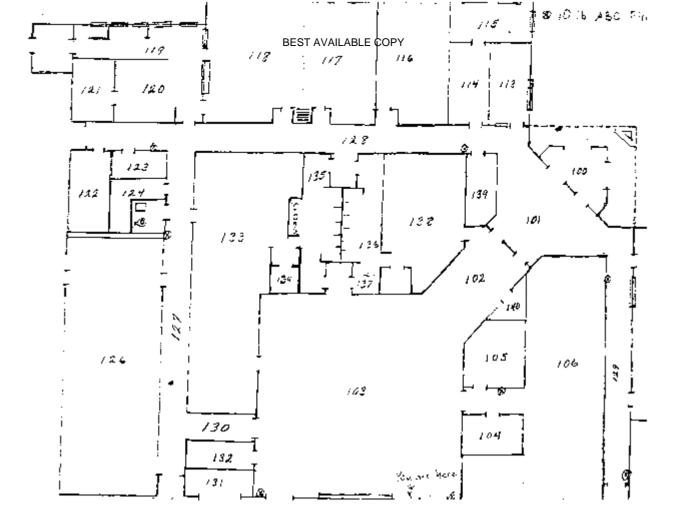


Room 17 and 18, moisture under floor tile a large area of floor tiles are loose with water underneath them. The source of moisture is believed to be the unit ventilator.



Boiler Room.

Appendix C Floor Plan



Appendix D References

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1761 of 5269

Appendix D. References

- 1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration. Occupational Exposure to Lead
- 2. American Conference of Governmental Industrial Hygienists (ACGIII) Threshold Limit Values and Biological Exposure Indices, 2010 Edition
- Industrial Ventilation: A Manual of Recommended Practice for Design, 25th Edition
- 4. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Ventilation for Acceptable Indoor Air Quality, 62.1-2007
- 5. 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
- 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(b)(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



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 Cheltenham Readiness Center

Prepared For:	National Guard Bureau Region North IH 301-IH Old Bay Lane Havre de Grace, MD 21078
Survey Location:	Cheltenham Readiness Center
Survey Location.	9900 Surratts Road
	Cheltenham, MD 20623
Prepared By:	Compliance Management International, Inc.
	1215 Manor Drive
	Suite 205
	Mechanicsburg, PA 17055
Survey Date:	October 2, 2013

November 20, 2013



Manager, Industrial Hygiene Services

Report Date:

Table of Contents

Section 1.0 Executive Summary
Section 2.0 Operation Description & Observations
Section 3.0 Lead Testing
Section 4.0 Lighting
Section 5.0 Indoor Air Quality
Section 6.0 Suspect Asbestos Containing Building Materials
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Section 8.0 Limitations
Appendix A. Laboratory Analysis Report
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Appendix C. Floor Plan
Appendix D. References

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on October 2, 2013, at the Cheltenham Readiness Center located at 9900 Surratts Road, Cheltenham, MD 20623. The survey was performed by Mr. Non-Responsive.

- 1. Lead was found in the sample collected from the top of the amnesty box in the Drill Hall. 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) 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%.
 - c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 parts per million (ppm).
 - d. Carbon dioxide (CO_2) levels met the ASHRAE 62.1-2013 recommended guidelines for mechanically ventilated office buildings and commercial settings.

See Section 5.0 for detailed sampling results.

4. Water stained ceiling tiles were observed at a few locations.

Section 2.0 Operation Description & Observations

The Cheltenham Readiness Center is mainly an administrative facility with a drill hall, offices, and classrooms. There were 3 full-time employees stationed at this facility at the time of this survey.

The building is reported to have been built in 1987. It is a single story structure. The exterior is brick. The interior walls are block, brick, and drywall. The floors are concrete, 12"x12" floor tiles, and carpet.

The heating system is an oil-fired hot water unit. The facility has wall mounted unit ventilators for air-conditioning.

There is no child-care facility in the building.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared to be properly designed. Personnel had supportive chairs.

This facility contains a converted firing range currently being used as a weight room and simulated firing range.

No suspect asbestos containing material (ACM) was observed at the time of this survey.

No chipped and peeling paint were observed at the time of the survey.

Housekeeping is adequate.

A few water stained ceiling tiles were observed but no current roof leaks were reported.

Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 micrometer (um) mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

Sample #	Location	Air ug/m ³	Surface ug/ft ²
1	Drill Hall	<6.4	*
2	Converted Range/Weight Room	<6.4	*
3	Blank	<3	*
4	Drill Hall – Floor	*	<110
5	Drill Hall – Top of Amnesty Box	*	130
6	Drill Hall – Top of Computer	*	<110
7	Kitchen – Top of Food Mixer	*	<110
8	Kitchen – Top of Microwave	*	<110
9	Hallway Outside of Converted	*	<110
9	Range/Weight Room – Floor		<110
10	Converted Range/Weight Room -	*	<110
10	Floor		<110
11	Converted Range/Weight Room –	*	<110
11	Top of Exercise Equipment		<110
12	Dining Hall – Top of Table	*	<110
13	Room 116 Classroom – Top of TV	*	<110
14	Room 108 Office – Top of Desk	*	<110
15	Blank - Wipe	*	<12
-	Criteria	50	200

Lead Testing Results Summary

Table Notes:

- 1. Bolded results exceed listed criteria
- 2. **ppm** = parts per million
- 3. ug/ft^2 = micrograms per square foot
- 4. $ug/m^3 = micrograms per cubic meter$
- 5. **ug** = micrograms

Sources:

- 1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges
- 2. OSHA 29CFR1910.1025 Lead Standard

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 "Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft² on floors and 250 ug/ft² on window sills should be observed. There is no child care provided at this facility.

Lead surface and air samples were collected. The following is a summary of the sample results from this survey.

- Lead was found in the sample collected from the top of the amnesty box in the Drill Hall.
- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m³).

Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98082EL). The light meter was last calibrated in March 2013. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Foot Candles	Recommended	
(FC)	Lighting (FC)	Sufficient Lighting
16.7	10	YES
38.0	30-50	YES
		YES
70.3	30	
65.8	50	YES
87.4	10	YES
46.2	30-50	YES
99.1	30-50	YES
70.4	30-50	YES
50.1	30-50	YES
57.3	30-50	YES
163.1	30-50	YES
113.8	30-50	YES
	16.7 38.0 70.3 65.8 87.4 46.2 99.1 70.4 50.1 57.3 163.1	$\begin{array}{c ccccc} 16.7 & 10 \\ \hline 16.7 & 10 \\ \hline 38.0 & 30-50 \\ \hline 70.3 & 30 \\ \hline 65.8 & 50 \\ \hline 87.4 & 10 \\ \hline 46.2 & 30-50 \\ \hline 99.1 & 30-50 \\ \hline 70.4 & 30-50 \\ \hline 50.1 & 30-50 \\ \hline 57.3 & 30-50 \\ \hline 163.1 & 30-50 \\ \hline \end{array}$

Light Survey Assessment Summary

Table Notes:

- 1. FC = Foot Candles
- 2. Bolded results did not meet listed criteria

Source: ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

The lighting levels met the minimum recommended guideline in all of the areas tested.

Section 5.0 Indoor Air Quality

Survey measurements were made for comfort parameters and ventilation (temperature, relative humidity, carbon dioxide, and carbon monoxide). The air quality measurements were collected using direct reading instrumentation for comfort parameters using a QTRAK IAQ Meter, Model 7575-X (Serial #7575X1228014). The IAQ Meter was last calibrated in May 2013.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) have developed indoor air quality guidelines for mechanically ventilated office buildings and commercial settings (ASHRAE standard 62.1-2013). ASHRAE specifies temperature ranges for human comfort (ASHRAE 55-2010). The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, recommends maintaining a relative humidity range between 30 to 60%.

The following table summarizes the measurements collected.

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Room 110 Office	76.8	46.8	522	0.0
Room 114 Office	76.2	59.1	524	0.0
Outdoors	83.6	48.3	419	0.0
Criteria	68-79	30-60	<1,119	<9

IAQ Assessment Summary

Table Notes:

- 1. **Bolded** results exceed listed criteria
- 2. **ppm** = parts per million
- 3. (%) = percent relative humidity
- 4. $^{\circ}\mathbf{F} = \text{degrees Fahrenheit}$

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2013, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements met the recommended 68-79°F in all occupied areas.
- Relative humidity levels met the recommended guideline of 30 60 % in all areas sampled.
- Carbon dioxide levels were measured to evaluate building ventilation or the introduction of outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level. For this survey, carbon dioxide levels did not exceed the recommended ceiling of

1,119 ppm (700 ppm + 419 ppm). This is an indication that outdoor air ventilation is adequate.

- Carbon monoxide levels measured were less than the recommended ceiling of 9 ppm. The recommended ceiling of 9 ppm referenced in the above table is the National Ambient Air Quality Standard for carbon monoxide
- A visual inspection was conducted throughout accessible portions of the facility to assess sources or pathways of factors potentially deleterious to IAQ. The following observation were noted:
 - 1. Water-damaged ceiling tiles were observed in the facility. Areas above the water stain should be investigated for the source of water infiltration.

Section 6.0 Suspect Asbestos Containing Building Materials (ACM)

There was no suspect asbestos containing material (ACM) noted at the time of this survey.

Inaccessible areas such as behind walls or crawlspaces were not inspected. ACM could potentially be present in these areas.

Section 7.0 Equipment

The following equipment was utilized during this survey. All sampling equipment was properly calibrated prior to use and verified for accuracy as applicable. See daily reports and calibrations logs for detailed information.

Equipment	Serial #	Calibration Date	Value
TSI QTrak IAQ Meter	1228014	3/2013	NA
Cal Light 400 Light Meter	98082EL	3/2013	NA
SKC Air Sampling Pump	767926	10/2/13	2.6 LPM
SKC Air Sampling Pump	798129	10/2/13	2.6 LPM

Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

Appendix A. Laboratory Analysis Report

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

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CERTIFICATE OF ANALYSIS

ISOIEC 17025-2005 waihaccreditedlabs.org LAS #100470 Client: National Guard Bureau Job Name: ARNG MD Chain Of Custody: 516883 301-IH Old Bay Lane, Attn: ARNG-CJG-P, Address: Job Location: Cheltenham RC **Date Submitted:** 10/7/2013 State Military Reservation Havre de Grace, Maryland 21078 Job Number: Not Provided Person Submitting: P.O. Number: W912K6-09-A-0003 Date Analyzed: 10/25/2013 Report Date: 10/28/2013



Summary of Atomic Absorption Analysis for Lead

Page 1 of 2

AIHA LAP, LLC ACCREDITED LABORATOR

NOUSTRIAL HYGIENE, ENVIRONMENTAL LEAT & ENVIRONMENTAL MICROBIOLOGY

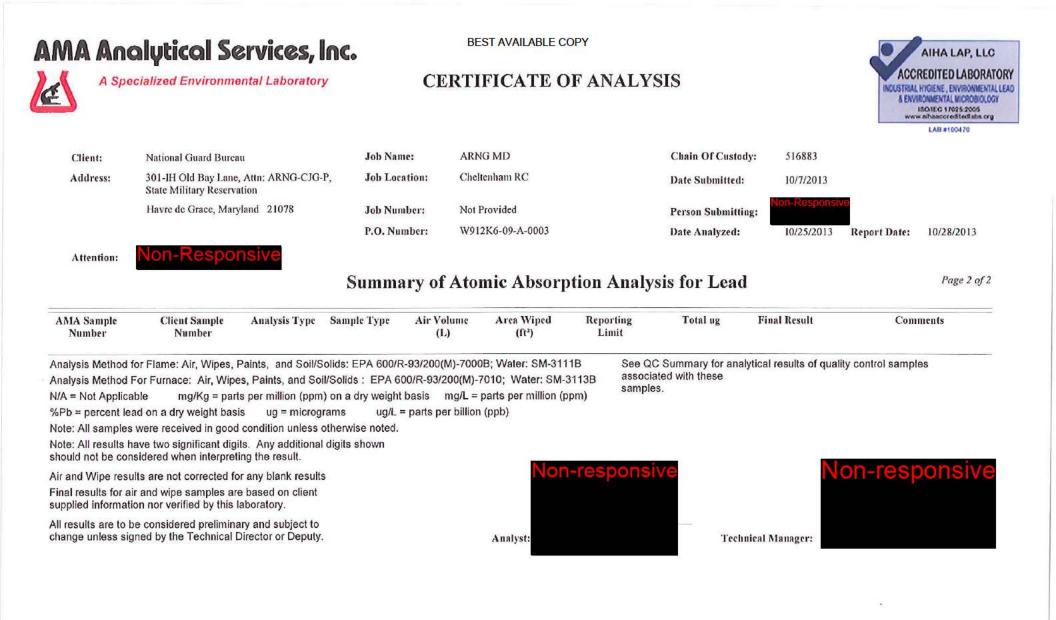
AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)		porting Limit	Total ug	Final Result		Comments
14001612	1	Flame	Air	468	N/A	6.4	ug/m³	<3	<6.4	ug/m³	
14001613	2	Flame	Air	468	N/A	6.4	ug/m³	<3	<6.4	ug/m³	
14001614	3	Flame	Air Blank	0	N/A	3	ug/m³		<3	ug	
14001615	4	Flame	Wipe	****	0.108	110	ug/fl²	<12	<110	ug/ft²	
14001616	5	Flame	Wipe	****	0.108	110	ug/ft²	14	130	ug/ft²	
14001617	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001618	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001619	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001620	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001621	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001622	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/fl²	
14001623	12	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001624	13	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001625	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
14001626	15	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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 FOIA Requested Record #J-15-0085 (MD)

 May, 2018
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 FOIA Requested Record #J-15-0085 (MD)

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Focused on Results www.amalab.com AIHA (#100470) NVLAP (#101143-0) NY EI 4475 Forbes Blvd. • Lanham, MD 20706 (301) 459-2640 • (800) 346-0961 • Fax (301)			CHA	IN	OF	CUS	STO	DY	Ì			lease Refer To Th umber For Inquire	his 51	16883
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Appendix B. Photographs



Exterior of facility

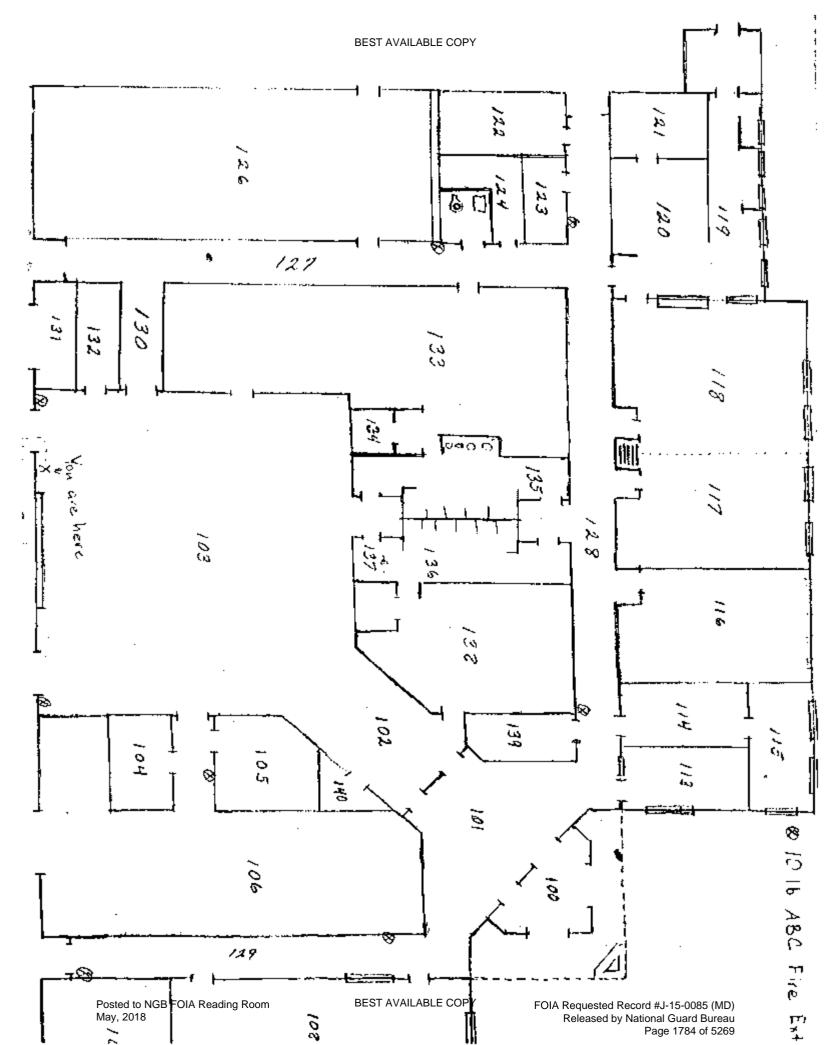


Drill Hall



Converted firing range/weight room

Appendix C. Floor Plan



Appendix D. References

- 1. Title 29 Code of Federal Regulations (CFR), Part 1910.1025, Occupational Safety and Health Administration, Occupational Exposure to Lead.
- 2. American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values and Biological Exposure Indices, 2013 Edition.
- 3. Industrial Ventilation: A Manual of Recommended Practice for Design, 28th Edition.
- 4. American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, 62.1-2013.
- 5. RP-1-2004, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.
- 6. RP-7-2001, Industrial Lighting, Illuminating Engineering Society of North America/ANSI.
- 7. National Emission Standard Hazardous Air Pollutants (NESHAP) The standards for asbestos are contained in 40 CFR 61.140 through 61.157.
- 8. National Ambient Air Quality Standards (NAAQS) National primary ambient air quality standards for carbon monoxide 40 CFR 50.8.
- 9. Environmental Protection Agency (EPA) standards [40 Code of Federal Regulations (CFR) 745.227 (h) (3)].
- 10. Derivation of Wipe Surface Screening Levels for Environmental Chemicals, the US Army Center for Health Promotion and Preventive Medicine (USACHPPM).
- 11. The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation, February 2002.
- 12. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 Nov 06.
- 13. ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Thermal Environmental Conditions for Human Occupancy, 55-2010.



DEPARTMENT OF THE ARMY US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-OFS

May 2004

MEMORANDUM FOR Army National Guard Bureau (NGB) Region North Industrial Hygiene NGB-AVS-SI-Non-Responsive, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03 SGT. MG (MD) Maurice D. Tawes Armory, Crisfield, MD

1. Enclosed is a copy of subject report and one CD-ROM.

2. Please direct any additional comments or concerns to Ms. Non-Responsive, at DSN 584-5475/3118, commercial (410) 436-5475/3118 or e-mail address at Non-Responsive (@apg.amedd.army.mil.

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Industrial Hygienist Industrial Hygiene Field Services Program



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U.S. Army Center for Health Promotion and Preventive Medicine



MDARNG FACILITIES IH BASELINE SURVEY MG (MD) MAURICE D TAWES ARMORY CRISFIELD, MD 55-ML-01ED-03

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U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed \$3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- Integrity is the foundation
- Excellence is the standard
- Customer satisfaction is the focus
- Its people are the most valued resource
- Continuous quality improvement is its pathway

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.



DEPARTMENT OF THE ARMY US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

EXECUTIVE SUMMARY MARYLAND ARMY NATIONAL GUARD FACILITIES INDUSTRIAL HYGIENE BASELINE SURVEYS, MG (MD) MAURICE D. TAWES ARMORY CRISFIELD, 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 building meets the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) recommended guidelines for air quality for relative humidity. To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room should not exceed 700 parts per million (ppm) more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. The indoor temperature of 84.9 degrees Fahrenheit exceeded the recommended ASHRAE indoor air quality guidelines for an acceptable thermal environment.

b. Illumination. All areas appeared to be adequately lit and occupants reported no areas of deficient lighting. The lighting met the Illumination Engineering Society of North America Guidelines.

c. Lead. All air sample results were below the laboratory analytical detection limits for lead in air and the Occupational Safety and Health Administration (OSHA) standard. All dust-lead wipe sample results were below both the USACHPPM recommended decontamination level for dust-lead on frequently contacted surfaces, as well as the EPA exposure standards for children.

d. Water Damage. The Armory has water damage from a leaking roof. The damage is located in the mechanical room where it has been cleaned up and the roof temporarily repaired. Two rooms located over the stage in the drill hall are closed off and can not be used until the leak in the roof is repaired.

e. Industrial Hygiene and Safety Programs. There are no HAZCOM or Respiratory Protection Programs for the full time state workers who oversee the armory.

Readiness thru Health Printed on BRecycled Paper

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3. RECOMMENDATIONS.

The Department of Defense Risk Assessment Codes (RAC) for Health Hazards enables one to prioritize remedial action for hazards. Risk Assessments Codes range in magnitude from 1 to 5, with 1 being the highest priority.

a. Indoor Air Quality. The RACs for Indoor Air Quality (Thermal Environmental Conditions) is classified as 5. Install more air conditioning units or fans to cool the armory to between 73-79 degrees Fahrenheit in the summer. The temperature in the winter should be between 68-74.5 degrees Fahrenheit. To alleviate occupant discomfort and odor control ASHRAE guidelines recommend that the carbon dioxide concentration in the room should not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. Check the ventilation system and ensure that the proper level of outdoor air is supplied.

b. The RAC for this armory for Lead Exposure is classified as 5. Clean all areas in and adjacent to the locker room (old IFR) where sampling results showed some lead residue. Apply a sealant to the area. Comprehensive guidelines are in Appendix F. This action should be accomplished before allowing children into the area. Test drinking water from water fountains and faucets for lead.

c. Water Damage. Fix the leaking roof.

d. Industrial Hygiene and Safety Programs. Provide HAZCOM and Respiratory Protection Programs for the full time state workers who oversee the armory.

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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 SEE DISTRIBUTION

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03

LOCATION: MG (MD) Maurice D. Tawes Armory, Crisfield, MD

1. AUTHORITY. E-Mail dated 28 February 2003 from Ms Non-Responsive, Industrial Hygienist, MD Army National Guard, to the USACHPPM Industrial Hygiene Field Services Program.

2. PURPOSE OF EVALUATION. To conduct surveys at Army National Guard (ARNG) facilities to identify and measure the existence and extent of potentially hazardous operations or conditions at ARNG facilities. The survey will serve to establish a baseline so that a worker's history of exposures is provided for each civilian or military employee.

3. BACKGROUND INFORMATION.

- a. Armory Mission. Engineering Support to the 229th Transportation Company.
- b. Date of Construction. 1928. The armory was rehabilitated in 1979.
- c. POC. Mr. Non-Responsive (410-968-0378).
- d. Survey Date. 4 September 2003.

4. SUMMARY OF ACTIONS.

a. Sampling. Surface dust-lead wipe and lead in air sampling was conducted to determine the existence of lead-based paint and/or lead-based paint hazards (paint-lead hazards). Carbon dioxide, temperature, and humidity measurements were collected to determine indoor air quality. Lighting conditions were measured. Sample results are in Appendix D.

b. Physical Condition of Facilities.

MCHB-TS-OFS

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b. Physical Condition of Facilities.

(1) Paint. The paint condition is intact. Sergeant Ruth McCuen, Environmental Compliance Assessment Coordinator for the MD NGB, stated that there are no records of lead-based paint abatement.

(2) Asbestos. Staff Sergeant McCuen stated that there are no records of an asbestos abatement. No asbestos was observed.

- (3) Mold. No mold was observed.
- (4) Safety Hazards. No safety hazards were observed.
- c. Other Building Issues.

In general the building is in good repair and the paint is intact. The Armory does have some water damage from a leaking roof. The damage is located in the mechanical room where it has been cleaned up and the roof temporarily repaired. Two rooms located over the stage in the drill hall are closed off and can not be used until the leak in the roof is repaired.

d. Safety and Industrial Hygiene Programs. There are no written program records at the armory. There is no HAZCOM Program for the full time state workers who oversee the armory. They do have PPE but no PPE program.

e. Heating, Ventilation, and Air-conditioning System. The armory has a forced air heating system. The system was not operating during this survey. Ventilation is normally provided by window-mounted air conditioning units and the manual operation of windows when the building is not being heated.

f. Noise Dosimetry. No operation that could produce hazardous noise levels was identified.

g. Lighting. Lighting was measured in fourteen locations. All lighting measurements were taken during storm conditions so there was limited outdoor lighting. Some measurements were taken with the lights off, because the rooms are normally used with the lights off.

h. Converted indoor firing range (IFR). Staff Sergeant Non-Responsive Environmental Compliance Assessment Coordinator for the MD NGB, stated there are no records of lead having been abated from the indoor firing range during its conversion. The IFR was converted to a locker room and gym as a self-help project about 13 years ago.

- i. Photographs (Appendix C).
- j. Site Maps. (Appendix B).

k. Facility use by children. The POC stated that the armory is currently used only by the units family support groups which includes children (the unit is deployed overseas) but it has been used extensively by the community and has wide-ranging use by children.

5. ASSESSMENT CRITERIA FOR LEAD. (Appendix A).

6. SAMPLING RESULTS.

a. Lead in air, surface dust-lead wipe, and indoor air quality sample results are in Appendix D. All air sample results were below the laboratory analytical detection limits of 3.0 to 15.0 μ/m^3 lead in air. This is well below the standard of 50 μ g/m³ lead in air. All dust-lead wipe sample results were below the laboratory analytical detection limits of 0.3 μ g/ft², below the standards of 40-200 μ g/ft².

3

Sample	Type of	Location	Floor	Photos	Results
Numbers	Sample			0000	
CR W01	Wipe	Locker room (former firing	Basement	0993	31
		range), floor by cage (trap area)			μg/ft²
CR W02	Wipe	Locker Room, floor, middle of	Basement	0994	13
		room			μg/ft²
CR W03	Wipe	Locker Room, floor, gym area	Basement	0996	5.6
					µg∕ft²
CR W04	Wipe	Supply Office, shelves, wall	Basement	0997	4.1
	_				µg/ft²
CR W05	Wipe	Kitchen, table top, near far wall	Basement	0998	9.2
	1				µg/ft²
CR W06	Wipe	Mechanical Room, floor near	Second	0999	10
	1	back wall			μg/ft²
CR W07	Wipe	State's Office, desk top	Second	1000	4.6
	···-P ·		~~~~~~		μg/ft²
CR W08	Wipe	Commander's Office,	Second	1002	17
	,, ipe	windowsill, middle of front wall.	Second	1002	μg/ft ²
CR W09	Wipe	Recruiter's Office, floor, near	Second	1003	7.9
	wipe	window wall	becond	1005	μg/ft²
CR W10	Wipe	Ops/Readiness Office, desk top	First	1004	3.8
	wipe	ops/Reddiness office, desk top	1 1150	100-	$\mu g/ft^2$
CR W11	Wipe	Personnel Office, table top near	First	1005	3.3
	wipe	window wall	THSt	1005	$\mu g/ft^2$
CR W12	Wipe	Personnel Office, floor, near Ops	First	1006	<u>μg/π</u> 6.9
	wipe	wall	First	1000	
CR W13	Wipe	Copy/break room, desk top	First	1007	$\mu g/ft^2$ 17
CR W15	wipe	Copy/break room, desk top	FIISt	1007	
	XX 7°			1000	$\mu g/ft^2$
CR W14	Wipe	Drill Hall, floor, center court	First	1008	7.6
				1000	μg/ft²
CR W15	Wipe	Drill Hall, floor of stage	First	1009	4.3
					μg/ft²
40903RR10	Air	State's Office	Second	1001	< 15
					mg/m ³
40903RR11	Air	Locker/Gym Room	Basement	0996	< 15
					mg/m³

 Table 1
 Lead Dust Wipe and Air Sample Results

b. Indoor Air Quality. The relative humidity was within normal ranges. The indoor temperature of 84.9 degrees Fahrenheit exceeded the recommended ASHRAE indoor air quality guidelines for an acceptable thermal environment. Install more air conditioning units or fans in occupied rooms to cool the armory to between 73-79 degrees Fahrenheit in the summer. The temperature in the winter should be between 68-74.5 degrees Fahrenheit.

The indoor carbon dioxide levels ranged from 410- 2353 ppm. (See Table 2). To alleviate occupant discomfort ASHRAE recommends that the carbon dioxide concentration in the room should not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm.

	I	
Class room	Basement	1060 parts per million (ppm) CO ₂
Maintenance shop (lawn equipments)	Basement	2353 ppm
Pump Room	Basement	931 ppm
Locker Room and Gym	Basement	736 ppm
Supply Office	Basement	584 ppm
Library Room	Basement	410 ppm
Kitchen	Basement	394 ppm
Drill Floor	First	687 ppm
Copy and Break Room	First	432 ppm
Lounge	First	547 ppm
Personnel Office	First	547 ppm
Ops/Readiness Office	First	534 ppm
State's Office	Second	708 ppm
Commander's Office	Second	711 ppm
Mechanical Room	Second	508 ppm
Outdoor		350 ppm

Table 2. Indoor Air Quality

c. Illumination. All lighting measurements were taken during storm conditions so there was limited outdoor lighting. Some measurements were taken with the lights off, because the rooms are normally used with the lights off. Even with the lights off, most measurements were within or near the ASHRAE Guidelines.

Location	Floor	Measurement	Guidelines
Locker/Gym Room	Basement	7.30 Foot Candles (FC)	10FC
Supply Office	Basement	46.5 FC	20-50 FC
Kitchen	Basement	35.0 FC	50 FC
Class Room	Basement	19.6 FC	50 FC
Mechanical Room	Second	20.0 FC	20-50 FC
State's Office	Second	86.3 FC	20-50 FC
Commander's Office	Second	86.3 FC	20-50 FC
Recruiter's Office	Second	16.4 FC (no over head	20-50 FC
		lights)	
Ops/Readiness Office	First	37.7 FC	50 FC
Personnel Office	First	39.5 FC	20-50 FC
Copy/Break Room	First	29.0 FC	20 FC
Drill Floor	First	1.64 FC (no lights)	10 FC
Drill Floor Stage	First	1.28 FC (no lights)	10 FC
Lounge	First	25.5 FC	10-20 FC

Table 3 Lighting Measurements

7. DISCUSSION AND CONCLUSIONS.

a. Indoor Air Quality. The armory relative humidity of 68.5% was within the ASHRAE recommended guidelines for air quality. The indoor temperature of 84.9 degrees Fahrenheit exceeds the recommended ASHRAE guidelines. ASHRAE standards for an acceptable thermal environment are between 73-79 degrees Fahrenheit in the summer and between 68-74.5 degrees Fahrenheit in the winter. The indoor carbon dioxide levels ranged from 410- 2353 ppm. To alleviate occupant discomfort and odor control ASHRAE recommends that the carbon dioxide concentration in a room not exceed 700 ppm more than the outdoor carbon dioxide concentration.

b. Illumination. All areas appeared to be adequately lit and occupants reported no areas of deficient lighting. The lighting met the Illumination Engineering Society of North America Guidelines.

c. Building Issues. The Armory has water damage from a leaking roof. The damage is located in the mechanical room where it has been cleaned up and the roof temporarily repaired. Two rooms located over the stage in the drill hall are closed off and can not be used until the leak in the roof is repaired.

d. Lead. All air sample results are below the laboratory analytical detection limit for lead in air of 3.0 to 15.0 μ g/m³. This is below the Occupational Health and Safety Administration (OSHA) standard of 50 μ g/m³. All dust-lead wipe sample results were below the USACHPPM recommended decontamination level of 200 μ g/ft² for dust-lead on frequently contacted surfaces. These wipe samples did not exceed the EPA lead exposure levels for children. However, the sample taken in the locker room (former firing range) floor by the cage (trap area) in the basement showed a level of 31 μ g/ft², close to the EPA exposure standard of 40 μ g/ft² for children for dust-lead on floors. AR 420-70 states that the purpose of Army lead hazard management is to protect children from all sources of lead exposure. However, its provisions only control these exposures, and do not eliminate them. Although this facility complies with EPA and Army regulations, recleaning and sealing the locker room 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-maiNon-Responsive@apg.amedd.army.mil.

Non-Responsive

INDUSTRIAL HYGIENIST USACHPPM LEAD AND ASBESTOS TEAM LEADER Industrial Hygiene Field Services Program EPA AHERA Asbestos Inspector and Management Planner/ Certification Number MD-070340 EPA Lead Inspector and Lead Risk Assessor/ Certification Number 04-7913

ENCLOSURE

CRISFIELD ARMORY RECOMMENDATIONS

The Department of Defense Instruction Number (DODI) 6055.1 provides Risk Assessment Codes (RAC) for Health Hazards, a procedure which allows us to assess the magnitude of exposure to physical, chemical, and biological agents and the possible medical effects of exposure. The RAC is an expression of the risk associated with the hazard and combines the hazard severity and accident probability into a single numeral. RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority. The RAC for this armory for Lead Exposure is classified as 5. The RAC for Indoor Air Quality is 5.

1. Lead Exposure.

a. Clean all areas in and adjacent to the former firing range rooms where sampling results showed some lead residue. Apply a sealant to the area. Comprehensive guidelines are in Appendix F. Consult with the Maryland Armory Environmental Coordinator concerning waste disposal requirements after cleanup. This action should be accomplished before allowing children into the area. RAC 5.

b. Test drinking water from water fountains and faucets for lead. It could not be determined if this has been done.

2. Indoor Air Quality. Thermal Comfort (Temperature).

a. Install more air conditioning units or fans to cool the armory to between 73-79 degrees Fahrenheit in the summer. The temperature in the winter should be between 68-74.5 degrees Fahrenheit. The indoor temperature of 84.9 degrees Fahrenheit exceeds the ASHRAE recommended guidelines for an acceptable thermal environment.

b. Check the ventilation system and ensure that the proper level of outdoor air is supplied. The indoor carbon dioxide levels ranged from 410- 2353 ppm. To alleviate occupant discomfort and to dilute odors and other pollutants ASHRAE recommends that the carbon dioxide concentration in the room should not exceed 700 ppm more than the outdoor ambient carbon dioxide concentration, which is approximately 350 ppm. RAC 5.

3. Water Damage.

Repair the leaking roof. The Armory has water damage from a leaking roof. The damage is located in the mechanical room where it has been cleaned up and the roof temporarily repaired. Two rooms located over the stage in the drill hall are closed off and can not be used until the leak in the roof is repaired. RAC 5.

4. Additional Recommendations. Provide HAZCOM and Respiratory Protection Programs for the full time state workers who oversee the armory.

9

APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

Subject: Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than $200 \ \mu g/ft^2$. This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. EPA standards (40 CFR 745.227(e)(8)(viii))are not directly applicable because they are developed for floors (40 μ g/ft²), windowsills (250 μ g/ft²) and window troughs (400 μ g/ft²) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. OSHA has no specific requirement for work area surfaces. The lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. OSHA used to cite a level of 200 μ g/ft² in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 μ g/ft² is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels above these recommendations do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All states will receive this guidance when it is completed.

