National Guard Bureau

Mid-West Regional Industrial Hygiene Office
301-IH Old Bay Lane
Havre de Grace, MD 21078

ARNG-CSG-P September 3, 2013

MEMORANDUM FOR: The Adjutant General for North Dakota

SUBJECT: Industrial Hygiene Survey at the Indoor Firing Range, Fargo Armory, North Dakota

National Guard Bureau (NGB) Mid-West Regional Industrial Hygiene (IH) Office field personnel conducted a survey on July 23, 2013 at the North Dakota Army National Guard Armory located at 3920 31st Street, Fargo, North Dakota. The site point of contact was Non-Responsive This survey included lead surface wipe sampling and ventilation testing for the indoor firing range.

Surface Wipe Sampling: Wipe samples were collected on representative surfaces in the facility and analyzed for lead. Two samples collected in the range had results above the lead surface guideline.

Ventilation: Face velocity measurements were made and smoke emitters were used to visually inspect airflow patterns at the firing line. Lanes 1 through 4 met the smoke emitter laminar flow requirement and the average face velocity requirement of 50 feet per minute (fpm) specified in NGR 385-15, *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges*. Lane 5 met the average face velocity in the standing position, but not at the kneeling and prone positions. Turbulence was also observed for Lane 5 during the smoke emitter testing. It was unclear what caused the reduced face velocity at the lower positions and the observed turbulence in Lane 5.

Observations: Detailed procedures were available for review including the range clean-up policies. A push broom was stored in the range and a dedicated high-efficiency particulate air (HEPA) vacuum was stored in the boiler room.

Occupational health risk assessment codes (RACs) are assigned to quantify health risks to personnel IAW DOD Letter of Instruction 6055.1, *DOD Safety and Occupational Health Program*. Risk assessment is an expression of health hazard severity and mishap probability, described in terms of route of exposure, actual exposure, exposure limit standards, potential health effects, duration of exposure, and number of exposed personnel. Guidance for RAC determination is attached to this memorandum.

Recommendations:

- **The area behind the firing line should be decontaminated to surface lead levels below 1,000 micrograms per square foot (µg/ft^2) using HEPA filter vacuums and/or wet methods. (RAC 2)**

- **Remove the push broom and use the HEPA filter vacuum for range clean-up. Dry sweeping is not permitted. Follow the vacuum manufacturer's instructions for maintenance and filter change-outs. (RAC 2)**

- **Consider the use of reduced-lead and lead-free ammunition (non-lead containing bullets) as available. If lead-free ammunition is not available, lead exposure can be significantly reduced by the use of jacketed rounds. Verify if the bullet trap is rated for the use of jacketed ammunition with the bullet trap manufacturer. (RAC 3)**

- **Investigate the low face velocity at the kneeling and prone positions and the turbulence in Lane 5. Coordinate with a qualified HVAC engineer to optimize the performance of this lane. (RAC 3)**

The NGB conducted this survey in the interest of preventing employee illness and to meet legal obligations where applicable. Results and recommendations are based on information provided by site personnel, field measurements, and conditions observed during the survey. For any further questions, please contact Non-Responsive

Non-Responsive

Regional Industrial Hygienist

Appendix	Title	Status
A.	Metals.....	Attached
B.	Organic Vapors.....	N/A
C.	Noise.....	N/A
D.	Ventilation.....	Attached
E.	Lighting.....	N/A
F.	Other IH Issues.....	N/A
G.	Other IH Sampling....	N/A

Appendix A
Metals

There is an active indoor firing range at the Fargo Armory which was constructed in 1993. Weapons are cleaned in the maintenance bay. Site personnel reported that children are not present this facility on a regular basis. The indoor range has five lanes, an automated paper target retrieval system, and a metal backstop. The range includes a control room, storage room, and a dedicated latrine/hand washing area.

Surface Wipe Sampling

Wipe samples were collected from representative areas of the facility using Environmental Express Ghost™ Wipes and templates IAW the Occupational Safety and Health Administration (OSHA) wipe sampling method (OSHA Technical Manual, Appendix II, 2-1). The samples were analyzed for lead by OSHA Method ID-121. The results and photos are contained in Table A-1.

Although OSHA does not have published exposure standards for metal surface contamination, 29 CFR 1910 requires that all surfaces must be kept as free as practicable of accumulations of toxic metal dusts. In addition, DOD has instituted a new policy to minimize surface contamination levels of heavy metals (*Control and Management of Surface Accumulations from Lead, Hexavalent Chromium, and Cadmium Operations*, DTM 12-003, 18 April 2012).

The NGB Mid-West Regional Industrial Hygiene Office has adopted target housekeeping guidelines for lead in firing ranges. Any results that exceed 1,000 micrograms per square foot (µg/ft^2) for lead are considered significant. Table A-1 shows that two samples collected in the range had results above the surface guideline for lead. These samples were collected on top of the target retrieval motor and on the work table behind firing line. For other areas of the facility outside of the firing range, the NGB Mid-West Regional Industrial Hygiene Office has adopted the lead surface guideline of 200 µg/ft^2 published in NG Pam 420-15, *Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges.* All of the results for samples collected outside of the range met the guideline.

Observations

Detailed procedures were available for review including the range clean-up policies. The Rifle Range SOP (Appendix C, Supplement Guidelines) specifies that users pickup brass with a squeegee and dust pan. Daily clean-up by facilities personnel includes high-efficiency particulate air (HEPA) vacuuming. The policy for monthly clean-up by facilities personnel lists specific steps for bullet trap lead removal and cleaning to include HEPA filter vacuuming and wet methods by qualified staff equipped with respiratory protection and coveralls. A professional contractor cleans the range annually according to site personnel. A push broom was stored in the range (Figure A-1) and a dedicated HEPA vacuum was stored in the boiler room.

Recommendations:

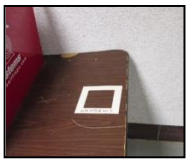
1. The area behind the firing line should be decontaminated to surface lead levels below 1,000 µg/ft^2 using HEPA filter vacuums and/or wet methods. (RAC 2)

2. Remove the push broom and use the HEPA filter vacuum for range clean-up. Dry sweeping is not permitted. Follow the vacuum manufacturer's instructions for maintenance and filter change-outs. (RAC 2)

3. Consider the use of reduced-lead and lead-free ammunition (non-lead containing bullets) as available. If lead-free ammunition is not available, lead exposure can be significantly reduced by the use of jacketed rounds. Verify if the bullet trap is rated for the use of jacketed ammunition with the bullet trap manufacturer. (RAC 3)

Figure A-1. Range Clean-up Equipment.

Table A-1
Surface Wipe Sampling Results for Lead
North Dakota Army National Guard, Fargo Armory
July 23, 2013

Sample #	Date	Location	Photo	Lead Result (µg/ft^2)	Guideline (µg/ft^2)	Guideline Met?
NDFGA-W1	7/23/13	Firing range Lane 2 on target retrieval motor		**8,750**	1,000	No
NDFGA-W2	7/23/13	Firing range on table behind firing line		**5,141**	1,000	No
NDFGA-W3	7/23/13	Firing range control room under table on floor		<91	1,000	Yes
NDFGA-W4	7/23/13	Break room on snack machine (Room 158)		<91	200	Yes
NDFGA-W5	7/23/13	Kitchen on top of ice machine		<91	200	Yes
NDFGA-W6	7/23/13	Drill floor on bleachers		<91	200	Yes
NDFGA-W7	7/23/13	Maintenance bay on floor of dock by file cabinet		<91	200	Yes
NDFGA-W8	7/23/13	Blank	N/A	ND	N/A	N/A

Notes: 1) µg / ft^2 = micrograms per square foot of surface area. 2) ND = none detected. 3) "<" means less than the reporting limit for the analytical method.

Laboratory Result Reports and Chain of Custody Sheets

FOH ENVIRONMENTAL LABORATORY
630 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

ANALYTICAL REPORT

Submitted To: USPHS / Federal Occupational Health
Denver Federal Center
Denver, CO 80225

Attention: Non-Responsive

Submitted By:

Reference Data: Lead
Sampling Site: NGB: Fargo, ND (Armory)
Sample Media: Ghost Wipe(s)®
Method Reference: OSHA ID-121
Project ID: Project 11287
DFOH Lab Nos.: TM-13-62702 through TM-13-62709
Date Received: 07/24/13
Data Analyzed: 07/29/13 - 07/30/13
Date Issued: 08/08/13

The wipe samples were hot plate digested. The samples were run on a Perkin Elmer 200 flame atomic absorption spectrophotometer (AA).

General Lab Comments:
All quality control criteria have been met.
* All samples received in condition acceptable for analysis unless otherwise noted.
** Sample results have not been corrected for contamination based on the field blank or other analytical blank unless otherwise noted.