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m³ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

APPENDIX B

SITE MAPS

APPENDIX C

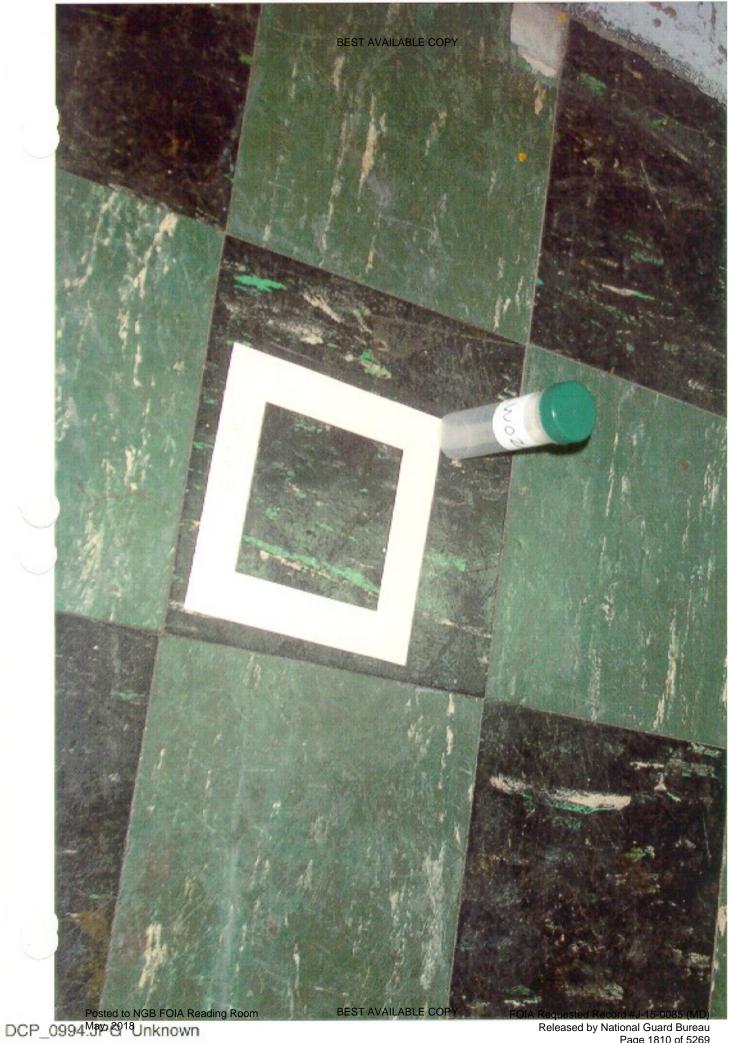
PHOTOGRAPHS

Photo Location	Room Number	Photo Number
Locker room (former	Basement	0993
firing range), floor by cage		
(trap area)		
Locker Room, floor,	Basement	0994
middle of room		
Locker Room, floor, gym	Basement	0996
area		
Supply Office, shelves,	Basement	0997
wall		
Kitchen, table top, near far	Basement	0998
wall		
Mechanical Room, floor	Second	0999
near back wall	İ	
State's Office, desk top	Second	1000
Commander's Office,	Second	1002
windowsill, middle of		
front wall.		
Recruiter's Office, floor,	Second	1003
near window wall		
Ops/Readiness Office,	First	1004
desk top		
Personnel Office, table top	First	1005
ncar window wall		
Personnel Office, floor,	First	1006
near Ops wall		
Copy/break room, desk	First	1007
top		
Drill Hall, floor, center	First	1008
court		
Drill Hall, floor of stage	First	1009
State's Office	Second	<u>1001</u> .
Locker/Gym Room	Basement	0996



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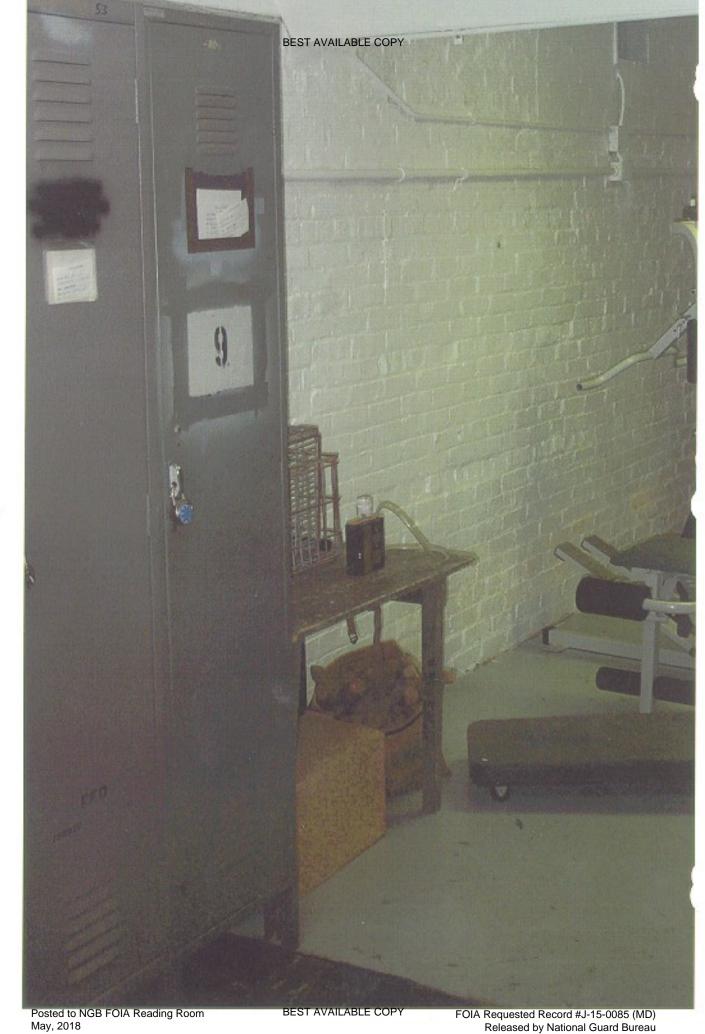




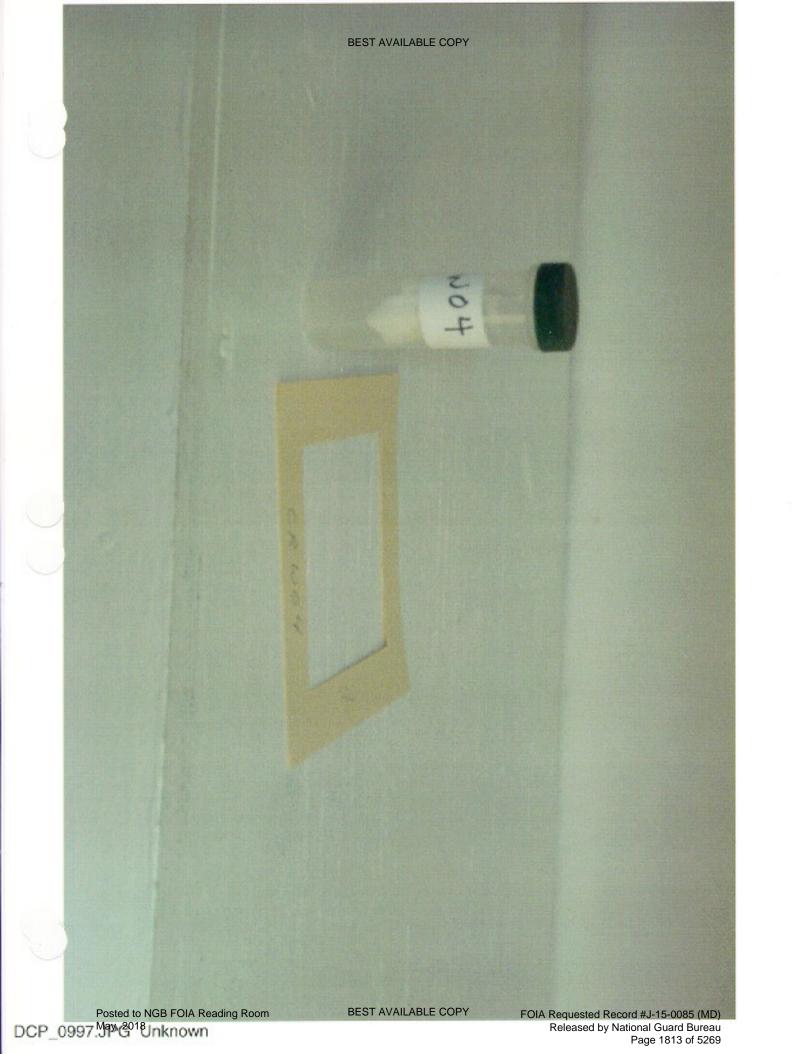
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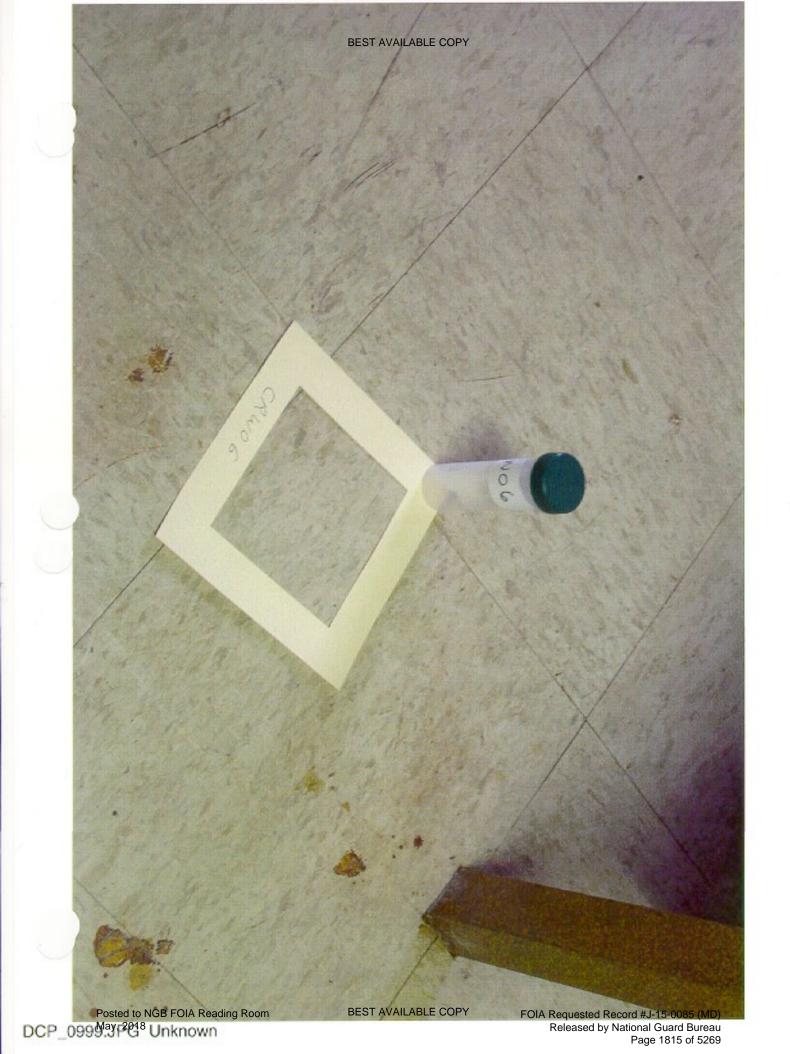


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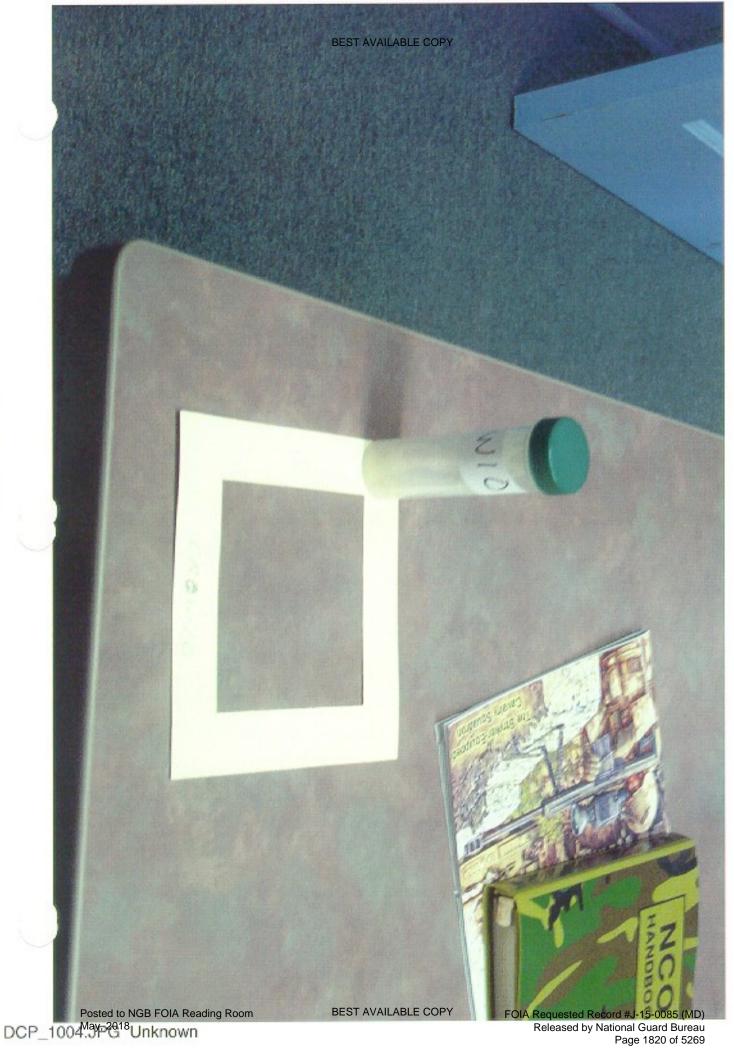


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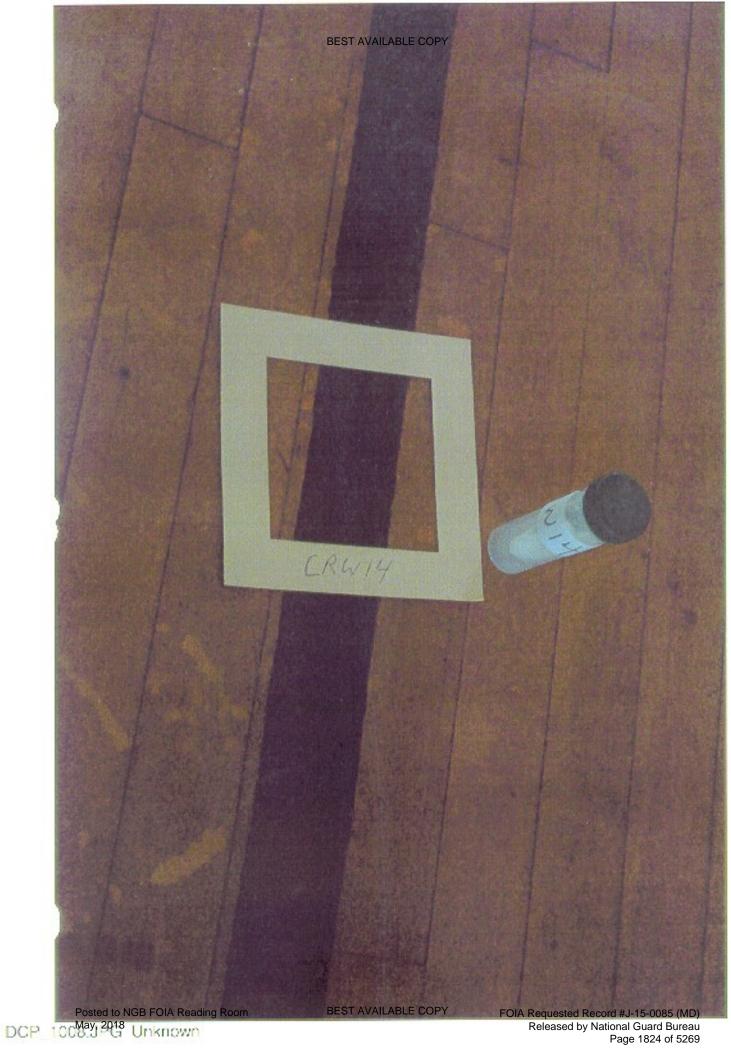
















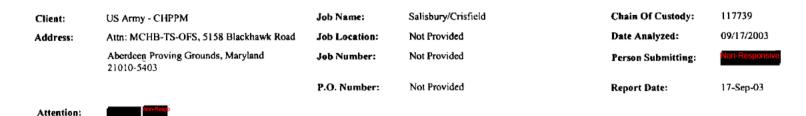
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APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

				Indoor Ra	inge fr	sfa		
Wipe Sample #	Armory	City	Active	Inactive	N/A	Cleaned?	Location of Samples	Conc. (µg/ft²)
CR W01							Locker room (former firing range), floor	31 μg/fl²
	Crisfield	Crisfield		Yes		No	by cage (trap area)	
CR W02	Crisfield	Crisfield				_	Locker Room, floor, middle of room	- 13 μg/ft²
CR W03	Crisfield	Crisfield					Locker Room, floor, gym area	5.6 µg/fl²
CR W04	Crisfield	Crisfield					Supply Office, shelves, wall	4,1 μg/ft ²
CR W05	Crisfield	Crisfield					Kitchen, table top, near far wall	-9.2 μg/ft²
CR W06	Crisfield	Crisfield					Mechanical Room, floor near back wall	10 µg/ft²
CR W07	Crisfield	Crisfield					State's Office, desk top	4.6 μg/ft²
CR W08		ľ					Commander's Office, windowsill,	17 μg/ft²
	Crisfield	Crisfield					middle of front wall.	
CR W09						Ι	Recruiter's Office, floor, near window	7.9 μg/ft²
	Crisfield	Crisfield					wall	
CR W10	Crisfield	Crisfield					Ops/Readiness Office, desk top	3.8 µg/ft²
CR W11		Ĩ					Personnel Office, table top near window	3.3 μg/ft²
	Crisfield	Crisfield					wall	
CR W12	Crisfield	Crisfield					Personnel Office, floor, near Ops wall	6.9 µg/ft²
CR W13	Crisfield	Crisfield					Copy/break room, desk top	-17 μg/ft²
CR W14	Crisfield	Crisfield					Drill Hall, floor, center court	$7.6 \mu g/ft^2$
CR W15	Crisfield	Crisfield		1			Drill Hall, floor of stage	4.3 μg/ft ²

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Page 1 of 1

AIHA

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)			Fi	inal Res		Comments
0367996	40903RR07	Flame	Аіг	260	N/A	11.54	ug/m³	<	12	ug/m'	
0367997	40903RR08	Flame	Air	254	N/A	11.81	ug/m³	<	12	ug/m³	
0367998	40903RR09 B1	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	
0367999	40903RA10	Flame	Air	202	N/A	14.85	ug/m³	<	15	ug/m³	
0368000	40903RR11	Flame	Air	196	N/A	15.31	ug/m³	<	15	ug/m³	
0368001	40903RR12BL	Flame	Air Blank	0	N/A	3.00	ug/m³	<	3	ug	

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7421; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) by weight mg/L = parts per million (ppm)

%Pb = percent lead by weight ug = micrograms ug/L = parts per billion (ppb) Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.



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CERTIFICATE OF ANALYSIS



Client;	US Army - CHPPM	Job Name:	MD Amg/Crisfield	Chain Of Custody:	117744
Address:	Attn: MCHB-7S-OFS, 5158 Blackhawk Road	Job Location:	Not Provided	Date Analyzed:	9/18/2003
	Aberdeen Proving Grounds, Maryland 21010-5403	Job Number:	Not Provided	Person Submitting:	Non-Resp
		P.O. Number:	Not Provided	Report Date:	18-Sep-03

Attention:

Page 1 of 2

Summary of Atomic Absorption Analysis for Lead

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft ¹)	Rep	orting imit	F	inal Rea		Comments
0368082	CR Blank I	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368083	CR W01	Furnace	Wipe	****	0.108	6.97	ug/ft²		31	ug/ft²	
0368084	CR W02	Furnace	Wipe	****	0.108	2.79	ug/ft²		13	ug/ft²	
0368085	CR W03	Furnace	Wipe	****	0.108	2.79	ug/fl²		5.6	ug/ft ²	
0368086	CR W04	Furnace	Wipe	****	0.108	2.79	ug/ft²		4.t	ug/ft²	
0368087	CR W05	Furnace	Wipe	****	0.108	2.79	ug/ft²		9.2	ug/ft²	
0368088	CR Blank 2	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368089	CR W06	Furnace	Wipe	****	0.108	2.79	ug/fl²		10	ug/ft²	
0368090	CR W07	Furnace	Wipe	****	0.108	2.79	ug/fi²		4.6	ug/fl²	
0368091	CR W08	Furnace	Wipe	****	0.108	2.79	ug/ft²		17	ug/ft²	
0368092	CR W09	Fumace	Wipe	****	0.108	2.79	ug/ft²		7.9	ug/ft²	
0368093	CR W10	Fumace	Wipe	****	0.108	2.79	ug/ft²		3.8	ug/ft²	
0368094	CR Blank 3	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	
0368095	CR W11	Fumace	Wipe	****	0.108	2.79	ug/fl²		3.3	ug/fl²	
0368096	CR W12	Furnace	Wipe	****	0.108	2.79	ug/ft ²		6.9	ug/ft²	
0368097	CR W13	Furnace	Wipe	****	0.108	2.79	ug/ft²		17	ug/N²	
0368098	CR W14	Furnace	Wipe	****	0.108	2.79	ug/ft²		7.6	ug/ft²	
0368099	CR W15	Furnace	Wipe	****	0.108	2.79	ug/fl²		4.3	ug/fl²	
0368100	CR Blank 4	Furnace	Wipe Blank	****	N/A	0.30	ug	<	0.3	ug	

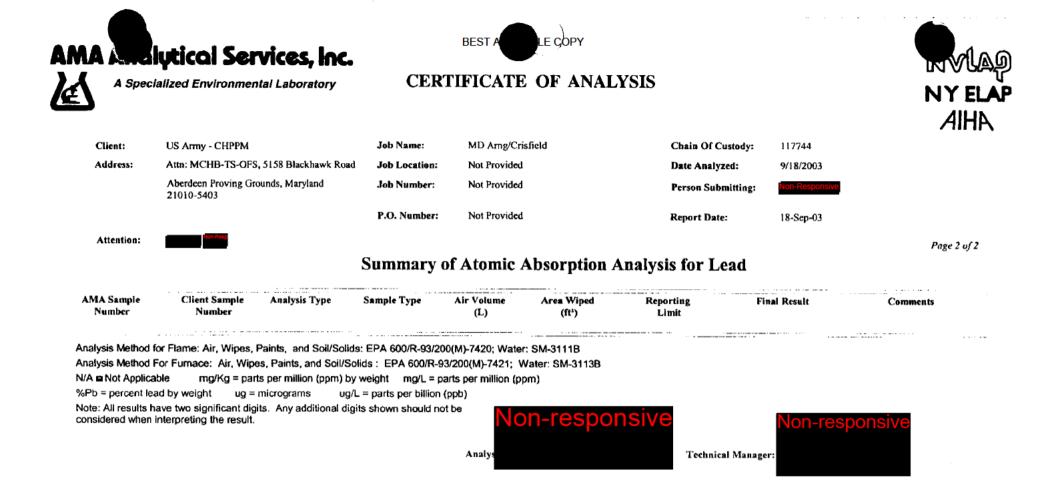
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APPENDIX E

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APPENDIX E

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APPENDIX F

LEAD CLEANING GUIDANCE

CHAPTER 14: CLEANING

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Step-by-Step Summary



- 1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
- 2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
- 3. Have sufficient cleaning equipment and supplies before beginning work.
- 4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
- 5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
- 6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
- 7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
- 8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
- 9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
- 10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
- 11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
- 12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
- 13. Paint or otherwise seal treated surfaces and interior floors.
- 14. Conduct a clearance examination (see Chapter 15).
- 15. If clearance is not achieved, repeat the final cleaning.



- 16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.
- 17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.
- 18. Cleaning equipment list:
 - HEPA vacuums.
 - Detergent.
 - Waterproof gloves.
 - Rags.
 - Sponges.
 - Mops.
 - Buckets.
 - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
 - 6-mil plastic bags.
 - Debris containers.
 - Waste water containers.
 - Shovels.
 - Rakes.
 - Water-misting sprayers.
 - 6-mil polyethylene sheeting (or equivalent).

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris and dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning

procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 µg/ft² on floors.
- 500 µg/ft² on interior window sills (stools).
- 800 µg/ft² on window troughs (the area where the sash sits when closed).
- 800 μg/ft² on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.



2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?

- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).



C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that finedust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.



Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

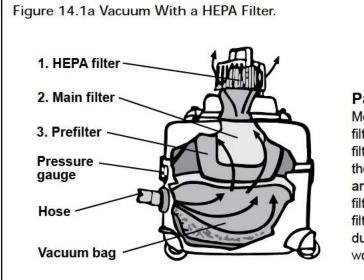
Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards and were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and prefilter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the prefilter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a highphosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

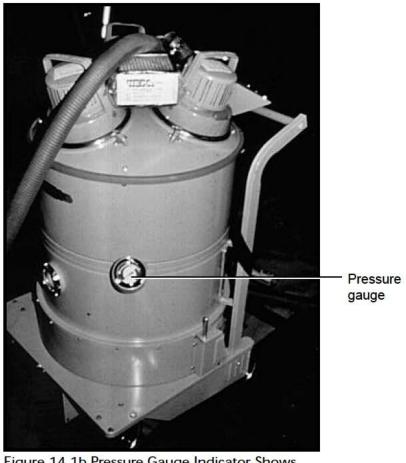
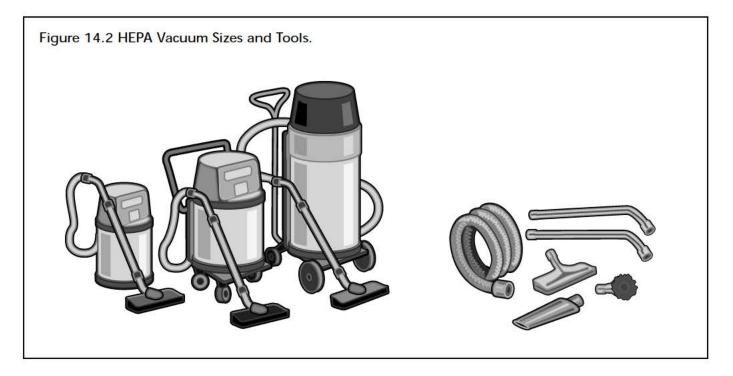


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

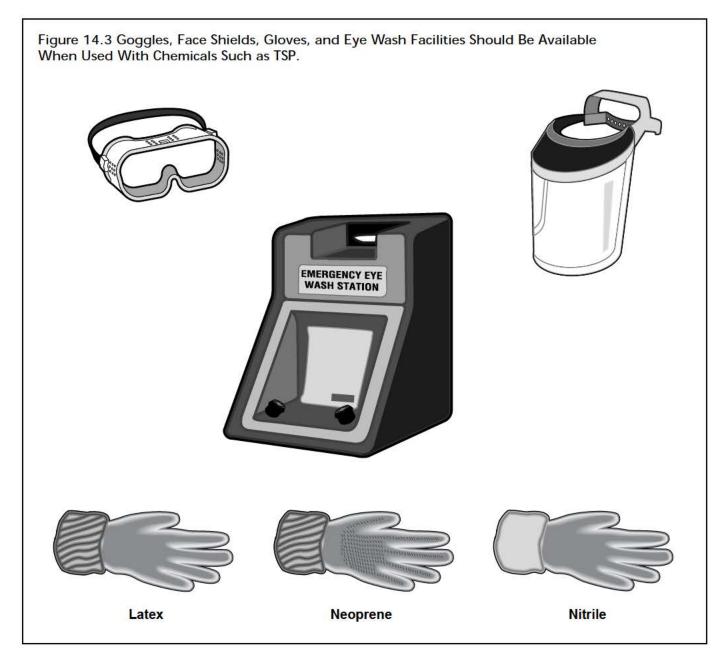
Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wetwash process.

Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no



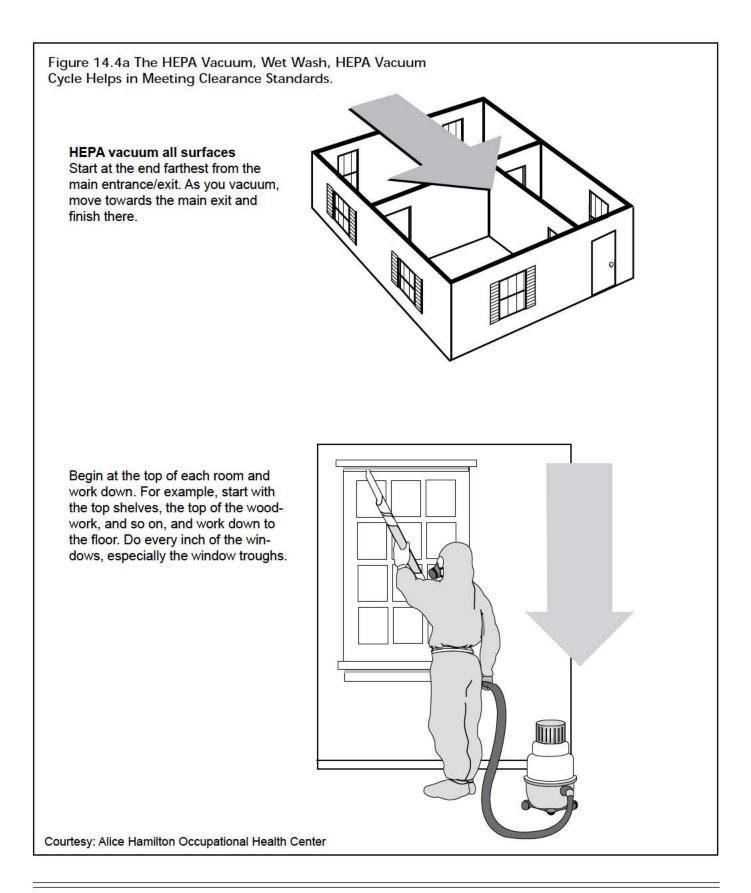
more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

✤ First, the area is HEPA vacuumed.



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Chapter 14: Cleaning

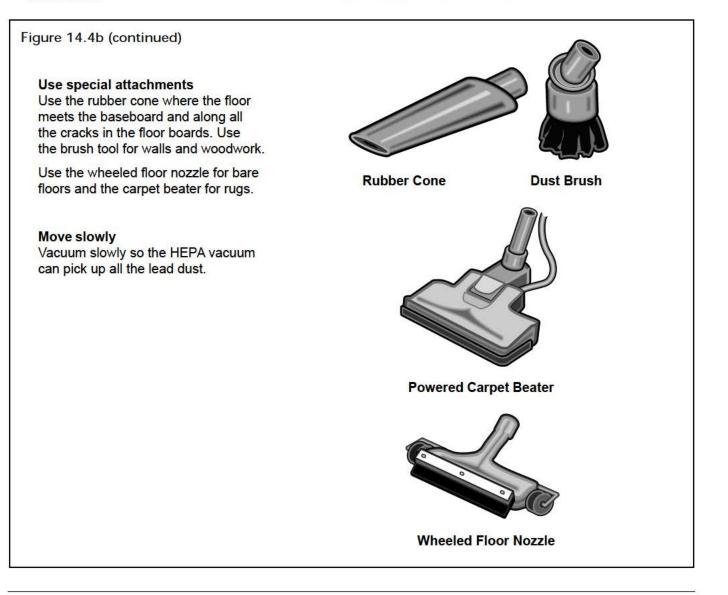
- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.



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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

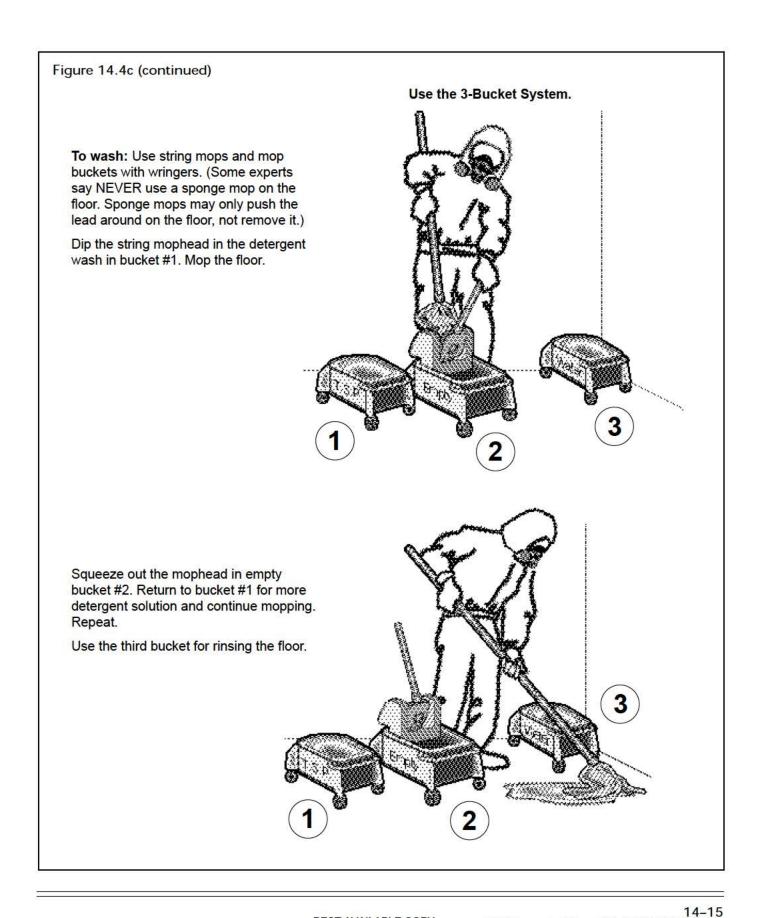


Wet Mop Floor



Don't Dry Sweep

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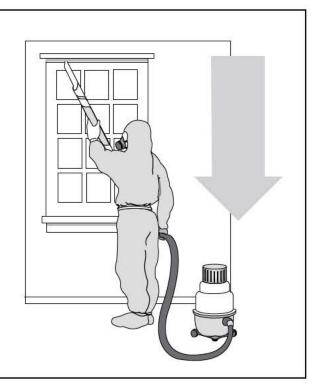


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Figure 14.4d (continued)

HEPA vacuum all surfaces a final time HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

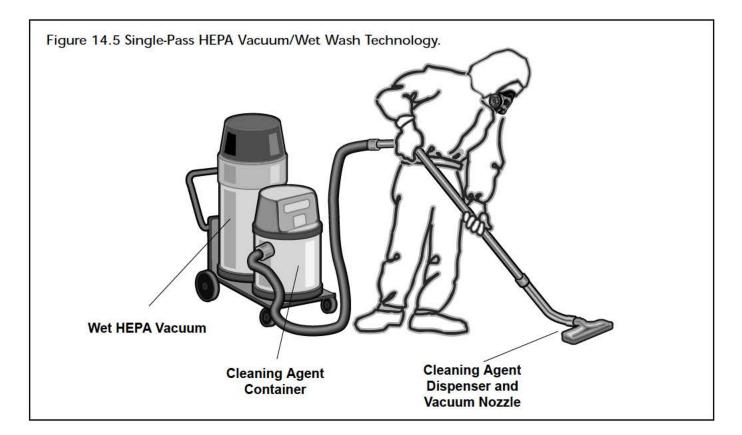
As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the



Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's



Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.



belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will



Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- ♦ Securing debris/plastic.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water and cleaned. All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plasticremoval process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).



Figure 14.8a Pick Up Corners of Plastic Sheeting.



Figure 14.8b Fold Plastic Inward.

Durable equipment, such as power and hand tools, generators, and vehicles, should be cleaned prior to their removal from the site; the cleaning should consist of a thorough HEPA vacuuming followed by washing.

B. Preliminary Visual Examination

After the preliminary final cleaning effort is completed, the certified supervisor should visually evaluate the entire work area to ensure that all work has been completed and all visible dust and debris have been removed. While the preliminary examination may be performed by the lead hazard control supervisor, contractor, or owner as a preparatory step before the final clearance examination, it does not replace the independent visual assessment conducted during clearance.

If the visual examination results are unsatisfactory, affected surfaces must be retreated and/or recleaned. Therefore, it is more cost effective to have the supervisor rather than the clearance examiner perform this initial examination.

C. Surface Painting or Sealing of Nonfloor Surfaces

The next step of the cleaning process is painting or otherwise sealing all treated surfaces except floors.

Surfaces, including walls, ceilings, and woodwork, should be coated with an appropriate primer and repainted. Surfaces enclosed with vinyl, aluminum coil stock, and other materials traditionally not repainted are exempt from the painting provision.

D. Final Inspection

The final clearance evaluation should take place at least 1 hour after the final cleaning. Clearance has three purposes: 1) to ensure that the lead hazard control work is complete, 2) to detect the presence of leaded dust, and 3) to make sure that all treated surfaces have been repainted or otherwise sealed. Clearance is usually performed after the sealant is applied to the floor. See Chapter 15 for information on clearance examination procedures.

E. Recleaning After Clearance Failure

If after passing the final visual examination, the dwelling unit fails the clearance wipe dust tests,

the HEPA/wet wash/HEPA cleaning cycle should be carefully and methodically repeated. Failure is an indication that the cleaning has not been successful. Recleaning should be conducted under the direct supervision of a certified supervisor. Care should be exercised during the recleaning of "failed" surfaces or components to avoid recontaminating "cleared" surfaces or components.

VI. Cleaning Cost Considerations

An important consideration in determining lead hazard control strategies and methods is the cost and difficulty of required daily and final cleanup operations and the ease with which one can meet dust-clearance standards. A general rule of thumb is that lead hazard control strategies that generate the most dust will have higher cleanup costs and higher initial clearance test-failure rates.

A. Initial Clearance Test Failure Rates

The likelihood of passing final dust-clearance tests is highly correlated with the chosen intervention strategy, methods, and care exercised by the contractor. For example, in one study (HUD, 1991) initial wipe-test failure rates were 14 percent for interior window sills, 19 percent for floors, and 33 percent for window troughs. The pass/fail rates for each surface were strongly associated with the dwelling unit abatement strategy employed. Chemical removal and hand-scraping strategies experi-enced higher failure rates than replacement and encapsulation/enclosure strategies (see Table 14.1).

However, results of the HUD demonstration project indicated that clearance failure is not solely related to abatement method. The report stated that "the diligence and effectiveness of an abatement contractor's cleaning process ... had a major impact on ... the likelihood of the dwelling unit to pass the final wipe test clearance" (HUD, 1991).



Figure 14.8c Dispose of Plastic Sheeting in a Plastic Trash Bag.

B. Key Factors In Effective Cleaning

Effective cleaning will be aided by adequate sealing of surfaces with polyethylene sheeting prior to lead hazard control, proper daily cleaning practices, good worker training, and attention to detail. Where poor worksite preparation is employed, additional cleaning may be required to meet clearance.

C. Special Problems

Surfaces such as porous concrete, old porous hardwood floors, and areas such as corners of rooms and window troughs pose especially difficult cleaning challenges. Porous concrete and corners of rooms normally require additional vacuuming to achieve an acceptable level of cleanliness.

The lead hazard control strategy of enclosure is frequently chosen for window troughs and for old porous hardwood floors due to the difficulty of adequately cleaning these surfaces. This



option provides not only a clean surface but a more permanently cleanable surface for dwelling occupants to maintain.

VII. Alternative Methods

Alternatives to the recommended cleaning tools and practices discussed in this chapter are available, some having significant potential for increasing effectiveness and lowering costs.

A recent Canadian study (CMHC, 1992) evaluated the effectiveness of contaminated dust cleanup activities using tools that would generally be available to construction contractors and homeowners. Vinyl flooring and carpeting were cleaned using several wet/dry vacuuming systems, sweeping, and wet mopping. The study found that regular vacuums with empty bags send a steady stream of fine particles into the air, while vacuums with partially filled bags were more efficient. This finding suggests the necessity for HEPA vacuums. Other vacuums may be used if workers do not experience increased exposures, if compliance with clearance standards is achieved, and if a variance from OSHA regulation (29 CFR 1926.62 (h)(4)) is obtained by the contractor or employer (if required).

Agitator heads on vacuums were demonstrated to significantly enhance vacuum effectiveness on carpets in cleaning up fine dust without increasing airborne dust levels. Table 14.2 suggests that a central vacuum with an agitator head is most efficient at removing dust and minimizing recontamination, probably because the vacuum exhaust is blown away from living areas. Because many houses do not have central vacuuming systems, a portable HEPA vacuum is the next best choice (see Table 14.2). Vacuums without agitator heads appeared to perform relatively poorly on carpets.

A. Vacuums

Regular (non-HEPA) dry vacuums potentially produce hazardous levels of airborne dust and therefore should be avoided. Externally exhausted vacuum units with adequate dustretaining capability may be used. The OSHA lead standard requires the use of HEPA vacuum equipment (see 29 CFR 1926.62 (h)(4), which states, "where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters").

B. Trisodium Phosphate and Other Detergents

TSP detergents have been used successfully for a number of years in lead hazard control work. However, in recent years, other new cleaning agents have been developed specifically for leaded dust removal. The need for alternatives has been fueled by the fact that TSP is an eye

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Table 14 1 Initial	Cleaning Wine Test	Failure Rates for	Various Abatement Strateg	ioc
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Dust Test Location	Hand Scrape w/Heat Gun	Chemical Removal	Enclosure	Encapsulation	Replacement	All Methods
Floors	28.8%	22.7%	20.0%	13.8%	12.5%	19%
Sills	24.4%	24.1%	8.2%	4.8%	17.4%	14%
Wells	44.5%	45.7%	23.7%	25.7%	21.0%	33%

Source: U.S. Department of Housing and Urban Development (August 1991) The HUD Lead-Based Paint Abatement Demonstration (FHA)



and skin irritant and is increasingly restricted from household use and unavailable in many local jurisdictions. TSP also damages some finishes. Recently reported trials of two new products suggest that alternative lead-specific cleaning agents may be more effective and safer than TSP (Grawe, 1993; Wilson, 1993). These Guidelines do not prohibit the use of non-TSP cleaning agents. HUD encourages further evaluation of alternative cleaning methods. Use of any cleaning agent that results in compliance with clearance criteria is encouraged.

Mass Removal Efficiency Percentages Cycle Number **Cleaning Method** Central Central **HEPA Vacuum** Portable Vacuum—Plain Vacuum—Agitator Vacuum—Plain Tool Head Tool 1 34.7 71.0 17.5 55.4 2 47.0 80.2 61.2 23.0 3 51.9 85.9 66.3 26.6 87.8 67.0 4 56.0 29.4 59.3 88.9 5 72.1 32.5 6 61.6 91.2 74.4 34.9 7 63.8 93.1 76.4 36.5 67.5 95.4 38.1 8 77.5 9 67.5 97.7 78.7 40.1 67.2 80.2 10 100.0 41.7 11 102.3 80.2 41.7 44.8 12 104.6 84.1 84.5 13 104.6 46.8 14 103.8 84.5 48.4 15 49.6 50.8 16 17 52.4 18 53.6 54.4 19 20 55.2

Table 14.2 Mass Removal Efficiency for Extended Vacuuming Cycles

Source: Canada Mortgage and Housing Corporation: Saskatchewan Research Council (December 1992) Effectiveness of Clean-up Techniques for Leaded Paint Dust

14-23

MDARNG Facilities IH Baseline Surveys MG (MD) Maurice D Tawes Armory, Crisfield, MD Project No. 55-ML-01ED-03

APPENDIX G

MOLD GUIDANCE

Army Facilities Management Information Document on Mold Remediation Issues

TG 277 FEBRUARY 2002



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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

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ARMY FACILITIES MANAGEMENT INFORMATION DOCUMENT ON MOLD REMEDIATION ISSUES

Moisture Control: The Army Way to Mold Prevention!

INTRODUCTION

Concern about indoor exposure to mold has been increasing as the public becomes more aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions.

This document provides the best and most current guidance for remediation of clean water damage (<48 hours) and mold contamination (>48 hours) into one resourceful Army guide. This guide has been designed to provide information to facilities management individuals who have little or no experience with mold remediation. It will assist them in making a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to develop or evaluate an in-house remediation plan or evaluate a remediation plan submitted by an outside contractor. If an outside contractor is employed, they must have experience cleaning up mold. Check their references, and have them follow the recommendations presented in this document, EPA guidelines, and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). A multi-disciplinary team approach to mold concerns is best. A health and safety professional, such as an industrial hygienist, should be consulted prior to any remediation activities to assist in the project.

Molds produce tiny spores to reproduce. Mold spores float through the indoor and outdoor air continually. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or uncorrected. There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.(1)

In all situations, the underlying cause of water accumulation must be rectified or mold growth will recur. Any initial water infiltration should be stopped and clean up began immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit mold growth. (Refer to Appendix A for detailed guidance on clean water damage response). If the source of water is elevated humidity, actions to maintain the relative humidity levels below 60% to inhibit mold growth should be taken (2). Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.

MOLD PREVENTION TIPS:

[Adapted from EPA, reference 1]

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilating, and air-conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide adequate drainage and slope the ground away from the foundation.