Analytical results are given on the enclosed tables. Results relate only to items tested. If you have any questions about these results, feel free to phone the Laboratory at (312) 886-0413.

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

Project 11287
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FOH ENVIRONMENTAL LABORATORY
536 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

LEAD on WIPE RESULTS

SAMPLE NUMBER*	LABORATORY NUMBER	CONCENTRATION (µg)	CONCENTRATION (µg/ft²)
NDFGA-W1	TM-13-62702	963	8750
NDFGA-W2	TM-13-62703	566	5141
NDFGA-W3	TM-13-62704	<10	<91
NDFGA-W4	TM-13-62705	<10	<91
NDFGA-W5	TM-13-62706	<10	<91
NDFGA-W6	TM-13-62707	<10	<91
NDFGA-W7	TM-13-62708	<10	<91
NDFGA-W8**	TM-13-62709	<10	

Surface Wipe Sampling Criteria

Metal	Acceptable Surface Level µg/ft²	Basis for Criteria
Lead	250	EPA TSCA 40 CFR 745 and HUD Window Sills

Metals in Wipe Limits
(based on one ft² sampled area)

Analyte	Analytical Method	Method Detection Limit	Minimum Reporting Limit
Lead	OSHA ID-121	5.0 µg/ft²	10 µg/ft²

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

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US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN-OF-CUSTODY / FIELD DATA SHEET

Environmental Laboratory
536 S. Clark Street South, Suite 714
Chicago, IL 60605-1521
Tel: (312)-886-0413 Fax: (312)-886-0434
Non-Responsive

Project Information
Name: Non-Responsive
Address:
Phone/Fax:
Email:

PROJECT REFERENCE #
Agreement No.: A 106644
Statement of Work No.: S 167033
Project No: P 167034
Agency: ARNG
Proj. Manager:
Location (City, State): Armory Fargo, ND

For Lab Use Only
Project /Report #: 11987
Due Date: 8/3/13
Samples Received Chilled? YES (NO) (circle one)
Rev. 07/2010

Conditions on Receipt with Name & Date

Container Types: P-Plastic, G-Glass, V-VOC
Preservatives: A-None, B-H_2SO_4, C-HNO_3, D-NaOH

Turn Around Time Codes: STD- Standard; 3D- Three Day Rush; WH Weekend/Holiday*

Analysis Requested: Lead

Sample ID #	Type	Media	Collected Date	Collected Time	Sample Location / Description	Air Flow (LPM)	Air Time (Min.)	Air Volume (Liters)	Wipe Area (ft^2)	Water Volume (Liters)	Water Code	Turn Around Time*	Lab ID #
NDFGA-W1	7	5	23JUL13						0.1			STD	TM13-62702
NDFGA-W2									0.1				62703
NDFGA-W3									0.1				62704
NDFGA-W4									0.1				62705
NDFGA-W5									0.1				62706
NDFGA-W6									0.1				62707
NDFGA-W7									0.1				62708
NDFGA-W8									—				62709

Sample Type Codes: 1-Air 2-Water 3-Paint 4-Soil 5-Dust 6-Bulk 7-Wipe 8 - Other

Sample Media Codes: 1-Charcoal 2-Matched Weight, 0.8um 3-PVC filter 4-M CE 0.8 um , 37 mm 5 -Ghost Wipes™ 6. Passive badge 7. Other

Non-Responsive

COMMENTS: Please forward results to Non-Responsive

* Applied to organic and inorganic analysis in cases of an emergency only. @ Applied to inorganic and organic samples, SD: Applied to organic and inorganic samples 7-10 business days.

Appendix D
Ventilation

The Fargo Armory indoor firing range has five lanes, an automated paper target retrieval system, and a metal backstop. The once-through mechanical ventilation includes powered make-up air via the perforated plenum wall behind the firing line and an exhaust filtration system behind the bullet trap (Figure D-1).

Firing Line

Make-up Air Plenum Wall

Bullet Trap

Exhaust System

Figure D-1. Fargo Armory Indoor Firing Range Ventilation.

A TSI Alnor Model AVM430A thermal anemometer calibrated according to the manufacturer's specifications was used to evaluate local exhaust ventilation systems at this facility. Ventilation rates were compared to criteria established by NGR 385-15, *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges.* NGR 385-15 requires an average face velocity of 50 feet per minute (fpm) across the firing line. Measurements were collected from the standing, kneeling, and prone positions and the results are included in Table D-1.

Lanes 1 through 4 met the minimum face velocity requirement at all levels. Lane 5 met the average face velocity in the standing position, but not at the kneeling and prone positions. Smoke emitters were used to visually inspect airflow patterns at the firing line across all lanes. The smoke plumes moved directly down range in a laminar pattern for Lanes 1 through 4; some

turbulence was observed in Lane 5 (Figure D-2). The table behind Lane 5 was rotated 90 degrees to investigate if the table and the small red bullet trap were obstructing the airflow pattern. After the table was moved, the face velocity at the standing position improved for Lane 5; however, rotating the table did not improve the velocity measurements at the lower positions in Lane 5 or eliminate the turbulence. There were no visible obstructions in the air intake room behind the plenum wall. It was unclear what caused the reduced face velocity at the lower positions and the observed turbulence in Lane 5.

Table D-1
Ventilation Measurements
North Dakota Army National Guard, Fargo Armory
Indoor Firing Range
July 23, 2013

Shooting Position >>>	Standing	Kneeling	Prone	Average of All 3 Positions	Standard Met?
	Face Velocity in feet per minute (fpm)				
Lane 1	85	75	55	72	Yes
Lane 2	65	65	55	62	Yes
Lane 3	65	70	60	65	Yes
Lane 4	100	70	20	63	Yes
Lane 5	60	15	30	35	Yes for standing No for kneeling/prone and overall
Lane 5 (table rotated)	90	20	13	41	Yes for standing No for kneeling/prone and overall

Figure D-2. Smoke Emitter Testing.

Recommendations:

1. Investigate the low face velocity at the kneeling and prone positions and the turbulence in Lane 5. Coordinate with a qualified HVAC engineer to optimize the performance of this Lane. (RAC 3)

National Guard Bureau

Mid-West Regional Industrial Hygiene Office
301-IH Old Bay Lane
Havre de Grace, MD 21078

ARNG-CSG-P August 29, 2013

MEMORANDUM FOR: The Adjutant General for North Dakota

SUBJECT: Industrial Hygiene Survey at the Indoor Firing Range, Grand Forks Armory, North Dakota

National Guard Bureau (NGB) Mid-West Regional Industrial Hygiene (IH) Office field personnel conducted a survey on July 22, 2013 at the North Dakota Army National Guard Armory located at 1501 48th Street South, Grand Forks, North Dakota. The site point of contact was Non-Respo [redacted], Physical Plant Director. This survey included personal air sampling for lead, surface wipe sampling for lead, and ventilation testing.

Air Sampling: Personal breathing zone samples were collected for two personnel firing 9 mm pistols to simulate a typical qualification scenario. Air sampling results were compared to the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) for lead. One of the actual personal air sampling results was well above the PEL. For this high sample, the 8-hour time-weighted average was then calculated and the result was below the PEL, but still above the OSHA Action Level. The OSHA Action Level is the level above which additional provisions of the OSHA lead standard (29 CFR 1910.1025) are triggered such as additional exposure monitoring, medical surveillance, and training.

The lead air sampling results were also compared to the intermittent lead levels published in NGR 385-15, *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges.* Based on the air sampling results for this scenario, adult personnel would only be allowed to use the range for 15 minutes per day and users under 17 years of age would not be allowed to use the range at all.

The employee with the high result fired ammunition side-by-side with his shooting partner, but he also conducted clean-up of the brass with a small hand broom and dust pan. The shooting partner's result and the area air sample result were below the reporting limit of the analytical method. Based on the activities observed and previous air sampling results in which no elevated airborne lead levels were found, it is likely that the dry sweeping was the major contributor to the high measured airborne lead level. For these reasons, there are no restrictions for this range as long as the recommendations in this memorandum are fully implemented.

Surface Wipe Sampling: Wipe samples were collected on representative surfaces in the facility and analyzed for lead. Two samples collected in the range and one sample from the maintenance bay had results above the surface guideline for lead.

Ventilation: Face velocity measurements were made and smoke emitters were used to visually inspect airflow patterns at the firing line. All five lanes met the average face velocity requirement of 50 feet per minute (fpm) specified in NGR 385-15. The smoke emitter testing demonstrated the required laminar flow downrange for all lanes.

Observations: Detailed procedures and inspections were available for review including the range clean-up policies. A professional contractor cleans the range annually according to site personnel. Push and hand brooms were stored in the range. There is carpeting in the range control room.