REMEDIATION PLANNING

- Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Select cleanup methods for moldy items (Appendix B)
- Select Personal Protection Equipment (PPE)- protect remediators (Appendix B)
- Select containment equipment protect building occupants (Appendix B)
- Select remediation personnel who have the experience and training needed to implement the remediation plan and use PPE and containment as appropriate

REMEDIATE MOISTURE AND MOLD PROBLEMS

- Fix moisture problem, implement repair plan and/or maintenance plan
- Dry wet, non-moldy materials within 48 hours to prevent mold growth (Appendix A)
- Clean and dry moldy materials (Appendix B)
- Discard moldy porous items that can't be cleaned (Appendix B)

REMEDIATION PROCEDURES

Four levels of abatement are described below. The size of the area impacted by mold contamination primarily determines the type of remediation. The sizing levels below are based on professional judgment and practicality; currently there is not adequate data to relate the extent of contamination to frequency or severity of health effects. The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of mold and preventing dust contaminated with mold from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement. The listed remediation methods were designed to achieve this goal, however, due to the general nature of these methods it is the responsibility of the people conducting remediation to ensure the methods enacted are adequate. (3)

Non-porous (e.g., metals, glass, and hard plastics) and semi-porous (e.g., wood, and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution. Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials (e.g., wallboard, and fabrics) that can be cleaned, can be reused, but should be discarded if possible. All materials to be reused should be dry and visibly free from mold. Routine inspections should be conducted to confirm the effectiveness of remediation work. (1 and 3)

The use of bleach or other biocides is questionable in most cases (8). The effectiveness of bleach in reducing living mold is dependent on concentration, residual chlorine levels, and contact time on the surface (8). All of these factors are difficult to control during remediation. Removal of all mold growth can generally be accomplished by physical removal of materials supporting active growth and thorough cleaning of non-porous materials (4). Therefore, application of a biocide serves no purpose that could not be accomplished with a detergent or cleaning agent (4).

The use of gaseous ozone or chlorine dioxide for remedial purposes is **not** recommended. Both compounds are highly toxic and contamination of occupied space may pose a health threat. Furthermore, the effectiveness of these treatments is unproven. For additional information on the use of biocides for remedial purposes, refer to the American Conference of Governmental Industrial Hygienists' document, "Bioaerosols: Assessment and Control."(4)

FOUR REMEDIATION LEVELS

[Adapted from NYCDOH Guidelines on Assessment and Remediation of Fungi in Indoor Environments (3) and EPA (1)]

Level I: Small Isolated Areas – Total surface area affected less than 10 square feet - e.g., ceiling tiles, small areas on walls. Refer to Appendix B for detailed guidance.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and doublebagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas used by remediation workers for egress should be cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Level II: Medium – Total Surface Area affected between 10 and 100 square feet - e.g., several wallboard panels. (See Appendix B for detailed guidance).

The following procedures *at a minimum* are recommended:

Refer to Appendix C for proper PPE selection. Limited or Full protection may be required depending on the situation.

Refer to Appendix D for Containment procedures.

The work area and areas directly adjacent should be covered with a single layer of 6 mil fire-retardant polyethylene sheet(s) and taped before remediation, to contain dust/debris.

Seal ventilation ducts/grills in the work area and areas directly adjacent with 6 mil polyethylene sheeting. Use an exhaust fan with a High Efficiency Particulate Air (HEPA) filter to generate negative pressurization.

The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Contaminated materials that cannot be cleaned should be sealed and doublebagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and surrounding areas should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

If abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of the mold is heavy (blanket coverage as opposed to patchy), then it is recommended that the remediation procedures for Level III be followed.

Level III: Large Area – Total Surface Area affected greater than 100 square feet or potential for increased occupant or remediator exposure during remediation is estimated to be significant. (See Appendix B for detailed guidance).

The following procedures are recommended:

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from occupied spaces using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

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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 doublebagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air(4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If any remediation sampling is deemed necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program.

Level IV: Remediation of HVAC Systems (See Appendix B for detailed guidance. For a small area (<10 ft²) follow Level I guidance for PPE and containment and for a areas (>10 ft²) follow Medium (Level II) or when greater than 100 ft² follow Large (Level III) guidance for PPE and containment as discussed in Appendices B, C, and D)

A Small Isolated Area of Contamination (total surface area affected <10 square feet) in the HVAC System

The HVAC system should be shut down prior to any remedial activities.

Regular building maintenance staff can conduct this level of remediation. Such persons should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Appendix C for PPE guidance. Respiratory protection (e.g., N95 disposable respirator), used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended (7). Gloves and goggles should be worn. All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional.

The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and double-bagged in 6-mil plastic bags and removed. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

All areas should be left dry and visibly free from contamination and debris.

Areas of Contamination (Total surface area affected >10 square feet) in the HVAC System

The following procedures are recommended:

The HVAC system should be shut down prior to any remedial activities.

Refer to Appendices C & D for PPE and Containment guidance.

Completely isolate the work area from other areas. Isolate the HVAC system using double layers of polyethylene plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

Utilize an exhaust fan with a HEPA filter to generate negative pressurization. Provide airlocks and a decontamination room.

Growth supporting materials that are contaminated, such as the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be sealed and removed in double-bagged 6-mil plastic. When a decontamination room is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. Since there are no special disposal requirements for moldy materials, they can be discarded as ordinary construction waste.

The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

All areas should be left dry and visibly free from contamination and debris.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in the indoor air samples should be similar to what is found in the local outdoor air (4). Since no Federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

If remediation sampling is necessary contact your local industrial hygiene office or contact safety and health professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HAZARD COMMUNICATION

When mold growth requiring Level III or IV (large-scale) remediation is found, the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners (1 and 3).

CONCLUSION

In summary, the prompt remediation of contaminated material and infrastructure repair must be the primary response to mold contamination in buildings. The simplest and most expedient remediation that properly and safely removes mold growth from buildings should be used. Widespread contamination poses much larger problems that must be addressed on a case-by-case basis in consultation with a health and safety specialist. Effective communication with building occupants is an essential component of all remedial efforts. Individuals with persistent health problems should go to the local occupational health clinic or see their physicians for a referral to practitioners who are trained in occupational/environmental medicine or related specialties and are knowledgeable about these types of exposures.

REFERENCES

- 1. U.S. Environmental Protection Agency. *Mold Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001, March 2001.
- American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Ventilation for Acceptable Indoor Air Quality - ASHRAE Standard (ANSI/ASHRAE 62-2001). Atlanta, Georgia, 2001.
- New York City Department of Health: Guidelines on Assessment and Remediation of Fungi in Indoor Environments. New York: New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology, (April 2000) January 2002.
- 4. American Conference of Governmental Industrial Hygienists (ACGIH): *Bioaerosols: Assessment and Control*, edited by Janet Macher. Cincinnati, OH: ACGIH, 1999.
- 5. U.S. Environmental Protection Agency. *Should You Have the Air Ducts In Your Home Cleaned?* EPA-402-K-97-002. October 1997.
- 6. Institute of Inspection, Cleaning and Restoration Certification (IICRC). *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, 2nd edition. 1999.
- 7. Occupational Safety & Health Administration. *Respiratory Protection Standard*, 29 Code of Federal Regulations 1910.134. 63 FR 1152. January 8, 1998.
- 8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force*, AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

Water Damage Cleanup and Mold Prevention

Appendix A presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Appendix A, refer to Appendix B for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Water D	amage - Cleanup and Mold Prevention			
Guidelines for Response to Mold Growth£	Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth£			
Water-Damaged Material†	Actions			
Books and papers	 For non-valuable items, discard books and papers. Photocopy valuable/important items, discard originals. Freeze (in frost-free freezer or meat locker) or freeze-dry. 			
Carpet and backing - dry within 24-48 hours§	 Remove water with water extraction vacuum. Reduce ambient humidity levels with dehumidifier. Accelerate drying process with fans. 			
Ceiling tiles	Discard and replace.			
Cellulose insulation	Discard and replace.			
Concrete or cinder block surfaces	 Remove water with water extraction vacuum. Accelerate drying process with dehumidifiers, fans, and/or heaters. 			
Fiberglass insulation	Discard and replace.			

Ξ

Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	 Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. Check to make sure under flooring is dry; dry under flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	 Remove water with water extraction vacuum. Accelerate drying process with dehumidifiers, fans, and/or heaters. May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	 May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. Ventilate the wall cavity, if possible.
Window drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	 Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. Wet paneling should be pried away from wall for drying

Ξ

£ If mold growth has occurred or materials have been wet for more than 48 hours, consult Appendix B. Even if materials are dried within 48 hours, mold growth may have occurred. Professionals may test items if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.

These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then OSHA may have requirements for Personal Protective Equipment and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

[†] If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

		for Remediating Building Mater Growth Caused by Clean Wate	
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
ł	SMALL - Total S	urface Area Affected Less Than 10 square	feet (ft ²)
Books and papers	3		
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3	Minimum	
Non-porous, hard surfaces (plastics, metals)	1, 2, 3	N-95 respirator, gloves, and goggles	None required
Upholstered furniture & drapes	1,3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		

	MEDIUM - To	tal Surface Area Affected Between 10 and 1	100 ft ²
Books and papers	3		
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	Limited or Full Use professional judgment, consider	Limited Use professional judgment, consider
Non-porous, hard surfaces (plastics, metals)	1,2,3		potential for remediator/occupant exposure and size of contaminated area
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		
LAK			
		ace Area Affected Greater Than 100 ft ² or F iator Exposure During Remediation Estim	
Increased Occ	upant or Remed		
Increased Occ Books and papers	aupant or Remed		
Increased Occ Books and papers Carpet and backing	3 1,3,4	iator Exposure During Remediation Estim Full Use professional judgment, consider	Full Use professional judgment, consider
Increased Occ Books and papers Carpet and backing Concrete or cinder block Hard surface, porous flooring	aupant or Remed 3 1,3,4 1,3	iator Exposure During Remediation Estim	rated to be Significant
Books and papers Books and papers Carpet and backing Concrete or cinder block Hard surface, porous flooring (linoleum, ceramic tile, vinyl) Non-porous, hard surfaces (plastics, metals)	aupant or Remed 3 1,3,4 1,3 1,2,3,4	Full Use professional judgment, consider potential for remediator/occupant exposure	Full Use professional judgment, consider potential for remediator exposure and
Increased Occ Books and papers Carpet and backing Concrete or cinder block Hard surface, porous flooring (linoleum, ceramic tile, vinyl) Non-porous, hard surfaces	upant or Remed 3 1,3,4 1,3 1,2,3,4 1,2,3	Full Use professional judgment, consider potential for remediator/occupant exposure	Full Use professional judgment, consider potential for remediator exposure and

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Appendix A if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

*Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) (4) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999) (6)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips

- Always maintain the containment area under negative pressure.
- Exhaust fans to outdoors and ensure that adequate makeup air is provided.
- If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above

the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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Industrial Hygiene/ Preventive Medicine Mold Assessment Guide

TG 278 February 2002



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Industrial Hygiene/Preventive Medicine Mold Assessment Guide

Introduction

The USACHPPM Industrial Hygiene Field Services Program receives requests from industrial hygiene (IH)/preventive medicine (PM) field personnel for information about mold investigations and clean-up procedures. Like all organisms, molds have an absolute requirement for water. The types of mold and their abundance in an area depend on the availability of nutrients (i.e., dirt), water and temperature. Chronic water intrusion, lack of adequate ventilation and moisture control, and or isolated floods, such as a water pipe bursting, are typical conditions, which lead to mold growth in buildings.

When mold growth is present, the removal and cleaning of contaminated materials must be handled with proper precautions, because disturbing this growth can result in bioaerosol release, i.e., sending millions of spores into the air.

This mold assessment guide used in conjunction with the *ARMY Facilities Management Information Document on Mold Remediation Issues (TG 277)*¹ will assist Industrial Hygienists and or Preventive Medicine personnel in conducting mold investigations. Since a team approach is recommended, the collaboration between IH/PM personnel and facility management personnel is vital to correct moldy conditions and prevent future mold growth. Use the following procedures and refer to Appendix A: Mold Investigation Decision Logic, for guidance on mold investigation, evaluation, and remediation for routine assessments.

Air sampling for mold should never be part of a routine assessment. Remediation strategies can generally be made on the basis of a visual inspection or confirmation with a bulk or surface sample. In addition, air sampling methods for some mold are prone to false negative results and therefore cannot be used to definitively rule out contamination².

Safety Tips While Investigating and Evaluating Mold and Moisture Problems³

- Be careful not to touch mold or moldy items with bare hands.
- Do not allow mold or mold spores to get into your eyes.
- Do not breathe in mold or mold spores.
- Consult **Appendices B, C, and D** for Remediation, Personal Protective Equipment (PPE) to be used during remediation and Containment guidance.
- Consider using PPE when disturbing mold during investigation. Depending upon the situation, a half-face NIOSH-approved N-95 respirator, gloves, and goggles are recommended.

Communicate with building occupants at all stages of process, as appropriate¹.

When mold growth requiring Level III or IV (large-scale) remediation is found (See Appendix B), the building owner, management, and/or employer should notify occupants in the affected area(s) of its presence. Notification should include a description of the remedial measures to be taken and a timetable for completion. Well-planned group meetings held before and after remediation with full disclosure of plans and results can be an effective communication mechanism. Individuals seeking medical attention should be provided with a copy of all inspection results and interpretation to give to their medical practitioners.

Routine Investigation and Evaluation of moisture and mold problems³.

- Determine the total surface area of visible mold affected (square feet).
- Consider the possibility of hidden mold.
- Clean up small mold problems and fix moisture problems before they become large problems.
- Select remediation personnel or team based on the assessment.
- Investigate areas associated with occupant complaints.
- Identify source(s) or cause of water or moisture problem(s).
- Note type of water-damaged materials (wallboard, carpet, etc.).
- Check inside air ducts and air handling unit.

Assessments Requiring Sampling

Air sampling may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with mold exposure (e.g., aspergillosis) and the occupational health physician/medical practitioner desires to confirm the causative agent.

Pre- and post-remediation air sampling may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems are contaminated. The purpose of such sampling is to assess the extent of contamination throughout a building and to confirm adequate remediation.

Air sampling may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of this sampling is to determine the location and degree of contamination².

When air sampling is deemed necessary and is performed, outdoor air samples should be collected at the same time at the fresh air intake, which serves the suspected area. Values obtained should be compared and the indoor and outdoor air samples should be similar in kinds and concentrations of mold to what is found locally in the outdoor air⁴. If they are different, bioamplification is occurring and the problem needs corrected.

Personnel conducting the sampling should be trained in proper air sampling methods for microbial contaminants. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists', "Bioaerosols: Assessment and Control⁴."

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA) or the American Conference of Governmental Industrial Hygienists (ACGIH). The laboratory conducting the analyses should participate in the AIHA Environmental Microbiology Proficiency Analytical Testing (EMPAT) program. For further mold assistance, contact USACHPPM, Industrial Hygiene Field Services Program, DSN 584-3118 or (410) 436-3118.

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1. USACHPPM Technical Guide 277, Army Facilities Management Information Document on Mold Remediation Issues, February 2002.

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7. Occupational Safety & Health Administration. *Respiratory Protection Standard*, 29 *Code of Federal Regulations 1910.134*. 63 FR 1152. January 8, 1998.

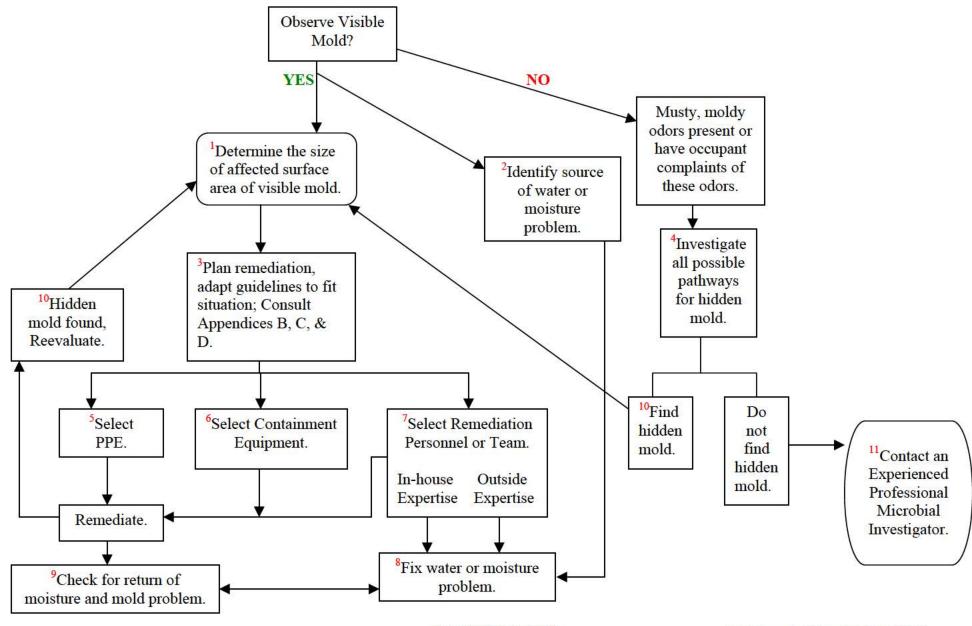
8. American Industrial Hygiene Association, *Report of Microbial Growth Task Force*, AIHA Press, Fairfax, VA, May 2001.

APPENDIX A

MOLD INVESTIGATION DECISION LOGIC

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MOLD INVESTIGATION DECISION LOGIC



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MOLD INVESTIGATION DECISION LOGIC NOTES:

1. Roughly approximate the total surface area of visible mold. Categorization of the remediation levels are sometimes borderline, so when trying to decide the category to apply, consider the extent of visible growth, such as a heavy blanket of growth on the surface, to barely visible. If heavy growth is apparent, consider moving up to the next level of protection.

2. Do not skip this step. Address the source of water or moisture problem or the mold will simply reappear.

3. Always protect the health and safety of the building occupants and remediators.

4. Mold may be hiding on the backside of drywall, vinyl wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads. Check walls behind furniture, pipe chases and utility tunnels, porous thermal or acoustic liners inside ductwork, or check the rafters (due to roof leaks or insufficient insulation)³.

5. Utilize appendices B and C for remediation guidance. Use your best judgment during investigations, if not disturbing the mold you may need minimal to no PPE. Do not alarm building occupants unnecessarily, but protect yourself as necessary.

6. If the containment is working properly, the polyethylene sheeting will billow inwards on all surfaces. If it flutters or billows outward, containment has not been achieved, and you should find and correct the problem before starting your remediation activities³. Confirm negative pressure with smoke tubes.

7. Select remediation personnel who have the experience and training needed to implement the remediation plan.

8. You must completely fix or eliminate the water or moisture problem to solve the problem.

9. You should revisit the site(s) approximately two weeks after remediation, and it should show no signs of water damage or mold growth.

10. If you discover hidden mold, revise your plan by reassessing the size of moldy area.

11. If you believe that you have a hidden mold problem, you may want to consider hiring an experienced mold investigative professional.

APPENDIX B

[Adapted from EPA 402-K-01-001, March 2001]

Mold Remediation Guidelines

Appendix B presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Appendix B are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, Should You Have the Air Ducts In Your Home Cleaned? (5) Although this EPA document has a residential focus, the same concept applies to other building types. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*						
Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment			
SMALL - Total Surface Area Affected Less Than 10 square feet (ft ²)						
Books and papers	3					
Carpet and backing	1, 3					
Concrete or cinder block	1, 3					
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3	Minimum	None required			
Non-porous, hard surfaces (plastics, metals)	1, 2, 3	N-95 respirator, gloves, and goggles				
Upholstered furniture & drapes	1, 3					
Wallboard (drywall and gypsum board)	3					
Wood surfaces	1, 2, 3	1				
MEDIUM - Total Surface Area Affected Between 10 and 100 ft ²						
Books and papers	3					
Carpet and backing	1,3,4					
Concrete or cinder block	1,3					
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area			
Non-porous, hard surfaces (plastics, metals)	1,2,3					
Upholstered furniture & drapes	1,3,4					
Wallboard (drywall and gypsum board)	3,4					
Wood surfaces	1,2,3					
		face Area Affected Greater Than 100 ft ² or diator Exposure During Remediation Esti				
Books and papers	3					
Carpet and backing	1,3,4					
Concrete or cinder block	1,3	Full	Full			
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4	Use professional judgment, consider	Use professional judgment, consider			
Non-porous, hard surfaces (plastics, metals)	1,2,3	potential for remediator/occupant exposure and size of contaminated area	potential for remediator exposure and size of contaminated area			
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)

APPENDIX C

[Adapted Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

PERSONAL PROTECTIVE EQUIPMENT

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of materials being handled. If you are using a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or polyvinyl chloride (PVC). If you are using a mild detergent or plain water, ordinary household rubber gloves may be used. To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust. Respiratory protection used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended(7). All individuals must be trained, have medical clearance, and must be fit-tested by a trained professional before wearing a respirator.

- Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates that pass through the filter. In situations where a full-face respirator is in use, additional eye protection is not required.
- Limited: Limited PPE includes use of a half-face or full-face air-purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators filter mold particles in the air. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health.
- Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air-purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the mask or hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation.

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

- Limited: Disposable paper overalls can be used.
- Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

®TYVEK, DuPont de Nemours, E.I., & Co., Wilmington, DE.

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APPENDIX D

[Source: EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

CONTAINMENT GUIDANCE

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Appendix B are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment. The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips

- Always maintain the containment area under negative pressure.
- Exhaust fans to outdoors and ensure that adequate makeup air is provided.
- If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft²) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to

minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area may have to be replaced once remediation is finished.

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Appendix B can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft² or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

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DEPARTMENT OF THE ARMY US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

REPLY TO ATTENTION OF

MCHB-TS-OFS

May 2004

MEMORANDUM FOR Army National Guard Bureau (NGB) Region North Industrial Hygiene NGB-AVS-SI-IH Non-Responsive, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03 CAPT. Thomas Price Armory and Organization Maintenance Shop, Cumberland, MD

1. Enclosed is a copy of subject report and one CD-ROM.

2. Please direct any additional comments or concerns to Ms at DSN 584-5475/3118, commercial (410) 436-5475/3118 or e-mail address at Non-Responsive apg.amedd.army.mil.



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Industrial Hygienist Industrial Hygiene Field Services Program

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U.S. Army Center for Health Promotion and Preventive Medicine



MDARNG FACILITIES IH BASELINE SURVEY CPT THOMAS PRICE ARMORY CUMBERLAND, MD 55-ML-01ED-03

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U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) lineage can be traced back over 50 years to the Army Industrial Hygiene Laboratory. That organization was established at the beginning of World War II and was under the direct jurisdiction of The Army Surgeon General. It was originally located at the Johns Hopkins School of Hygiene and Public Health, with a staff of three and an annual budget not to exceed \$3000. Its mission was to conduct occupational health surveys of Army operated industrial plants, arsenals, and depots. These surveys were aimed at identifying and eliminating occupational health hazards within the Department of Defense's (DOD) industrial production base and proved to be beneficial to the Nation's war effort.

Until 1995, it was nationally and internationally known as the U.S. Army Environmental Hygiene Agency or AEHA. Its mission is expanding to support the worldwide preventive medicine programs of the Army, DOD and other Federal Agencies through consultations/ supportive services; investigations and training.

Today, AEHA is redesignated the U.S. Army Center for Health Promotion and Preventive Medicine. Its mission for the future is to provide worldwide technical support for implementing preventive medicine, public health and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing work environment.

The professional disciplines represented at the Center include chemists, physicists, engineers, physicians, optometrists, audiologists, nurses, industrial hygienists, toxicologists, entomologists, and many other as well as sub-specialties within these professions.

The organization's quest has always been one of excellence and continuous quality improvement; and today its vision, to be the nationally recognized Center for Health Promotion and Preventive Medicine, is clearer than ever. To achieve that end, it holds ever fast to its values which are steeped in its rich heritage:

- Integrity is the foundation
- Excellence is the standard
- Customer satisfaction is the focus
- Its people are the most valued resource
- Continuous quality improvement is its pathway

The organization, which stands on the threshold of even greater challenges and responsibilities, has General Officer leadership. As it moves into the next century, new programs are being added related to health promotion/wellness, soldier fitness and disease surveillance. As always, its mission focus is centered upon the Army Imperatives so that we are trained and ready to enhance the Army's readiness for war and operations other than war.

It is an organization fiercely proud of its history, yet equally excited about the future. It is destined to continue its development as a world-class organization with expanded services to the Army, DOD, other Federal Agencies, the Nation and the World Community.

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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. THOMAS PRICE ARMORY CUMBERLAND, 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.

(1) The building meets the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) standards for air quality for relative humidity and carbon dioxide levels.

(2) The temperature in one room exceeds the ASHRAE standard for an acceptable thermal environment.

b. Asbestos. There is a potential hazard from asbestos tiles throughout the armory that are damaged. Damaged asbestos tiles may become friable and asbestos fibers may be released.

c. Lead. Workers involved in renovation and abatement activities may be occupationally exposed to lead and asbestos. All air samples are below the laboratory analytical detection limits for lead in air. The air is not believed to be an exposure pathway for lead in this facility. There are surface dust-lead samples above the USACHPPM recommended decontamination levels. The elevated dust-lead in and adjacent to the converted indoor firing range when contacted may be hazardous to the general workforce and to children. These surface dust-lead samples also greatly exceeded the EPA lead exposure levels for children under six.

d. Safety. There is no door to exit the shop area. Garage doors are the only means of exit and they are electronically driven.

e. Illumination. All areas within the armory appear to be adequately lit. However, part of the back of the OMS does not have lighting installed.

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f. Ventilation. The exhaust system is not working in one of the maintenance bays. One part of the bay does not have an exhaust system.

3. RECOMMENDATIONS. The Department of Defense Risk Assessment Codes (RAC) for Health Hazards enables one to prioritize remedial action for hazards. Risk Assessments Codes range in magnitude from 1 to 5, with 1 being the highest priority.

a. Indoor Air Quality. The RAC for Thermal Environmental Conditions is 5. The temperature in Room 115 exceeds the ASHRAE standard for an acceptable thermal environment. Install more air conditioning units or fans to cool this room to between 73 and 79 degrees Fahrenheit in the summer. Maintain the temperature in the winter between 68 and 74.5 degrees Fahrenheit.

b. Asbestos. The RAC for Asbestos Exposure is classified as 5. Provide a written asbestos hazard management plan for all remaining asbestos in this facility. Remove and replace the damaged asbestos tiles.

c. Lead. The RAC for this armory for Lead Exposure is classified as 4. To minimize lead exposure, 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. There is a potential for 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. 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.

d. Safety. The RAC for Safety Hazards is classified as 5. There is no door to exit the shop area. Garage doors are the only means of exit and they are electrically driven. Ensure that the armory complies with all provisions of section 39.2.42 of The National Fire Protection Association (NFPA) 101 Life Safety Code 2003. This section addresses the number and distance requirements for exits. Install lighting in the area of the OMS that does not have adequate lighting installed. The exhaust system is not working in one of the maintenance bays. One part of the bay does not have an exhaust system. Install one vehicle tailpipe exhaust outlet per work bay per guidance provided in the Army National Guard Bureau Design Guide for Logistics Facilities (DG 415-2) (1990). This issue is currently being addressed by USACHPPM.

e. Illumination. Install lighting in the area of the OMS that does not have adequate lighting installed.

f. Ventilation. The exhaust system is not working in one of the maintenance bays. One part of the bay does not have an exhaust system. Install one vehicle tailpipe exhaust outlet per work bay per guidance provided in the Army National Guard Bureau Design Guide for Logistics Facilities (DG 415-2) (1990).

MDARNG Facilities IH Baseline Surveys CPT Thomas Price Armory, Cumberland, 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

MCHB-TS-OFS

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, Project No. 55-ML-01ED-03

LOCATION: CAPT. Thomas Price Armory and Organization Maintenance Shop, Cumberland, MD

1. AUTHORITY. E-Mail dated 28 February 2003 from Ms<mark>Non-Responsive</mark>, 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. 121st Engineering Battalion Mechanized.

a. Date of Construction. 1959.

c. Survey Date. 20 August 2003.

d. POC. SGM^{Non-Responsive} (301) 678-6912 and SGT ^{Non-Responsive} (410) 702-9772; (410) 446-2972.

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. Temperature, carbon dioxide, and relative humidity measurements were collected to determine indoor air quality.

b. Physical Condition of Facilities.

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(1) Paint. Sergeant^{Non-Responsive}, Environmental Compliance Assessment Coordinator for the MD NGB, stated that all asbestos and lead-based paint has been abated.

(2) Asbestos. Staff Sergeant the stated that all asbestos has been abated. However, we did see tiles suspected of containing asbestos throughout the armory that were damaged and cracked. Some of the tiles were loose and felt "squishy" when they were stepped on. We observed that asbestos has been removed from the pipes.

(3) Mold. No mold was observed.

(4) Safety Hazards. No safety hazards were observed.

c. Other Building Issues.

(1) The exhaust system is not working in one of the maintenance bays. One part of the bay does not have an exhaust system.

(2) There is no door to exit the shop area. Garage doors are the only means of exit and they are electrically driven.

d. Safety and Industrial Hygiene Programs.

(1) There are no written program records at the armory.

(2) Personal protective equipment is worn at all times in the OMS.

e. Heating, Ventilation, and Air-conditioning System. The armory and the Organization Maintenance Shop (OMS) is heated with natural gas. Ventilation and air are provided by window-mounted air conditioning units and the manual operation of windows.

f. Noise Dosimetry. No operation that could produce hazardous noise levels was identified.

g. Lighting. All areas within the armory appeared to be adequately lit and occupants reported no areas of deficient lighting. Part of the back of the OMS does not have lighting installed

h. Converted indoor firing range (IFR). Staff Sergeant^{Non-Responsive}, Environmental Compliance Assessment Coordinator for the MD NGB, stated that all lead in the converted indoor firing range had been abated during its conversion. The IFR was converted to a locker room.

- i. Photographs (Appendix C).
- j. Site Maps (Appendix B).
- k. Facility use by children. The POC stated that children use this facility occasionally.

5. ASSESSMENT CRITERIA. (Appendix A).

6. SAMPLING RESULTS.

a. Indoor Air Quality. The relative humidity and carbon dioxide levels were all within normal ranges. One indoor room exceeded the ASHRAE indoor air quality standard for temperature. Outside the temperature was 77.7 degrees F, the relative humidity was 63.1 %, and the carbon dioxide level was 285 ppm. In Room 106, the temperature was 79.0 degrees F, the relative humidity was 59.3%, and the carbon dioxide level was 305 ppm. In Room 115 the temperature was 81.0 degrees F, the relative humidity was 56.4 %, and the carbon dioxide level was 338 ppm. In the OMS office the temperature was 79.4 degrees F, the relative humidity was 37.1 %, and the carbon dioxide level was 625 ppm.

b. 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 0.004 mg/m³ and 0.005 mg/m³ lead in air. Three of 14 dust-lead surface wipes exceeded the USACHPPM recommended decontamination level of 200 μ g/ft² for floors and other frequently-contacted surfaces. These samples also exceeded the EPA lead exposure levels for children under six.

7. DISCUSSION AND CONCLUSIONS.

a. Indoor Air Quality. The relative humidity and carbon dioxide levels were within ASHRAE standards for air quality. The temperature in one room exceeded ASHRAE standards.

b. Asbestos. There were asbestos tiles throughout the armory that were damaged and cracked. Some of the tiles were loose and felt "squishy" when they were stepped on. Damaged asbestos tiles may become friable and asbestos fibers may be released. There is a potential hazard from these damaged asbestos tiles. 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. We did observe that asbestos has been removed from the pipes.

c. Lead.

(1) Air samples. All air samples are below the laboratory analytical detection limit for lead in air of 0.004 to 0.005 mg/m³.

(2) Dust-lead. One of the surface wipe samples exceeding USACHPPM decontamination guidance was collected in the area where the baffle used to be in the old IFR (1552). One was collected from the floor midpoint of the IFR lanes (1553). The other one was collected on the floor in the supply office Room 122 (1555).

(3) Child exposure to dust lead. These surface dust-lead wipe samples also greatly exceeded the EPA lead exposure levels for children. EPA regulations define dust-lead standards for young children in child-occupied facilities. The EPA standard for dust-lead on floors is $40\mu g/ft^2$, and $100\mu g/ft^2$ 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. 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 six may exceed those that the regulations are intended to prevent.

(4) Occupational Exposure. Elevated levels of dust-lead exist on surfaces that may be contacted by the general workforce. Workers involved in renovation and abatement activities may be occupationally exposed to lead.

d. Safety. There is no door to exit the shop area. Garage doors are the only means of exit and they are electrically driven.

e. Illumination. Part of the back of the OMS does not have lighting installed. There is no door to exit the shop area. Garage doors are the only means of exit and they are electrically driven.

f. Ventilation. The exhaust system is not working in one of the maintenance bays. One part of the bay does not have an exhaust system.

9. RECOMMENDATIONS. Enclosure.

10. ADDITIONAL ASSISTANCE. For additional assistance, or questions concerning this report, please contact the undersigned at DSN 584-3118, commercial 410-436-3118, or by e-mail Non-Responsive@apg.amedd.army.mil.



 INDUSTRIAL HYGIENIST
 USACHPPM LEAD AND ASBESTOS TEAM LEADER Industrial Hygiene Field Services Program
 EPA AHERA Asbestos Inspector and Management Planner/ Certification Number MD-070340
 EPA Lead Inspector and Lead Risk Assessor/ Certification Number 04-7913

ENCLOSURE

CUMBERLAND 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 Asbestos Exposure is 3. The RAC for Thermal Conditions is 5. DODI 6055.1 also provides RACs for Safety and Ergonomic Hazards. The RAC for Safety Hazards is classified as 5.

1. RAC # 1. Lead Exposure.

a. 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.

b. A potential occupational exposure to lead has been identified for workers involved in renovation and abatement activities. These workers are required to be in compliance with the OSHA lead in construction standard 29 CFR 1926.62.

c. There is a potential for personnel taking lead contamination out of the workplace into their vehicles and homes. Wear disposable gloves and disposable coveralls as extra protection when working in areas identified as having elevated levels of lead.

d. Test drinking water from water fountains and faucets for lead. It could not be determined if this has been done.

e. Address all potential lead hazards before extending this facility to use for children. If children will be using this facility, clean surfaces to the EPA dust-lead standards for young children of 40 μ g/ft² on floors and 100 μ g/ft² for dust-lead on window sills.

2. RAC # 2. Asbestos Exposure. Provide a written asbestos hazard management plan for all remaining asbestos in the facility. Army regulation 200-1 (Environmental Protection and Enhancement) 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. Damaged asbestos tiles may become friable and asbestos fibers may be released. Remove and replace the damaged asbestos tiles.

3. RAC # 3. Thermal Conditions. The armory relative humidity and carbon dioxide levels meet ASHRAE standards for air quality. The temperature in Room 115 exceeds the ASHRAE standard for an acceptable thermal environment. Install more air conditioning units or fans to cool Room 115 to between 73-79 degrees Fahrenheit in the summer. The temperature in the winter should be between 68-74.5 degrees Fahrenheit.

4. RAC # 4. Safety Hazards.

a. There is no door to exit the shop area. Garage doors are the only means of exit and they are electrically driven. Ensure that the armory complies with all provisions of section 39.2.42 of The National Fire Protection Association (NFPA) 101 Life Safety Code 2003. This section addresses the number and distance requirements for exits.

b. Install lighting in the area of the OMS that does not have adequate lighting installed.

5. Additional Recommendations. The exhaust system is not working in one of the maintenance bays. One part of the bay does not have an exhaust system. Install one vehicle tailpipe exhaust outlet per work bay per guidance provided in the Army National Guard Bureau Design Guide for Logistics Facilities (DG 415-2) (1990). (This issue is currently being addressed by USACHPPM. Additional information will be provided when it becomes available).

7

MDARNG Facilities IH Baseline Surveys CPT Thomas Price Armory, Cumberland, MD Project No. 55-ML-01ED-03

APPENDIX A

ASSESSMENT CRITERIA FOR LEAD

Subject: Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than $200 \ \mu g/ft^2$. This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. EPA standards (40 CFR 745.227(e)(8)(viii))are not directly applicable because they are developed for floors (40 μ g/ft²), windowsills (250 μ g/ft²) and window troughs (400 μ g/ft²) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. OSHA has no specific requirement for work area surfaces. The lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. OSHA used to cite a level of 200 μ g/ft² in their Technical Manual and 29 CFR 1926.62 as guidance to its own inspectors for evaluating the cleanliness of lunchroom and locker room surfaces that are supposed to be kept as clean as possible.

d. In a report titled Derivation of Wipe Surface Screening Levels for Environmental Chemicals, USACHPPM has determined that 200 μ g/ft² is a safe surface contamination level. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels above these recommendations do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All states will receive this guidance when it is completed.