Occupational health risk assessment codes (RACs) are assigned to quantify health risks to personnel IAW DOD Letter of Instruction 6055.1, *DOD Safety and Occupational Health Program*. Risk assessment is an expression of health hazard severity and mishap probability, described in terms of route of exposure, actual exposure, exposure limit standards, potential health effects, duration of exposure, and number of exposed personnel. Guidance for RAC determination is attached to this memorandum.

Recommendations:

- **Provide personal exposure sampling results to workers who were monitored. (RAC 2)**
- **Reemphasize procedures to minimize generating airborne lead dust during clean-up such as using the squeegee, high-efficiency particulate air (HEPA) filter vacuum, and/or wet methods. Remove the push and hand brooms. Dry sweeping, dusting, wiping, or blowing with compressed air are not permitted. Follow the vacuum manufacturer's instructions for maintenance and filter change-outs. (RAC 2)**
- **Conduct additional personal air sampling in the firing range to ensure exposures are maintained below OSHA limits. (RAC 2)**
- **Update the site-specific SOP for the firing range to include a written compliance plan for the control of employee lead exposure IAW the OSHA lead standard (29 CFR 1910.1025) and NGR 385-15, 5-1, *Control of Potential Lead Poisoning*. (RAC 2)**
- **The area behind the firing line should be decontaminated to surface lead levels below 1,000 micrograms per square foot (µg/ft^2) and the horizontal surfaces in the maintenance bay should be decontaminated to surface lead levels below 200 µg/ft^2 using HEPA filter vacuums and/or wet methods. (RAC 2)**
- **Remove the carpeting in the control room. Coordinate with the State Environmental Office for proper disposal. (RAC 3)**
- **Consider the use of reduced-lead and lead-free ammunition (non-lead containing bullets) as available. If lead-free ammunition is not available, lead exposure can be significantly reduced by the use of jacketed rounds. Verify if the bullet trap is rated for the use of jacketed ammunition with the bullet trap manufacturer. (RAC 3)**

The results of this sampling effort reflect the tasks, weapons, and ammunition evaluated during this survey and are not necessarily representative of all firing scenarios. Additional sampling is required to fully characterize the exposures for other scenarios at this range. The NGB

conducted this survey in the interest of preventing employee illness and to meet legal obligations where applicable. Results and recommendations are based on information provided by site personnel, field measurements, and conditions observed during the survey. For any further questions, please contact Non-Responsive

Non-Responsive
Regional Industrial Hygienist

Appendix	Title	Status
A.	Metals……	Attached
B.	Organic Vapors…….	N/A
C.	Noise……..	N/A
D.	Ventilation……..	Attached
E.	Lighting…….....	N/A
F.	Other IH Issues…….	N/A
G.	Other IH Sampling….	N/A

Appendix A
Metals

There is an active indoor firing range at the Grand Forks Armory which was constructed in 1996. Weapons are cleaned in the maintenance bay. Site personnel reported that children are not present this facility on a regular basis. The indoor range has five lanes, an automated paper target retrieval system, and a metal backstop. The range includes a control room, storage room, and a dedicated latrine/hand washing area.

Air Sampling

Personal breathing zone air samples were collected for two personnel firing 9 mm pistols to simulate a typical qualification scenario (Figure A-1). Each shooter fired 100 rounds of .22 (Remington High Velocity, Rim Fire) and 100 rounds of 9 mm (Federal Ammunition, Center Fire) ammunition over a 30-minute period. An area air sample was also collected. All air sampling was conducted while the ventilation system was operating.

Figure A-1. Personal Air Sampling during Live Fire.

SKC air sampling pumps (Universal XR Pump Model PCXR8) were calibrated with a primary airflow meter (BIOS Defender 510-M) before and after each sample was collected. SKC 37-millimeter cassettes with 0.8-micron mixed cellulose ester (MCE) filters were used to collect the air samples which were analyzed for lead by Occupational Safety and Health Administration (OSHA) Method ID-121.

Air sampling results were compared to the OSHA Permissible Exposure Limit (PEL) for lead. The results, as shown in Table A-1, are the actual concentrations measured over the sampling period and are not the calculated 8-hour time-weighted average (TWA) values. The actual results were compared to the OSHA PEL and the Action Level. This is a conservative bounding approach since the calculated 8-hour TWAs are lower than the actual results due to the short sampling times. One of the actual personal air sampling results was well above the PEL. For this high sample, the 8-hour TWA was then calculated and the result was below the PEL, but still above the OSHA Action Level. The OSHA Action Level is the level above which additional provisions of the OSHA lead standard (29 CFR 1910.1025) are triggered such as additional exposure monitoring, medical surveillance, and training. In 1996, air sampling results collected for this facility by Air Force personnel were well below the OSHA PEL and Action Level.

The lead air sampling results in Table A-1 were also compared to the intermittent lead levels published in NGR 385-15, *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges.* Based on the high air sampling result for the scenario stated above, personnel would only be allowed to use the range for 15 minutes per day and users under 17 years of age would not be allowed to use the range at all. NGR 385-15 is found at: http://www.ngbpdc.ngb.army.mil/pubs/385/ngr385-15.pdf.

The employee with the high result fired ammunition side-by-side with his shooting partner, but he also conducted clean-up of the brass with a small hand broom and dust pan. The shooting partner's result and the area air sample result were below the reporting limit of the analytical method. Based on the activities observed and previous air sampling results in which no elevated airborne lead levels were found, it is likely that the dry sweeping was the major contributor to the high measured airborne lead level. For these reasons, there are no restrictions for this range as long as the recommendations in this memorandum are fully implemented.

The results of this sampling effort reflect the tasks, weapons, and ammunition evaluated during this survey and are not necessarily representative of all firing scenarios. Additional sampling is required to fully characterize the exposures for other scenarios at this range.

Table A-1
Personal Air Sampling Results for Lead
North Dakota Army National Guard, Grand Forks Armory
Indoor Firing Range
July 22, 2013

Name	Date	Tasks	Sample #	Sample Volume (L)	Lead (mg/m^3)
OSHA PEL-TWA					**0.05**
OSHA Action Level & NGR 385-15 Limit for up to 8 Hours of Use					**0.03**
Area	7/22/13	Lane 3	NDGFA-M1	204	<0.002
Non-Responsive	7/22/13	Lane 4 shooter (firing and manual clean-up)	NDGFA-M2	56	**0.75 TWA = 0.044**
Non-Responsive	7/22/13	Lane 3 shooter (firing only)	NDGFA-M3	54	<0.009
Blank	7/22/13	Blank sample	NDGFA-M4	N/A	ND

Notes: 1) L = liters. 2) mg / m^3 = milligrams per cubic meter. 3) ND = none detected. 4) "<" means less than the reporting limit for the analytical method.

Recommendations:

1. Provide personal exposure sampling results to workers who were monitored. (RAC 2)

2. Reemphasize procedures to minimize generating airborne lead dust during clean-up such as using the squeegee, high-efficiency particulate air (HEPA) filter vacuum, and/or wet methods. Dry sweeping, dusting, wiping, or blowing with compressed air are not permitted. (RAC 2)

3. Conduct additional personal air sampling in the firing range to ensure exposures are maintained below OSHA limits. (RAC 2)

4. Update the site-specific SOP for the firing range to include a written compliance plan for the control of employee lead exposure IAW the OSHA lead standard (29 CFR 1910.1025) and NGR 385-15, 5-1, *Control of Potential Lead Poisoning*. An example template for a written lead compliance plan is available in the Navy Environmental Health Center, Technical Manual NEHC–TM6290.99-10, Appendix C found at: http://www.med.navy.mil/sites/nmcphc/Documents/industrial-hygiene/indoor_firing_range.pdf. (RAC 2)

Surface Wipe Sampling

Wipe samples were collected from representative areas of the facility using Environmental Express Ghost™ Wipes and templates IAW the OSHA wipe sampling method (OSHA Technical Manual, Appendix II, 2-1). The samples were analyzed for lead by OSHA Method ID-121. The results and photos are contained in Table A-2.

Although OSHA does not have published exposure standards for metal surface contamination, 29 CFR 1910 requires that all surfaces must be kept as free as practicable of accumulations of toxic metal dusts. In addition, DOD has instituted a new policy to minimize surface contamination levels of heavy metals (*Control and Management of Surface Accumulations from Lead, Hexavalent Chromium, and Cadmium Operations*, DTM 12-003, 18 April 2012).

The NGB Mid-West Regional Industrial Hygiene Office has adopted target housekeeping guidelines for lead in firing ranges. Any results that exceed 1,000 micrograms per square foot (µg/ft^2) for lead are considered significant. Table A-2 shows that two samples collected in the range had results above the surface guideline for lead. These samples were collected on top of the target retrieval motor and on the floor behind firing line.

For other areas of the facility outside of the firing range, the NGB Mid-West Regional Industrial Hygiene Office has adopted the lead surface guideline of 200 µg/ft^2 published in NG Pam 420-15, *Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges.* Table A-3 show that one result was above the guideline. The high sample was collected in the maintenance bay where weapons are cleaned

Observations

Detailed procedures and inspections were available for review including the range clean-up policies. Appendix C, Grand Forks Armory Complex, Local Supplement, Firing Range Policy specifies that users pickup brass with a squeegee and dust pan. Daily clean-up by facilities personnel includes high-efficiency particulate air (HEPA) vacuuming. The policy for monthly clean-up by facilities personnel lists specific steps for bullet trap lead removal and cleaning to include HEPA filter vacuuming and wet methods by qualified staff equipped with respiratory protection and coveralls. A professional contractor cleans the range annually according to site personnel. Push and hand brooms were stored in the range (Figure A-2). There is carpeting in the range control room.

Recommendations:

1. The area behind the firing line should be decontaminated to surface lead levels below 1,000 µg/ft^2 and the horizontal surfaces in the maintenance bay should be decontaminated to surface lead levels below 200 µg/ft^2 using HEPA filter vacuums and/or wet methods. (RAC 2)

2. Remove the push brooms and use the HEPA filter vacuum. Dry sweeping is not permitted. Follow the vacuum manufacturer's instructions for maintenance and filter change-outs. (RAC 2)

3. Remove the carpeting in the control room. Coordinate with the State Environmental Office for proper disposal. (RAC 3)

4. Consider the use of reduced-lead and lead-free ammunition (non-lead containing bullets) as available. If lead-free ammunition is not available, lead exposure can be significantly reduced by the use of jacketed rounds. Verify if the bullet trap is rated for the use of jacketed ammunition with the bullet trap manufacturer. (RAC 3)

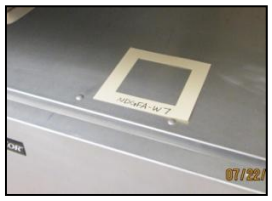
Figure A-2. Range Clean-up Equipment.

Table A-2
Surface Wipe Sampling Results for Lead
North Dakota Army National Guard, Grand Forks Armory
Indoor Firing Range
July 22, 2013

Sample #	Date	Location	Photo	Lead ($\mu g/ft^2$)
Surface Guideline (Firing Range)				**1,000**
NDGFA-W1	7/22/13	Firing range control room on table near main door		<91
NDGFA-W2	7/22/13	Firing range control room on table near window		735
NDGFA-W3	7/22/13	Firing range Lane 2 on top of target retrieval motor		**6,932**
NDGFA-W4	7/22/13	Firing range Lane 5 on floor near wall		**3,914**

Notes: 1) $\mu g / ft^2$ = micrograms per square foot of surface area. 2) ND = none detected. 3) "<" means less than the reporting limit for the analytical method.

Table A-3
Surface Wipe Sampling Results for Lead
North Dakota Army National Guard, Grand Forks Armory
Armory Areas Outside of the Indoor Firing Range
July 22, 2013

Sample #	Date	Location	Photo	Lead ($\mu g/ft^2$)
Surface Guideline				**200**
NDGFA-W5	7/22/13	In hall outside firing range entry door on floor		<91
NDGFA-W6	7/22/13	Drill hall on bleachers		<91
NDGFA-W7	7/22/13	Kitchen on top of food warmer		<91
NDGFA-W8	7/22/13	Maintenance bay on pump electrical box		**227**
NDGFA-W9	7/22/13	Break room on top of microwave (Room 45)		<91
NDGFA-W10	7/22/13	Blank	N/A	ND

Notes: 1) $\mu g / ft^2$ = micrograms per square foot of surface area. 2) ND = none detected. 3) "<" means less than the reporting limit for the analytical method.

Laboratory Result Reports and Chain of Custody Sheets

FOH ENVIRONMENTAL LABORATORY
538 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

ANALYTICAL REPORT

Submitted To: USPHS / Federal Occupational Health
Denver Federal Center
Denver, CO 80225

Attention: Non-Responsive

Submitted By:

Reference Data: Lead
Sampling Site: NGB: Grand Forks, ND (Armory)
Sample Media: Ghost Wipe(s)® and Air (0.8 µm MCE filter)
Method Reference: OSHA ID-121
Project ID: Project 11285
DFOH Lab Nos.: TM-13-62656 through TM-13-62669
Date Received: 07/24/13
Data Analyzed: 07/29/13 – 08/01/13
Date Issued: 08/06/13

The air samples were microwave digested using a CEM MDS-2000 and wipe samples were hot plate digested. The samples were run on a Perkin Elmer 200 flame atomic absorption spectrophotometer (AA).

General Lab Comments:
All quality control criteria have been met.
* All samples received in condition acceptable for analysis unless otherwise noted.
** Sample results have not been corrected for contamination based on the field blank or other analytical blank unless otherwise noted.

Analytical results are given on the enclosed tables. Results relate only to items tested. If you have any questions about these results, feel free to phone the Laboratory at (312) 886-0413.

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

Project 11285
Page 1 of 2

FOH ENVIRONMENTAL LABORATORY
538 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

LEAD on WIPE RESULTS

SAMPLE NUMBER*	LABORATORY NUMBER	CONCENTRATION (µg)	CONCENTRATION (µg/ft²)
NDGFA-W1	TM-13-62656	<10	<91
NDGFA-W2	TM-13-62657	81	735
NDGFA-W3	TM-13-62658	763	6932
NDGFA-W4	TM-13-62659	431	3914
NDGFA-W5	TM-13-62660	<10	<91
NDGFA-W6	TM-13-62661	<10	<91
NDGFA-W7	TM-13-62662	<10	<91
NDGFA-W8	TM-13-62663	25	227
NDGFA-W9	TM-13-62664	<10	<91
NDGFA-W10**	TM-13-62665	<10	None Detected

Surface Wipe Sampling Criteria

Metal	Acceptable Surface Level µg/ft	Basis for Criteria
Lead	250	EPA TSCA 40 CFR 745 and HUD Window Sills

Metals in Wipe Limits
(based on one ft² sampled area)

Analyte	Analytical Method	Method Detection Limit	Minimum Reporting Limit
Lead	OSHA ID-121	5.0 µg/ft²	10 µg/ft²

LEAD in AIR RESULTS

SAMPLE NUMBER*	LABORATORY NUMBER	AIR VOLUME (L)	CONCENTRATION (mg)	CONCENTRATION*** (mg/m³)
NDGFA-M1	TM-13-62666	204	<0.0005	<0.002
NDGFA-M2	TM-13-62667	56	0.0419	0.75
NDGFA-M3	TM-13-62668	54	<0.0005	<0.009
NDGFA-M4**	TM-13-62669		<0.0005	None Detected

*** Denotes samples were rerun and confirmed on the GFAAS.

ANALYTE	METHOD DETECTION LIMIT (mg/m³)	REPORTING LIMIT (mg/m³)
Lead (AA)	0.005 @ 960 L	0.01 @ 960 L
Lead (GFAAS)	0.0003 @ 960 L	0.0005 @ 960 L

ANALYTE	EXPOSURE LIMITS – (mg/m³)		
	OSHA	NIOSH	ACGIH
Lead	0.05	< 0.1	0.05

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

Project 11285
Page 2 of 2

US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN-OF-CUSTODY / FIELD DATA SHEET

Environmental Laboratory
536 S. Clark Street South, Suite 714
Chicago, IL 60605-1521
Tel: (312)-886-0412 Fax: (312)-886-0434
Non-Responsive

PROJECT REFERENCE

Agreement No.:	A	106644
Statement of Work No.:	S	167033
Project No:	P	167034
Agency		ARNG
Proj. Manager		
Location (City, State):		Armory Grand Forks ND

For Lab Use Only
Project /Report #: 11285
Due Date: 8/12/13
Samples Received Chilled? (YES) NO (circle one)
Conditions on Receipt with Name & Date
1 of 2
Rev. 07/2010

Water Sample Codes
Container Types: P-Plastic, G-Glass, V-VOC
Preservatives: A-None, B-H_2SO_4, C-HNO_3, D-NaOH

Turn Around Time Codes
STD- Standard
3D- Three Day Rush@
WH Weekend/Holiday*

Analysis Requested: Lead

Contact Information
Non-Responsive

ID #	Type	Media	Collected Date	Collected Time	Sample Location / Description	Air Flow (LPM)	Air Time (Min.)	Air Volume (Liters)	Wipe Area (ft²)	Water Volume (Liters)	Water Code	Turn Around Time	Lab ID #
NDGFA-W1	7	5	22JUL13						0.1			STD	TM-13-626656
NDGFA-W2													626657
NDGFA-W3													626658
NDGFA-W4													626659
NDGFA-W5													626660
NDGFA-W6													626661
NDGFA-W7													626662
NDGFA-W8													626663
NDGFA-W9													626664
NDGFA-W10									—				626665

Sample Type Codes: 1-Air 2-Water 3-Paint 4-Soil 5-Dust 6-Bulk 7-Wipe 8 - Other

Sample Media Codes: 1-Charcoal 2-Matched Weight, 0.8um 3-PVC filter 4-M CE 0.8 um , 37 mm 5-Ghost Wipes™ 6. Passive badge 7. Other

Non-Responsive

COMMENTS: Please forward results t Non-Responsive

* Applied to organic and inorganic analysis in cases of an emergency only. @ Applied to inorganic and organic samples. SD: Applied to organic and inorganic samples 7-10 business days.