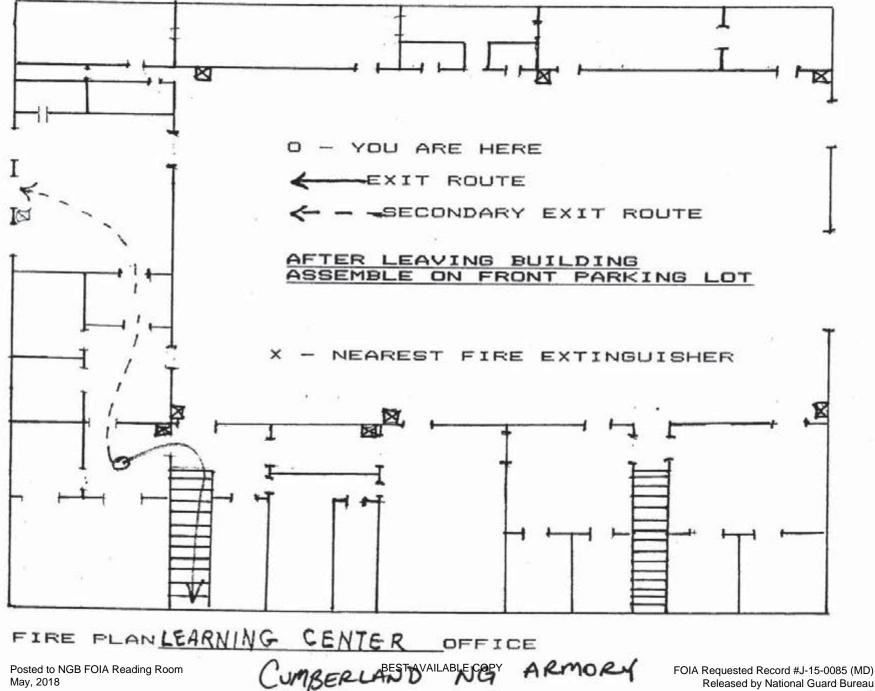
3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of 0.05 mg/m³ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

MDARNG Facilities IH Baseline Surveys CPT Thomas Price Armory, Cumberland, MD Project No. 55-ML-01ED-03

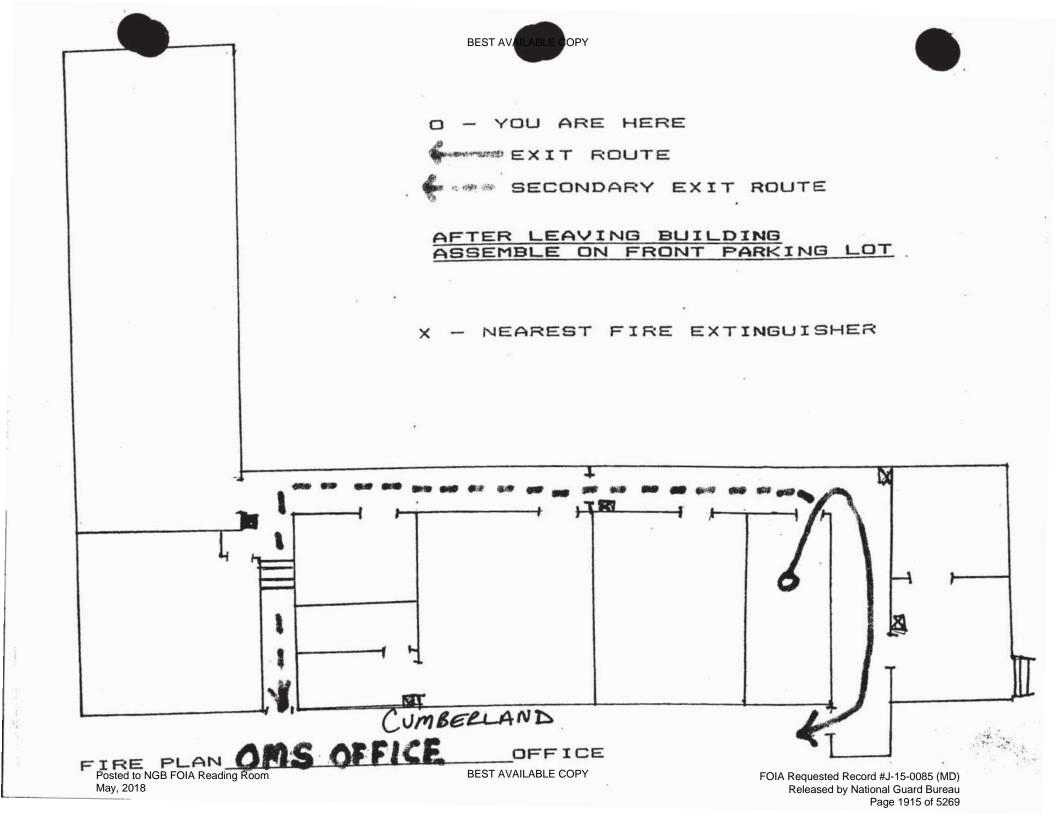
APPENDIX B

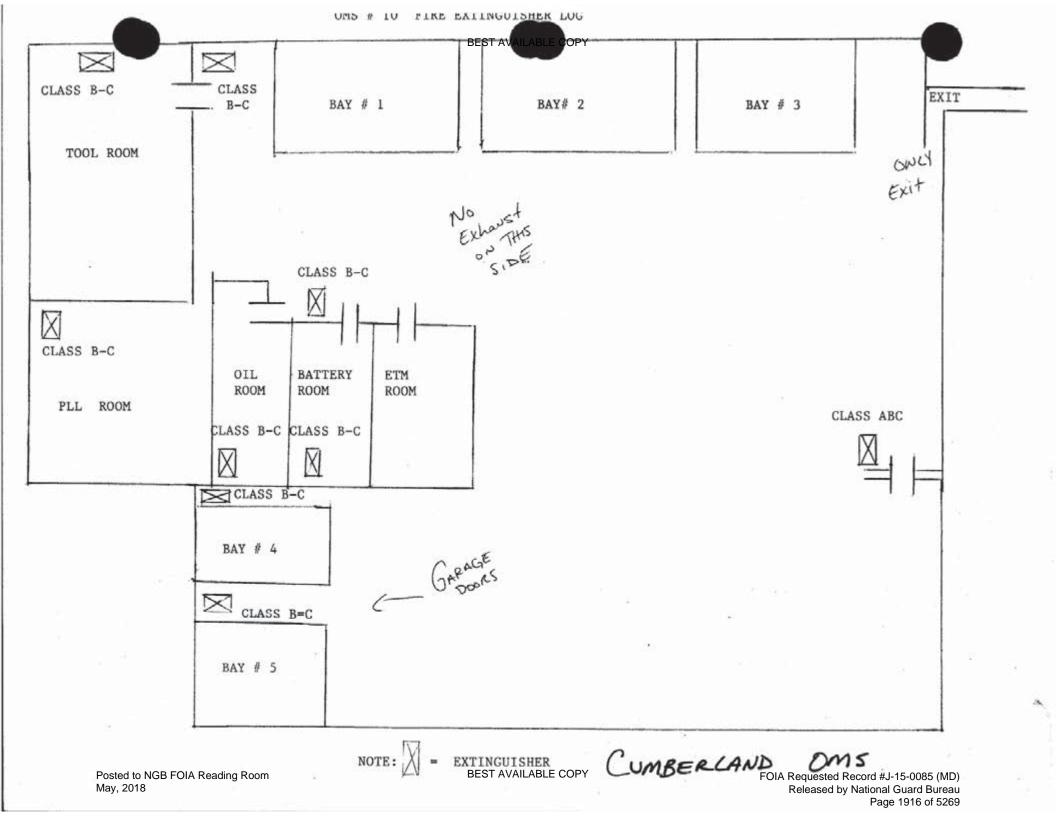
SITE MAPS





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MDARNG Facilities IH Baseline Surveys CPT Thomas Price Armory, Cumberland, MD Project No. 55-ML-01ED-03

APPENDIX C

PHOTOGRAPHS

Photograph Number	Photograph Location								
1546	Drill area near Room 113 and near water fountain								
1549	Counter into kitchen area from drill area								
1550	SFC ^{Non-Responsive} Office- Window sill under AC unit								
1551	Desktop in SFC ^{Non-Responsive} s Office								
1552	Floor where baffle used to be in former IFR								
1553	Floor midpoint of IFR lanes								
1554	Desk in front of former IFR								
1555	Supply office Room 122 desk								
1556	Supply office Room 122 refrigerator top								
1557	Supply Office Room 122 floor								
1558	OMS office window sill under AC unit								
1559	OMS office floor								
1560	Maintenance area of OMS								
1561	OMS area near lift On top of wall (1/2 wall)								



1.11

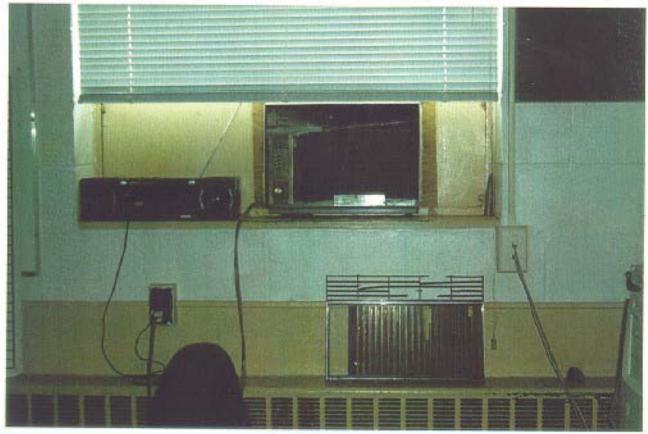




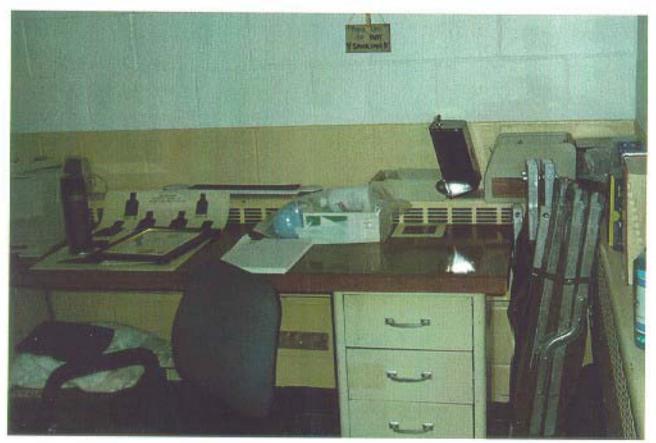
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1553

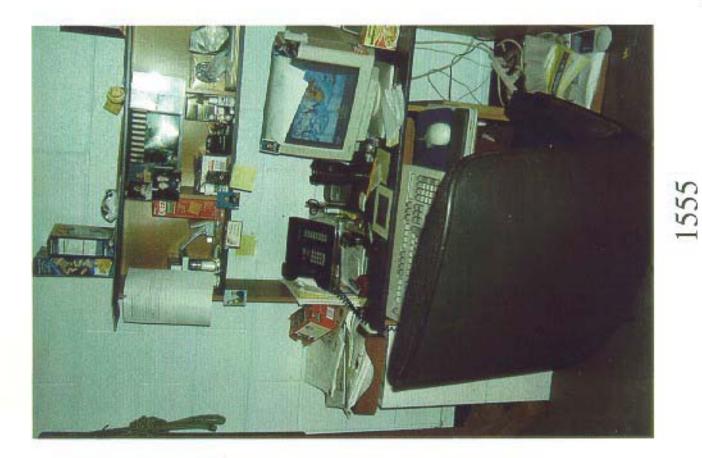


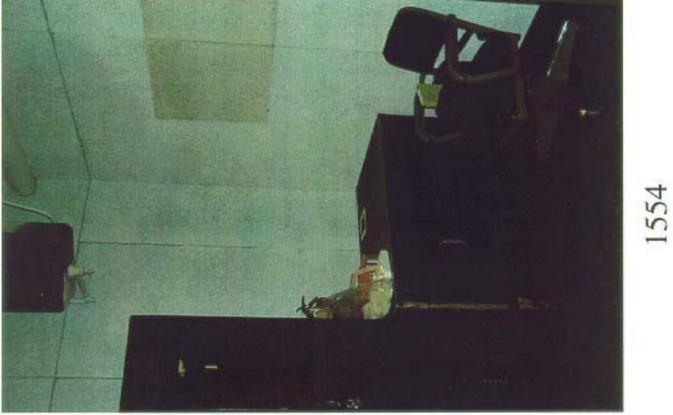
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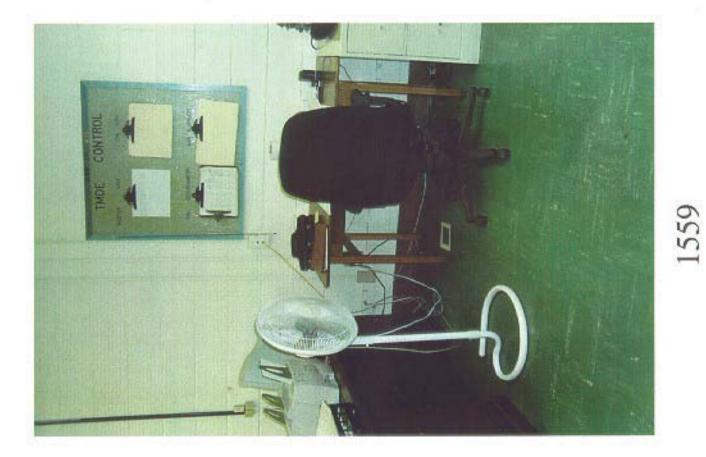


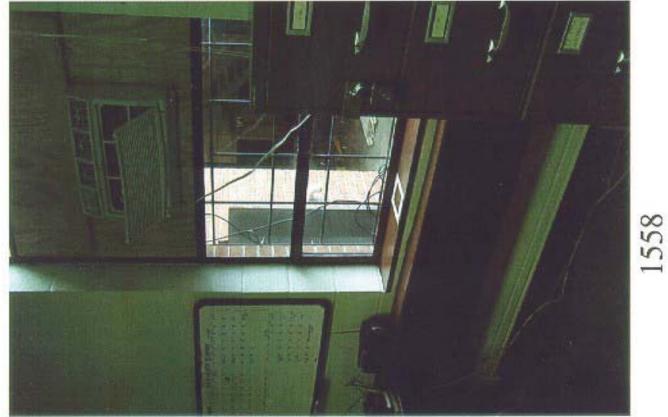
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MDARNG Facilities IH Baseline Surveys CPT Thomas Price Armory, Cumberland, MD Project No. 55-ML-01ED-03

APPENDIX D

SAMPLING SHEETS AND LAB ANALYSES

ing				Indoor Range Info	nge Inf	0		
Ro								Conc.
Wipe Sample #	Armory	City	Active	Inactive	NIA	Cleaned?	Location of Samples	(µg/ft²)
	Cumberland	Cumberland		Yes	2	Unknown		
CUW01	Cumberland	Cumberland					On wall in drill area near Room 113; near water fountain	<12
CUW02	Cumberland	Cumberland					On counter for kitchen area onto drill area	<110
CUW03	Cumberland	Cumberland					On window sill under AC unit in SFC	<110
供UW04	Cumberland	Cumberland					On desktop in SFC	<110BE
CUW05	Cumberland	Cumberland					On floor in former IFR baffle area	<110
SUW06	Cumberland	Cumberland					On floor midpoint of IFR lancs	3,500≶
Cow Og	Cumberland	Cumberland					On desk in front of old IFR	<110
GUW08	Cumberland	Cumberland					Room 122 on desk of supply SGT's office	<110日
60M0	Cumberland	Cumberland					Room 122 on top of refrigerator in supply office	<1100
ČUW10	Cumberland	Cumberland					Room 122 on floor in supply office	<110×
CUW11	Cumberland	Cumberland					On window sill in OMS office under AC unit	<110
CUW12	Cumberland	Cumberland					On floor in OMS office	<110
RUW13	Cumberland	Cumberland					On desktop in maintainence area of OMS	<110
EUW14	Cumberland	Cumberland					On top of wall in OMS area near lift	<110
R								

Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1927 of 5269

A-SI, Job Name: Cumberland National Guard Armony Chain Of Custody: A-SI, Job Location: Not Provided Date Analyzed: Job Location: Not Provided Date Analyzed: Job Number: Not Provided Person Submitting: P.O. Number: Not Provided Report Date: P.O. Number: Not Provided Report Date: P.O. Number: Not Provided Report Date: P.O. Summary of Atomic Absorption Analysis for Lead (fi ²) e Sample Type Air Volume (L) (fi ²) Limit	N/A 12.00	0.108 111.52	**** 0.108 111.52	**** 0.108 111.52	**** 0.108 111.52	**** 0.108 111.52	nk **** N/A 12.00	**** 0.108 111.52	**** 0.108 111.52	Wipe 11.22 ug/tf*	-11/20 20:111 001:0 ****	71.00 20.111 001.0 **** 01.00 001.0 001.0 001.0 001.001.001.001	Wine **** 0.108 111 52 10/ft2	Wipc **** 0.108 111.52 ug/f ²	0365508 CUW14 Flame Wipe **** 0.108 111.52 ug/ft ² < 110 ug/ft ²
A Specialized Environmental Laboratory at: National Guard Bureau ress: 301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation Havre de Grace, Maryland 21078 Havre de Grace, Maryland 21078 attoin: Attained attained Havre de Grace, Maryland 21078 attained attained Maryland 21078 Havre de Grace, Maryland 21078 Maryle Client Sample Analysis Type ber Number	CU Blank 01 Flame	CU W01 Flame					12			CU W08 Flame		CU W 10 Flame	CI W12 Hame	CU W13 Flame	CU W14 Flame

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. 4475 Forbes Blvd. • Lanham, MD 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (301) 459-2643 An AIHA (#8863), NVLAP (# 101143), & New York ELAP (#10920) Accredited Laboratory

NY ELAP		13 Page 2 of 2	Comments	BEST AVAILABLE COPY	EOHA Bedraatspeet Georadethy for the sample, ar 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, the randice use of the client to protect and protection to clients, the public and these Laboratories for the excutasy conducts. As a mutual protection to clients, the public and these Laboratories for the excutasy conducts and confiction protocol samples and the effect to protocol samples and the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization for the excutasy conducts. As a mutual protection to clients, the public and these Laboratories for the excutasy and completence protocol sample are stated and sample are stated and and the destructed in accordance with the appropriory guadelines. As a antual protection to clients, the public and these Laboratories for the excutasy and confiction protocol sample material will be described in accordance with the approprise regulatory guadelines. We appreciately the other APAL and the effect. We appreciate the effect and the effect and these Laboratories are collected by precised and the effect.
	116955 08/28/2003	29-Aug-03	Final Result	1	ttual protecti ising or publ
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CERTIFICATE OF ANALYSIS	Cumberland National Guard Armory Not Provided	Not Provided Report Date: Not Provided Report Date: Of Atomic Absorption Analysis for Lead	Area Wiped (ft ²)	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	of the quality or condition of apparently identical d upon the condition that it is not to be used, in w ided by the persons submitting them and, unless be discarded in accordance with the appropriate
CERTIFIC	Job Name: Cun Job Location: Not Job Number: Not		Sample Type Air Volume (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-31 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. Swam	ssarily indicative of the qua i it is addressed and upon th information provided by th
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A Specialized Environmental Laboratory	National Guard Bureau 301-1H Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation Havre de Grace. Marviand 21078		Client Sample Number	Analysis Method for Flame: Air, Wipes, Pa Analysis Method For Furnace: Air, Wipes, NA N/A = Not Applicable mg/Kg = parts %Pb = percent lead by weight ug = m Note: All results have two significant digits considered when interpreting the result.	the sample, or samples, ir d accepted for the exclusiv ations and collection prof
A A Specia	Client: Address:	Attention:	AMA Sample Number	Analysis Method for Flame: Air Analysis Method For Furnace: N/A = Not Applicable mg %Pb = percent lead by weight Note: All results have two sign considered when interpreting th	ort applies only to Sample types, loc: for the accuracy a

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TEST REPORT Page 1 of 2 8/27/03

Submitted To:

Commander, USACHPPM 5158 Blackhawk Road, Attn: MCHB-TS-OFS APG, MD 21010-5403

Reference Data: Client Sample No.: P.O. No.: Sample Location: Sample Type: Method Reference: DCL Set ID No.: DCL Sample ID No.: Sample Receipt Date: Preparation Date: Analysis Date:

Lead CUAS01 through CUBlank02 Not Available Cumberland NG Armory Filter NIOSH 7300 03-S-4146 03-25409 through 03-25414 8/27/2003 08/27/03 08/27/03

The samples were prepared and analyzed in accordance with NIOSH method 7300 using a Perkin Elmer 3000XL ICP.

The sample condition upon receipt was acceptable except where noted.

The results are in the enclosed data table. Results relate only to the items tested and are not blank corrected unless indicated in the data table.

This report shall not be reproduced except in full, without the written approval of the laboratory.

Non-Responsive

Analyst

Non-Responsive	
<u>86</u>	
Reviewer	

CINCINNATI OFFICE 4388 GLENDALE-MILFORD ROAD CINCINNATI, OHIO 45242-3706 513 733-5336, FAX 513 733-5347

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TEST REPORT Page 2 of 2 03-S-4146

Results Lead

Client #	DCL #	Sample Volume (L)	µg/sample	mg/m ³
CUAS01	03-25409	209.0	ND	<0.005
CUAS02	03-25410	221.1	ND	<0.005
CUAS03	03-25411	215.8	ND	<0.005
CUAS04	03-25412	233.2	ND	<0.004
CUBlank01	03-25413	0	ND	-
CUBlank02	03-25414	0	ND	-
	Prep Blank		ND	
% Recovery	LCS		101.	****
RPL	and the second second second second		1.	

ND = not detected at or above the reporting limit (RPL). LCS = laboratory control sample.

lesponsi on-h

Analyst

Reviewe



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ANALYTICAL REQUEST FORM

REGULAR Status (5 working days from receipt)

RUSH Status Required · ADDITIONAL CHARGE RESULTS REQUIRED BY 27 AUGUST 2003

CONTACT DATACHEM LABS PRIOR TO SENDING SAMPLES

Date	Purchase Order No.	Quote No.
Company N	COMMANDER, USACHPPM	Sample Coll
Address _	ATTN: MCHB-TS-OFS 5158 BLACKHAWK ROAD APG, MD 21010-5403	Sampling Site
City	Non-Responsive	Industrial Pro
Person to Conta	ad	Date of Colle
Telephone (4	10 436-5475	Time Collecte
Fax Telephone	(410) 436 - 5471	Date of Shipr
	(if different from above)	QC Require
		Collector

Quote No
Sample Collection
Sampling Site Cumberland NG Aemory
Industrial Process NGB ARMORY
Date of Collection 20 Aug 03
Time Collected
Date of Shipment
QC Requiremente - Responsive
Collector's
Signature

DATE

REQUEST FOR ANALYSES 03-S-4146

Laboratory Use Only	Client Sample Number	Media Type*	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
25409	CUASOI		209.0	LEAD NIOSH 7300
35410	CUASO2		221.1	LEAD NIOSH 7300
25411	CUAS 03		215.8	LAD NIOSH 730 &
25412	CUAS 04		233.2	LEAD NIOSH 7300
35413	CURLANKOI			
25#14	CUBANKOZ			
				5
		-		
11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				

CHAIN OF CUSTODY

Non-Responsive	Dele I Time	Received by: (Signature) Dybleu	8137103 10:10
Re (Si	Dale / Time	Received by: (Signature)	Dale / Time

4388 Glendale Milford Road / Cincinnati, OH 45242 • 800-458-1493 or 513-733-5336 / Fax: 513-733-5347

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	AN	P					Page 1 of 2																			
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				80	_	28		Final Result	< 12	110	110	110	110	2000	12	3500	110	011	110	966	110	110	011	110		
74			Chain Of Custody:	Date Analyzed:	Person Submitting:	Report Date:	r Lead		v	~ ~	×	~ ~	2 V		v	2	×	v	V N	2.	~	v	V	v		
			Chai	Date	Perse	Repo	sis fo	Reporting	gn	ug/Us	ug/ft ¹	₁IJ/ân	zU/Bn	rg/ft²	ßn			rg/fgn		"ug/ft		ug/ft²				
1	SISAT		PLA STATE)	Analy	ß	12.00	111.52	111.52	111.52	111.52	111.52	12.00	111.52	111.52	111.52	111.52	111.52	111.52	111.52	111.52	111.52		
	RTIFICATE OF ANALYSIS		Cumberland National Guard Armory				Summary of Atomic Absorption Analysis for Lead	Area Wiped (ft)	N/A	0.108	0.108	0.108	0.108	0.108	N/A	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108		
	TIFICATE		Cumberland P	Not Provided	Not Provided	Not Provided	f Atomic /	Air Volume (L)		****		****		:	:	:	***	:	:	•		:	••••	•		
78	CE		Job Name:	Job Location:	Job Number:	P.O. Number:	Summary o	ysis Type Sample Type	Wipe Blank	Wipe	Wipe	Wipe	Wipc	Wipe	Wipe Blank	Wipe	Wipe	Wipe	Wipe	Wipc	Wipe	Wipc	Wipe	Wipe		
	vices, inc.			Attn: NGB-AVN-SI, ion	and 21078			Analysis Type	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame	Flame		
·	And ytical Services, In A Specialized Environmental Laboratory		National Guard Bureau	301-tH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Havre de Grace, Maryland 21078		on-Respondy	Client Sample Number	CU Blank 01	CU W01	CU W02	CU W03	CU W04	CU W05	CU Blank 02	CU W06	CU W07	CU W08	CU W09	CUWID	. CUWII	CU W12	CU W13	CUW14		
1	AMA Andividol Services, Inc.	1	Client:	Address:			Attention:	AMA Sample Number	0365493	0365494	0365495	0365496	0365497	0365498	0365499	0365500	0365501	0365502	0365503	0365504	0365505	0365506	0365507	0365508		
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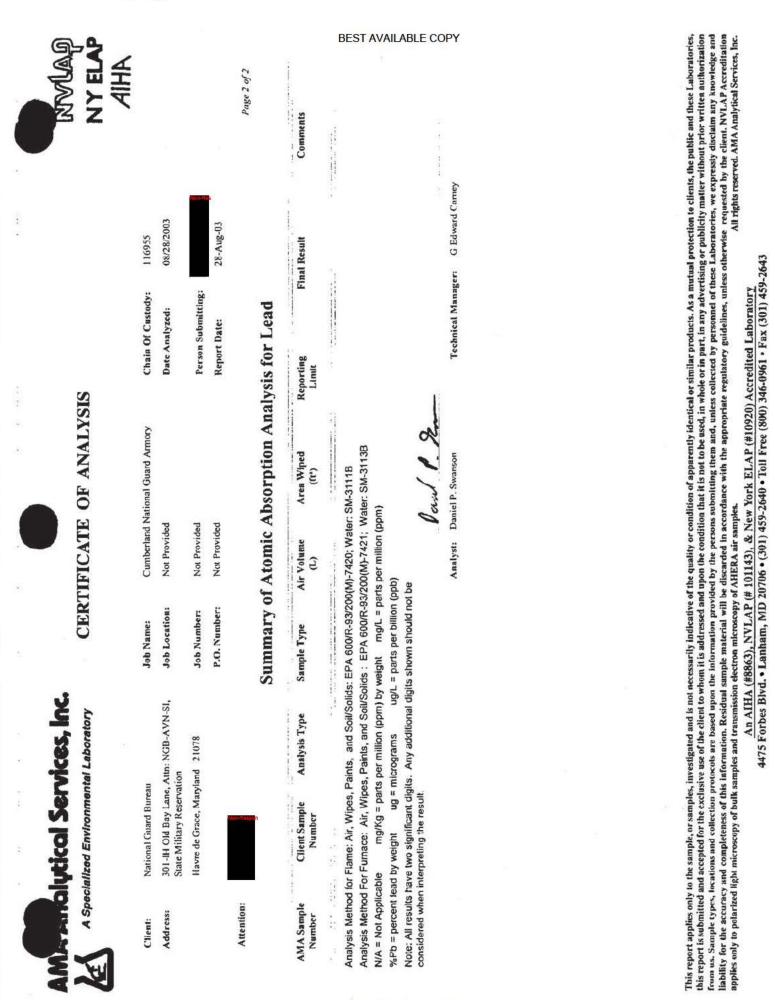
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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1933 of 5269

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TEST REPORT Page 1 of 2 8/27/03

Submitted To: Non-K

Commander, USACHPPM 5158 Blackhawk Road, Attn: MCHB-TS-OFS

APG, MD 21010-5403

Reference Data: Client Sample No .: P.O. No.: Sample Location: Sample Type: Method Reference: DCL Set ID No .: DCL Sample ID No .: Sample Receipt Date: Preparation Date: Analysis Date:

Lead CUAS01 through CUBlank02 Not Available Cumberland NG Armory Filter NIOSH 7300 03-S-4146 03-25409 through 03-25414 8/27/2003 08/27/03 08/27/03



The samples were prepared and analyzed in accordance with NIOSH method 7300 using a Perkin Elmer 3000XL ICP.

The sample condition upon receipt was acceptable except where noted.

The results are in the enclosed data table. Results relate only to the items tested and are not blank corrected unless indicated in the data table.

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Non-Res	ponsive
Anaryst	



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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TEST REPORT Page 2 of 2 03-S-4146

Results Lead

Client #	DCL #	Sample Voluma (L)	µg/sample	mg/m ³
CUAS01	03-25409	209.0	ND	<0.005
CUAS02	03-25410	221.1	ND	<0.005
CUAS03	03-25411	215.8	ND	<0.005
CUAS04	03-25412	233.2	ND	<0.004
CUBlank01	03-25413	0	ND	-
CUBlank02	03-25414	0	ND	-
	Prep Blank		ND	····
<pre>% Recovery</pre>	LCS		101.	
RPL			1.	

ND = not detected at or above the reporting limit (RPL). LCS = laboratory control sample.

Allarysc



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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 1936 of 5269

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ANALYTICAL REQUEST FORM

Signature

REGULAR Status (5 working days from receipt)

RUSH Status Required - ADDITIONAL CHARGE RESULTS REQUIRED BY 27 AUGUST 2003

CONTACT DATACHEM LABS PRIOR TO SENDING SAMPLES

Date	_ Purchase Order No	Quote No
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City		Zo Industrial
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Fax Telephon	1410) 436 -5471	Date of Si
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REQUEST FOR ANALYSES 03-S-4146

Laboratory Use Only	Client Sample Number	Media Type*	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
25409	CUASOI		209.0	LEAD NIOSH 7300
35410	CUASO2		221.1	LEAD NINSH 7300
35411	CUASO3	-9	215.8	LAD NIOSH 730 &
35412	CUAS04		233.2	LEAD NIOSH 7300
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Roling (Signature)	Received by: (Signature)	Data / Time

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MDARNG Facilities IH Baseline Surveys CPT Thomas Price Armory, Cumberland, MD Project No. 55-ML-01ED-03

APPENDIX E

REFERENCES

APPENDIX E

REGULATIONS AND STANDARDS

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2. Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program, August 19, 1998. http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf.

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4. AR 385-10, The Army Safety Program, 29 February 2000. http://www.usapa.army.mil/pdffiles/r385_10.pdf.

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MDARNG Facilities IH Baseline Surveys CPT Thomas Price Armory, Cumberland, MD Project No. 55-ML-01ED-03

APPENDIX F

LEAD CLEANING GUIDANCE

CHAPTER 14: CLEANING

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Cleaning: How To Do It

- 1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
- 2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
- 3. Have sufficient cleaning equipment and supplies before beginning work.
- 4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
- 5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
- 6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
- 7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
- 8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
- 9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
- 10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clear-ance criteria are met and workers are not overexposed.
- 11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
- 12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
- 13. Paint or otherwise seal treated surfaces and interior floors.
- 14. Conduct a clearance examination (see Chapter 15).
- 15. If clearance is not achieved, repeat the final cleaning.

—— Step-by-Step Summary (continued)

- 16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.
- 17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.
- 18. Cleaning equipment list:
 - HEPA vacuums.
 - Detergent.
 - Waterproof gloves.
 - Rags.
 - Sponges.
 - Mops.
 - Buckets.
 - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
 - ✤ 6-mil plastic bags.
 - Debris containers.
 - Waste water containers.
 - Shovels.
 - Rakes.
 - Water-misting sprayers.
 - ♦ 6-mil polyethylene sheeting (or equivalent).

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris and dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning

procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- ♦ 100 µg/ft² on floors.
- 500 μg/ft² on interior window sills (stools).
- 800 µg/ft² on window troughs (the area where the sash sits when closed).
- 800 μg/ft² on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.

*

2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?

- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- ✓ Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).



C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that finedust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.



Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards and were properly separated from work



1720 Walton Road Blue Bell, PA 19422 610-828-3078 Fax 610-828-7842

February 16, 2009

<u>E-MAIL</u> Ms. Non-Responsive

Army National Guard ATTN: NGB-ARS-IHNE 301-IH Old Bay Lane Havre de Grace, MD 21078

Subject: Industrial Hygiene Assessment Report Cumberland Readiness Center, Cumberland, Maryland 21502 IES Project No. EHS08794.02

Dear Non-Re

IES Engineers (IES) is pleased to enclose the final report of the Industrial Hygiene assessment conducted at the Army National Guard Readiness Center facility located in Cumberland, Maryland. Thank you for the opportunity to perform this assessment. Should you have any questions, please contactNon-Responsive or me.

Sincerely,



Senior Manager, Health, Safety & Industrial Hygiene Services

cc: Non-Responsive, IES

BEST AVAILABLE COPY



NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE HAVRE DE GRACE, MARYLAND

FINAL INDUSTRIAL HYGIENE ASSESSMENT CUMBERLAND READINESS CENTER 1100 BROWN AVENUE, CUMBERLAND, MARYLAND, 21502 SURVEY DATE: JULY 24, 2008

IES PROJECT NO. EHS08794.02 REPORT DATE: FEBRUARY 16, 2009



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1.0 EXECUTIVE SUMMARY

1.1 Introduction

Assessment Date: July 24, 2008

Purpose:

The National Guard Bureau (NGB) retained IES Engineers (IES) to assist in performing an Industrial Hygiene assessment at the Army National Guard (ARNG) Readiness Center (RC) located at 1100 Brown Avenue in Cumberland, Maryland (Captain Thomas Price Armory). 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 Cumberland RC facility. Mr. Non-Responsive, CIH, Senior Project Manager of IES, performed the assessment. Assessment activities were conducted with reference to the Statement of Work – Industrial Hygiene Services for National Guard Bureau Industrial Hygiene Region North Baseline Surveys for Readiness Centers and Administrative Buildings, May 2008, and included:

- 1) Dust sampling and analysis for lead surface contamination,
- 2) Air sampling and analysis for lead (to determine administrative personnel exposure to airborne lead),
- 3) Bulk sampling of suspected asbestos-containing building materials, or lead-containing paint (where advised),
- 4) Physical (visual) site inspection of all internal building areas to note condition of materials, particularly those suspected to be lead or asbestos-containing, as well as potential water-damaged materials, housekeeping conditions and related safety hazards, ergonomic considerations, and indicators of indoor air quality.
- 5) Measurements of relative humidity, carbon dioxide and temperature in occupied areas of each floor, as well as lighting supporting evaluation with respect to indoor environmental standards,
- 6) Visual inspection and/or measurement of ventilation systems within the readiness center (general and local exhaust), as pertinent, supporting evaluation of indoor air quality and maintenance procedures,
- 7) Evaluation of attached garages, within the scope of readiness center operations, with respect to visual examination, hazards present, and observation/documentation of controls utilized including administrative, personal protective equipment and ventilation controls, and associated impact upon readiness center operations.

Conferred With: SFC David Myers, Administrative Supervisor, Cumberland RC



1.2 Facility Description

The Cumberland RC is located at 1100 Brown Avenue, Cumberland, Maryland, and is primarily designed and operated as a 25,922 square foot training facility, which includes an upstairs section (19,162 square feet), basement (4,480 square feet), and basement garage (2,280 square feet). The Cumberland RC principally houses the 243^{rd} Engineers Company, 729^{th} Support Batallion. Readiness Center Operations provides training, training support and administrative support to the Army National Guard. Predominant construction features of the facility include interior and exterior block masonry walls on concrete slab with brick exterior cladding, and insulated metal pan roof structure. Interior finishes included 12 inch square (12" x 12") floor tile, 9 inch square (9" x 9") floor tile, or masonry tile floors, suspended fiber acoustic ceiling tile (2'x2'), and painted drywall partitions.

The RC includes: lobby, supply room and storage, men's and women's locker rooms, men's and women's restrooms, fitness center, kitchen, administrative office block, meeting room, computer learning center, distance learning center, platoon, NCO and old signal command offices. The basement floor includes: co-ed locker facility, restrooms, lounge area, recruiter office, Field Maintenance Support (FMS) offices, and separate attached garage facility (managed wholly by FMS unit), and boiler room/caretaker's office-storage area.

The facility is heated, ventilated, and/or air-conditioned by varied systems. Air-conditioning is supplied through portable units positioned at windows. Separate localized exhaust ventilators are located in the drill room exterior walls. Gas-fired heating units serve the drill room. Each restroom and locker area is local-exhaust ventilated. A boiler/circulating hot water heating system is used for heating throughout most of the facility, whether via localized heaters/fan coil units, or wall mounted registers. Certain gas/oil-fired radiant heaters are located in the maintenance (garage) bays.

The facility is occupied by 12 full-time personnel. The full-time complement includes: two active guard reserve, two recruiters, and one administrative support. Three state workers include a full-time caretaker, part-time caretaker, and one person serving the computer lab. In addition, there are six personnel assigned to the FMS #9 unit. Normal scheduled work operations occur Tuesday through Friday, between the hours 0630 to 1700. Training at the facility occurs monthly on weekends. On the day of the IH assessment, the facility was fully occupied by assigned personnel.

Field Maintenance Shop (FMS #9)

A maintenance/garage section is incorporated into this facility, connected to the basement. The FMS #9 is a separately operated Unit, located at the Cumberland RC facility.

Please refer to Appendix A of this report for current photographs of facility areas/conditions. Refer to subsequent report sections 1.3 - Key Findings and Conclusions, and 2.0 - Operation Description and Condition for further information.



1.3 Key Findings and Conclusions

Several key findings and conclusions were noted as follows:

HVAC/Ventilation-Related Service

- Men's Locker Room/Restroom exhaust fan system was not operational during the survey. A noticeable musty odor was present.
- An abandoned HVAC ventilation ductwork was found in the basement. However, RC personnel do not know the source of this duct, since there are no central HVAC currently operational.
- Women's Restroom exhaust fans were not operational during the survey.
- The boiler/hot water heating valve-distribution system is no longer functional. Localized temperature control is presently limited. Circulating water pumps are presently being re-built.
- The Cumberland RC recently purchased several "drainless" portable air-conditioning units. The units are installed in the room space with vents to outdoors. They reportedly operate without condensate drainage from cooling coils. These units should be carefully monitored, and the design process further reviewed to verify no unforeseen hazards may arise from operation.

Other Ventilation

- Kitchen vent hoods serving stove and automatic dishwashing equipment were found operational. The kitchen is not routinely operated. Some water leakage was noticed on the floor beneath a refrigerator.
- Retractable vehicle exhaust ventilation ducts and hoods are located in the long maintenance service (garage) bays, and were found operational.

Facility Condition

- New windows have been installed throughout the armory; windows may be opened for natural ventilation.
- The supply storage areas were found with materials stacked on floors in area, with some potential housekeeping/safety hazards.
- The boiler chemical treatment program was found managed by off-site personnel.
- The boiler room was found with some delaminating paint from floor and hot water system valves. All boiler breeching insulation appeared intact, and in good condition.
- Excessive items were found stored in the caretaker's office/storage area. A flammable storage cabinet was found blocked by boxes and articles.
- Nine inch square floor tile was found throughout the facility (estimated to cover approximately two-thirds of facility floors, except basement renovated areas, and drill hall). This floor tile type is commonly known to contain asbestos, and should be treated as presumed asbestos-containing material. Asbestos-containing floor tile should be managed according to an Operations and Maintenance Plan. Certain floor areas are reportedly cleaned with hot water but not waxed. This condition is not anticipated to properly protect the floor tile from degradation, or limit minor fiber release.
- Twelve inch square floor tile (in good condition) was found to replace 9 x 9 square inch floor tile in basement areas, reportedly renovated in conjunction with removal of the old firing range.



- Thermal system insulation was reportedly replaced with fiberglass insulation materials. Currently visible materials appear to be fiberglass, in good condition.
- Some minor paint delamination at kitchen and boiler room floors was observed.
- Ceiling plaster was found slightly delaminated at the Women's restroom (near supply storage), due to apparent water leak. The area was found dry, and has reportedly been repaired. The plaster was sampled and reported with "no asbestos detected".
- A kitchen fire extinguisher was found out of inspection (last inspected May 2007).

Sampling Results

- A ceiling plaster sample collected from damaged plaster (finish layer) in women's restroom and subsequently analyzed and reported with "no asbestos detected".
- Surface dust samples were collected throughout various locations of the facility, with certain surface dust concentrations found to exceed the $200 \,\mu g/ft^2$ OSHA guideline for maintenance of surface cleanliness. The extent of the low level contamination should be further determined, followed by appropriate clean-up action, where necessary.
- Bulk paint samples were collected in the kitchen (floor paint), and boiler room (floor and valve paint). All samples were reported by the analyzing laboratory with lead content less than the lead-containing threshold (0.5%). Standard maintenance practices are advised.

Water Leaks

• No water leaks were evident during the survey, except for the ceiling leak previously noted in the women's restroom.

EH&S Compliance & Support

- Caretaker is required to order cleaning and chemical products through the Pikesville Armory, "Garage 13". Product delivery may not be timely, in limited quantities; therefore, localized purchasing may occur. Material safety data sheets are not secured during these purchases.
- Current, up-to-date MSDS were not found on-site for all chemical products in Caretaker's storage. Caretaker utilizes personal protection only to extent that such protection is voluntarily used (i.e. hearing protectors or glove protection may be used during chemical use, though no particular glove types were reported to be specified for certain jobs.
- Flammable and combustible storage cabinets were found in main garage bay. Flammable and combustible contents may be interchangeably stored in the respective cabinets.
- An outdoor portable truck wash/recycling system was observed on-site, in addition to other hazardous material storage (clean and separate waste oil, clean and waste anti-freeze, etc). System maintenance is managed by FMS 9 personnel, and is not monitored or used by readiness center personnel.



Illuminance Levels

• The average illuminance levels in several areas throughout the facility were found less than the Army National Guard recommended values. Although the lower-than-recommended lighting levels found are not expected to present an imminent hazard, proper lighting levels promote safe work and may reduce ergonomic stressors.

1.4 Recommendations

IES' recommendations resulting from this assessment, including the determination of the Risk Assessment Code (RAC) for occupational exposures, are included in a separate document entitled, "Cumberland_RC_08_Recommendations."