Non-Responsive

US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN-OF-CUSTODY / FIELD DATA SHEET

Environmental Laboratory
536 S. Clark Street South, Suite 714
Chicago, IL 60605-1521
Tel: (312)-886-0412 Fax: (312)-886-0434
Non-Responsive

PROJECT REFERENCE

Agreement No.:	A	106644
Statement of Work No.:	S	167033
Project No:	P	167034
Agency		ARNG
Proj. Manager		
Location (City, State):		Armory IFR Grand Forks ND

For Lab Use Only
Project /Report #: 11285
Due Date: 8/12/13
Samples Received Chilled? YES NO (circle one)
Conditions on Receipt with Name & Date
2 of 2
Rev. 07/2010

Water Sample Codes
Container Types: P-Plastic, G-Glass, V-VOC
Preservatives: A-None, B-H_2SO_4, C-HNO_3, D-NaOH

Turn Around Time Codes
STD- Standard
3D- Three Day Rush@
WH Weekend/Holiday*

Analysis Requested: Lead

Contact Information
Non-Responsive

ID #	Type	Media	Collected Date	Collected Time	Sample Location / Description	Air Flow (LPM)	Air Time (Min.)	Air Volume (Liters)	Wipe Area (ft²)	Water Volume (Liters)	Water Code	Turn Around Time	Lab ID #
NDGFA-M1	1	4	22JUL13			2.0	102	204				STD	TM-13-626666
NDGFA-M2						2.0	28	56					626667
NDGFA-M3						2.0	27	54					626668
NDGFA-M4						—	—	—					626669

Sample Type Codes: 1-Air 2-Water 3-Paint 4-Soil 5-Dust 6-Bulk 7-Wipe 8 - Other

Sample Media Codes: 1-Charcoal 2-Matched Weight, 0.8um 3-PVC filter 4-M CE 0.8 um , 37 mm 5-Ghost Wipes™ 6. Passive badge 7. Other

Non-Responsive

COMMENTS: Please forward results t Non-Responsive

* Applied to organic and inorganic analysis in cases of an emergency only. @ Applied to inorganic and organic samples. SD: Applied to organic and inorganic samples 7-10 business days.

Non-Responsive

Appendix D
Ventilation

The Grand Forks Armory indoor firing range has five lanes, an automated paper target retrieval system, and a metal backstop. The once-through mechanical ventilation includes powered make-up air via the perforated plenum wall behind the firing line and an exhaust filtration system behind the bullet trap (Figure D-1).

Firing Line and Make-up Air Plenum Wall

Bullet Trap

Figure D-1. Grand Forks Armory Indoor Firing Range.

A TSI Alnor Model AVM430A thermal anemometer calibrated according to the manufacturer's specifications was used to evaluate local exhaust ventilation systems at this facility. Ventilation rates were compared to criteria established by NGR 385-15, *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges.* NGR 385-15 requires an average face velocity of 50 feet per minute (fpm) across the firing line. Measurements were collected from the standing, kneeling, and prone positions and the results are included in Table D-1. All five lanes met the average face velocity requirement.

Table D-1
Ventilation Measurements
North Dakota Army National Guard, Grand Forks Armory
Indoor Firing Range
July 22, 2013

Shooting Position >>>	Standing	Kneeling	Prone	Average of All 3 Positions	Standard Met?
	Face Velocity in feet per minute (fpm)				
Lane 1	100	120	100	107	Yes
Lane 2	100	110	110	107	Yes
Lane 3	125	100	100	108	Yes
Lane 4	90	95	100	95	Yes
Lane 5	100	110	100	103	Yes

Smoke emitters were used to visually inspect airflow patterns at the firing line across all lanes. The smoke plumes moved directly down range for all lanes in a laminar pattern (Figure D-2).

Figure D-2. Smoke Emitter Testing.

Recommendations:

None.

National Guard Bureau

Mid-West Regional Industrial Hygiene Office
301-IH Old Bay Lane
Havre de Grace, MD 21078

ARNG-CSG-P April 1, 2015

MEMORANDUM FOR: The Adjutant General for North Dakota

SUBJECT: Ventilation and Lead Surface Testing Survey at the Indoor Firing Range, Building 6400, Camp Grafton, North Dakota

National Guard Bureau (NGB) Mid-West Regional Industrial Hygiene (IH) Office field personnel conducted a survey on February 26, 2015 at the North Dakota Army National Guard Indoor Firing Range, Building 6400, located at Camp Grafton, North Dakota. The site point of contact was Non-Responsive. This survey included surface wipe sampling for lead and ventilation testing in the firing range.

Occupational health risk assessment codes (RACs) are assigned to quantify health risks to personnel IAW DOD Letter of Instruction 6055.1, *DOD Safety and Occupational Health Program*. Risk assessment is an expression of health hazard severity and mishap probability, described in terms of route of exposure, actual exposure, exposure limit standards, potential health effects, duration of exposure, and number of exposed personnel. Guidance for RAC determination is attached to this report.

Surface Wipe Sampling: Thirteen surface wipe samples were collected from representative areas in and adjacent to the range. Samples were collected in the kitchen to assess migration of lead into food handling spaces and on the basketball backstop in the drill room. Nine of the thirteen samples were above NGB recommended standards for lead. One sample collected on the basketball backstop contained 573 µg/ft^2, well above the recommended level of 40 µg/ft^2 for areas occupied by children. <u>The following actions are required:</u>

- Because of the very high levels of surface lead in the firing range, the range should be decontaminated according to the guidelines and procedures in NG Pam 420-15.
- (RAC 2)

- Utilizing workers trained in the hazards of lead dust and in safe cleaning work practices. (RAC 2)

- Maintenance and housekeeping workers must be provided with proper personal protective equipment. (RAC 2)

- Workers assigned to lead decontamination work are required to be in a medical surveillance program for lead exposure. (RAC 2)

- Clean surfaces with high-efficiency particulate air (HEPA) filter vacuums or wet methods. (RAC 2)

- Remove brooms and equipment from behind the bullet trap. (RAC 3)

- Install a locker/wash room adjacent to the range with entrance in the garage bay area. (RAC 3)

- The door from the range to the drill room should be closed except for emergency egress. (RAC 4)

- Prior to the start of range rehabilitation, the environmental office must be notified to determine the disposition of any debris containing hazardous materials (lead). (RAC 3)

- Post-cleaning surface wipe sample results must be less than 200 micrograms per square foot (ug/ft2) (40 micrograms in the case of child exposure). (RAC 2)

Ventilation:

Face velocity measurements were made and smoke emitters were used to visually inspect airflow patterns at the firing line. All five lanes met the average face velocity requirement of 50 feet per minute (FPM) as specified in NGR 385-15. The smoke emitter testing demonstrated the required laminar flow downrange for all five lanes. There was no turbulence that resulted in airflow moving back behind the firing line at the five firing stations. <u>The following actions are required:</u>

- To prevent lead dust from accumulating on the roof as well as in and around the building, a HEPA filtration system should be installed on the exhaust ventilation system. Any modification to the ventilation system should also insure that air flow at the firing line be consistently maintained at no less than 50 fpm. This may require that the exhaust fan be adjusted to increase the cubic feet of air per minute. (RAC 2)

- Install a manometer in the duct work leading to the exhaust fan that is capable of measuring at least 2.0 inches of static pressure. (RAC 3)

- Develop and update the site-specific SOP for the firing range in accordance with NGR 385-15. (RAC 2)

At this time, the range is classified as: “Unsafe” due to the potential release of lead containing dust to the outdoors and the potential re-entry of lead dust into the building’s fresh air intake vents.