2.0 OPERATION DESCRIPTION & CONDITION

INSTALLATION: RC Army National Guard BUILDING: 1100 Brown Avenue, Cumberland, Maryland, 21502 LOCATION: Facility-wide

2.1 General Description & Condition

OPERATION DESCRIPTION: On the day of the assessment, IES observed routine operations in progress. Unit operations at the Cumberland RC facility include:

1) 243rd Engineers Company (EC) – Routine operations include administration, planning, supply, training preparation and associated training support and recruiting. The 243rd EC operation does not utilize the garage/vehicle maintenance facilities at this site. These are managed and operated by FMS #9. The Caretaker provides minor maintenance and custodial support for this facility. This includes cleaning interior facilities, floors and windows, minor repairs, changing light bulbs, minor floor maintenance, and outdoor grounds-keeping.

2) Distance Learning Center – Support for professional training and troop development.

3) FMS# 9 – Provides vehicle maintenance support for the region.

NOTE: Survey assessment activities were focused primarily on Readiness Center operations. General information was collected for FMS 9 operations, since these operations are separately managed, and not part of Cumberland Readiness Center operations.

GENERAL FACILITY CONDITION: The general facility condition was found to be in fair to good condition, also reflecting the earlier construction for the facility.

2.2 Specific Site Survey & Conditions

The site survey was conducted by Mr. Non-Responsive, CIH, Senior Project Manager of IES, as coordinated by SFC Non-Responsive, of the Hagerstown RC.

CHEMICAL AND PHYSICAL AGENTS SAMPLED:

<u>Air Sampling and Analysis of Lead</u> – Air sampling and analysis of lead was not completed due to inavailability of sample media at time of sampling (i.e., sample media shipped from the laboratory did not arrive on the date requested). LTC^{NOT-Responsive} was notified on the survey date. LTC^{NOT-Responsive} indicated that sampling and analysis will be conducted by the NGB at a later upcoming scheduled date.

<u>Surface Lead Wipe Sampling and Analysis</u> – 19 surface wipe samples were collected throughout the facility, at specified or randomly selected areas. Certain surface dust sample results were reported with lead concentration exceeding the OSHA guideline of 200 micrograms per square foot (μ g/ft²) for lead surface contamination in the workplace. This level was established to support housekeeping cleanliness in facilities required to establish written OSHA lead compliance programs, and may also



be referenced as a threshold for general work area cleanliness. Horizontal surface dust sample results were found to exceed the $200 \,\mu g/ft^2$ guideline for samples collected from the kitchen (heater vent fins), administrative office, library, supply storage room, men's locker room (exhaust vent surfaces), and stairwell near basement Maintenance office. Surface dust contamination at these locations was found to range between $210 - 530 \,\mu g/ft^2$. These findings may reflect salient conditions; however, further surface dust sampling and analysis is advised, and follow-up cleaning as necessary. Surface cleaning should be conducted using wet-wiping and/or HEPA cleaning methods.

<u>Bulk Sample Analysis (Lead Paint)</u> – Facility paint was generally found in good condition. Bulk samples (paint chips) were collected from boiler room floor, and a boiler system valve for subsequent lead analysis. Sample results were reported as 0.079% lead (floor), and 0.02% (valve), and both samples indicate lead content less than 0.5% by weight, the criteria used to define "lead-based paint" by USEPA regulation.

<u>Bulk Sample Analysis (Asbestos)</u> – A ceiling plaster sample was collected from the women's restroom, in proximity to plaster damage due to a water leak. The sample was subsequently analyzed for asbestos content with reported results of "No Asbestos Detected."

<u>Indoor Air Quality Measurement</u> – General IAQ measurements (relative humidity, carbon dioxide, carbon monoxide and temperature) were made throughout the RC facility at 19 point locations, including maintenance/garage areas, supporting indoor air quality assessment.

Refer to report sections 1.3 - Key Findings and Conclusions, and 3.0 - Sample Results and Measurements for details, and to the document entitled: "Cumberland_RC_08_Recommendations" for further action.

VENTILATION/ HEATING, VENTILATING & AIR-CONDITIONING (HVAC) SYSTEMS: Ventilating systems were found as follows:

- Within the men's locker, and women's restroom, exhaust ventilation was found non-operational.
- The fitness center was found without mechanical exhaust ventilation.
- Several office areas were found with portable air-conditioning units, ducted to outdoors through modified window manifold (DeLonghi Pinquino 11,000 BTU).
- The kitchen is equipped with an outdoor, ambient make-up air vent, to permit make-up air introduction when the kitchen door is closed. This duct system was found open and operational. The kitchen stove and dishwasher are local exhaust-ventilated to outdoors, and were found operational, with significantly noticeable airflow.
- The Caretaker, nor others at the facility have periodic HVAC inspection/service responsibility, and could not provide service records for review. No annual HVAC service records were available on-site, and the HVAC servicer, assigned at Pikesville Unit "Garage 13" is not readily accessible.

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LIGHTING: The average luminance levels were collected throughout the facility, with certain locations found with illuminance levels less than ARNG recommended standards.

WATER DAMAGE: The facility was principally free of visible water damage. Water damage was evident in the women's restroom (near supply storage). The area was found dry, and has reportedly been repaired.

HOUSEKEEPING: In general housekeeping was found acceptable at the facility; however, the supply room/storage areas, and caretaker's storage area were found with considerable floor-stacked items. A flammable storage cabinet located in the caretaker's storage was blocked by stored articles. Excess stored materials should be removed from passageways to alleviate slip/trip/fall hazards, and to reduce potential fire hazards.

ERGONOMICS: No inherent ergonomic hazards were noted during the survey.

FMS 9/ATTACHED GARAGE: A detailed review of this operation was not completed, since this operation is not part of routine readiness center operations. The FMS 9 reportedly receives several periodic inspections and audits during the year by regulatory and other internal environmental, health and safety organizations.

A copy of IES' field notes from this assessment is included in a separate document entitled, "Cumberland_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, "Cumberland_RC_08_Recommendations."

3.0 SAMPLE RESULTS AND MEASUREMENTS

3.1 Indoor Air Quality

Measurements of air temperature, relative humidity, carbon dioxide (CO₂), and carbon monoxide (CO) concentrations were collected using a calibrated direct reading hand-held TSI Q-Trak indoor air quality monitoring instrument. Sample results for CO were compared with the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) for exposure assessment purposes. TLVs are established through a peer review process, and are published annually in ACGIH's *TLVs and BEIs* booklet. The TLV's represent airborne exposure concentrations and conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. Due to wide variations in individual susceptibility, a small percentage of workers may experience discomfort or be affected by certain substances at concentrations below the recommended threshold limit.⁽¹⁾



Generally, measured levels of carbon dioxide (CO₂), carbon monoxide (CO), relative humidity (%RH), and temperature (F), were found within guidelines established by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, throughout building locations surveyed.

Refer to Table 1 - Air Temperature, Relative Humidity, CO₂ and CO Measurements for details of measured air temperature, relative humidity, CO₂, and CO collected throughout the building during the assessment.

Refer to Appendix B - Indoor Air Quality Sample Location Map detailing the IAQ measurement locations throughout the facility.

TABLE 1AIR TEMPERATURE, RELATIVE HUMIDITY, CO2, AND CO MEASUREMENTS

Location:	Cumberland National Guard RC, Cumberland, Maryland
Date:	July 24, 2008

Sample		Nearest				Relative
Location		Sample	CO ₂ *	CO	Temperature	Humidity
ID	Sample Location/Description	Time	(ppm)	(ppm)	(°F)	(%RH)
Q1	Main Office	09:10	456	1.1	52	78
Q2	Library	09:15	467	1.9	54	79
Q3	Commanding Officer (office)	09:15	426	1.0	55	79
Q4	Lobby	09:40	520	1.3	55	78
Q5	Supply Room Storage	09:45	436	1.0	57	80
Q6	Supply Room (Large)	09:50	431	1.4	49	79
Q7	Men's Locker	10:00	428		52	79
Q8	Fitness Center	10:05	399	1.6	50	80
Q9	Kitchen	10:15	421	1.4	47	82
Q10	Drill Hall	10:40	409	1.0	51	80
Q11	Platoon Seargent Office	10:45	413	1.3	48	81
Q12	Distance Learning Center	11:00	429	1.1	48	81
Q13	Computer Learning Center	11:10	413	1.5	41	78
Q14	Meeting Room	11:20	400	1.0	45	80
Q15	Co-Ed Locker Room	11:40	414	1.2	51	77
Q16	Basement Lounge	12:00	636	1.0	45	73
Q17	Boiler Room	12:15	424	1.4	46	81
Q18	Maintenance Bay, long	12:30	360	1.0	48	76
Q19	Outdoors, parking lot	12:35	360	1.0	48	81

* CO2 levels exceeding 700 ppm indicate occupancy. Higher levels identified may indicate inadequate air exchange.

** %RH levels >	≥ 60% may	contribute to	bioaerosol	growth.	

TABLE FOOTNOTES	
Measurement device:	All measurements collected in real-time using a TSI Q-Trak indoor air quality monitor, at
	approximately 4 feet above ground/floor height.
ррт	Parts of contaminant per million parts of air. All CO2 and CO concentrations expressed in
	ppm.



Exposure Guidelines	
CO2	Indoor CO2 concentrations should be maintained at less than 700 ppm above outdoor air
	levels – (ASHRAE 62.1-2007) ⁽²⁾
CO	50 ppm (OSHA PEL-TWA); 25 ppm (ACGIH TLV-TWA)
Temperature	68 °F to 79 °F (ASHRAE 55-2004) ⁽³⁾
Relative Humidity (%RH)	30% to 60% (ASHRAE 55-2004) ⁽³⁾

3.2 Lead Dust Sampling

IES performed wipe sampling throughout facility areas of the RC and FMS 9, at specified and other selected locations. All wipe sampling was conducted according to best practices and guidelines published in Section II: Chapter 2, Sampling for Surface Contamination, of the OSHA Technical Manual. Wipe samples were collected over 100 cm² areas using pre-packaged, pre-wetted Ghost Wipes (Environmental Express). Surface dust samples were subsequently packaged and shipped to AMA Analytical Services of Lanham, Maryland for lead analysis according to Method EPA600/R-93/(200M)-7421. AMA maintains accreditation with the American Industrial Hygiene Association, and with the National Voluntary Laboratory Accreditation Program.

All wipe sample results were reported in micrograms of lead per square foot of surface sampled $(\mu g/ft^2)$ for the purposes of this assessment, and for subsequent comparison with OSHA guideline criteria of 200 μ g/ft².

A summary of analysis results are presented in Table 2 – Wipe Sampling Results Summary (Lead). Refer to Appendix C for the complete laboratory analysis results.

TABLE 2 WIPE SAMPLING RESULTS SUMMARY (LEAD)

Location: Date:

Cumberland National Guard RC, Cumberland, Maryland July 24, 2008

Sample ID	Location	Surface Area Sampled	Lead Surface Concentration (µg/ft ²)
CW-01	Basement, Co-Ed Locker, top of cabinets, horizontal surface composite (HSC)	100 cm^2	< 110
CW-02	Basement, Lounge, HSC	100 cm^2	< 110
CW-06	Kitchen, top of old refrigerator	100 cm^2	110
CW-07	Kitchen, heater vent fins	100 cm^2	480
CW-08	Kitchen, make-up air vent to outdoors	100 cm^2	< 110
CW-09	Drill Room/Assembly Hall, top of exit light	100 cm^2	< 110
CW-10	Platoon Sergeant Office, HSC	100 cm^2	< 110
CW-11	Distance Learning Office, HSC	100 cm^2	< 110
CW-12	Computer Learning Laboratory, HSC	100 cm^2	< 110
CW-13	Library (near Administrative Office), HSC	100 cm^2	530
CW-14	Administrative Office, HSC	100 cm^2	420



Sample ID	Location	Surface Area Sampled	Lead Surface Concentration (µg/ft ²)
CW-15	NE Stairwell, wall @ stair ledge, HSC	100 cm^2	< 110
CW-16	Women's Restroom, top of door	100 cm^2	160
CW-17	Supply Storage Room, HSC	100 cm^2	210
CW-18	Men's Locker Room, exhaust vent surfaces, HSC	100 cm^2	420
CW-19	Fitness Center, top of electric conduit near ceiling	100 cm^2	140
CW-20	Basement, Maintenance Bay, HSC	100 cm^2	< 110
CW-21	Basement, Stairwell near Maintenance Office, wall @ stair ledge, HSC	100 cm^2	280

TABLE FOOTNOTES

THELE I COL	
Collection	Wipe sample collected with nitrile glove donned on hand, using 'Ghost Wipe' towlette, by sequential wipe using
procedure:	template or best estimate of 100 cm2 area; multiple passes with clean surface of wipe and subsequent folding, and placement to a labeled, sealed plastic vial or bag.
μg/ft2:	Micrograms lead per square foot. Note: laboratory converts result from $\mu g/100 \text{ cm}^2$ to $\mu g/\text{ft}^2$, prior to reporting.
< 1% Pb	Less than 1% lead detected in sample results.
OSHA	The USDOL/OSHA does not have a promulgated standard for lead surface contamination; however, OSHA has
guideline	provided an interpretive level of 200 µg/ft ² to assess the housekeeping requirement of "as free as reasonably
standard for	practicable". This interpretation is presented in OSHA Industrial Hygiene Technical Manual (TED 01-00-0150;
surface	1/20/1999), and in a letter of interpretation dated 01/13/2003, and subsequently issued into public domain.
contamination	
by lead	

3.3 Lead Paint Chip Sampling

IES observed certain deteriorating paint surfaces within the facility. Two paint chip samples were subsequently collected and shipped for analysis by AMA Analytical Services of Lanham, Maryland. Samples were analyzed for lead content according to the USEPA Method EPA600/R-93/(200M)-7421. All sample results were reported as percent lead for purposes of this assessment. According to the method, lead-based paint is defined as containing lead equal to or exceeding 1 milligram per square centimeter (mg/cm²) or containing 0.5% by weight.

A summary of results are presented in Table 3 – Paint Chip Sampling Summary below. Refer to Appendix C for the complete laboratory analysis results.

TABLE 3 PAINT CHIP SAMPLING RESULTS SUMMARY (LEAD)

Location:	Cumberland National Guard RC, Cumberland, Maryland
Date:	July 24, 2008

Sample Number	Sample Location	Paint characteristic	Result (% Pb)
CW-04	Basement, Boiler Room, floor paint	Grey-Blue Paint	0.079
CW-05	Basement, Boiler Room, circulating water valve	White Paint	0.02



3.4 Asbestos Bulk Sampling

Ceiling plaster collected from the Women's restroom ceiling was submitted for analysis by AMA Analytical Services, a laboratory participating in the National Voluntary Laboratory Accreditation Program. Sample analysis was performed by polarized light microscopy according to USEPA method EPA/600R-93/116, with results reported as "No Asbestos Detected". Further sampling may be advised wherever major renovation or repair is completed, since plaster composition may vary depending on batch materials used.

A summary of analysis results are presented in Table 4 – Asbestos Bulk Sampling Results Summary. Refer to Appendix C for the complete laboratory analysis results.

TABLE 4 ASBESTOS BULK SAMPLING RESULTS SUMMARY

Location:	Cumberland National Guard RC, Cumberland, Maryland
Date:	July 24, 2008

Sample Number	Sample Location	Sample characteristic	Result (% Asbestos)
CW-22	Women's Restroom, plaster ceiling material, finish coat	Plaster layer	NAD *

* "NAD" No asbestos detected via polarized light microscopy - Analysis Method EPQ/600/R-93/116 dated Jul 1993.

3.5 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 5 – Illuminance Readings Summary. 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 5 ILLUMINANCE READINGS SUMMARY

Location:Cumberland National Guard RC, Cumberland, MarylandDate:July 24, 2008

Sample ID	Sample Description	Average Illuminance Measurements (fc)	ARNG Recommended Illuminance Value (fc)
I1	Main Office, table height (TH)	29	30-50
I2	NCO (Commanding Officer) Office	28	30-50
I3	Orderly Room	50	30-50
I4	First Sergeant's Office	56	30-50
15	Retention NCO	46	30-50
I6	Lobby	4	10
I7	Supply Room Storage	23	30
I8	Large Supply Room	8	10
I9	Men's Locker	13	7
I10	Fitness Center	23	30
I11	Kitchen	26	50
I12	Drill Hall	20	10
I13	Platoon Sergeant's Office	20	30-50
I14	Distance Learning Center	27	30-50
I15	Computer Learning Center	28	30-50
I16	Meeting Room	17	30-50
I17	Copy Room	10	10
I18	Basement, Co-Ed Locker Room (drill weekends)	21	7
I19	Basement, Lounge	14	10
I20	Basement, Boiler Room	6	30
I21	Garage, Maintenance Bays	52	50

NOTES:

All illuminance measurements and recommended values are expressed in foot candles (fc), and were collected from approximate table height.

4.0 SAMPLING EQUIPMENT

Table 6 lists the sampling equipment that was used as a part of the assessment.



TABLE 6 SAMPLING EQUIPMENT LIST

Equipment Type	Make/Model	Equipment/Serial Number	Equipment Identification
Light Meter	International Light, IL1400A, illum. probe	3206/1782	R2373/3691
Indoor Air Quality Monitor	TSI Model 8554 Q-Trak	02071015	R10120

5.0 **REFERENCES**

- 1. ACGIH, 2008 TLVs and BEIs.
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), Standard 62-2007, "Ventilation for Acceptable Indoor Air Quality," ASHRAE, Atlanta, Georgia, 2004.
- 3. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), Standard 55-2004, "Thermal Environmental Conditions for Human Occupancy," ASHRAE, Atlanta, Georgia, 2004.
- 4. "Evaluation of Lighting Standing Operating Procedure (SOP) and Illumination Requirements for Existing Facilities," ARNG, 17 November 2007.
- 5. Occupational Safety and Health Administration, 29 CFR 1910.1025, Lead.



APPENDIX A

READINESS CENTER PHOTOGRAPHS





Photograph #1 – RC Lobby/Entry Area, view from entrance



Photograph #2 – Drill Hall, general view

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Photograph #3 – Drill Hall, wall-mounted ventilation exhaust



Photograph #4 – Women's Restroom, water-damaged ceiling plaster





Photograph #5 – Supply Room Office/Storage, material stacked in space



Photograph #6 – Men's Locker Room, non-functional exhaust (lead sample collected at vent)





Photograph #7 – Fitness Center, rubber mat over 12 x 12 tile





Photography #8 - Fitness Center, natural ventilation via open windows



Photograph #9 – Kitchen, outdoor/make-up air duct/vent





Photograph #10 – Distance Learning Center office, portable "drainless" air-conditioner, (vent intake and exhaust to outdoors)





Photograph #11 – Computer Lab/Learning center





Main Floor, Administrative Office, nine inch square floor tile





Photograph #12 – Basement, Unknown HVAC/ventilation duct



Basement, Recruiter's Office





Basement, Lounge, view of window-mounted air-conditioner



Main Floor, Old Signal Command Office, view of 9 inch square floor tile (presumed asbestos-containing)



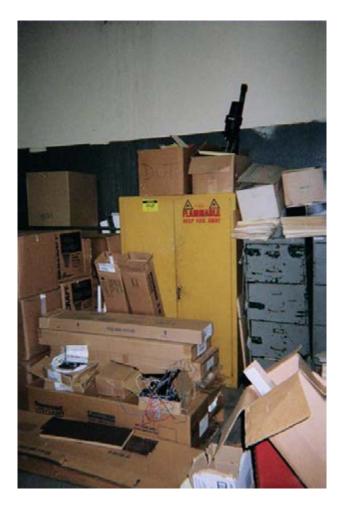


Basement, FMS Unit Office, nine inch square floor tile maintained in good condition.



Basement, Boiler Room, delaminating paint from valves





Basement, Caretaker's Office/Storage (old coal room), storage conditions

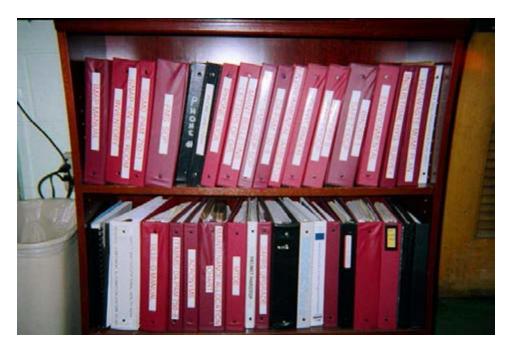


Basement, FMS 9 Garage, view of vehicle exhaust vent system





Basement, FMS 9, Flammable and Combustible storage cabinets



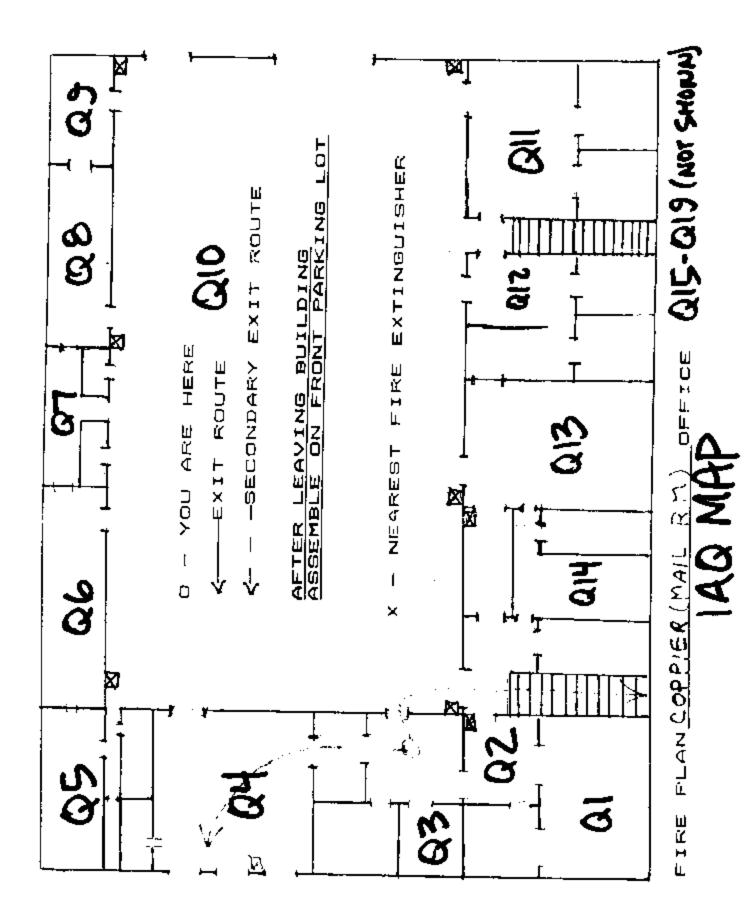
Basement, FMS 9 Office, written programs applicable to FMS 9



APPENDIX B

INDOOR AIR QUALITY MAP

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APPENDIX C

LABORATORY ANALYSIS RESULTS

<u>An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Labor atory</u> 4475 Forbes Blvd. • Lanham, MD, 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (3(1) 459-2643 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 protocels are based upon the information growided by the persons submitting them and, unless collected by personnel of these. Laborabets, we expressly disclaim any knowledge and lability for the accuracy submitting them and, unless collected by personnel of these. Laborabets, we expressly disclaim any knowledge and lability for the accuracy made completeness of the information. Residual sample material will be discarded in accuracy with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP accuracy of the Federal Covernment. All rights reserved. transmission ensuits of the federal covernment. All rights reserved. AMA Analytical Services, Inc.

) ug/ft²	< 110		ug/ft²	111.52	0.108	****	Wipe	Flame	CW-20	0873126
) ug/ft²	140	1 ²	ug/ft²	111.52	0.108	••••	Wipe	Flame	CM-19	0873125
) ug/ft²	420	h2	ug/ft²	111.52	0.108	****	Wipe	Flame	CW-18	0873124
	ug/ft²	210	P2	ug/ft²	111.52	0.108	****	Wipe	Flame	CM-17	0873123
	ng/ft²	160	₽²	ug/ft²	111.52	0.108	****	Wipe	Flame	CW-16	0873122
	ug/ft²	< 110		ug/ft²	111.52	0.108	***	Wipe	Flame	CW-15	0873121
	ug/ft²	420	(r)	ug/ft²	111.52	0.108	::	Wipe	Flame	CW-14	0873120
	ug/ft²	530	(t ²	ug/ft²	111.52	0.108	:::	Wipe	Flame	CW-13	0873119
	ug/ft²	< 110		ug/ft²	111.52	0.108	***	Wipe	Flame	CW-12	0873118
		011 >		ug/fl²	111.52	0.108	i	Wipe	Flame	CM-11	0873117
		< 110		ug/fi,	111.52	0.108	:	Wipe	Flame	CW-10	0873116
	ug/ft²	< 110		ug/ĥ²	111.52	0.108		Wipe	Flame	CW-09	0873115
		< 110		ug/ft²	111.52	0.108	:	Wipe	Flame	CW-08	0873114
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I Þ AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

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AMA Analytical Services, Inc.

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 matual 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 then. NVLAP accreditation applies only to polarized light microscopy of bulk samples and transmission electives microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government. All rights reserved.

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4475 Forbes Blvd. - Lanham, MD, 20706 - (301) 459-2640 - Toll Free (800) 346-0961 - Fax (301) 459-2643

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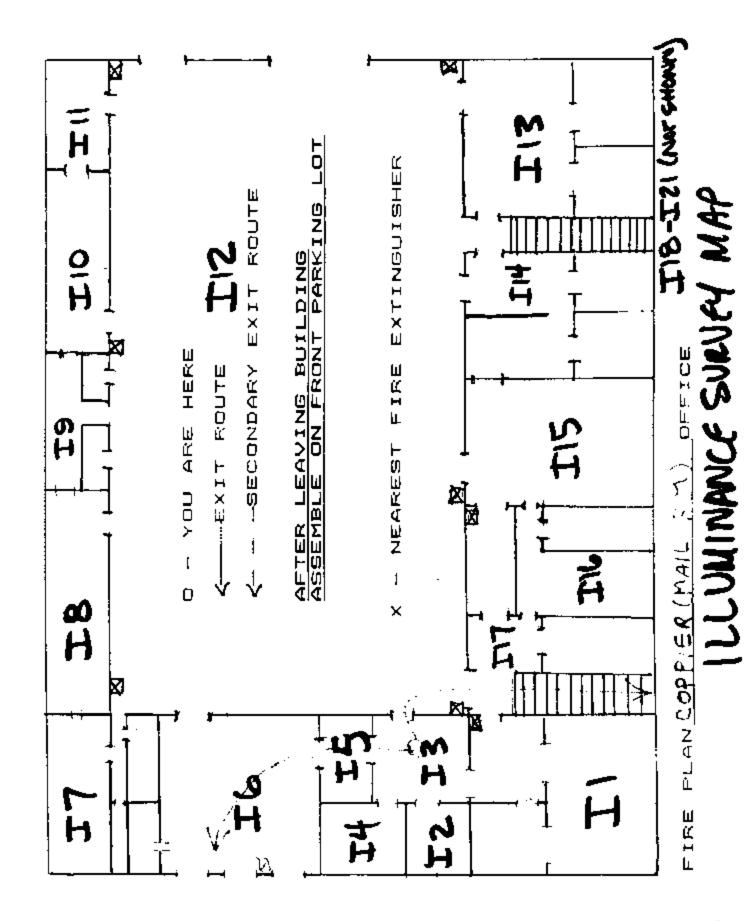
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APPENDIX D

ILLUMINANCE READINGS MAP

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National Guard Region North

National Guard Readiness Center Industrial Hygiene Evaluation Cumberland Army National Guard Armory Cumberland, MD 21502-3499

Prepared for:

National Guard Region North Industrial Hygiene Office 301 Old Bay Lane Havre De Grace, MD 21078

Attn:

n-Responsive

Prepared by:

Bonus Environmental, LLC P.O. Box 121 Mt. Pleasant, Michigan 48804

> Project No. 1061-03 August 4, 2010

Bonus Environmental, LLC

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APPENDICES

Appendix A	Shop Diagram
Appendix B	Lead Sample Results
Appendix C	Photographs
Appendix D	References



August 4, 2010 Project No. 1061-03

National Guard Region North Industrial Hygiene Office 301 Old Bay Lane Havre De Grace, MD 21078-4003

Attn: Non-Responsive

Project: Army National Guard Readiness Center, Industrial Hygiene Evaluation Cumberland 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 Cumberland Army National Guard Readiness Center located at 1100 Brown Avenue in Cumberland, Maryland. The purpose of this evaluation was to generate or to update a previous baseline evaluation so that employee exposure history can be provided to each civilian and military employee. The following industrial hygiene and safety programs were evaluated during this industrial hygiene evaluation performed by Bonus Environmental, LLC representative Non-Responsive on May 18, 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 Cumberland Readiness Center is an Army National Guard armory comprised of offices, a drill hall, kitchens, a former indoor firing range, an attached maintenance garage, a fitness room, supply rooms, a boiler room, a battery room, a locker room, a classroom and a lunch room. The point of contact for this facility was SFC Non-Responsive. Five (5) full-time administrative personnel and four (4) full-time maintenance personnel are employed in the approximately 25,922 ft² facility. A shop diagram depicting the locations of the operations identified during this industrial hygiene evaluation is attached to this report as Appendix A.

The National Guard Bureau Region North Industrial Hygiene Office provided governmental furnished equipment and sampling media required to perform the industrial hygiene evaluation. Chain of custody forms for laboratories approved by the National Guard Bureau Region North Industrial Hygiene Office were provided with the sampling media. All samples collected during this industrial

P.O. Box 121 BESTAVALABLE 76894 hygiene evaluation were sent to the National Guard Bureau Region North Industrial Hygiene Office approved laboratories for analysis.

2.0 – LEAD SAMPLING

2.1 – Lead Wipe Sampling

Lead wipe sampling was performed according to the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame). Twenty one (21) wipe samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. The National Guard Bureau Region North Industrial Hygiene Office has established/interpreted a threshold of 200 μ g/ft² of lead concentration for surface cleanliness. The following table outlines the locations and analytical results for the lead wipe samples collected during this project

Army National Guard - Cumberland Readiness Center											
		Lead Wipe Sample Results	[[
Sample #	Sample Date	Sample Location	Sample Area (ft ²)	Sample Result (µg/ft ²)							
CL-W-1	5-18-10	Field Blank		< 12							
CL-W-2	5-18-10	Drill hall, NW corner, top of microwave	0.111	< 110							
CL-W-3	5-18-10	Drill hall, along west wall, top of trophy case	0.111	< 110							
CL-W-4	5-18-10	Drill hall, along east wall, top of "Amnesty box"	0.111	< 110							
CL-W-5	5-18-10	Drill hall, floor, south end "free throw" line	0.111	< 110							
CL-W-6	5-18-10	Drill hall, floor, north end "free throw" line	0.111	< 110							
CL-W-7	5-18-10	Kitchen (NW corner of Drill hall), along south wall, top of file cabinet	0.111	< 110							
CL-W-8	5-18-10	Locker room (former indoor firing range), NE corner, light fixture	0.111	140							
CL-W-9	5-18-10	Locker room (former indoor firing range), SE corner, surface of overhead heater	0.111	< 110							
CL-W-10	5-18-10	Locker room (former indoor firing range), SW corner, top of locker #53	0.111	< 110							
CL-W-11	5-18-10	Locker room (former indoor firing range), center of room, floor	0.111	< 110							
CL-W-12	5-18-10	Outside of NE entrance to locker room, on handrail to ground floor	0.111	< 110							
CL-W-13	5-18-10	Fitness room, NE corner, top of stereo	0.111	< 110							
CL-W-14	5-18-10	Supply room #2, center of room, top of file cabinet	0.111	< 110							
CL-W-15	5-18-10	Lobby, ledge along north wall	0.111	< 110							
CL-W-16	5-18-10	Office #8/9, NW corner, table top surface	0.111	< 110							
CL-W-17	5-18-10	DLC classroom, north side, surface of eastern-most desk	0.111	< 110							

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	Army National Guard - Cumberland Readiness Center Lead Wipe Sample Results												
Sample #	Sample Date	Sample Area (ft²)	Sample Result (µg/ft²)										
CL-W-18	5-18-10	Lunch room, on bar countertop surface	0.111	< 110									
CL-W-19	5-18-10	FMS maintenance office room #19, along north wall, top of shelf	0.111	< 110									
CL-W-20	5-18-10	Boiler room, SW corner, top of compressor	0.111	< 110									
CL-W-21	5-18-10	Maintenance garage, south side of bay #2, top of parts drawer	0.111	< 110									
CL-W-22	5-18-10	Maintenance garage, battery room, surface of center storage shelf	0.111	1,800									

Surface cleanliness threshold = $< 200 \ \mu g/ft^2$

2.2 – Lead Air Sampling

The purpose of lead air monitoring was to document task-specific activities and corresponding exposures to lead. Occupational Safety and Health Administration (OSHA) 29 CFR 1926.62 requires employers whose employees are exposed to lead in the work place, in any quantity, make a determination whether any employee's exposure exceeds the action level (AL) of 30 μ g/m³ or the maximum permissible exposure limit (PEL) of 50 μ g/m³ as 8-hour time weighted averages (TWAs). If employee exposures are less than 30 μ g/m³, training is required under the Hazard Communication 29 CFR 1926.59. Exposures that exceed the AL or PEL require the employer to comply with additional requirements, including air monitoring, additional training, and restricted work practices as outlined in OSHA 29 CFR 1926.62.

Representative fixed area sampling was conducted for potential airborne concentrations of lead in accordance with accepted Industrial Hygiene methods recognized by the National Institute for Occupational Safety and Health (NIOSH) and OSHA. Representative breathing zone samples were not collected from an employee performing administrative tasks.

Lead exposure monitoring was performed in accordance with the EPA method 600/R-93/200(M)-7420 (Atomic Absorption - Flame) with SKC personal air sampling pumps calibrated to 2.0 liters per minute. All samples were collected on 37 mm diameter cassettes with mixed-cellulose ester filters. All sampling pumps were calibrated before and after each use to ensure volume accuracy. Two (2) samples and one (1) field blank were sent under chain-of-custody procedures to AMA Analytical Services, Inc., an AIHA accredited laboratory located in Lanham, Maryland. Analytical results of the lead wipe and air samples are attached to this report as Appendix B.

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	Army National Guard - Cumberland 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 18,	2010	-	-		-		-						
CL-A-1	FB	Field Blank				0	3	< 3	N/A				
CL-A-2	IWA	Room #6, SFC	2.0	0743	1523	920	3.3	< 3.3	N/A				
CL-A-3	IWA	Maintenance garage, between bays 1 & 2	2.0	0746	1526	920	3.3	< 3.3	N/A				

PS = Personal sample, IWA = Inside work area, N/A = Not Applicable

Note: The OSHA PEL of 50 $\mu g/m^3$ is averaged over an 8 hr work shift

3.0 - PHYSICAL CONDITION OF FACILITY / PERSONNEL CONCERNS

3.1 - Lead Based Paint

During the industrial hygiene evaluation of the Army National Guard Cumberland Readiness Center, Bonus Environmental, LLC performed a visual inspection of the facility in regards to lead based paint. Bonus Environmental, LLC identified one area of peeling paint which could potentially pose a lead exposure hazard. This area was the west wall of the boiler room. A bulk sample paint chip was collected from the west wall of the boiler room. The paint chip sample was sent under chain-ofcustody procedures to AMA Analytical Services, Inc. located in Lanham, Maryland for analysis. Sample analysis has indicated that the paint chip sample contained detectable levels of lead. The paint is therefore considered to be lead based paint and all activities that involve lead based paints are regulated by OSHA Lead in Construction Standard, 29 CFR 1926.62. The OSHA Lead in Construction Standard does not assign a numerical value of which must be present within the paint to be considered lead based paint. Paints which contain any detectable level of lead shall be treated and handled as lead based paint. HUD defines lead based paint as having greater than 0.5% lead by weight. The paint chip sample collected during this industrial hygiene evaluation did not contain lead in excess of 0.5% by weight. Analytical results are attached to this report as Appendix B.

LeadCheckTM, ChromateCheckTM, NickelCheckTM, and CadmiumCheckTM swabs were utilized as a screening method on the floor of Maintenance bay #1, where welding activities have occurred in the past. Metal-specific swabs were used to test for the presence of cadmium, chromate, lead, and nickel. All swabs gave a negative indication for the given metal contaminant.

3.2 – Presumed Asbestos Containing Materials

During the industrial hygiene evaluation of the Army National Guard Cumberland 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.

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3.3 - Water Damage/Mold Growth

During the industrial hygiene evaluation of the Army National Guard Cumberland 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 Cumberland 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 Cumberland 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 Cumberland Readiness Center, Bonus Environmental, LLC measured temperature, relative humidity, carbon monoxide (CO), and carbon dioxide (CO₂) throughout the facility. A calibrated TSI Q-Trak Model 7565 Indoor Air Quality Monitor equipped with a Q-Trak Probe 982 was utilized to record indoor air quality measurements.

Carbon dioxide is a natural component of air and the amount of CO_2 in a given air sample is commonly expressed as parts per million (ppm). The outdoor air in most locations contains about 380 ppm carbon dioxide. Higher outdoor CO_2 concentrations can be found near vehicle traffic areas, industry and sources of combustion. The concentrations of CO_2 found in most offices are well below the OSHA Permissible Exposure Limit (PEL) of 5,000 ppm when averaged over an 8-hour time period for an industrial workplace. While levels below 5,000 ppm are considered to pose no serious health threat, studies have indicated that individuals in offices with elevated CO_2 concentrations tend to report drowsiness, lethargy and a general sense that the air is stale. Ventilation rates for office spaces are defined by various codes and standards. The most widely accepted standard is the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 62. According to ASHRAE Standard 62.1-2007, CO_2 concentrations below 700 ppm above the outdoor level are considered to indicate adequate ventilation and provide human comfort. The CO_2 measurements collected during this industrial hygiene evaluation ranged from 438 ppm to 543 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

P.O. Box 121 BESTAVALABLE 76894 headaches, dizziness, disorientation, nausea and fatigue. The effects of CO exposure can vary greatly from person to person depending on age, overall health and the concentration and length of exposure. The OSHA has established a PEL of 50 ppm. OSHA standards prohibit worker exposure to more than 50 parts of the gas per million parts of air averaged during an 8-hour time period. The peak CO level for employees is 200 ppm. The CO measurements collected during this industrial hygiene evaluation ranged from 0.5 ppm to 1.2 ppm. CO levels were well below the OSHA PEL during this industrial hygiene evaluation.

During the industrial hygiene evaluation of the Army National Guard Cumberland Readiness Center, Bonus Environmental, LLC collected temperature measurements. Temperature measurements throughout the facility ranged from 64.8°F to 71.6°F and are considered to be within an acceptable range.

During the industrial hygiene evaluation of the Army National Guard Cumberland Readiness Center, Bonus Environmental, LLC collected relative humidity measurements. Relative humidity measurements throughout the facility ranged from 45.3% to 47.8% 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 - Cumberland Readiness Center Indoor Air Quality Measurements											
Location	CO ₂ (ppm)	CO (ppm)	Relative Humidity (%)	Temperature (°F)							
Outdoors, south side entrance	401	1.7	63.8	65.1							
Drill hall, center of room	438	1.1	46.1	64.8							
Fitness room #3	474	0.6	46.9	65.0							
Supply room #2	472	0.9	47.4	65.5							
Office room 8/9	509	1.0	47.8	66.4							
VTEC room	511	0.5	47.7	70.7							
Lunch room	505	1.0	46.7	70.0							
FMS maintenance office room #19	543	1.1	46.2	71.1							
Boiler room	476	1.2	45.7	71.6							
Battery room	484	1.2	45.3	70.3							
Maintenance garage, between bays 1 & 2	468	1.1	45.5	70.4							

Required/Recommended Values

 CO_2 - OSHA PEL = 5,000 ppm and ASHRAE Standard 62.1-2007 = no greater than 700 ppm above outdoor

CO - OSHA PEL = 50 ppm and OSHA Ceiling Limit = 200 ppm

Temperature - ASHRAE Standard 55-2004 = between approximately 67 and 82 °F.

RH – ANSI/ASHRAE Standard 62.1-2007 = <65%

4.0 – LIGHTING

Utilizing a properly calibrated Cooke Corporation cal-Light 400 light meter, Bonus Environmental, LLC collected illumination readings throughout the facility. Illumination measurements recorded during this industrial hygiene evaluation are summarized in the table below.

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Army National Guard - Cumberland City Readiness Center Lighting Survey											
Location	Measurement in Foot Candles	Requirement in Foot Candles	Requirement Met?								
Common area/Kitchen/Room 116	13.2	10	YES								
Fitness room #3	5.2	30	NO								
Men's latrine	25.5	5	YES								
Supply room #2	36.4	30	YES								
Supply room #1	11.9	30	NO								
FAC Engineer office #4	36.0	50	NO								
Common women's latrine	21.8	5	YES								
Drill hall, center of room	26.5	30	NO								
Front entrance lobby	11.7	5	YES								
Room #6 – Office	61.6	50	YES								
Retention NCO office	27.3	50	NO								
Room #7 – Office	22.1	50	NO								
Room #8/9 – Office	66.0	50	YES								
Library	79.7	30	YES								
Room #10 – Office	23.9	50	NO								
Room #11 – Office	58.5	50	YES								
Telecommunications Room (Internet access room)	8.6	30	NO								
SR. staff men's latrine	36.6	5	YES								
Copy room	21.7	30	NO								
Common kitchen	16.6	10	YES								
Training room #12	23.9	30	NO								
Female restroom	22.1	5	YES								
DLC classroom	32.2	30	YES								
VTEC office	38.4	50	NO								
Room #13 – Office	52.5	50	YES								
Room #14 – Office	14.6	50	NO								
Room #15 - Office	36.9	50	NO								
Locker room #16	60.4	7	YES								
Recruiter's office #17	21.5	50	NO								
Common men's room	41.2	5	YES								
Lunch room	22.4	10	YES								
Common kitchen	3.2	10	NO								
Hallway outside of lunch room	15.4	5	YES								
Dispatch office #18	68.5	50	YES								
FMS Maintenance Office #19	98.5	50	YES								
Boiler room	32.0	30	YES								
Caretaker's storage room	11.2	30	NO								
Center of maintenance shop, bay #1	52.0	75	NO								
OMS tool room #23	16.8	30	NO								
OMS computer room #24	29.5	30	NO								
Battery room #22	45.9	30	YES								
Storage area above rooms 22 & 24	18.4	30	NO								
Maintenance shop, between bays 2 & 3	20.6	75	NO								
Storage vaults 1 & 2		Inaccessible									

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Lighting levels were compared to the levels outlined within the ANSI/IESNA RP-1-04 Office Lighting Handbook, and the ANSI/IESI RP-7-01 Lighting Industrial Facilities Handbook. Areas within the facility which did not meet the foot candle requirements are identified with a "NO" within the Requirement Met? column. It is recommended that illumination be improved in all the areas that did not meet the requirements. Improving illumination can be achieved by replacing burned-out lamps/bulbs, cleaning fixtures, relocating detailed work activities to more illuminated areas, and using supplemental task lighting.

5.0 – EVALUATION OF ATTACHED GARAGE

5.1 – Operational Description - Readiness Center

Five administrative and four maintenance personnel are assigned to the Cumberland Readiness Center to provide space for units to support and train soldiers. Vehicle maintenance typically occurs during the normal work hours of Monday-Friday, 0630-1700. The attached garage includes four bays, three of which include vehicle exhaust ventilation. Personal protective equipment including leather gloves, nitrile gloves, ear plugs, and safety glasses are available to all employees who work within the attached garage. Activities conducted on the day of the industrial hygiene evaluation included engine and brake repairs.

5.2 – Local Exhaust Ventilation System

Exhaust ventilation systems were identified in the Cumberland Readiness Center facility during the industrial hygiene evaluation. The ventilation system consisted of a central exhaust fan and series of flexible trunks of ductwork. The central exhaust fan was centrally located and exhausted directly to the outdoors through the west wall. The exhaust ventilation system was installed for the purpose of removing diesel exhaust fumes. A TSI VelociCalc 9555 Multiparameter Ventilation Monitor was utilized to collect multiple measurements of the face velocity of each flexible trunk of ductwork. The table below details the results of the ventilation system evaluation in the Cumberland Readiness Center facility.

Army National Guard - Cumberland Readiness Center Vehicle Exhaust - Ventilation System Evaluation											
Location	Measured Average Face Velocity (fpm)	Calculated Volumetric Flow (cfm)	Area of the Opening (ft ²)	Sufficient Air Flow							
Bay #2 (south)	2,473	866	0.35	NO							
Bay #3 (center)	1,164	407	0.35	NO							
Bay #4 (north)	1,438	503	0.35	NO							

cfm = cubic feet per minute, calculated by multiplying the measured face velocity by the area of the opening, fpm = feet per minute, calculated reference value = 1,385 acfm

Figure VS-85-02 on page 13-151 of the ACGIH "A Manual of Recommended Practice for Design, 26th Edition" specifies that tailpipe exhaust ventilation volumes for operating engines connected directly to a tailpipe exhaust system are to be determined by the engine displacement, the engine RPM, and tailpipe exhaust temperature, plus a 20% safety factor. The largest types of vehicles serviced within the Maintenance Shop are M917A2 20-ton dump trucks equipped with a Detroit Diesel 60

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series 12.7 Liter diesel engine which operates at 1,800 RPM. Based on an average tailpipe temperature of 300°F, the minimum required volume flow rate of the overhead exhaust system used to control emissions from the fumes of diesel exhaust was calculated to be 1,385 acfm (actual cubic feet per minute). The representative exhaust duct systems tested in the Cumberland Readiness Center facility did not provide sufficient air flow.

6.0 – BATTERY SHOP

Mechanics from the Maintenance Shop work within the Battery Shop on an as needed basis. The Battery room is used for storage and charging of batteries. Batteries in need of repair are shipped to another facility. Personal protective equipment including an apron, nitrile gloves, eye goggles, and face shield are available to all employees who work within the Battery Shop. No work activities were being performed within the Battery Shop during the industrial hygiene evaluation.

Lead acid batteries produce hydrogen gas and other fumes at 80% recharge point, making proper ventilation in the battery charging area extremely important. Hydrogen gas is not only colorless and odorless, but is lighter than air, causing the gas to rise to the top of a building. For safety purposes, the concentration of hydrogen in the air should be kept below 1% to reduce risk of explosion. An evaluation of the ventilation system within the Battery Shop was performed during this industrial hygiene evaluation of the facility. The Battery Shop is used as a place of storage and charging of lead-acid batteries. Forty (40) 8-cell (1,225 cranking amps capacity) batteries were located in the battery room, with twenty three (23) of them on chargers. A wall-mounted rectangular exhaust fan measuring 22"x 8" located along the west wall provides ventilation to the room. A TSI VelociCalc 9555 Multiparameter Ventilation Monitor was utilized to measure the face velocity at the exhaust fan. Measurements indicated that the exhaust fan provides an average volumetric flow rate of 583 fpm. The entry door to the Battery Shop is kept open to provide make-up air. The ventilation rate of the exhaust system required during the charging of twenty three (23) 8-cell batteries within the Battery Shop was calculated with the following formula.

Q = 0.054 x I x N where,

- Q = required ventilation rate, cfm
- I = 0.21 x (capacity of largest battery to be charged in amp-hours)
- or 0.25 x (maximum obtainable amps from charger), whichever is greater
- N = number of batteries to be charged at one time x number of cells per battery

In this case, the required ventilation of the exhaust system (Q) within the Battery Shop was determined to be 250 cfm, where I=0.21 x 120 Ah, N=23 x 8. The ventilation rate of the exhaust system in place within the Battery Shop was determined to be 711 cfm.

7.0 - CONCLUSION

Bonus Environmental, LLC was contracted by the National Guard Bureau Region North to identify and measure the existence and extent of potentially hazardous operations or conditions at the Cumberland Army National Guard Readiness Center located at 1100 Brown Avenue in Cumberland, Maryland. The purpose of this evaluation was to generate or to update a previous baseline evaluation

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so that employee exposure history can be provided to each civilian and military employee. An industrial hygiene evaluation of the facility was performed by Bonus Environmental, LLC representative Jeff Walworth on May 18, 2010:

Bonus Environmental, LLC recommends that any areas of concerns outlined within this report be evaluated to ensure the necessary actions are made. Following the completion of the industrial hygiene evaluation, Bonus Environmental, LLC found the following safety and/or indoor air quality conditions of the facility to be within acceptable levels/condition in regards to the following:

- Carbon Dioxide
- Carbon Monoxide
- Lead Air Samples
- Water-Damage / Mold Growth
- Ergonomics

- Housekeeping
- Presumed Asbestos Containing Materials
- Temperature
- Relative Humidity

Air sampling was not conducted during this industrial hygiene evaluation for metal welding fumes, as this task was not performed during this industrial hygiene evaluation. It was reported to Bonus Environmental, LLC that welding activities are conducted approximately once per month, with a typical duration of 1-2 minutes. It is recommended that air sampling be performed during the next scheduled industrial hygiene evaluation for metal welding fumes if welding activities are conducted on a larger scale within this facility.

It has been a pleasure to be of assistance to you. Please contact us if you have any questions concerning this report or if we can be of any further assistance in any other environmental or occupational health matter.

Sincerely,



Bonus Environmental, LLC



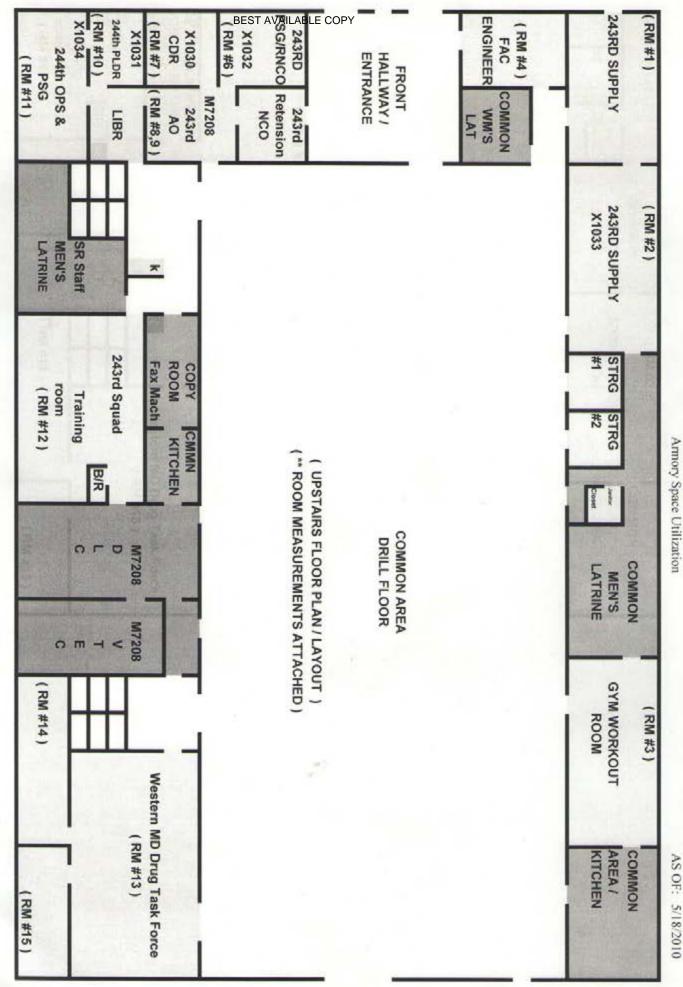
Principal Bonus Environmental, LLC

Cumberland_10_Report.docx

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<u>Appendix A</u>

Shop Diagram



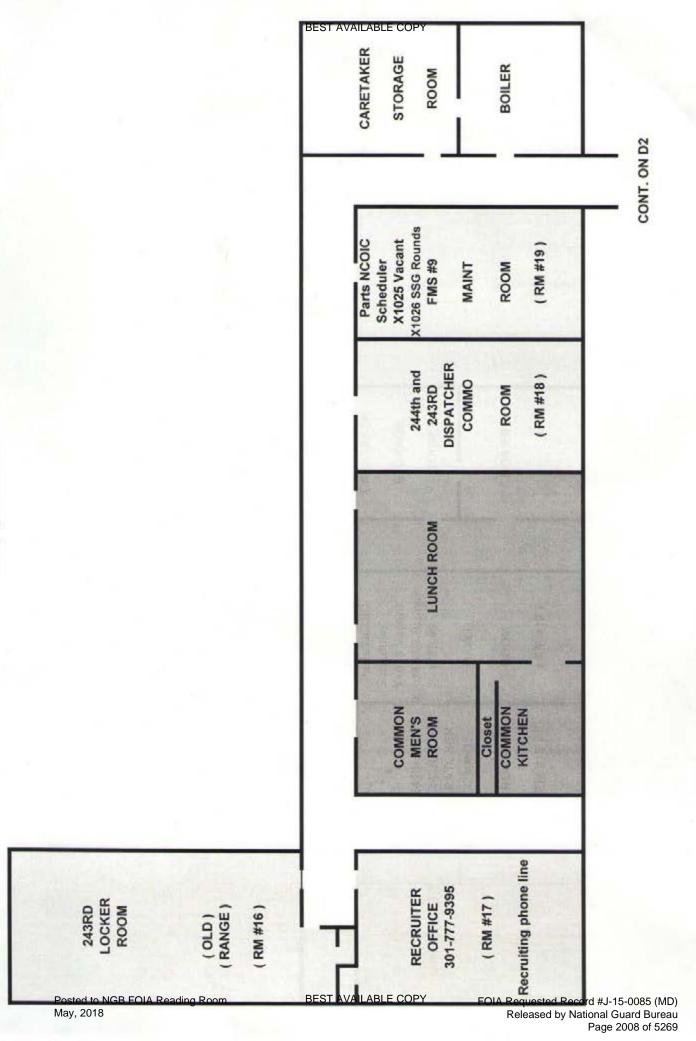
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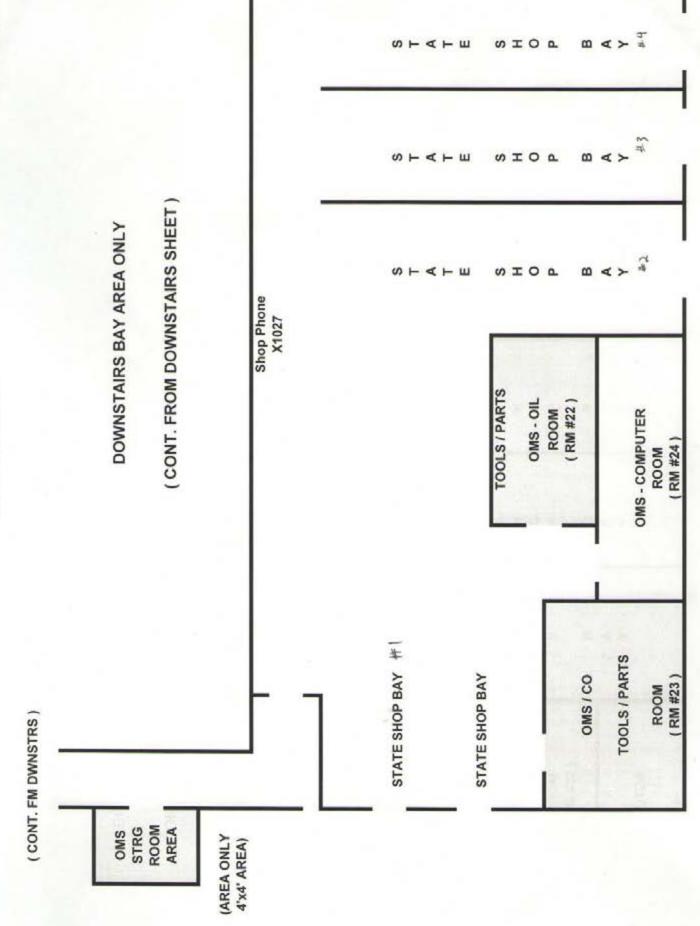
Armory Space Utilization



W V E R

5

Armory Space Utilization



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<u>Appendix B</u>

Lead Sample Results

4475 Forbes Blvd. • Lanham, MD, 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (301) 459-2643 An AlHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

AIHA 2 Environmental Land See ableage and for obtain	100470		07601	Date: 6/1/2010	Page 2 of 2	Comments	1944 - 19							samples	nd soil		(mey and	
			Non-F	Report Date:										lity control	in wine a			K C	11	Edward Ca	
	507190	5/21/2010		5/28/2010		Final Result	<110 no/ft2				<110 ug/ft ²		1800 ug/ft²	I results of qual	only to paint ch					Aanager: G	
0	Chain Of Custody:	Date Submitted:	Person Submitting:	Date Analyzed:	of Atomic Absorption Analysis for Lead	Total ug	<12	<12	<12	<12	<12	<12	200	See QC Summary for analytical results of quality control samples	associated with these sampes. NY ELAP accreditation applies only to paint chin wine and soil	:				Technical	
CERTIFICATE OF ANALYSIS					ı Analysi	Reporting Limit	ug/ft²	u2/ft2	ug/ft²	ug/ft²	ug/ft²	ug/ft²	ug/ft²	See QC S	associated NY ELAP	samples.	-		IM	in the second se	
5					rption	Re	110	110	110	110	110	110	110	118	A-3113B		*	1.1	UX//X	a McGan	
	Cumberland Armory	Cumberland, MD	Cumberland Armory	W912K6-09-A-0003	nic Absoı	Area Wiped (ft ²)	0.111	0.111	0.111	0.111	0.111	0.111	0.111	Water: SM-311	t21; Water: SN ion (nom)					Analyst: Nid	
				F	•	Air Volume (L)	***	****	****	***	****	***	***	3/200(M)-7420;	A 600/R-93/200(M)-7421; Wat	lion (ppb)					
	Job Name:	Job Location:	Job Number:	P.O. Number:	Summary	Sample Type	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	ds: EPA 600/R-9	olids:EPA 600 w weight mg/l	/L = parts per bil	erwise noted.	gits shown			
		Attn: NGB-AVN-SI, ion	and 21078	Non-r	P	Analysis Type S	Flame	Flame	Flame	Flame	Flame	Flame	Flame	aints, and Soil/Soli	ce: Air, Wipes, Paints, and Soil/Solids : El ma/Ka = parts per million (nom) by weinht	icrograms ug	ondition unless oth	. Any additional di g the result.	any blank results	boratory.	
	National Guard Bureau	301-IH Old Bay Lane, Attn: NGB-AVN-SI, State Military Reservation	Havre de Grace, Maryland			Client Sample Number	CL-W-16	CL-W-17	CL-W-18	CL-W-19	CL-W-20	CL-W-21	CL-W-22	Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7420; Water: SM-3111B	ruma	t by weight ug = mi	vere received in good cu	ve two significant digits. dered when interpreting	s are not corrected for s	Analyst: Nida McGarvey Technical Manager: G Edward Carney Conception of the final results for air and wipe samples are based on client Analyst: Nida McGarvey Technical Manager: G Edward Carney Conception of the file of the	
3	Client:	Address:		A #fem#jone		AMA Sample Number	1047885	1047886	1047887	1047888	1047889	1047890	1047891	Analysis Method fo	Anaiysis metnod For N/A = Not Applicable	%Pb = percent lead by weight	Vote: All samples w	Vote: All results hav hould not be consi	vir and Wipe result:	inal results for air upplied information	-

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AMA Analytical Services, Inc.

QC Summary

Sample Delivery Group: 19395

Analysis Type: Sample Type: Analysis Date:

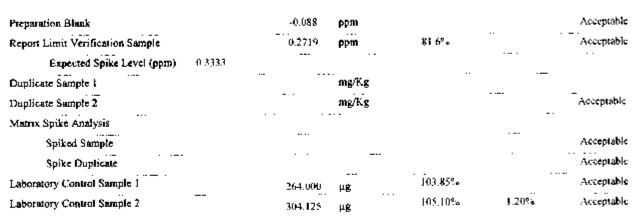
Result

5/28/2010 Percent

Recovery

Flame Wipe

RPD Comment



Calibration Information

Correlation of Calibration Curve:

All calibration verification samples are within acceptance limits.

0 999829

Notes:

Samples included in this Sample Delivery Group (SDG)

Chain Of Custo	dy AMA Sample Number	Client Sample Number	
507190	47870	CL-W-I	
507190	47871	C1W-2	
SDG Number:	19395		 Page 1 of 2

Samples included	in this Sample I	Delivery Group (SDG)
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Chain Of Custody	AMA Sample Number	Client Sample Number
507190	47872	CL-W-3
507190	47873	CL-W-4
\$07190	47874	C1W-5
507190	47875	CL-W-6
507190	47876	C1W+7
507190	47877	CL-W-8
507190	47878	CL-W-9
507190	47879	CL-W-10
507190	47880	CL-W-H
507190	47881	CL-W-12
507190	47882	CL-W-13
507190	47883	CL-W-14
507190	47884	CL+W+15
507190	47885	CL-W-16
\$97190	47886	CL-W-17
507190	47887	CL-W-18
507190	47888	CL-W-19
507190	47889	CL-W-20

SDG Number: 19395

Page 2 of 2

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AMA Analytical Services, Inc.

Focused on Results!!



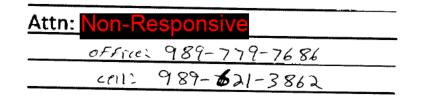
Page:2/5

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 pageons:
 - a. National Guard Subcontracto b. |
 - Non-Responsive CIV NGB: c. A CIV NGB

e bonu.	senvironmental com
@us.army.mil	
.army.mil	

- 3) Hard Copy Reports & Invoices shall be nandled in the following manner:
 - a. Original Invoices and Copies of Reports shall be sent to the National Guard National Guard Bureau Attn: Shirley Chapman/Ken Forsythe 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



- All Pb Wipes shall be handled in the following manner:
 - a. All samples shall be analyzed utilizing FLAA procedures
 - b. Samples whose results are reported as less than the reporting limit, and the reporting limit is greater than 40ug/ft2 shall be re-analyzed utilizing GFAA procedures.
- 5) All other samples Pb Paints, Soils, & Airs, PCM Airs, PLM Bulks, TEM Airs, & TEM Bulks shall be analyzed utilizing standard analytical procedures

Asbestos · Lead · Mold

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2016 of 5269

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2018 of 5269

<u>Appendix C</u>

Photographs



NGB/ Army National Guard – Cumberland Readiness Center Project No. 1061-03

August 4, 2010 Page 14



Building exterior, south entrance



Drill Hall



Boiler Room, west wall, peeling lead based paint

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Building exterior, east side



Boiler Room





NGB/ Army National Guard – Cumberland Readiness Center Project No. 1061-03

August 4, 2010 Page 15

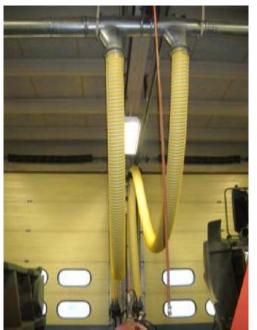


Maintenance Garage, safety board



Battery Shop, exhaust grill on west wall





Maintenance Garage, vehicle exhaust system



Maintenance Garage, flammable storage cabinet

Battery Shop

Bonus Environmental, LLC Work 989 7776 767691A Reading Room May, 2018 P.O. Box 121 BESTAX VAILABLE 76894 *Mt. Pleasant, MI* 48804 FOIA Requested Recold #9-15-0085 (MP) com Released by National Guard Bureau Page 2021 of 5269

<u>Appendix D</u>

References



- 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.
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- 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
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- 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



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 Cumberland Readiness Center

Prepared For:	National Guard Bureau Region North IH 301-IH Old Bay Lane Havre de Grace, MD 21078
Survey Location:	Cumberland Readiness Center 1100 Brown Avenue Cumberland, MD 21502
Prepared By:	Compliance Management International, Inc. 1215 Manor Drive Suite 205 Mechanicsburg, PA 17055
Survey Date:	June 4, 2013

Report Date: July 2, 2013



Non-Responsive Senior Industrial Hygienist

Table of Contents

Section 1.0 Executive Summary
Section 2.0 Operation Description & Observations
Section 3.0 Lead Testing
Section 4.0 Lighting
Section 5.0 Indoor Air Quality
Section 6.0 Suspect Asbestos Containing Building Materials
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Section 8.0 Limitations
Appendix A. Laboratory Analysis Report
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Appendix D. References

Section 1.0 Executive Summary

An industrial hygiene survey was conducted on June 4, 2013, at the Cumberland Readiness Center located at 1100 Brown Avenue, Cumberland, MD 21502. The survey was performed by Mr. Non-Responsive.

- 1. Lead surface, bulk, and air samples were collected. Surface levels of lead were below 200 micrograms per square foot (ug/ft²) in all locations sampled. See Section 3.0 for detailed sampling results.
- 2. Lighting levels did not meet the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) recommended guideline in two locations. See Section 4.0 for detailed findings.
- 3. Indoor air quality (IAQ) parameters of temperature, relative humidity, carbon monoxide and carbon dioxide (ventilation) were evaluated during the assessment.
 - a. Temperature levels met the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 55-2010 recommended guideline of 68-79 °F in the areas sampled.
 - b. The relative humidity levels met the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG 277 recommended guideline of 30-60% in all occupied areas sampled.
 - c. Carbon monoxide (CO) levels were less than the National Ambient Air Quality Standard (NAAQS) recommended ceiling of 9 ppm.
 - d. Carbon dioxide (CO_2) levels met the ASHRAE 62.1-2010 recommended guidelines for mechanically ventilated office buildings and commercial settings.
- 4. Several areas have suspect asbestos containing material (ACM) floor tiles. Black floor tile mastic was sampled and found to contain 3% chrysotile asbestos. See Section 6.0 for detailed findings.

Section 2.0 Operation Description & Observations

The Cumberland Readiness Center is mainly an administrative facility with a drill hall, offices, distance learning center, and a converted firing range area (currently wall locker storage room). There were approximately 2 full-time employees stationed at this facility at the time of this survey. It was reported that in 2009 a new roof and gas to hot water heating system were installed. There is an FMS facility at this location.

The building is reported to have been built in 1960. It is a two-story structure. The exterior is brick. The interior walls are concrete block, plaster, and paneling with drywall in some of the offices. The floors are concrete, carpet, 9"X9" and 12"X12" floor tiles.

The heating system consists of a gas-fired hot water generating unit. There is no central A/C system; some portable A/C units are present in the facility.

There is no child-care facility in the building.

No ergonomic concerns were reported. Office areas have computer work stations. Work stations appeared to be properly designed. Personnel had supportive chairs.

This facility has a converted firing range that is now used to store wall lockers.

It was reported that the new heating system (2009) dose not have thermostat controls on one side of the building, the distant learning center side of the building, which is causing temperature extremes in the facility.

This facility has some areas of localized damaged and missing 9"X9" asbestos floor tile, < 10% of the total floor tile. The areas of missing floor tiles have exposed black mastic.

House keeping practices were good.

Section 3.0 Lead Testing

Various surfaces within the facility were screened for lead using surface/wipe samples. Surface/wipe samples were collected in accordance with the American Society for Testing and Materials (ASTM) E 1792 protocols. Air samples were collected using 0.8 um mixed cellulose ester (MCE) filter cassettes attached to low volume air sampling pumps. Blank samples were submitted to the laboratory for quality control purposes. Samples were sent to AMA Analytical Services, Inc., in Lanham, Maryland, for lead analysis using Environmental Protection Agency (EPA) Method 600/R-93/200 (M)-7420. A copy of the laboratory analysis report can be found in Appendix A.

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 Pepsi Machine	*	<110
5	Drill Hall – Top of Table	*	<110
6	Kitchen – Top of Refrigerator	*	<110
7	Kitchen – Top of Toaster Oven	*	<110
8	Converted Firing Range/Wall Locker Storage – Floor	*	<110
9	Converted Firing Range/Wall Locker Storage – Top of Wall Locker	*	<110
10	Hallway – Floor outside of Converted Firing Range/Wall Locker Storage	*	<110
11	Room 5 Lounge – Top of Bar	*	<110
12	Basement Hallway – Top of Heating Radiator	*	<110
13	Room 14 Office – Top of Desk	*	<110
14	Distant Learning Center – Top of TV	*	<110
15	Room 11 – Office Top of Book Shelf	*	<110
16	Room 2 243 rd Supply – Top of File Cabinet	*	<110
17	Blank - Wipe	*	<12
18	Blank - Air	<3	*
-	Criteria	50	200

Lead Testing Results Summary

Table Notes:

- 1. **Bolded** results exceed listed criteria
- 2. **ppm** = parts per million
- 3. ug/ft^2 = micrograms per square foot
- 4. ug/m^3 = micrograms per cubic meter
- 5. **ug** = micrograms

Sources:

1. NG PAM 420-15 Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges

2. OSHA 29CFR1910.1025 Lead Standard

The National Guard Bureau currently utilizes 200 micrograms per square foot (ug/ft^2) as a benchmark for identifying lead-contaminated surfaces. This guideline is referenced in NG PAM 420-15 "Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges" as a satisfactory surface contamination level unless the facility is utilized as a childcare facility. In such cases, U.S. Department of Housing and Urban Development (HUD) limit of 40 ug/ft² on floors and 250 ug/ft² on windowsills should be observed. There is no child care provided at this facility.

Lead surface and air samples were collected. The following is a summary of the sample results from this survey.

- Surface levels of lead were below the recommended guideline of 200 ug/ft² in all of the locations sampled
- Air samples for lead were below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit of 50 micrograms per cubic meter (ug/m³).
- No Chipping or Peeling paint was observed at the time of the inspection.

Section 4.0 Lighting

A lighting assessment was conducted throughout the facility. Measurements were collected using a Cooke Cal-Light 400 Precision Light Meter (Serial No. 98011EL). The light meter was last calibrated in November 2012. Measurements collected were compared to ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

Location	Foot Candles (FC)	Recommended Lighting (FC)	Sufficient Lighting
Drill Hall	23.8	10	Yes
Kitchen	24.4	50	No
Gym	40.4	30	Yes
Men's Bathroom	28.6	5	Yes
Room 2 243 rd Supply	80.5	30	Yes
Room 1 243 rd Supply	20.2	30	No
Room 8/9 Office	72.7	30-50	Yes
Room 10 Office	36.6	30-50	Yes
Room 11 Office	35.7	30-50	Yes
Copy Room	25.1	10	Yes
Distant Learning Center	84.1	50	Yes
Room 14 Office	66.3	30-50	Yes
Lounge	31.9	10	Yes
Converted Firing Range/Wall			Yes
Locker Storage	61.3	30	

Light Survey Assessment Summary

Table Notes:

1. FC = Foot Candles

2. Bolded results did not meet listed criteria

Source: ANSI/IESNA RP-7-01 Lighting Industrial Facilities and RP-1-04 Office Lighting.

The lighting level did not meet the minimum recommended guideline in the kitchen, and room one. 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 measureme	nts collected.
--	----------------

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)
Room 14 Office	70.0	55.8	553	0.0
Distant Learning Center	73.3	41.4	393	0.0
Room 2 243 rd Supply	73.2	42.0	378	0.0
Outdoors	67.0	35.1	352	0.0
Criteria	68-79	30-60	<1,052	<9

IAQ Assessment Summary

Table Notes:

- 1. **Bolded** results exceed listed criteria
- 2. **ppm** = parts per million
- 3. (%) = percent relative humidity
- 4. $^{\circ}\mathbf{F} = \text{degrees Fahrenheit}$

Sources: The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) 55-2010, 62.1-2010, Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) & The US Army Technical Guide 277 Army Facilities Management Information Document on Mold Remediation.

Summary of findings and recommendations:

- Temperature measurements met the recommended 68-79°F in all occupied areas.
- Relative humidity levels met the recommended guidelines in all sampled areas. Relative humidity should be maintained at 30-60%.
- Carbon dioxide levels were measured to evaluate building ventilation or the introduction or outdoor air into the building. The recommended ceiling is obtained by adding 700 ppm to the measured outdoor carbon dioxide level for this survey. For this survey, carbon dioxide levels did not exceed the recommended ceiling of 1,052 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:
 - It was reported that the new heating system (2009) dose not have thermostat controls on one side of the building, the distant learning center side of the building, which is causing temperature extremes in 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 9"X9" floor tiles in most rooms green, black, and red.
- 2. The following areas have localized <10% of the total floor tile present, damaged or missing floors tiles exposing the black mastic, and should be repaired:
 - Room 12 approximately 10 missing tiles
 - Room 2 243rd supply approximately 45 missing tiles

A bulk sample was collected from room 12 of the black mastic where the 9"X9" floor tiles are missing. The laboratory results showed that the mastic contained 3% chrysotile asbestos.

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	6/4/13	2.5 LPM
SKC Air Sampling Pump	648349	6/4/13	2.5 LPM

Section 8.0 Limitations

This report summarizes our evaluation of the conditions observed at the above referenced location. Our findings are based upon our observations and sampling results obtained at the facility at the time of our visit. The report, results, and subsequent recommendations reported herein are also limited to the information available at the time it was prepared and investigated. Conditions may have been in effect prior to the sampling events that have changed over time and which cannot be predicted within the scope of this limited investigation. Any conditions discovered which deviate from the data contained in this report should be presented to us for our evaluation.

This report is intended for the exclusive use of the client. This report and the findings herein shall not, in whole or in part, be relied upon by any other parties, disseminated or conveyed to any other party without prior written consent of the National Guard Bureau, and Compliance Management International, Inc. The findings are relative to the dates of our site visits and should not be relied upon for substantially later dates.

Appendix A. Laboratory Analysis Report

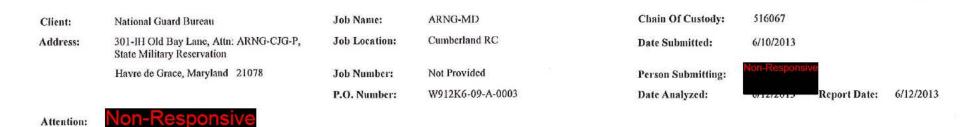
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CERTIFICATE OF ANALYSIS

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISOBIC O 17025 2005 www.alhancedtedtable.org



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)	12 (P. 17)	oorting Jimit	Total ug	Final Res	ult	Comments
13068537	1	Flame	Air	450	N/A	6.7	ug/m³	<3	<6.7	ug/m³	
13068538	2	Flame	Air	450	N/A	6.7	ug/m³	<3	<6.7	ug/m³	
13068539	3	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13068540	4	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13068541	5	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13068542	6	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13068543	7	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13068544	8	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13068545	9	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13068546	10	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13068547	11	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13068548	12	Flame	Wipe	****	0.108	110	ug/fl²	<12	<110	ug/fl²	
13068549	13	Flame	Wipe	****	0.108	110	ug/fl²	<12	<110	ug/ft²	
13068550	14	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/fl²	
13068551	15	Flame	Wipe	****	0.108	110	ug/ft²	<12	<110	ug/ft²	
13068552	16	Flame	Wipe	****	0.108	110	ug/fl²	<12	<110	ug/ft²	
13068553	17	Flame	Wipe Blank	****	N/A	12	ug		<12	ug	
13068554	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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CERTIFICATE OF ANALYSIS

Client: National Guard Bureau Job Name: ARNG-MD Chain Of Custody: 516067 Address: 301-IH Old Bay Lane, Attn: ARNG-CJG-P. Job Location: Cumberland RC Date Submitted: 6/10/2013 State Military Reservation Havre de Grace, Maryland 21078 Job Number: Not Provided **Person Submitting:** P.O. Number: W912K6-09-A-0003 Date Analyzed: 6/12/2013 Report Date: 6/12/2013 Attention:

Summary of Atomic Absorption Analysis for Lead

Page 2 of 2

AIHA LAP, LLC ACCREDITED LABORATOR

INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedtaba.org LAB #100470

AMA Sample Number	Client Sample Number	Analysis Type	Sample Type	Air Volume (L)	Area Wiped (ft²)	Reporting Limit	Total ug	Final Result	Comments
Analysis Method F N/A = Not Applical	or Flame: Air, Wipes, or Furnace: Air, Wip ole mg/Kg = par d on a dry weight bas	es, Paints, and So ts per million (ppn	il/Solids:EPA 6 i) on a dry weight	00/R-93/200(M)-	7010; Water: SM-3 parts per million (p	113B associ	ated with these	alytical results of	quality control samples
	were received in good		~		(PP-7)				
Note: All results ha	ave two significant dig sidered when interpret	its. Any additiona							
ir and Wipe resul	ts are not corrected for	or any blank result	S						0 0
inal results for air	and wipe samples ar	e based on client			\leq	\mathbf{C}			\mathcal{D}
	e considered prelimin ned by the Technical I				Analyst: Suphi	n Chinnapad	Tee	hnical Manager:	G Edward Carpor

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) NY1 4475 Forbes Blvd. • Lanham, MD 20706 (301) 459-2640 • (800) 346-0961 • Fax (301)		CHAIN	OF (CUSTOE	PΥ		lease Refer To This umber For Inquires)	516	067 sel.tr
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BEST AVAILABLE COPY 150202 210 REV. 6.08 OWI (410) 247-2024 514007 prove 2012 AMA Analutical Services, Inc. (Please Refer To This Focused on Results www.amalab.com Number For Inquires) CHAIN OF CUSTODY AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920) 4475 Forbes Blvd. . Lanham, MD 20706 (301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643 Submittal Information: Mailing/Billing Information: ARNG MO 1 STADNERS 1. Client Name: National Guard Bureau Curherland nc_ 2. (Joh Location) 2. Address 1: ____ 301-IH Old Bay Lane__ P.O. #: W912K6-09-A-0003 3. Job #: 3. Address 2: ____Attn: NGB-ARS-IHNE_ @ p**h** 0273 4. Contact Pers 4. Address 3: Havre de Grace, Maryland 21078 5. Stillinted b lature 5. Phone #: (410) 942-0273 Fax #: (410) 942-0254 Reporting Information (Results will be provided as soon as technically feasible): (NORMAL BUSINESSHOURS) REPORT TO: AFTER HOURS (must be pre-scheduled) D Include COC/Field Data Sheets with Report Q Immediate C 3 Day Results Required By Noon Dimmediate Date Due:_____ K) (B) 5 Day + (EveryAttempt Will Be on-Responsive D Next Day 24 Hours Time Due: Pus.armv.mil CI Fa Made to Accomodate) 🖸 2 Day Date Due: Comments: Q Ve ous.army.mil Metals Analysis Aspestos Analysis TEM Bulk D Pb Paint Chip _____(QTY) ELAP 198.4/Chatfield PCM Air - Please Indicate Filter Type: _(QTY) D Pb Dust Wipe (wipe type (OTY) UNIOSH 7400_____(QTY) ONY State PLM/TEM _(QTY) D Pb Air____(QTY) C Fiberglass (QTY) TEM Air - Please Indicate Filter Type:(QTY) (OTY) Q Residual Ash D Pb Soil/Solid (OTY) TEM Dust □ Pb TCLP_____ (OTY) DAHERA (QTY) Qual. (pres/abs) Vacuum/Dust_____(QTY) Drinking Water D Pb____(QTY) Cu____(QTY) As____(QTY) C NIOSH 7402 ___(QTY) Quan. (s/area) Vacuum D5755-95 _____ (QTY) □ Waste Water □ Pb____(QTY) □ Cu____(QTY) □ As____(QTY) (OTY) Other (specify_____ Quan. (s/area)Dust D6480-99_____ (OTY) D Pb Furnace (Media _____) (QTY) PLM Bulk TEM Water EPA 600 - Visual Estimate Fungal Analysis (OTY)(OTY) Oual (pres/abs)____ Collection Apparatus for Spore Traps/Air Samples:____ EPA Point Count____(QTY) (QTY) CI ELAP 198.2/BPA 100.2____ ____(QTY) INY State Friable 198.1 ____ Collection Media_ CI EPA 100.1 (OTY) Grav. Reduction ELAP 198.6_ ... (OTY) Spore-Trap (QTY) Surface Vacuum Dust (QTY) C All samples received in good condition unless otherwise noted. Other (specify_____ $_{(QTY)}$ Surface Swab (QTY) Culturable ID Genus (Media (QTY) Surface Tape_____ (QTY) Culturable ID Species (Media____)_ MISC (TEM Water samples _____ °C) Q Vermiculite Other (Specify_____)___(OTY) C Asbestos Soil PLM_(Quil) PLM_(Quin) PLM/TEM_(Quin) PLM/TEM_(Quin) CLIENT CONTACT NOLD (SAMPHEAN LORMATION VOLUME WIPE 200 Ĕ SAMPLE LOCATION CLIENT ID (LABORATORY STAFF ONLY) (LITERS) AREA **IDENTIFICATION** DATE NUMBER × Date/Time: 100 CAN Contact: By:··· 69 13 Room 14 Dusk К. ĸ He Leasure Condit. TV × × 15 C. W. Book Shelf K, X Borry Do Hle Cohint Date/Time: By: × 1 Contact: \mathcal{O} FT RIA-K 5 the × X O15 RIANS. × An Fime Hale 19 Rully Ashmaster: Biper . . . Date/Time: Contact: By: Sign: 🧷 _By (Print): ____ 1. Date/Time RCVD: ____/ ____@____ _Via:____ ______ Sign: ____ PLANOBYOIA Reading Roomalyzed: _____/ @_____BESTAVAILABLE COPY___ FOIA Requested Record 5 0085 (MD) MAKA BO18NLY: Time: Released by National Guard Bureau Date: . 3. Results Reported To:_ Page 2041 of 5269 (CUSTODY)

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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 or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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D Pb Dust Wipe (wipe type.