The NGB conducted this survey in the interest of preventing employee illness and to meet legal obligations where applicable. Results and recommendations are based on information provided by site personnel, field measurements, and conditions observed during the survey. For any further questions, please contact Non-Responsive

Non-Responsive
Regional Industrial Hygienist

Ventilation and Lead Surface Testing Survey at the Indoor Firing Range

Building 6400, Camp Grafton, North Dakota

Firing Range Design

Firing ranges are to be designed to prevent lead exposure to the occupants. This is mainly accomplished by room ventilation and clean areas with hand washing facilities. The firing range in Building 6400 is entered directly from the drill room. There is no separate control room or hand washing/clean locker area adjacent to the range. The range has not been used since July 2013 when limited live firing was conducted for personal airborne lead exposure monitoring. At the time of ventilation testing in July 2013, the supply air flowed into the range from the back wall that was constructed of cinder blocks with vents in the wall. In the past year, the block wall was removed and replaced with a metal wall with numerous small holes to produce a more even laminar flow of air toward the firing line.

Standards and Criteria for Indoor Firing Ranges

The following policy guides are used for the renovation and safe use of indoor firing ranges.

- *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges NGR 385-15*
- *Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges NG Pam 420-15*
- *Indoor Firing Range Design Guidance DG 415-1, 2-3.3*

Lead on Surfaces

Although OSHA does not have published exposure standards for metal surface contamination, 29 CFR 1910 requires that all surfaces must be kept as free as practicable of accumulations of toxic metal dusts. In addition, DOD has instituted a policy to minimize surface contamination levels of heavy metals (*Control and Management of Surface Accumulations from Lead, Hexavalent Chromium, and Cadmium Operations*, DTM 12-003, 18 April 2012). The NGB Mid-West Regional IH Office has adopted target housekeeping guidelines for lead dust in firing ranges. Any results that exceed 1,000 micrograms per square foot ($\mu g/ft^2$) for lead are considered significant. For areas where children may be present, NG PAM 420-15 requires lead levels to be less than 40 $\mu g/ft^2$. All other work areas in the building should be less than 200 $\mu g/ft^2$ for lead.

Airborne Lead

The OSHA Permissible Exposure Limit for lead is 0.05 mg/m3 and the Action Level is 0.03 mg/m3 based on an 8-hour time-weighted average. Exposures above the Action Level will require additional exposure monitoring, medical surveillance, and training under the OSHA lead standard (29 CFR 1910.1025). Based on the OSHA standard, Publication NGR 385-15, *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges* allows for intermittent lead level exposures. Personnel are allowed to use the range for the maximum period (up to 8 hours per day for adults and up to 4 hours per day for users under 17 years of age).

Surface Wipe Sampling

Thirteen surface wipe samples were collected from representative areas in and adjacent to the range using Environmental Express Ghost™ Wipes and templates (OSHA Technical Manual, Appendix II, 2-1). Wipe samples were collected in the kitchen to assess migration of lead into food handling spaces and on the basketball backstop in the drill room. The samples were analyzed for lead by OSHA Analytical Method ID-121. Nine of the thirteen samples were above NGB recommended standards for lead. One sample collected on the basketball backstop contained 573 µg/ft^2, well above the recommended level of 40 µg/ft^2 for areas occupied by children. The results and photos are contained in Table 1.

Recommendations

Because of the very high levels of surface lead in the firing range, the range should be decontaminated according to the guidelines and procedures in NG Pam 420-15. (RAC 2)

Utilizing workers trained in the hazards of lead dust and in safe cleaning work practices. (RAC 2)

Maintenance and housekeeping workers must be provided with proper personal protective equipment. (RAC 2)

Workers assigned to lead decontamination work are required to be in a medical surveillance program for lead exposure. (RAC 2)

Clean surfaces with high-efficiency particulate air (HEPA) filter vacuums or wet methods. (RAC 2)

Remove brooms and equipment from behind the bullet trap. (RAC 3)

Install a locker/wash room adjacent to the range with entrance in the garage bay area. (RAC 3)

The door from the range to the drill room should be closed except for emergency egress. (RAC 4)

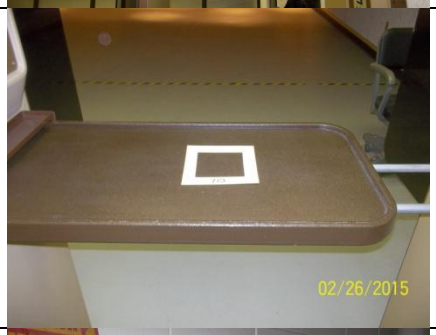
Prior to the start of rehabilitation, the environmental office must be notified to determine the disposition of any debris containing hazardous materials (lead). (RAC 3)

Post-cleaning surface wipe sample results must be less than 200 micrograms per square foot (µg/ft^2) (40 micrograms in the case of child exposure). (RAC 2)

Table 1
Surface Wipe Sampling Results for Lead
North Dakota Army National Guard
Indoor Firing Range
Camp Grafton
February 26, 2015

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-1 Firing Range on table behind firing line		200	142
W-2 Drill Room on basket ball backstop		40	**573**
W-3 Kitchen on ice machine		40	<10
W-4 Lane 5 on wall shelf behind firing line		200	**58,500**

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-5 Firing range on floor behind firing line		200	**850**
W-6 Firing range on floor at station #2		200	**1,460**
W-7 Firing range half way down the range		1,000	**3,859**
W-8 Firing range on brown metal retrieval support at station #1		1,000	**1,179**

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-9 Firing range on brown metal retrieval support at station #1		1,000	**1,877**
W-10 Firing range on support table at station #4		200	**778**
W-11 Garage bay area on metal bench next to bullet trap door		200	<91
W-13 Kitchen on cup ice machine		40	<10

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-14 Firing range on wall		200	**324**
W-15 blank			ND

Notes: 1) µg / ft^2 = micrograms per square foot of surface area. 2) N/A = not applicable. 3) ND = none detected. 4) "<" means less than the reporting limit for the analytical method.

Ventilation

Face velocity measurements were made and smoke emitters were used to visually inspect airflow patterns at the firing line. A TSI Alnor Model AVM430A thermal anemometer calibrated according to the manufacturer's specifications was used to evaluate airflow at the firing line. All five lanes met the average face velocity requirement of 50 feet per minute (fpm) specified in NGR 385-15. (Table 2) The smoke emitter testing demonstrated the required laminar flow downrange for all five lanes. There was no turbulence that resulted in airflow moving back behind the firing line at the five firing stations. (Figures 1-4)

Currently, the exhaust ventilation for the range is vented directly outdoor on the roof of the building. The fresh air intake for the kitchen is also located on the roof. Based on this design, there is the potential for lead containing dust to enter the fresh air intake to the kitchen. However, the firing range has not been used since the opening of the kitchen.

Recommendations

To prevent lead dust from accumulating on the roof as well as in and around the building, a HEPA filtration system should be installed on the exhaust ventilation system. Any modification to the ventilation system should also insure that air flow at the firing line be consistently maintained at no less than 50 fpm. This may require that the exhaust fan be adjusted to increase the cubic feet of air per minute. (RAC 2)

Install a manometer in the duct work leading to the exhaust fan that is capable of measuring at least 2.0 inches of static pressure. (RAC 3)

Develop and update the site-specific SOP for the firing range in accordance with NGR 385-15. (RAC 2)

Table 2
Firing Line Ventilation Measurements
North Dakota Army National Guard
Indoor Firing Range
Camp Grafton
February 26, 2015

Shooting Position >>>	Standing	Kneeling	Prone	Average of all 3 positions	Standard Met?
	Face Velocity in feet per minute (FPM)				
Lane 1	55	82	81	72	Yes
Lane 2	90	80	51	73	Yes
Lane 3	66	67	50	61	Yes
Lane 4	50	51	50	50	Yes
Lane 5	83	62	52	65	Yes

Figure 1 – Smoke Test at Firing Line

Figure 2 – Smoke Test at Firing Line

Figure 3 – Smoke Test at Bullet Stop

Figure 4 – Exhaust Vent Above Bullet Stop

Figure 5 – Supply Air Wall

Laboratory Result Reports and Chain of Custody Sheets

FOH ENVIRONMENTAL LABORATORY
536 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

ANALYTICAL REPORT

Submitted To: USPHS / Federal Occupational Health
Denver Federal Center
Denver, CO 80225

Attention: Non-Responsive

Submitted By:

Reference Data: Lead
Sampling Site: NGB: Camp Grafton, ND (Firing Range)
Sample Media: Ghost Wipe(s)®
Method Reference: OSHA ID-121
Project ID: Project 12702
DFOH Lab Nos.: TM-15-79010 through TM-15-79024
Date Received: 03/04/15
Data Analyzed: 03/04/15 – 03/05/15
Date Issued: 03/05/15

The wipe samples were hot plate digested. The samples were run on a Perkin Elmer 200 flame atomic absorption spectrophotometer (AA).

General Lab Comments:
All quality control criteria have been met.
* All samples received in condition acceptable for analysis unless otherwise noted.
** Sample results have not been corrected for contamination based on the field blank or other analytical blank unless otherwise noted.

Analytical results are given on the enclosed tables. Results relate only to items tested. If you have any questions about these results, feel free to phone the Laboratory at (312) 886-0413.

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

FOH ENVIRONMENTAL LABORATORY
536 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

LEAD on WIPE RESULTS

SAMPLE NUMBER*	LABORATORY NUMBER	CONCENTRATION (µg)	CONCENTRATION (µg/ft²)
W-1	TM-15-79010	16	142
W-2	TM-15-79011	63	573
W-3	TM-15-79012	<10	<91
W-4	TM-15-79013	6435	58500
W-5	TM-15-79014	94	850
W-6	TM-15-79015	161	1460
W-7	TM-15-79016	425	3859
W-8	TM-15-79017	130	1179
W-9	TM-15-79018	206	1877
W-10	TM-15-79019	86	778
W-11	TM-15-79020	<10	<91
W-12	TM-15-79021	<10	<91
W-13	TM-15-79022	<10	<91
W-14	TM-15-79023	36	324
W-15**	TM-15-79024	<10	

Surface Wipe Sampling Criteria

Metal	Acceptable Surface Level µg/ft²	Basis for Criteria
Lead	200 for facilities (all surfaces)	NG Pam 420-15, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 November 2006, http://www.ngbpdc.ngb.army.mil/pubs/420/ngpam420_15.pdf
Lead	40 for any potentially child occupied areas of facility (all surfaces); used for armories with public access, family services offices, or other routine use by children	NG Pam 420-15, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 November 2006, http://www.ngbpdc.ngb.army.mil/pubs/420/ngpam420_15.pdf

Metals in Wipe Limits
(based on one ft² sampled area)

Analyte	Analytical Method	Method Detection Limit	Minimum Reporting Limit
Lead – Flame AA	OSHA ID-121	5.0 µg/ft²	10 µg/ft²

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN-OF-CUSTODY / FIELD DATA SHEET

Environmental Laboratory
536 S. Clark Street South, Suite 714
Chicago, IL 60605-1521
Tel: (312)-886-0413 Fax: (312)-886-0434

Non-Responsive

[redacted]

PROJECT REFERENCE

Agreement No.:	A	106644
Statement of Work No.:	S	180648
Project No:	P	180649
Agency Proj. Manager		Firing Range ARNG
Location (City, State):		Camp Grafton ND

For Lab Use Only
Project /Report #: 12702
Due Date: 3/10/15
Samples Received Chilled? YES / (NO) (circle one)
Conditions on Receipt with Name & Date
Rev. 07/2010

Water Sample Codes[2]
Container Types:
P-Plastic, G-Glass, V-VOC
Preservatives:
A-None, B-H_2SO_4, C-HNO_3, D-NaOH

Turn Around Time Codes[4]
STD- Standard
3D- Three Day Rush[5]
WH Weekend/Holiday*

Analysis Requested: Lead

ID #	Type[1]	Media[2]	Collected Date	Collected Time	Sample Location / Description	Air Flow (LPM)	Air Time (Min.)	Air Volume (Liters)	Wipe Area (ft²)	Water Volume (Liters)	Water Code[3]	Turn Around Time*	Lab ID #
W-1	7	5	Feb 26						16			STD	NHS-79010
W-2													79011
W-3													79012
W-4													79013
W-5													79014
W-6													79015
W-7													79016
W-8													79017
W-9													79018
W-10													79019
W-11													79020
W-12													79021
W-13													79022

Sample Type Codes[1]
1-Air 2-Water 3-Paint 4-Soil 5-Dust 6-Bulk 7-Wipe 8 - Other

Sample Media Codes[2]
1-Charcoal 2-Matched Weight, 0.8um 3-PVC filter 4-MCE 0.8 um , 37 mm 5 -Ghost Wipes™ 6 Passive badge 7- Other

Non-Responsive

COMMENTS: * from Revised COC emailed on 3/5/15 ARG

* Applied to organic and inorganic analysis in cases of an emergency only. [5] Applied to inorganic and organic samples, SD: Applied to organic and inorganic samples 7-10 business days.

page 1 of 2

US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN-OF-CUSTODY / FIELD DATA SHEET

536 S. Clark Street South, Suite 714
Chicago, IL 60605-1521
Tel: (312)-886-0413 Fax: (312)-886-0434
Non-Responsive [redacted]

Name: Non-Responsive [redacted]
Address:
Phone/Fax:
Email:

Agreement No.: A
Statement of Work No.: S
Project No.: P
Agency: Firing Range
Proj. Manager: ARNG
Location (City, State): Camp Grafton ND

For Lab Use Only
Project /Report #: 12702
Due Date: 3/20/15
Samples Received Chilled? YES NO (circle one)
Conditions on Receipt with Name & Date
Rev 07/2010

Container Types: P-Plastic, G-Glass, V-VOC
Preservatives: A-None, B-H_2SO_4, C-HNO_3, D-NaOH

STD- Standard
3D- Three Day Rush[⊕]
WH Weekend/Holiday*

Lead

ID #	Sample Type¹	Sample Media²	Collected Date	Collected Time	Sample Location / Description	Air Flow (LPM)	Air Time (Min.)	Air Volume (Liters)	Wipe Area (ft²)	Water Volume (Liters)	Water Code³	Turn Around Time*	Lab ID #	Lead
W-14	7	5	Feb 26						16			STD	TM-15-79023	↓
W-15									-				↓ 79024	

1-Air 2-Water 3-Paint 4-Soil 5-Dust 6-Bulk 7-Wipe 8-Other

1-Charcoal 2-Matched Weight, 0.8um 3-PVC filter 4-MCE 0.8 um, 37 mm 5-Ghost Wipes™ 6-Passive badge 7-Other

Non-Responsive [redacted]

COMMENTS:

* Applied to organic and inorganic analysis in cases of an emergency only. ⊕ Applied to inorganic and organic samples, SD: Applied to organic and inorganic samples 7-10 business days

page 2 of 2

National Guard Bureau

Mid-West Regional Industrial Hygiene Office
301-IH Old Bay Lane
Havre de Grace, MD 21078

ARNG-CSG-P June 12, 2015

MEMORANDUM FOR: The Adjutant General for North Dakota

SUBJECT: Ventilation and Lead Surface Testing Survey at the Indoor Firing Range, Readiness Center, Fargo, North Dakota

National Guard Bureau (NGB) Mid-West Regional Industrial Hygiene (IH) Office field personnel conducted a survey on April 30, 2015 at the North Dakota Army National Guard Indoor Firing Range, Readiness Center, located in Fargo, North Dakota. The site point of contact was Non-Respon [redacted]. This survey included surface wipe sampling for lead and ventilation testing in the firing range and adjacent rooms.

Occupational health risk assessment codes (RACs) are assigned to quantify health risks to personnel IAW DOD Letter of Instruction 6055.1, *DOD Safety and Occupational Health Program*. Risk assessment is an expression of health hazard severity and mishap probability, described in terms of route of exposure, actual exposure, exposure limit standards, potential health effects, duration of exposure, and number of exposed personnel. Guidance for RAC determination is attached to this report.

Surface Wipe Sampling
Twenty-four surface wipe samples were collected from representative areas in and adjacent to the range. Wipe samples were collected in the kitchen to assess migration of lead into food handling spaces and on the basketball backstop in the drill room. Seventeen of the twenty-four samples were above NGB recommended standards for lead. Samples collected in the firing range and control room were as high as 53,682 µg/ft^2 on the gun rest support at firing line position number 3. Samples collected in the fan room or mechanical room 161 were 45,273 and 146,955 µg/ft^2. A sample collected on the basketball backstop in the drill room contained 409 µg/ft^2, well above the recommended level of 40 µg/ft^2 for areas occupied by children.

Recommendations

- Because of the very high levels of surface lead in the firing range, the range, mechanical room, and storage room should be decontaminated according to the guidelines and procedures in NG Pam 420-15. (RAC 2)

- Utilizing workers trained in the hazards of lead dust and in safe cleaning work practices. (RAC 2)

- Maintenance and housekeeping workers must be provided with proper personal protective equipment. (RAC 2)

- Workers assigned to lead decontamination work are required to be in a medical surveillance program for lead exposure. (RAC 2)

- Clean surfaces with high-efficiency particulate air (HEPA) filter vacuums or wet methods. (RAC 2)

- Post-cleaning surface wipe sample results must be less than 200 micrograms per square foot ($\mu g/ft^2$) and 40 $\mu g/ft^2$ in areas open to the public. (RAC 2)

Ventilation

Face velocity measurements were made and smoke emitters were used to visually inspect airflow patterns at the firing line. A TSI Alnor Model AVM430A thermal anemometer calibrated according to the manufacturer's specifications was used to evaluate airflow at the firing line. All five lanes met the average face velocity requirement of 50 feet per minute (fpm) specified in NGR 385-15. (Table 2) The smoke emitter testing demonstrated the required laminar flow downrange for all five lanes. There was slight turbulence above firing position 5 that resulted in airflow moving back behind the firing line.