Drinking Water Pb_

Waste Water D Pb_

D Pb Furnace (Media _

Collection Media.

Q Surface Tape_____

□ Spore-Trap_

Q Surface Swab_

(QTY)

Collection Apparatus for Spore Traps/Air Samples:.

(QTY)

_(QTY)

(QTY)

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_(QTY) Cu____(QTY) CAs__

Surface Vacuum Dust

Culturable ID Species (Media_

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D Pb Air_

Fungal Analysis

D Pb TCLP_

D Pb Soil/Solid

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AMA Analytical Services, Inc. Focused on Results www.amalab.com AIHA (#100470) NVLAP (#101143-0) NV 4475 Forbes Blvd. • Lanham, MD 20706 (301) 459-2640 • (800) 346-0961 • Fax (30	n Y ELAP (10920)	CHAI	N OF CUSTODY	(Please Refer To This Number For Inquires)	5
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All samples received in good condition unless otherwise noted.

ONY State PLM/TEM

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Quan. (s/area)Dust D6480-99_

(TEM Water samples _____ °C)

Quan. (s/area) Vacuum D5755-95 ____

C Residual Ash_

Qual. (pres/abs)_

D EPA 100.1_

C ELAP 198.2/EPA 100.2_

TEM Dust

TEM Water

PCM Air – Please Indicate Filter Type:	
Q NIOSH 7400(QTY)	
G Fiberglass (QTY)	
TEM Air - Please Indicate Filter Type:	
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NIOSH 7402 (QTY)	
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	EPA 600 – Visual Estimate	13	_(QTY)
	EPA Point Count	_(QTY)	
	NY State Friable 198.1	(Q	TY)
	Grav. Reduction ELAP 198.6		_(QTY)
	Other (specify)	(QTY)
MIS	SC		

Q Vermiculite

CLIENT ID NUMBER	SAMPLE INFORMATI SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	No.	PLAN	EAD	MOLD	AR	BUL	Sing	ATRI	and and	TAPE	SWAL	(LABO	RATORY STAFF ON	LY)
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Appendix B. Photographs



Exterior of facility



Drill Hall

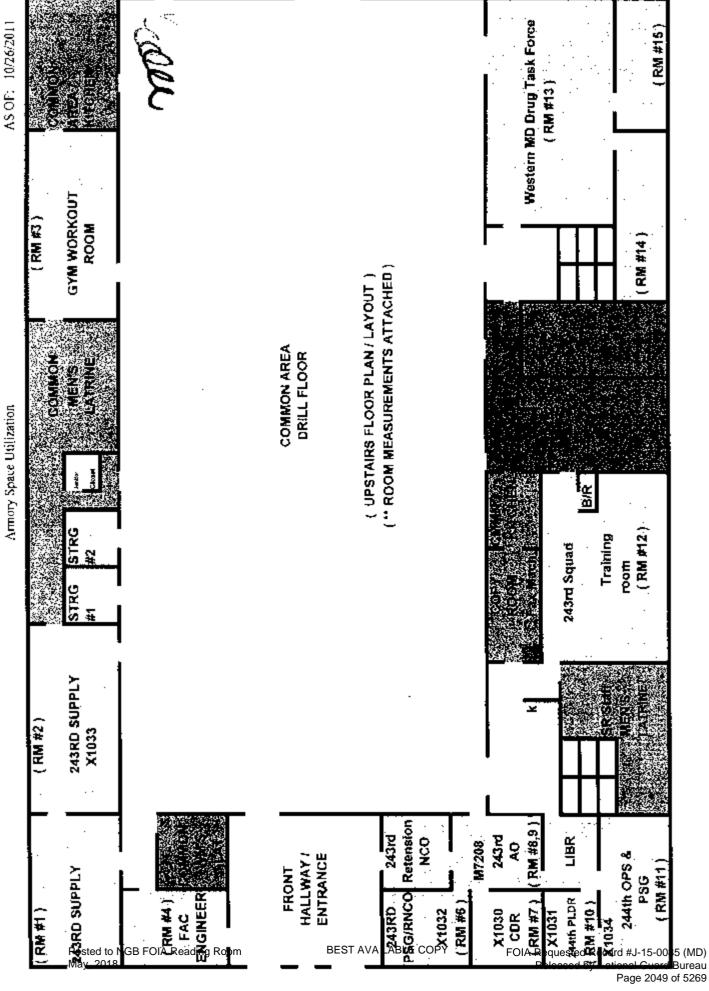


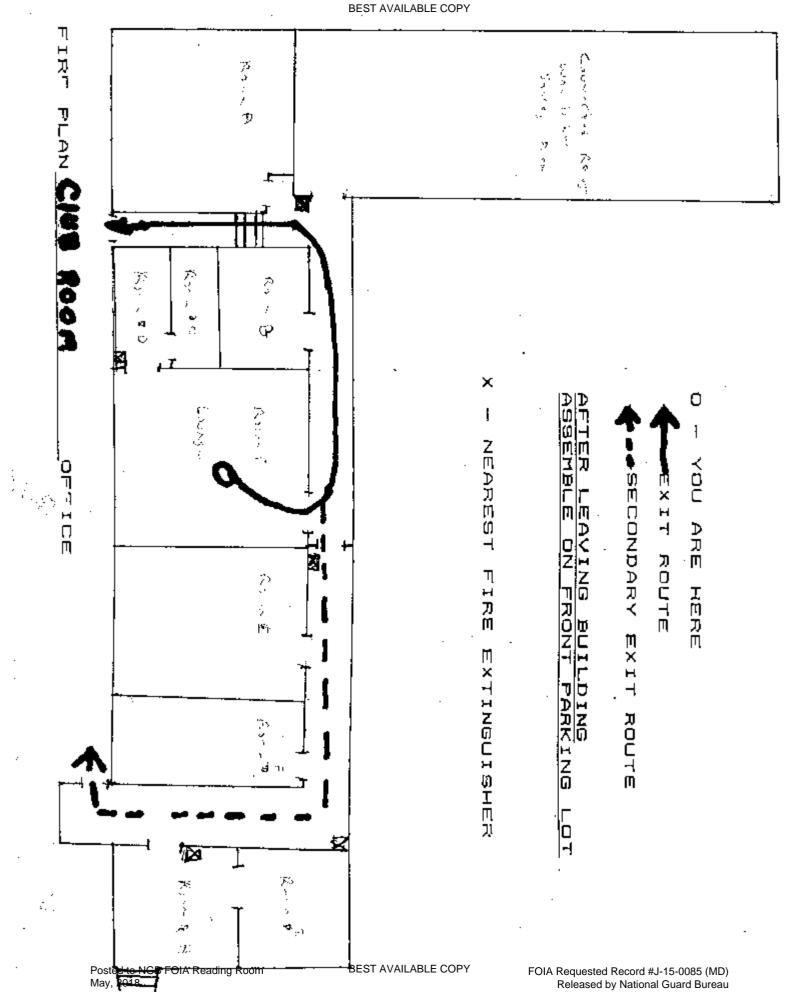
Converted firing range/wall locker storage area



One of two locations of missing 9"X9" floor tile exposing black mastic, this location is room 2, 243rd supply room, the other location is room 12

Appendix C. Floor Plan





7

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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.



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. Non-Responsive), Army National Guard Bureau, 301-IH Old Bay Lane, Havre de Grace, MD 21078

SUBJECT: Maryland Army National Guard Facilities Industrial Hygiene Baseline Surveys, SGM Jerome Maynard Grollman Armory, Dundalk, MD, Project No. 55-ML-01ED-03/05

1. Enclosed is the final copy of the subject report and two CD-ROMs.

2. The project number for this service reflects the current fiscal year of dispatch and the actual field work which was completed for fiscal year 2003. The State of Maryland Army National Guard occupational health nurse was immediately notified in writing of findings necessitating immediate corrective action in Maryland armories. In addition, the National Guard Bureau Region North Industrial Hygiene Office has been notified of all the results of lead in dust sampling conducted in all facilities. Draft reports were reviewed by you or other members of the National Guard and members of this Center, including our editorial staff, during drafting stages in report preparation leading up to the final report.

3. Our point of contact is Ms. Non-Responsive at commercial 410-436-5475/3118, DSN 584-5475/3118, or electronic mail: Non-Responsive @us.army.mil

FOR THE COMMANDER:

Non-Responsive

Encl

Director, Occupational Health Sciences

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FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2052 of 5269



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 DUNDALK ARMORY DUNDALK, MD PROJECT NO. 55-ML-01ED-03/05 23 JULY 2003

1. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard facilities to identify and measure the existence and extent of potentially hazardous operations or conditions at these facilities. The survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee.

2. FINDINGS.

a. <u>Lead</u>. Lead levels in dust exceeded the recommended limit in several areas of the building. Higher results in the former indoor firing range (IFR) indicate that it was not properly decontaminated when it was converted to a storage area. Personnel working in the former IFR are exposed to lead on stored materials and track lead into other areas of the armory and into their own vehicles and homes. Lead-contaminated paint has begun to deteriorate and will continue to do so unless it is stabilized. Falling paint is likely to contribute to the levels of lead in dust. Lead in dust sample results from several areas in the armory greatly exceeded the regulatory limits for children under 6 years of age. 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 these limits before allowing children to continue to use it.

- b. Asbestos. All known asbestos in the armory has been abated.
- c. Lighting. All areas were judged to be adequately lit except for Room 102 A.

3. RECOMMENDATIONS.

a. <u>Lead</u>. The Risk Assessment Codes (RACs) for health hazards due to lead exposure were assessed as 3 for adult exposure and 2 for child exposure. To minimize exposure to lead develop and implement a written Lead Hazard Management Plan for Dundalk Armory. Ensure that the armory is in compliance with the Occupational Safety and Health Administration (OSHA) general industry lead standard, Title 29 Code of Federal Regulations (CFR) Part 1910.1025, and the OSHA Lead in Construction Standard, Title 29 CFR Part 1926.62. Address all potential lead

Readiness thru Health



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EXSUM, MDARNG IH Baseline Surveys, Dundalk, Maryland, Project No. 55-ML-01ED-03/05

hazards before continuing to extend the use of this facility to children. If children will continue to use this facility, clean surfaces to the Environmental Protection Agency and State of Maryland lead in dust standards. Discontinue events and advertising until cleanup is completed. Clean all areas where sampling results showed elevated levels of lead. At a minimum, if only adults use this facility, clean to the recommended safe levels for adults. Follow the comprehensive guidelines for cleaning in Appendix E. Follow the decontamination requirements for the IFR in the Addendum to National Guard Bureau All States Letter P01-0075. Consult with the Maryland Armory Environmental Coordinator concerning disposal requirements after cleanup. Stabilize the deteriorated paint on the walls. 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.

b. <u>Lighting</u>. The RAC for health hazards associated with inadequate illumination was assessed as 5. Increase lighting levels in Room 102 A to 28-46 foot candles to conform to the Illuminating Engineering Society of North America guidelines.



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 DUNDALK ARMORY DUNDALK, MD PROJECT NO. 55-ML-01ED-03/05 23 JULY 2003

1. REFERENCES. See Appendix A.

2. PURPOSE OF EVALUATION. To conduct surveys at Maryland Army National Guard facilities to identify and measure the existence and extent of potentially hazardous operations or conditions. The survey will serve to establish a baseline so that an occupational exposure history can be compiled for each civilian or military employee.

3. AUTHORITY. Fax, National Guard Bureau (NGB) Region North Industrial Hygiene Office. (NGB-AVS-SI-IH/Ms. Non-Responsive), 28 February 2003, subject: SAB

4. BACKGROUND INFORMATION.

a. <u>Armory Mission</u>. Light infantry battalion.

b. <u>Facility Use by Children</u>. The point of contact stated that the armory periodically sponsors family support group activities and meals. The Maryland Military Department is currently advertising Dundalk Armory as available for rental for activities that include young children.

5. FACILITY EVALUATION.

a. <u>Sampling Locations and Results</u>. Samples were collected for lead in air, on surfaces (wipe samples), and in bulk paint to determine the presence of lead hazards. Sample locations are shown in Appendix B.

b. Physical Condition of Facility.

(1) General. There was deteriorated paint throughout the armory. Otherwise, the facility appeared to be in good physical condition. No mold or moisture source capable of supporting mold was observed.

Readiness thru Health



FOIA Requested Record #J-15-0085 (MD) Released by National Guard Bureau Page 2055 of 5269

(2) Asbestos. At the time of the survey, the building was under contract to have all asbestos floor tiles replaced and to have the asbestos insulation on pipes removed. The building manager, MAJ Non-Responsive, stated on 22 March 2005 that all known asbestos has been removed.

(3) Safety Hazards. Personnel conducting the survey reported that furniture and other equipment on the drill hall floor posed a potential tripping hazard. MAJ Non-Responsive stated on 22 March 2005 that all equipment had been removed from the drill hall.

c. <u>Safety and Industrial Hygiene Programs</u>. There were no written records for Safety or Industrial Hygiene programs, nor was there any documentation of program elements.

d. <u>Heating, Ventilation, and Air Conditioning Systems</u>. The building was centrally heated by steam baseboard radiators. Some areas of the building had central air conditioning, but most areas had window air conditioning units.

e. <u>Lighting</u>. All areas of the armory were judged to be adequately lit except for Room 102A, where lighting levels of 17-20 foot candles were measured.

f. <u>Converted Indoor Firing Range (IFR)</u>. The IFR had been converted to a storage area.

g. Photographs. See Appendix C.

h. Survey Date. 23 July 2003.

6. ASSESSMENT CRITERIA FOR LEAD. See Appendix D for details.

a. <u>Lead in Air.</u> The army occupational exposure limit for lead in air is the Occupational Safety and Health Administration (OSHA) 8-hour time-weighted average Permissible Exposure Limit of 50 micrograms of lead per cubic meter (μ g/m³) of air.

b. <u>Lead in Dust.</u> The Environmental Protection Agency (EPA) and State of Maryland limits for lead in dust are 40 micrograms per square foot $(\mu g/ft^2)$ on floors, 250 $\mu g/ft^2$ on window sills, and 400 $\mu g/ft^2$ in window troughs. These limits apply to pre-1978 army facilities only if children under 6 years of age occupy them for 60 or more hours per year. The NGB Region North concurs with the U.S. Army Center for Health Promotion and Preventive Medicine-recommended safe limit of 200 $\mu g/ft^2$ on floors and frequently-contacted surfaces.

c. <u>Lead in Paint</u>. Paint containing lead levels of 0.5% or more by weight in dried solid (also reported as 5000 milligrams per kilogram) is considered to be lead based paint according to both Federal and Maryland State Regulations. Paint containing lead levels of more than 0.7 milligrams per square centimeter is considered to be lead based paint according to Maryland

State Regulations. In AR 420-70, Buildings and Structures, lead-contaminated paint is defined as any paint containing detectable amounts of lead. The army considers lead-contaminated paint to be potentially hazardous to children if it is disturbed or deteriorating.

d. <u>Lead Carcinogenicity</u>. The Department of Health and Human Services National Toxicology Program (NTP) released the Report on Carcinogens, Eleventh Edition in February 2005. The NTP report lists "lead and lead compounds" as "reasonably anticipated to be human carcinogens".

7. SAMPLING RESULTS FOR LEAD. See Appendix B.

a. <u>Lead in Air</u>. All air sample results were below the laboratory reporting limits for lead in air of $5.8-5.9 \ \mu g/m^3$ and were therefore far below the army exposure limit.

b. <u>Bulk Paint Samples</u>. The two bulk samples of deteriorated paint had detectable levels of lead and were therefore lead-contaminated paint.

c. <u>Lead in Dust</u>. Four of the10 surface wipe results were above the recommended adult exposure limit. The highest measured result was 47,000 μ g/ft² on the floor of the former IFR in the bullet trap area (photo #1355). A level of 973 μ g/ft² was found on a baffle suspended from the ceiling in the former IFR (photos #1356-1358). Levels of 518 μ g/ft² and 344 μ g/ft² were found on the operations office window sill (photo #1364) and on a work table in the exercise area in the garage (photo #1360) respectively.

d. <u>Child Exposure to Lead in Dust</u>. Five of the 10 surface lead wipe results were above the EPA and State of Maryland exposure limits for children under the age of six.

8. DISCUSSION AND CONCLUSIONS.

a. Lead Exposure.

(1) Adults. No significant airborne exposures were measured. Lead levels in dust exceeded the recommended limit in several areas of the building. Higher results in the former IFR indicate that it was not properly decontaminated when it was converted to a storage area. Personnel working in the former IFR are exposed to lead on stored materials and track lead into other areas of the armory and into their own vehicles and homes. Lead-contaminated paint has begun to deteriorate and will continue to do so unless it is stabilized. Falling paint is likely to contribute to the levels of lead in dust. At a minimum, the former IFR should be properly decontaminated in accordance with NGB guidance, other rooms with excessive levels should be cleaned using appropriate techniques, and all deteriorated paint surfaces should be stabilized. In the meantime, personnel working in the former IFR should wear disposable garments to prevent them from tracking lead out, and this room should be locked and posted for access in

emergencies only. Compliance with OSHA lead regulations is required to protect personnel working in areas with elevated lead levels or repairing deteriorated lead-contaminated paint. A written Lead Hazard Management Plan should be developed and implemented to properly manage lead hazards and their sources until they are eliminated.

(2) Children. Lead in dust results from several areas in the armory greatly exceeded the regulatory limits for children under 6 years of age, and the two samples of deteriorated paint were found to be 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 these limits before allowing children to continue to use it.

b. <u>Lighting</u>. Lighting levels in Room 102 A should be increased to 28-46 foot candles to conform to the Illuminating Engineering Society of North America standard.

9. RECOMMENDATIONS.

The Department of Defense Instruction 6055.1 provides a method for assigning Risk Assessment Codes (RACs) to health hazards that are based on the magnitude of exposures to physical, chemical, and biological agents and the possible medical effects. A RAC is an expression of the risk associated with a hazard that combines the hazard severity and accident probability into a single numeral. The RACs enable one to prioritize hazards. They range in magnitude from 1 to 5, with 1 being the highest priority.

a. Lead Exposure for Adults. RAC 3. Lead Exposure for Children. RAC 2.

(1) Develop and implement a written Lead Hazard Management Plan for Dundalk Armory. Ensure that the armory is in compliance with the Occupational Safety and Health Administration (OSHA) general industry lead standard, Title 29 Code of Federal Regulations, Parts1910.1025, and the OSHA Lead in Construction Standard, Title 29 CFR Part 1926.62.

(2) Address all potential lead hazards before continuing to extend the use of this facility to children. If children will continue to use this facility, clean surfaces to the EPA and State of Maryland lead in dust standards of $40 \mu g/ft^2$ on floors and $250 \mu g/ft^2$ on window sills. Discontinue advertising and hosting events that include children until cleanup is completed.

(3) Clean all areas where sampling results showed elevated levels of lead. At a minimum, if only adults use this facility, clean to the recommended safe levels for adults. Follow the comprehensive guidelines for cleaning in Appendix E. Follow the decontamination

requirements for the IFR provided in the Addendum to NGB All States Letter P01-0075. Consult with the Maryland Armory Environmental Coordinator concerning disposal requirements after cleanup.

(4) Stabilize the deteriorated paint on the walls.

(5) 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.

b. Lighting. RAC 5. Increase lighting levels in Room 102A to 28-46 foot candles.

10. SITE MAP. See Appendix F.

11. MOLD GUIDANCE. There was no visible mold present at the time of the survey. If mold occurs in the future, refer to the mold guidance in Appendix G.

12. ADDITIONAL ASSISTANCE. For additional assistance or questions concerning this report, please contact the undersigned at DSN 584-5475/3118, commercial (410) 436-5475/3118, or electronic mail: Non-Responsive @us.army.mil

Non-Responsive

Industrial Hygienist USACHPPM Lead and Asbestos Team Leader Industrial Hygiene Field Services Program

APPROVED:



Technical Manager Industrial Hygiene Field Services Program

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APPENDIX A

REFERENCES

A-1

APPENDIX A

REFERENCES

1. Title 29, Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Administration, current edition. http://www.osha.gov/comp-links.html

2. Department of Defense Instruction (DODI) 6055.1, Department of Defense Occupational Safety and Health (OSH) Program, August 19, 1998. http://www.dtic.mil/whs/directives/corres/pdf/i60551_081998/i60551p.pdf

3. AR 40-5, Medical Service, Preventive Medicine, 15 October 1990. http://www.usapa.army.mil/pdffiles/r40_5.pdf

4. AR 385-10, The Army Safety Program, 29 February 2000. http://www.usapa.army.mil/pdffiles/r385_10.pdf

5. DA PAM 40-503, Medical Services, Industrial Hygiene Program, 30 October 2000. http://www.usapa.army.mil/pdffiles/p40_503.pdf

6. American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs), ACGIH Cincinnati, OH, 2005. http://www.acgih.org/TLV/

7. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) 62-2002, Ventilation for Acceptable Indoor Air Quality.

8. Illuminating Engineering (February 1, 1993) RP-1-1993, American National Standard Practice for Office Lighting, ANSI/IES RP-1-1993.

9. USACHPPM Interim Report No. 39-EJ-1157-99, Derivation of Wipe Surface Screening Levels for Environmental Chemicals, 1999.

10. OSHA Instruction, CPL 02-02-058 - CPL 2-2.58 - 29 CFR 1926.62, Lead Exposure In Construction; Interim Final Rule-- Inspection and Compliance, Procedures, 1993. http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=1570

11. U.S. Department of Housing and Urban Development (HUD), Technical Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing 1998. http://www.hud.gov/offices/lead/guidelines/hudguidelines/index.cfm

MDARNG IH Baseline Surveys, Project No. 55-ML-01ED-03-05

APPENDIX B

SAMPLING SHEETS AND LAB ANALYSES

B-1



Reservoirs Environmental, Inc.

2059 Bryant St. Denver, CO 80211 (303) 964-1986 Fax (303) 477-4275 Toll Free (866) RESI-ENV

August 15, 2003

Laboratory Code: Subcontract Number: Laboratory Report: Project Description: RES NA RES 96014-1 None Given Pikesville NG Armory

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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 is stated in the analysis table. Results have been sent to your office.

RES 96014-1 is the job number assigned to this study. This report is considered highly confidential and the sole inoperty of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than hose authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you hould have any questions about this report, please feel free to call me at 303-964-1986.



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Page 1 of 2

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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 96060-1
Client:	Army National Guard IH - West
Client Project Number / P.O.:	None Given
Client Project Description:	None Given
Date Samples Received:	July 30, 2003
Analysis Type:	USEPA SW846 3050B / AA (7420)
Turnaround:	3-5 Day
Date Samples Analyzed:	July 31, 2003

Client	Lab	Detection	LEAD
1D Number	ID Number	Limit	CONCENTRATION
		(%)	(%)
PI BULK 01	EM 800569	0.005	0.149
PT BULK 02	EM 800570	0.005	0.396
PI BULK 03	EM 800571	0.005	. 0.863
PI BULK 04	EM 800572	0.005	0.139
PI BULK 05	EM 800573	0.005	0.067
PI BULK 06	EM 800574	0.005	0.120
PI BULK 07	EM 800575	0.005	0.110
PI BULK 08	EM 800576	0.005	0.259
PI BULK 09	EM 800577	0.005	0.058
PI BULK 010	EM 800578	0.005	800.0
DK BULK 01	EM 800579	0.005	0.136
DK BULK 02	EM 800580	0.005	0.014
CA BULK 01	EM 800581	0.005	0.345
CA BULK 02	EM 800582	0.005	811.0
CA BULK 03	EM 800583	0.005	0.037
CA BULK 04	EM 800584	0.005	0.154
CA BULK 05	EM 800585	0.005	0.034
CA BULK 06	EM 800586	0.005	0.005

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NVLAP Accredited Laboratory #101896 AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD IN AIR

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RES Job Number:	RES 96012-1
Client:	USACHPPM
Client Project Number / P.O.:	None Given
Client Project Description:	Dun Daik NG Armory
Date Samples Received:	July 29, 2003
Analysis Type:	NIOSH AA(7082)
Tornaround:	3-5 Day
Date Samples Analyzed:	July 30, 2003

Client	Lab	Аіг	LEAD	Detection	LEAD
ID Number	ID Number	Volame (L)	(µg)	Limit (µg/m³)	CONCENTRATION (µg/m³)
DKAS-01	EM 799976	428	BDL	5.8	BDL.
DKAS-02	EM 799977	428	BDL	5.8	BDL
DKAS-03	EM 799978	426	BDL	5.9	BDL
DKPb-Blank01	EM 799979	0	BDI.		
DKPb-Blank02	EM 799980	0	BDL		

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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 96060-1
Client:	Army National Guard 1H - West
Client Project Number / P.O.:	None Given
Client Project Description:	None Given
Date Samples Received:	July 30, 2003
Analysis Type:	USEPA SW846 3050B / AA (7420)
Tomaround:	3-5 Day
Date Samples Analyzed:	July 31, 2003

Client	Lab	Detection	LEAD
1D Number	(D Number	Limit	CONCENTRATION
		(%)	(%)
PI BULK 01	EM 800569	0.005	0.149
P1 BULK 02	EM 800570	0.005	0.396
PI BULK 03	EM 800571	0.005	p.863
PI BULK 04	EM 800572	0.005	0.139
PI BULK 05	E24 600573	0.005	0.067
PI BULK 06	EM 800574	0.005	0.120
PI BULK 07	EM 800575	0.005	0.110
PI BULK 08	EM 800576	0.005	0.259
PI BULK 09	EM 800577	0.005	0.058
PI BULK 010	EM 800578	0.005	0.008
DK BULK 01	EM 800579	0.005	0.136
DK BULK 02	EM 800580	0.005	0.014
CA BULK 01	EM 800583	0.005	0.345
CA BULK 02	EM 800582	0.005	0.118
CA BULK 03	EM 800583	0.005	0.037
CA BULK 04	EM 800584	0.005	0.154
CA BULK 05	EM 800585	0.005	0.034
CA BULK 06	EM 800586	0.005	0.005

BPL = Below Detection Limit

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NVLAP Accredited Laboratory #101896 AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD IN AIR

RES Job Number:	RES 96012-1
Client:	USACHPPM
Client Project Number / P.O.:	None Given
Client Project Description:	Dun Daik NG Armory
Date Samples Received:	July 29, 2003
Analysis Type:	NIOSH AA(7082)
Turnaround:	3-5 Day
Date Samples Analyzed:	July 30, 2003

Client	Lab	Air	LEAD	Detection	LEAD
ID Number	ID Number	Volame (L)	(µg)	i.imit (µg/m²)	CONCENTRATION (ug/m ²)
DKAS-01	EM 799976	428	BDL	5.8	BDL
DKAS-02	EM 799977	428	BDL	5.8	BDL
DKAS-03	EM 799978	426	BDL	5.9	BDL
DKPb-Blank01	EM 799979	Û	BDL		
DKPb-Black02	EM 799980	0	BDL		

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BDL = Below Detection Limit

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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: Subcontract Number: Laboratory Report: Project Description: RES NA RES 96061-1 None Given None Given

Non-Responsive

Army National Guard IH - West 3401 Quebec Street, Suite 7200 Denver CO 80207

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the American Industrial Hygiene Association, Lab ID 101533 - Accreditation Certificate #480. The laboratory is currently proficient in both PAT & ELPAT programs respectively.

Reservoirs has analyzed the following sample(s) using Atomic Emission Spectroscopy - Inductively Coupled Plasma (AES-ICP) per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the analysis table. Results have been sent to your office.

RES 96061-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those authorized by the client. Samples will be disposed of after sixty days unless longer storage is requested. If you should have any questions about this report, please feel free to call me at 303-964-1986.

Sincerely,



President

RESERVOIRSEEN WIRONWENTAL, INC.

NVLAP Accredited Laboratory #101896 AIHA Certificate of Accredidation #480 LAB ID 101533

TABLE ANALYSIS: LEAD BY WIPE SAMPLING

RES Job Number:	RES 96061-1
Client:	Army National Guard IH - West
Client Project Number / P.O.:	None Given
Client Project Description:	None Given
Date Samples Received:	July 30, 2003
Analysis Type:	USEPA SW846 3050B / AA(7420)
Turnaround:	3-5 Day
Date Samples Analyzed:	August 4, 2003

Client	Lab	Sample	LEAD	Detection	LEAD
ID Number	ID Number	Area	(µg)	Limit	CONCENTRATION
		(sq.ft.)		(µg/sq.ft.)	(µg/sq.ft.)
PI Blank 1	EM 800587	0.11	BDL	23	BDL
PI Blank 2	EM 800588	0.11	BDL	23	BDL
PI Blank 3	EM 800589	0.11	BDL	23	BDL
PI Blank 4	EM 800590	0.11	BDL	23	BDL
PI W16	EM 800591	0.11	22.8	23	207
PI W17	EM 800592	0.11	14.2	23	129
PI W18	EM 800593	0.11	56.2	23	511
PI W19	EM 800594	0.11	26.2	23	238
PI W20	EM 800595	0.11	10.1	23	92
PI W21	EM 800596	0.11	BDL	23	BDL
PI W22	EM 800597	0.11	BDL	23	BDL
PI W23	EM 800598	0.11	BDL	23	BDL
PI W24	EM 800599	0.11	BDL	23	BDL
PI W25	EM 800600	0.11	BDL	23	BDL
PI Blank 5	EM 800601	0.11	BDL	23	BDL
PI Blank 6	EM 800602	0.11	BDL	23	BDL
DK Blank 01	EM 800603	0.11	BDL	23	BDL
DK W01	EM 800604	0.11	BDL	23	BDL
DK W02	EM 800605	0.11	BDL	23	BDL
DK W03	EM 800606	0.11	BDL	23	BDL
DK W04	EM 800607	0.11	BDL	23	BDL
DK W05	EM 800608	0.11	5200.0	23	47273
DK W06	EM 800609	0.11	107.0	23	973
DK W07	EM 800610	0.11	37.8	23	344
DK W08	EM 800611	0.11	BDL	23	BDL
DK W09	EM 800612	0.11	7.2	23	65
DK W10	EM 800613	0.11	57.0	23	518
DK Blank 02	EM 800614	0.11	BDL	23	BDL
DK W11	EM 800615		S	ample not subm	itted
DK Blank 03	EM 800616	0.11	BDL	23	BDL

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MDARNG IH Baseline Surveys, Project No. 55-ML-01ED-03-05

APPENDIX C

PHOTOGRAPHS

C-1

Dundalk Armory Locations of Lead Paint and Surface Wipe Samples

Photo Number	Location of Samples
1350	Lead Wipe Sample/Top of refrigerator in kitchen area
1351	Lead Wipe Sample/Horizontal wall near refrigerator and window
	in kitchen
1352	Bulk Paint Sample/Supply Room/recently renovated, painted roof
1353	Lead Wipe Sample/HHC orderly office on floor under window
1354	Lead Wipe Sample/Anti-armor Platoon office walls and floors
	being renovated
1355	Lead Wipe Sample/Storage Room/former IFR Bullet Trap area
	/renovated and being used for storage
1356	Lead Wipe Sample/former IFR near light pointed toward bullet
	trap
1357	Lead Wipe Sample/Storage Room (former IFR) near light pointed
	toward bullet trap
1358	Lead Wipe Sample/Storage Room (former IFR) near light pointed
	toward bullet trap
1359	Bulk Paint Sample/wall near entrance to former IFR
1360	Lead Wipe Sample/Worktable in garage/workout area with
	equipment
1361	Lead Wipe Sample/Mail Room/Personnel office/floor under
	window
1362	Lead Wipe Sample/On top locker in one room of Mail
	Room/Personnel office
1363	Lead Wipe Sample/On top locker in one room of Mail
	Room/Personnel office
1364	Lead Wipe Sample/Operations office window sill







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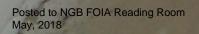
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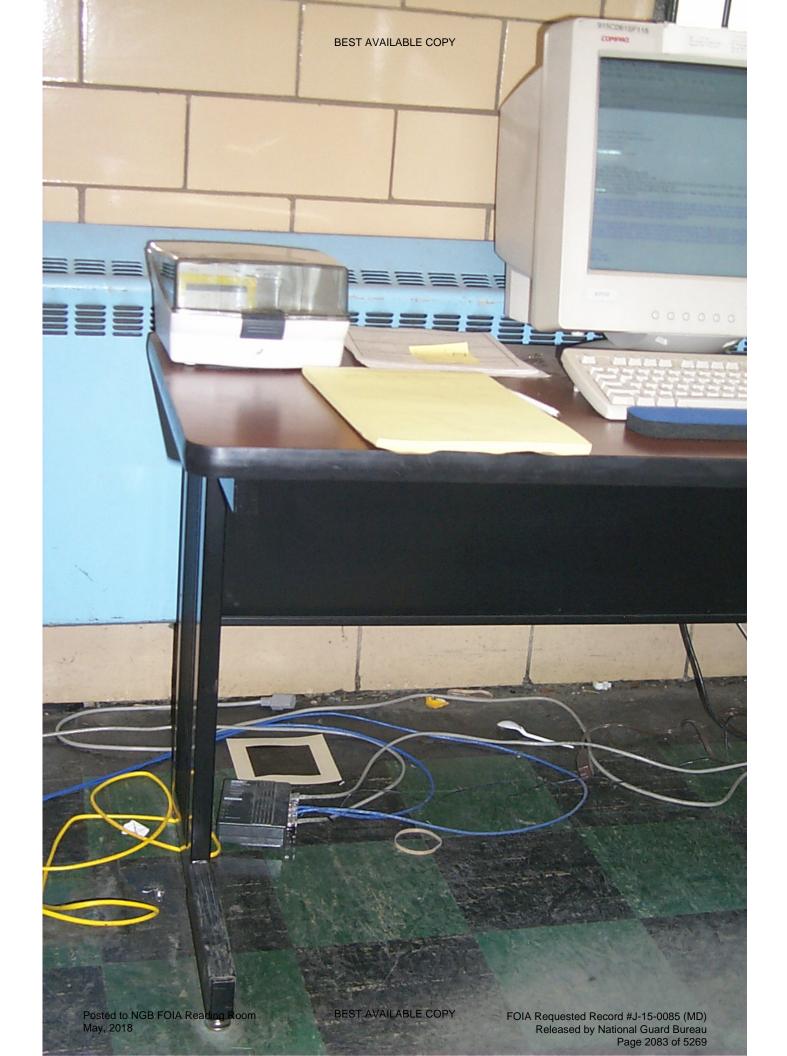
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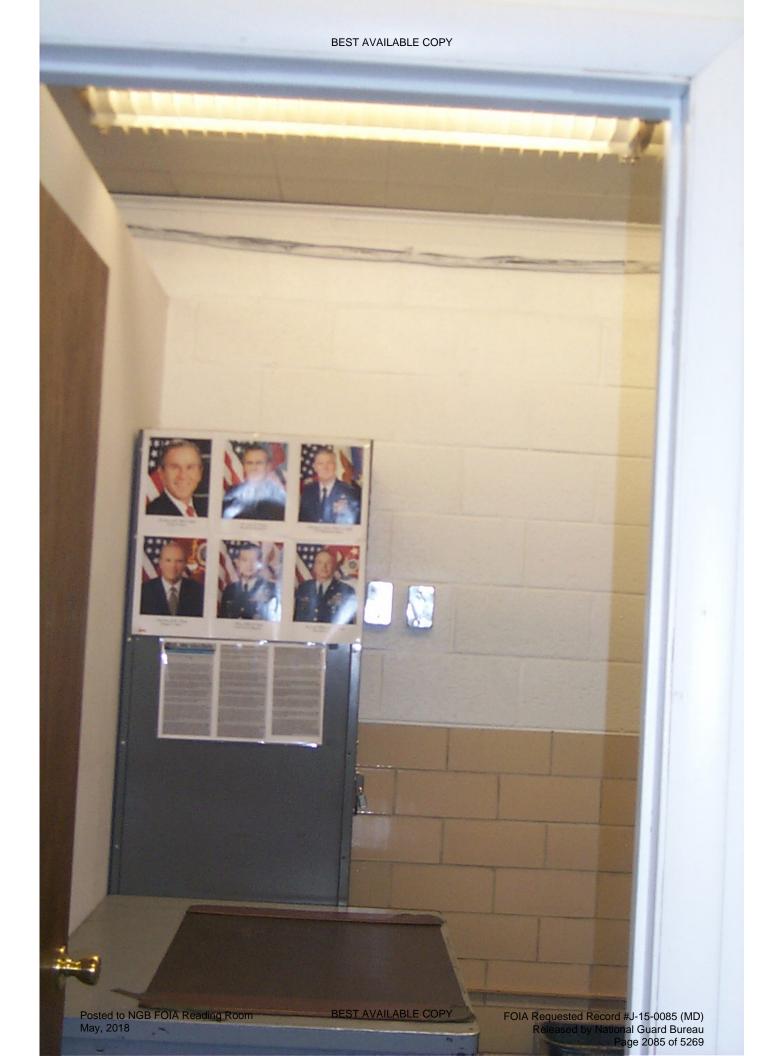


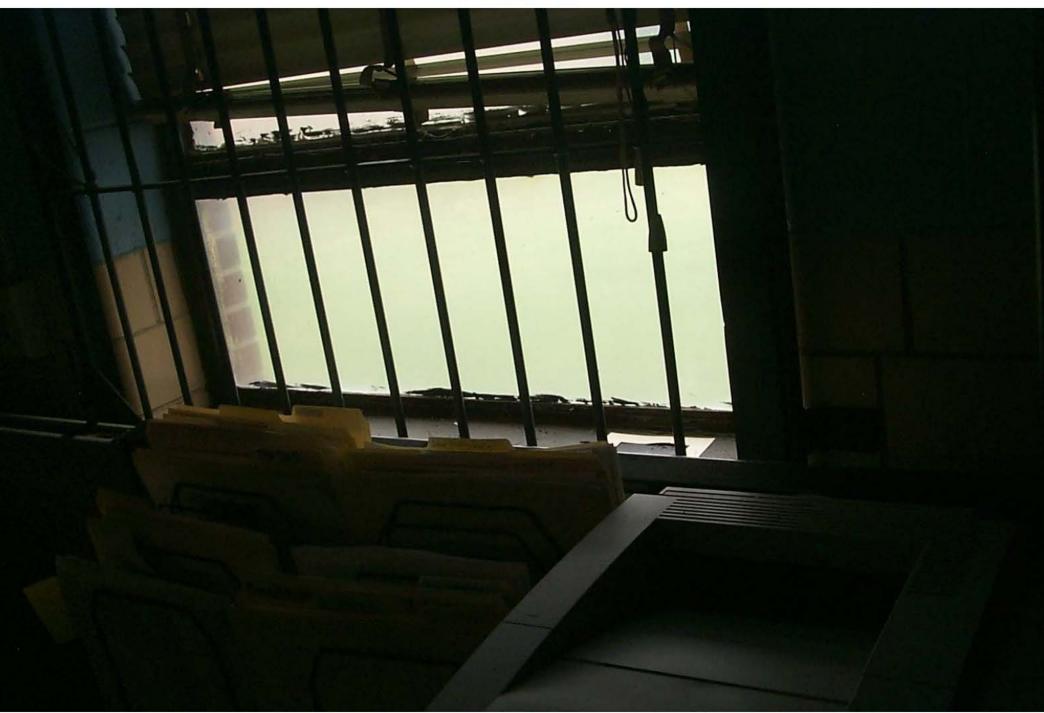
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MDARNG IH Baseline Surveys, Project No. 55-ML-01ED-03-05

APPENDIX D

NATIONAL GUARD BUREAU REGION NORTH INDUSTRIAL HYGIENE OFFICE

ASSESSMENT CRITERIA FOR LEAD

D-1

SUBJECT: National Guard Bureau Region North Industrial Hygiene Office Proposed Recommendations for Surface Lead in Armories

1. In armories that do not contain childcare facilities, the NGB Region North Industrial Hygiene Office recommends cleaning the areas in which sample results are greater than $200 \mu g/ft^2$. This guidance is based on professional judgment, risk assessments, adaptation of OSHA guidance, and feasibility of cleaning to a certain level.

a. The EPA standards (40 CFR 745.227(e) (8) (viii)) and State of Maryland standards are not directly applicable because they are developed for floors (40 μ g/ft²), windowsills (250 μ g/ft²)and window troughs (400 μ g/ft²) in residential and childcare facilities. Most of the wipe samples in armories were collected in undisturbed areas and therefore, results are worst case scenarios and do not correlate to these standards.

b. The OSHA has no specific requirement for work area surfaces. The OSHA lead standard (29 CFR 1910.1025(h)) states that all surfaces shall be maintained as free as practicable of accumulations of lead. In workplaces where lead is generated, surface levels may be much higher, but personnel exposures can be controlled by limiting airborne lead levels and following good cleanup and hygienic practices.

c. The OSHA cites a level of $200 \ \mu g/ft^2$ 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 μ g/ft² is a safe surface contamination level for adult exposures. They have also applied these standards as the decontamination levels for surfaces in administrative offices.

e. It should be noted that levels higher than those recommended above do not necessarily mean there is a significant hazard to workers who are following good cleaning and hygienic practices since there is no correlation between wipe and air samples. Rather, we recommend these levels as a precautionary measure.

2. The NGB Occupational Health Branch is developing guidance for armories that are used as childcare facilities. All States will receive this guidance when it is completed.

3. Ambient air samples collected in the armory were well below OSHA's permissible exposure limit for lead (29 CFR 1910.1025(c)) of $50 \mu g/m^3$ averaged over an 8-hour day. Therefore, based on these conditions there is currently no overexposure to personnel from lead in this building.

MDARNG IH Baseline Surveys, Project No. 55-ML-01ED-03-05

APPENDIX E

LEAD CLEANING GUIDANCE

E-1

CHAPTER 14: CLEANING

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Step-by-Step Summary



- 1. Include step-by-step procedures for precleaning, cleaning during the job, and daily and final cleanings in project design or specifications.
- 2. Assign responsibilities to specific workers for cleaning and for maintaining cleaning equipment.
- 3. Have sufficient cleaning equipment and supplies before beginning work.
- 4. If contamination is extensive, conduct precleaning of the dwelling unit. Move or cover all furniture and other objects.
- 5. Conduct ongoing cleaning during the job, including regular removal of large and small debris and dust. Decontamination of all tools, equipment, and worker protection gear is required before it leaves containment areas. Electrical equipment should be wiped and high-efficiency particulate air (HEPA) vacuumed, not wetted down, to minimize electrocution hazards.
- 6. Schedule sufficient time (usually 30 minutes to an hour) for a complete daily cleaning, starting at the same time near the end of each workday after lead hazard control activity has ceased.
- 7. For final cleaning, wait at least 1 hour after active lead hazard control activity has ceased to let dust particles settle.
- 8. Use a vacuum cleaner equipped with a HEPA exhaust filter. HEPA vacuum all surfaces in the room (ceilings, walls, trim, and floors). Start with the ceiling and work down, moving toward the entry door. Completely clean each room before moving on.
- 9. Wash all surfaces with a lead-specific detergent, high-phosphate detergent, or other suitable cleaning agent to dislodge any ground-in contamination, then rinse. Change the cleaning solution after every room is cleaned.
- 10. Repeat step 8. To meet clearance standards consistently, a HEPA vacuum, wet wash, and HEPA vacuum cycle is recommended. For interim control projects involving dust removal only, the final HEPA vacuuming step is usually not needed (see Chapter 11). Other cleaning methods are acceptable, as long as clearance criteria are met and workers are not overexposed.
- 11. After final cleaning, perform a visual examination to ensure that all surfaces requiring lead hazard control have been addressed and all visible dust and debris have been removed. Record findings and correct any incomplete work. This visual examination should be performed by the owner or an owner's representative who is independent of the lead hazard control contractor.
- 12. If other construction work will disturb the lead-based paint surfaces, it should be completed at this point. If those surfaces are disturbed, repeat the final cleaning step after the other construction work has been completed.
- 13. Paint or otherwise seal treated surfaces and interior floors.
- 14. Conduct a clearance examination (see Chapter 15).
- 15. If clearance is not achieved, repeat the final cleaning.



- 16. Continue clearance testing and repeated cleaning until the dwelling achieves compliance with all clearance standards. As an incentive to conduct ongoing cleaning and a thorough final cleaning, the cost of repeated cleaning after failing to achieve clearance should be borne by the contractor as a matter of the job specification, not the owner.
- 17. Do not allow residents to enter the work area until cleaning is completed and clearance is established.
- 18. Cleaning equipment list:
 - HEPA vacuums.
 - Detergent.
 - Waterproof gloves.
 - Rags.
 - Sponges.
 - Mops.
 - Buckets.
 - HEPA vacuum attachments (crevice tools, beater bar for cleaning rugs).
 - 6-mil plastic bags.
 - Debris containers.
 - Waste water containers.
 - Shovels.
 - Rakes.
 - Water-misting sprayers.
 - 6-mil polyethylene sheeting (or equivalent).

I. Introduction

This chapter describes cleaning procedures to be employed following abatement and interim control work. Dust removal as an interim control measure is covered in Chapter 11.

All lead hazard control activities can produce dangerous quantities of leaded dust. Unless this dust is properly removed, a dwelling unit will be more hazardous after the work is completed than it was originally. Once deposited, leaded dust is difficult to clean effectively. Whenever possible, ongoing and daily cleaning of leaded dust during lead hazard control projects is recommended. Ongoing and daily cleaning is also necessary to minimize worker exposures.

Cleaning is the process of removing visible debris and dust particles too small to be seen by the naked eye. Removal of lead-based paint hazards in a dwelling unit will not make the unit safe unless excessive levels of leaded dust are also removed. This is true regardless of whether the dust was present before or generated by the lead hazard control process itself. Improper cleaning can increase the cost of a project considerably because additional cleaning and clearance sampling will be necessary. However, cleaning and clearance can be achieved routinely if care and diligence are exercised.

A. Performance Standard

Although the cleaning methods described in this chapter are feasible and have been shown to be effective in meeting clearance standards, other methods may also be used if they are safe and effective. This performance-oriented approach should stimulate innovation, reduce cost, and ensure safe conditions for both residents and workers.

B. Small Dust Particles

Dust particles that are invisible to the naked eye remain on surfaces after ordinary cleaning

procedures. A visibly clean surface may contain high and unacceptable levels of dust particles and require special cleaning procedures.

C. Difficulties in Cleaning

While cleaning is an integral and essential component of any lead hazard control activity, it is also the most likely part of the activity to fail.

Several common reasons for this failure include low clearance standards, worker inexperience, high dust-producing methods, and deadlines.

1. Low Clearance Standards

Because very small particles of leaded dust are easily absorbed by the body when ingested or inhaled, a small amount can create a health hazard for young children. Therefore, "clearance standards" are extremely low for acceptable levels of leaded dust particles on surfaces after hazard control activities, and careful cleaning procedures are required. Although it is not possible to remove *all* leaded dust from a dwelling, it is possible to reduce it to a safe level.

Clearance standards are described more fully in Chapter 15. The permissible amount of leaded dust remaining on each of the following surfaces following lead hazard work is as follows:

- 100 µg/ft² on floors.
- 500 µg/ft² on interior window sills (stools).
- 800 µg/ft² on window troughs (the area where the sash sits when closed).
- 800 µg/ft² on exterior concrete.

These levels are based on wipe sampling. Clearance testing determines whether the premises or area are clean enough to be reoccupied after the completion of a lead paint hazard control project. A cleaned area may not be reoccupied until compliance with clearance standards has been established. To prevent delays, final testing and final cleaning activities should be coordinated.



2. Worker Inexperience

To understand the level of cleanliness required to meet the established clearance standards for hazard control cleanup, new hazard control personnel often require a significant reorientation to cleaning. Many construction workers are used to cleaning up only dust that they can see, not the invisible dust particles that are also important to remove.

3. High Dust-Producing Methods and/or Inadequate Containment

High dust-generating methods, inadequate containment during hazard control work, and poor work practices can all make achievement of clearance particularly difficult. Work practices necessary to prevent spreading of dust throughout a dwelling (e.g., by tracking dust out of work areas) are essential but sometimes tedious. Essential work practices are sometimes mistakenly considered to be "flexible guidelines" rather than necessary standards that are designed to ensure that the job is completed, not only safely, but also on time and within budget.

4. Deadlines

Daily and final cleanings have sometimes been compromised due to project deadlines, since cleaning comes at the end of the job. Hurried efforts often result in clearance failure. Delayed and over-budget hazard control projects are often the result of repeated, unplanned recleanings that are necessitated by inadequate containment and sloppy work practices.

II. Coordination of Cleaning Activities

A. Checklist

The owner or contractor may use the following cleaning checklist before any lead hazard control activity:

- ✓ Is the critical importance of cleaning in a hazard control project understood?
- ✓ Have all workers been trained and certified for hazard control work?

- ✓ Have the precleaning, daily, and final cleanings been scheduled properly and coordinated with the other participants in the hazard control process?
- ✓ Have cleaning equipment and materials been obtained?
- ✓ Do the workers know how to operate and maintain special cleaning equipment, and do they have directions for the proper use of all cleaning materials?
- Have all workers carefully studied the step-by-step procedures for precleaning (if needed), in-progress cleaning, and daily and final cleanings?
- ✓ Are all workers properly protected during the cleaning processes (see Chapter9)?
- ✓ Have provisions been made to properly contain and store potentially hazardous debris (see Chapter 10)?
- ✓ Have dust-clearance testing and related visual inspections been arranged (see Chapter 15)?
- ✓ Are the clearance criteria to be met fully understood?
- ✓ Have all appropriate surfaces been properly painted or otherwise sealed?
- ✓ Have appropriate records been maintained that document participants' roles in the hazard control project?

B. Equipment Needed for Cleaning

The following equipment is needed to conduct cleaning: high-efficiency particulate air (HEPA) vacuums and attachments (crevice tools, beater bar for cleaning rugs), detergent, waterproof gloves, rags, sponges, mops, buckets, 6-mil plastic bags, debris containers, waste water containers, shovels, rakes, water-misting sprayers, and 6-mil polyethylene plastic sheeting (or equivalent).



C. Waste Disposal

Regulations governing hazardous and nonhazardous waste storage, transportation, and disposal affect both the daily and final cleaning procedures. The hazard control contractor and the disposal contractor should work together to establish formal written procedures, specifying selected containers, storage areas, and debris pickups, to ensure that all relevant regulations are met.

III. Cleaning Methods and Procedures

Many of the special cleaning methods and procedures detailed in this chapter are not standard operating procedure for general home improvement contractors. Therefore, project designers, responsible agencies, or owners must ensure that contractors follow the methods and procedures recommended herein or specially designed alternative procedures, even though some may appear to be redundant and unnecessary. These methods have been shown to be feasible and effective in many situations and skipping steps in the cleaning procedures can be counterproductive.

A. Containment

Because of the difficulty involved in the removal of fine dust, dust generated by hazard control work should be contained to the extent possible to the inside of work areas. Inadequately constructed or maintained containment or poor work practices will result in additional cleaning efforts, due to dust that has leaked out or been tracked out of the work area (see Chapter 8).

B. Basic Cleaning Methods: Wet Wash and Vacuum Cleaning Techniques

Because leaded dust adheres tenaciously, especially to such rough or porous materials as weathered or worn wood surfaces and masonry surfaces (particularly concrete), workers should be trained in cleaning methods. As a motivator, some contractors have awarded bonuses to workers who pass clearance the first time.

Two basic cleaning methods have proven effective, when used concurrently, in lead-based paint hazard control projects: a special vacuum cleaner equipped with a HEPA exhaust filter, followed by wet washing with special cleaning agents and rinsing, followed by a final pass with the HEPA vacuum.

Although HEPA filtered vacuums and trisodium phosphate (TSP) cleaners have been considered the standard cleaning tools for lead hazard control projects, new research, discussed under the "Alternatives Methods" section in this chapter, suggests that other tools and products may also be effective in efficiently cleaning dust while providing adequate worker protection from airborne exposure risks. Some of these innovations may even be superior.

1. HEPA Vacuuming

HEPA vacuums differ from conventional vacuums in that they contain high-efficiency filters that are capable of trapping extremely small, micron-sized particles. These filters can remove particles of 0.3 microns or greater from air at 99.97 percent efficiency or greater. (A micron is 1 millionth of a meter, or about 0.00004 inches.) Some vacuums are equipped with an ultra-low penetration air (ULPA) filter that is capable of filtering out particles of 0.13 microns or greater at 99.9995 percent efficiency. However, these ULPA filters are slightly more expensive, and may be less available than HEPA filters.

Vacuuming with conventional vacuum machines is unlikely to be effective, because much of the fine dust will be exhausted back into the environment where it can settle on surfaces. A recent Canadian study revealed that finedust air levels were exceedingly high when a standard portable vacuum with a new bag was used, although partially filled bags were found to be more efficient (CMHC, 1992). Considerations for the proper use of a HEPA vacuum are listed below.



Operating Instructions

There are a numerous manufacturers of HEPA vacuums. Although all HEPA vacuums operate on the same general principle, they may vary considerably with respect to specific procedures, such as how to change the filters. To ensure the proper use of equipment, the manufacturer's operating instructions should be carefully followed and if possible, training sessions arranged with the manufacturer's representative.

Although HEPA vacuums have the same "suction" capacity as ordinary vacuums that are comparably sized, their filters are more efficient. Improper cleaning or changing of HEPA filters may reduce the vacuum's suction capability.

Special Attachments

Because the HEPA vacuum will be used to vacuum surfaces other than floors, operators should buy attachments and appropriate tool kits for use on different surfaces—such as brushes of various sizes, crevice tools, and angular tools.

Selecting Appropriate Size(s)

HEPA vacuums are available in numerous sizes, ranging from a small lunchbucket-sized unit to track-mounted systems. Two criteria for size selection are the size of the job and the type of electrical power available. Manufacturer recommendations should be followed.

Wet-Dry HEPA Vacuums

Some hazard control contractors have found the wet-dry HEPA vacuums to be particularly effective in meeting clearance standards. These vacuums are equipped with a special shut-off float switch to protect the electrical motor from water contact.

Prefilters

HEPA filters are usually used in conjunction with a prefilter or series of prefilters that trap the bulk of the dust in the exhaust airstream, particularly the larger particles. The HEPA filter traps most of the remaining small particles that have passed through the prefilter(s). All filters must be maintained and replaced or cleaned as specified in the manufacturer's instructions. Failure to do so may cause a reduction in suction power (thus reducing the vacuum's efficiency and effectiveness). Failure to change prefilters may damage the vacuum motor and will also shorten the service life of the HEPA filter, which is far more expensive than the prefilters.

HEPA Vacuuming Procedures

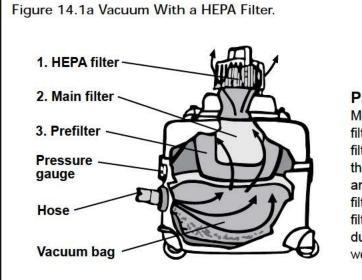
Surfaces frequently vacuumed include ceilings, walls, floors, windows, interior and exterior sills, doors, heating, ventilation, and air conditioning (HVAC) equipment (heating diffusers, radiators, pipes, vents), fixtures of any kind (light, bathroom, kitchen), built-in cabinets, and appliances.

To aid in dislodging and collecting deep dust and lead from carpets, the HEPA vacuum must be equipped with a beater bar (agitator head) that is fixed to the cleaning head. This bar should be used on all passes on the carpet face during dry vacuuming (see Chapter 11 for details on carpet and furniture cleaning).

All rooms and surfaces should be included in the HEPA vacuum process, except for those that (1) were found not to have lead-paint hazards and were properly separated from work areas before the process began (see Chapter 8), or (2) were never entered during the process. Porches, sidewalks, driveways, and other exterior surfaces should be vacuumed if exterior hazard control work was conducted, or if debris was stored or dropped outside. Vacuuming should begin on the ceilings and end on the floors, sequenced to avoid passing through rooms already cleaned, with the dwellings' entryway cleaned last.

Emptying the HEPA Vacuum

Used filters and vacuumed debris are potentially hazardous waste and should be treated accordingly (see Chapter10). Therefore, operators should use extreme caution when opening the HEPA vacuum for filter replacement or debris removal to avoid accidental release of accumulated dust into the environment. This may occur, for example, if the vacuum's seal has been broken and the vacuum's bag is disturbed.



Parts of a HEPA-vacuum

Most HEPA-vacuums have three filters: HEPA filter, main filter, and prefilter. Debris gets sucked in through the hose into the vacuum bag. The air and dust get filtered through the prefilter, the main filter, and the HEPA filter. The HEPA filter captures the lead dust before the air is released into the work area again.

Operators should also wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function, which should be done in the containment area or offsite.

2. Wet Detergent Wash

Several types of detergents have been used to remove leaded dust. Those with a highphosphate content (containing at least 5 percent trisodium phosphate, also known as TSP) have been found to be effective when used as part of the final cleaning process (Milar, 1982). TSP detergents are thought to work by coating the surface of dusts with phosphate or polyphosphate groups which reduces electrostatic interactions with other surfaces and thereby permits easier removal. Because of environmental concerns some States have restricted the use of TSP, and some manufacturers have eliminated phosphates from their household detergents. However, high-TSP detergents can usually be found in hardware stores and may be permitted for limited use, such as lead hazard control.

Other non-TSP cleaning agents developed specifically for removing leaded dust have also been found to be effective (possibly more effective than TSP) in limited trials by several

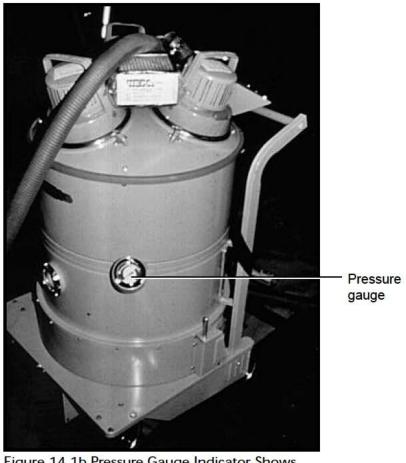
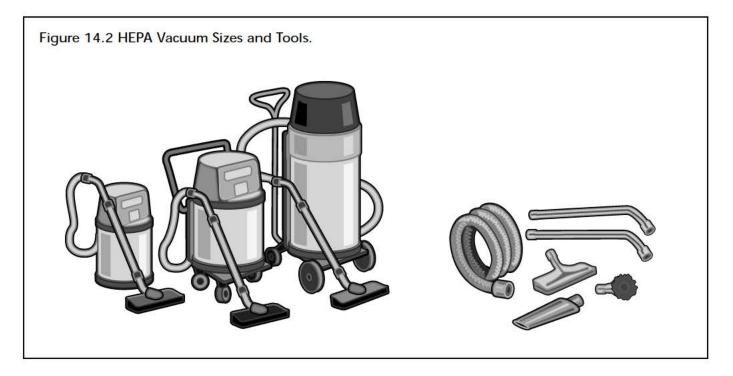


Figure 14.1b Pressure Gauge Indicator Shows When Filters Require Changing.



investigators (Grawe, 1993; Wilson, 1993) and may also be safer, since TSP is a skin and eye irritant. See section VII for more information on non-TSP detergents. Proper procedures for using high-phosphate detergents also apply to most other types of detergents and include the following steps:

Manufacturer's Dilution Instructions

Users of cleaning agents for leaded dust removal should follow manufacturer's instructions for the proper use of a product, especially the recommended dilution ratio. Even diluted, trisodium phosphate is a skin irritant and users should wear waterproof gloves. Eye protection should also be worn, and portable eyewash facilities should be located in or very near the work area. Consult manufacturer's directions for the use of other detergents.

Appropriate Cleaning Equipment

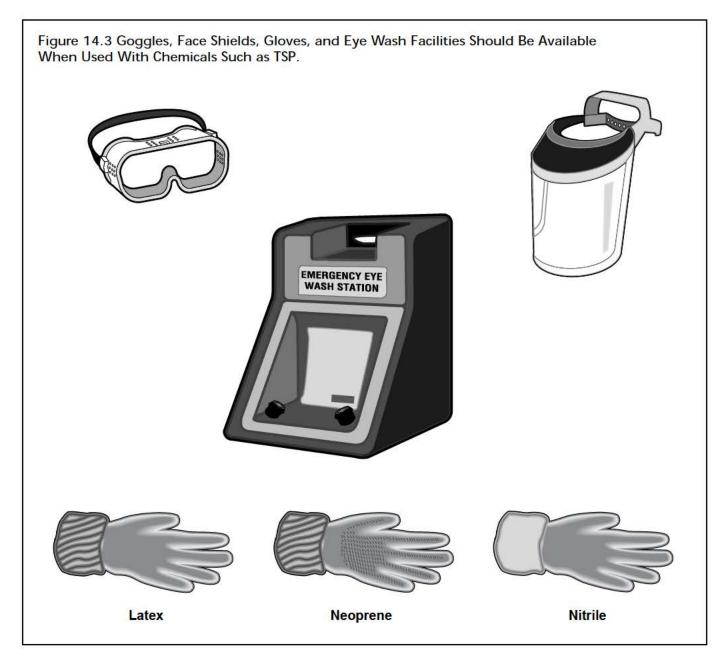
Because a detergent may be used to clean leaded dust from a variety of surfaces, several types of application equipment are needed, including cleaning solution spray bottles, wringer buckets, mops, variously sized hand sponges, brushes, and rags. Using the proper equipment on each surface is essential to the quality of the wetwash process.

Proper Wet-Cleaning Procedures

At the conclusion of the active lead hazard control process and the initial HEPA vacuuming, all vacuumed surfaces should be thoroughly and completely washed with a high-phosphate solution or other lead-specific cleaning agent (or equivalent) and rinsed. Select a detergent that does not damage existing surface finishes (TSP may damage some finishes). Work should proceed from ceilings to floors and sequenced to avoid passing through rooms already cleaned.

Changing Cleaning Mixture

Many manufacturers of cleaners will indicate the surface area that their cleaning mixture will cover. To avoid recontaminating an area by cleaning it with dirty water, users should follow manufacturer-specified surface-area limits. However, regardless of manufacturers' recommendations, the cleaning mixture should be changed after its use for each room. As a rule of thumb, 5 gallons should be used to clean no



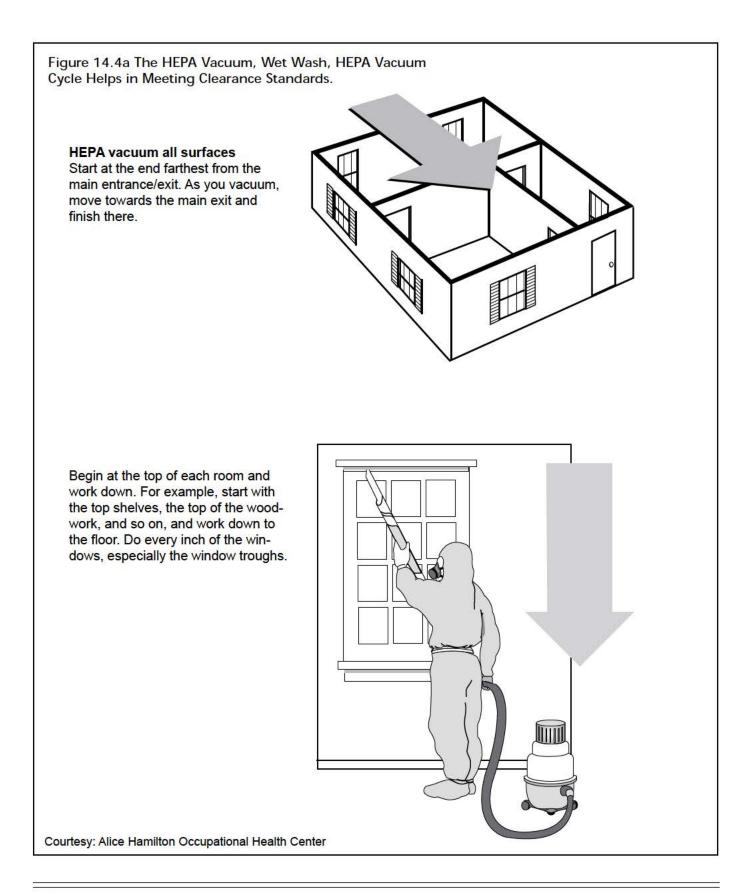
more than 1,000 square feet. Used cleaning mixture is potentially hazardous waste (see Chapter 10); consult with your local water and sewage utility for directions on its proper disposal. Wash water should never be poured onto the ground. The wash water is usually filtered and then poured down a toilet (if the local water authority approves).

3. The HEPA/Wet Wash/HEPA Cycle

Typical Procedures

The usual cleaning cycle that follows lead hazard control activities is called the HEPA vacuum/wet wash/HEPA cycle and is applied to an entire affected area as follows:

✤ First, the area is HEPA vacuumed.



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Chapter 14: Cleaning

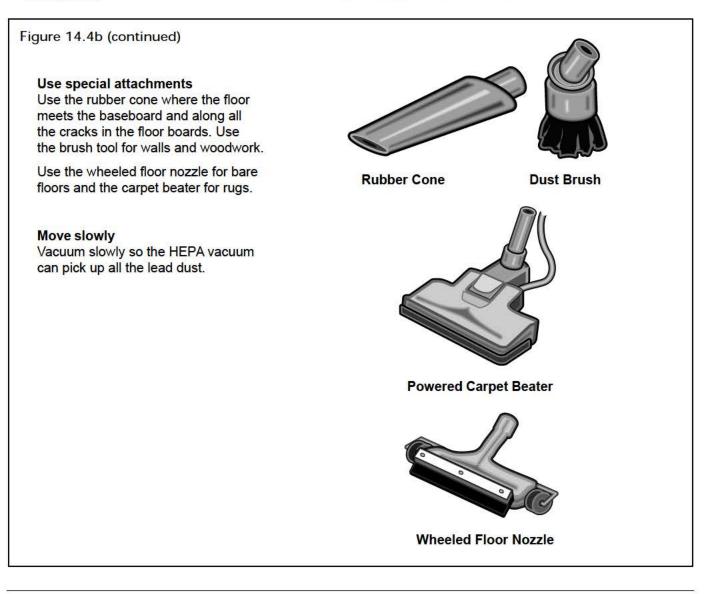
- Next, the area is washed down.
- After drying, the area is again HEPA vacuumed.

The rationale for this three-pass system is as follows:

- The first HEPA vacuum removes as much dust and remaining debris as possible.
- The wet wash further dislodges dust from surfaces.
- The final HEPA cycle removes any remaining particles dislodged but not removed by the wet wash.

Single-Pass Wet Wash/HEPA Vacuum

Some lead hazard control contractors have found HEPA spray cleaner vacuums to be a cost-effective alternative to the three-pass system. Similar to home carpet-cleaning machines, these vacuums simultaneously deliver a solution to the surface and recover the dirty solution. Theoretically, this process combines two of the steps in the HEPA vacuum/wet wash/HEPA cycle into one step. While anecdotal evidence indicates that the spray cleaner wet wash/HEPA is effective for some uses, limitations have been noted in its use for ceilings, vertical surfaces, and hard to reach areas. This device may be used as long as clearance standards are met.



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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

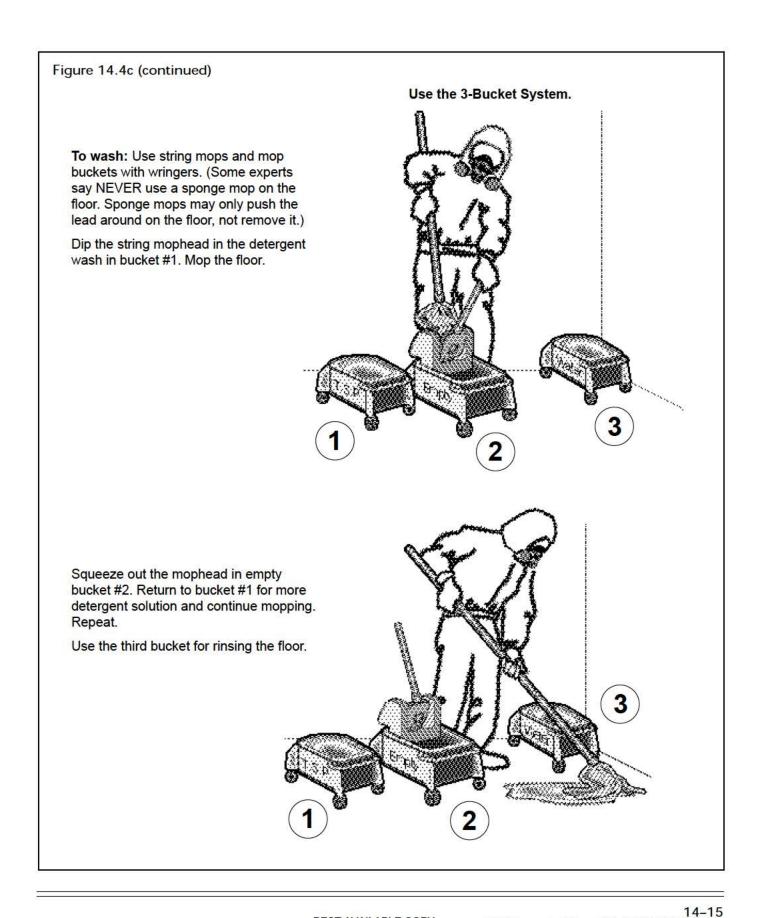


Wet Mop Floor



Don't Dry Sweep

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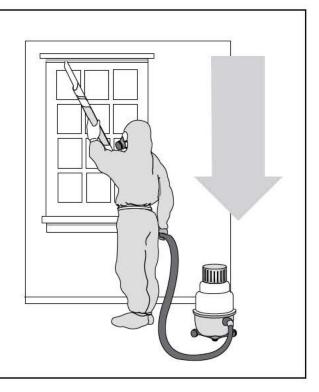


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Figure 14.4d (continued)

HEPA vacuum all surfaces a final time HEPA vacuum *all surfaces* in the work area, including areas that had been covered with plastic.

Starting at the far end, work towards the decontamination area. Begin with ceilings or the top of the walls and work down, cleaning the floors last. Do every inch of the windows, especially the troughs. Use the corner tool to clean where the floor meets the baseboard and all the cracks in the floor boards. Use the brush tool for the walls. Move slowly and carefully to get all the dust.



4. Sealing Floors

Before clearance, all floors without an intact, nonporous coating should be coated. Sealed surfaces are easier for residents to clean and maintain over time than those that are not sealed. Wooden floors should be sealed with a clear polyurethane or painted with deck enamel or durable paint. Vinyl tile, linoleum, and other similar floors should be sealed with an appropriate wax. Concrete floors should be sealed with a concrete sealer or other type of concrete deck enamel. However, if these floors are already covered by an effective coat of sealant, it may be possible to skip this step.

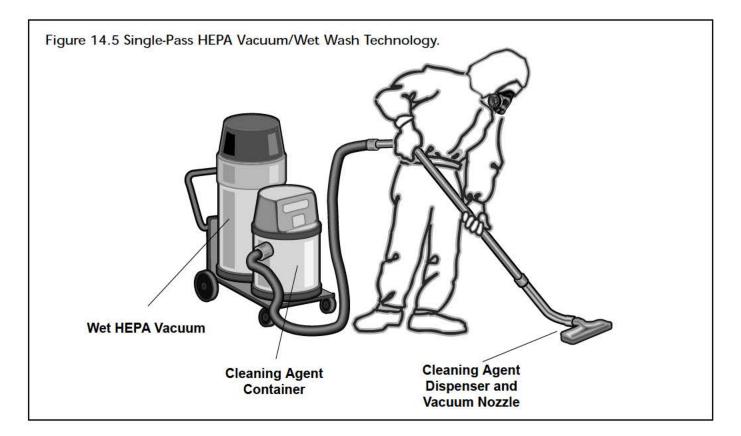
As an alternative to sealing, floors may be covered with new vinyl tile, sheet vinyl, linoleum flooring, or the equivalent to create a more permanent cleanable surface. New surfaces should be cleaned with a cleaning solution that is appropriate for that type of surface.

IV. Order of Cleaning Procedures During Lead Hazard Control

The special cleaning procedures to be followed during a lead-based paint hazard control project are discussed in chronological order below. Skipping steps in the process may result in failure to meet post-lead hazard control clearance standards.

A. Precleaning Procedures

Precleaning (i.e., cleaning conducted before lead hazard control is begun) is necessary only in dwelling units that are heavily contaminated with paint chips. Precleaning involves the removal of large debris and paint chips, followed by HEPA vacuuming. These steps may be followed by removal of occupant personal possessions, furniture, or carpeting, depending on the



Worksite Preparation Level selected (see Chapter 8). If the furniture will not be cleaned, it should be removed from the area or covered with plastic prior to beginning the precleaning procedure. Carpeting should always be misted before its removal to control the generation of hazardous dust.

It is usually the resident's responsibility to remove most of his or her personal possessions. However, if necessary, owners or project management should be prepared to complete this activity before lead hazard control work begins. As a last resort, the contractor may pack any remaining belongings and carefully seal and move the boxes, supplying all necessary boxes, packing materials, and staff to complete the task. Following cleaning and clearance, the contractor should return all packed items to their appropriate places. Leaving these tasks to the contractor may be expensive and inefficient, since the contractor will need to be insured for this function if the occupant's



Figure 14.6 Precleaning Is Needed in Areas Where Contamination and Deterioration Are High.



belongings are damaged. Additionally, moving furniture, rugs, drapes, and other items owned by the occupant could increase leaded dust levels. Clearance should be conducted after cleaning but before resident items are moved back in.

B. Ongoing Cleaning During the Job

Periodic HEPA vacuuming during the lead hazard control work may be necessary to minimize tracking of dust and paint chips from one area to another (e.g., when a large amount of paint chips or dust is being generated).

C. Daily Cleaning Procedures

Cleaning activity should be scheduled at the end of each workday when all active lead hazard control throughout the dwelling has ceased. Sufficient time must be allowed for a thorough and complete cleaning (usually about 30 minutes to an hour). Daily cleaning helps achieve clearance dust levels by minimizing problems that may otherwise occur during final cleaning and limiting worker exposures. While daily cleaning can be skipped in vacant dwelling units, it is required when occupants will



Figure 14.7 Plastic Sheeting Should Be Repaired as Part of Daily Cleanup.

return in the evening. Under no circumstances should debris or plastic be left outside overnight in an unsecured area, even if the dwelling is vacant. Daily cleaning should consist of:

- Removing large debris.
- Removing small debris.
- HEPA vacuuming, wet clean, HEPA vacuuming (horizontal surfaces only).
- Cleaning exterior.
- Patching and repairing plastic sheeting.
- ♦ Securing debris/plastic.

1. Large Debris

Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to a secure area on the property designated for waste storage. All sharp corners, edges, and nails should be hammered down to prevent injury and minimize the tearing of plastic. It is not necessary to wrap each individual piece of debris in plastic if the entire load can be wrapped. A secure area either outside or inside the property must be designated as a temporary waste-storage area. Covered, secured, and labeled dumpsters placed on or near the property may be used. Proper segregation of waste should be enforced at this time (see Chapter 10).

2. Small Debris

After being misted with water, small debris should be swept up, collected, and disposed of properly. The swept debris should be placed in double 4-mil or single 6-mil polyethylene (or equivalent) plastic bags, properly sealed, and moved to the designated trash storage area. Trash bags should not be overloaded; overloaded bags may rupture or puncture during handling and transport.

3. Exterior Cleaning

Areas potentially affected by exterior lead hazard control should be protected via a containment system (see Chapter 8). Because weather can adversely affect the efficacy of exterior

containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleaning, the immediate area should be examined visually to ensure that no debris has escaped containment. Any such debris should be raked or vacuumed and placed in single 6mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris. HEPA vacuuming is appropriate for hard exterior surfaces, not soil.

4. Worker Protection Measures

General worker protection measures are discussed in Chapter 9. Studies indicate that during daily cleaning activities, especially while wet sweeping, workers may be exposed to high levels of airborne dust. Therefore, workers should wear protective clothing and equipment, especially appropriate respirators.

5. Maintaining Containment

The integrity of the plastic sheeting used in a lead hazard control project must be maintained. During their daily cleaning activities, workers should monitor the sheeting and immediately repair any holes or rips with 6-mil plastic and duct tape.

V. Order of Final Cleaning Procedures After Lead Hazard Control

Before treated surfaces can be painted or sealed, final cleaning procedures must be completed. Because airborne dust requires time to settle, the final cleaning process should start no sooner than 1 hour after active lead hazard control has ceased in the room. See Appendix 11 for details regarding dust settling.

A. Final Cleaning

As the first stage in the final cleaning, floor plastic should be misted and swept as detailed earlier in this chapter. Upper-level plastic, such as that on cabinets and counters, should be removed first, after it has been misted with water and cleaned. All plastic should be folded carefully from the corners/ends to the middle to trap any remaining dust. Next, remove both layers of plastic from the floor.

Plastic sheets used to isolate contaminated rooms from noncontaminated rooms should remain in place until after the cleaning and removal of other plastic sheeting; these sheets may then be misted, cleaned, and removed last.

Removed plastic should be placed into double 4-mil or single 6-mil plastic bags, or plastic bags with equivalent (or better) performance characteristics, which are sealed and removed from the premises. As with daily cleanings, this plasticremoval process usually requires workers to use protective clothing and respirators.

After the plastic has been removed from the contaminated area, the entire area should be cleaned using the HEPA/wet wash/HEPA cycle, starting with the ceiling and working down to the floor. After surfaces are repainted or sealed, a final HEPA/wet wash/HEPA cycle may be necessary if accumulated dust caused by other work is visible.

1. Decontamination of Workers, Supplies, and Equipment

Decontamination is necessary to ensure that worker's families, other workers, and subsequent properties do not become contaminated. Specific procedures for proper decontamination of equipment, tools, and materials prior to their removal from lead hazard control containment areas should be implemented, as described below and in Chapters 9 and 10.

Work clothing, work shoes, and tools should not be placed in a worker's automobile unless they have been laundered or placed in sealed bags. All vacuums and tools that were used should be wiped down using sponges or rags with detergent solutions.

Consumable/disposable supplies, such as mop heads, sponges, and rags, should be replaced, after each dwelling is completed. Soiled items should be treated as contaminated debris (see Chapter 10).