Recommendations

- Although the average face velocity at each firing line position is above 50 feet per minute, Lanes 4 and 5 had less than 50 feet per minute in either the kneeling or prone shooting positions. Combined with slight turbulence at Lane 5, the airflow should be increased on the range. (RAC 2)

The NGB conducted this survey in the interest of preventing employee illness and to meet legal obligations where applicable. Results and recommendations are based on information provided by site personnel, field measurements, and conditions observed during the survey. For any further questions, please contact Non-Responsive

[redacted]

Non-Responsive

Regional Industrial Hygienist

Ventilation and Lead Surface Testing Survey at the Indoor Firing Range

Fargo, North Dakota

Firing Range Design

Firing ranges are to be designed to prevent lead exposure to the occupants. This is mainly accomplished by room ventilation and clean areas with hand washing facilities. The firing range (room 156) at this facility has a separate control room (room 154) and hand washing/restroom adjacent to the range. A storage room (room 153) is located off of the control room. Supply air to the range is through mechanical room. Air flows from this room around a bend in the wall into the range through a perforated metal plenum wall that provides laminar airflow past the firing line toward the target/bullet trap. From the plenum behind the bullet trap air is pulled by an exhaust fan in mechanical room 161 through filters and vented outdoors. The firing range is open for used at this time.

Standards and Criteria for Indoor Firing Ranges

The following policy guides are used for the renovation and safe use of indoor firing ranges.

- *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges NGR 385-15*
- *Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges NG Pam 420-15*
- *Indoor Firing Range Design Guidance DG 415-1, 2-3.3*

Lead on Surfaces

Although OSHA does not have published exposure standards for metal surface contamination, 29 CFR 1910 requires that all surfaces must be kept as free as practicable of accumulations of toxic metal dusts. In addition, DOD has instituted a policy to minimize surface contamination levels of heavy metals (*Control and Management of Surface Accumulations from Lead, Hexavalent Chromium, and Cadmium Operations*, DTM 12-003, 18 April 2012). The NGB Mid-West Regional IH Office has adopted target housekeeping guidelines for lead dust in firing ranges. Any results that exceed 1,000 micrograms per square foot ($\mu g/ft^2$) for lead are considered significant. For areas where children may be present, NG PAM 420-15 requires lead levels to be less than 40 $\mu g/ft^2$. All other work areas in the building should be less than 200 $\mu g/ft^2$ for lead.

Surface Wipe Sampling

Twenty-four surface wipe samples were collected from representative areas in and adjacent to the range using Environmental Express Ghost™ Wipes and templates (OSHA Technical Manual, Appendix II, 2-1). Wipe samples were collected in the kitchen to assess migration of lead into food handling spaces and on the basketball backstop in the drill room. The samples were analyzed for lead by OSHA Analytical Method ID-121. Seventeen of the twenty-four samples were above NGB recommended standards for lead. Samples collected in the firing range and control room were as high as 53,682 $\mu g/ft^2$ on the gun rest support at firing line position number 3. Samples collected in the fan room or mechanical room 161 were 45,273 and 146,955 $\mu g/ft^2$. A sample collected on the basketball backstop in the drill room contained 409 $\mu g/ft^2$, well above the recommended level of 40 $\mu g/ft^2$ for areas occupied by children. The results and photos are contained in Table 1.

Recommendations

1. Because of the very high levels of surface lead in the firing range, the range, mechanical room, and storage room should be decontaminated according to the guidelines and procedures in NG Pam 420-15. (RAC 2)

2. Utilizing workers trained in the hazards of lead dust and in safe cleaning work practices. (RAC 2)

3. Maintenance and housekeeping workers must be provided with proper personal protective equipment. (RAC 2)

4. Workers assigned to lead decontamination work are required to be in a medical surveillance program for lead exposure. (RAC 2)

5. Clean surfaces with high-efficiency particulate air (HEPA) filter vacuums or wet methods. (RAC 2)

6. Post-cleaning surface wipe sample results must be less than 200 micrograms per square foot ($\mu g/ft^2$) (40 micrograms in the case of child exposure). (RAC 2)

Table 1
Surface Wipe Sampling Results for Lead
North Dakota Army National Guard
Indoor Firing Range
Fargo, ND
April 30, 2015

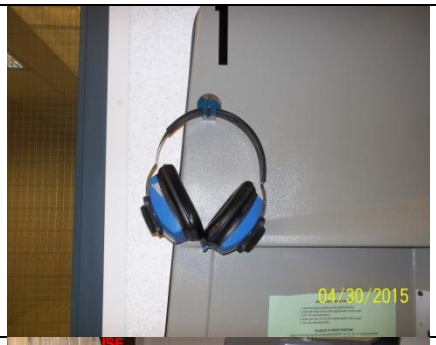
Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-1 Drill Room on floor		40	<10
W-2 Drill Room on basket ball support		40	**409**
W-3 Drill Room on wall ledge		40	**61**
W-4 Kitchen on ice machine		40	<10

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-5 Room 158 Vending Table with microwave		40	<10
W-6 Room 158 on vending machine		40	**187**
W-7 Room 143 Men's locker room on locker #C96		200	<91
W-8 On water fountain		200	<91

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-9 Hallway outside firing range on floor		200	**243**
W-10 Room 154 firing range on PA system		200	**737**
W-11 Room 154 firing range on table		200	**822**
W-12 Room 154 firing range on floor		200	**480**

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-13 Room 153 Range storage on shelf		200	**4,370**
W-14 Room 153 on floor		200	**2,135**
W-15 Room 156 Range floor behind firing line		1,000	**2,765**
W-16 Room 156 Range floor at position 4		1,000	**5,616**

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-17 Room 156 Range on gun-rest support position 3		1,000	**53,682**
W-18 Room 156 Range on floor at target end		none	196,682
W-19 Room 156 Range on table		1,000	617
W-20 Room 156 Range on target retrieval motor position 3		1,000	**14,336**

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-21 Room 156 Range on hearing muffs		40	**568**
W-22 Room 161 Fan Mechanical room on exhaust AHU		200	**45,273**
W-23 Room 161 Fan Mechanical room on floor by filters		200	**146,955**
W-24 Hallway outside room 161 on floor		200	**2,250**
W-25 blank			ND

Notes: 1) $\mu g / ft^2$ = micrograms per square foot of surface area. 2) N/A = not applicable. 3) ND = none detected. 4) "<" means less than the reporting limit for the analytical method.

Ventilation

Face velocity measurements were made and smoke emitters were used to visually inspect airflow patterns at the firing line. A TSI Alnor Model AVM430A thermal anemometer calibrated according to the manufacturer's specifications was used to evaluate airflow at the firing line. All five lanes met the average face velocity requirement of 50 feet per minute (fpm) specified in NGR 385-15. (Table 2) The smoke emitter testing demonstrated the required laminar flow downrange for all five lanes. There was slight turbulence above firing position 5 that resulted in airflow moving back behind the firing line. (Figures 1-4)

Recommendations

Although the average face velocity at each firing line position is above 50 feet per minute, Lanes 4 and 5 had less than 50 feet per minute in either the kneeling or prone shooting positions. Combined with slight turbulence at Lane 5, the airflow should be increased on the range. (RAC 2)

Table 2
Firing Line Ventilation Measurements
North Dakota Army National Guard
Indoor Firing Range
Fargo, ND
April 30, 2015

Shooting Position >>>	Standing	Kneeling	Prone	Average of all 3 positions	Standard Met?
	Face Velocity in feet per minute (FPM)				
Lane 1	102	120	93	105	Yes
Lane 2	88	117	92	99	Yes
Lane 3	86	128	77	98	Yes
Lane 4	82	75	41	66	Yes
Lane 5	126	28	5	53	Yes

Figure 1

Figure 2

Figure 3

Figure 4

Laboratory Result Reports and Chain of Custody Sheets

FOH ENVIRONMENTAL LABORATORY
536 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

ANALYTICAL REPORT

Submitted To: USPHS / Federal Occupational Health
Denver Federal Center
Denver, CO 80225

Attention: Non-Responsive

Submitted By:

Reference Data: Lead
Sampling Site: NGB: Fargo, ND
Sample Media: Ghost Wipe(s)®
Method Reference: OSHA ID-121
Project ID: Project 12801
DFOH Lab Nos.: TM-15-80005 through TM-15-80029
Date Received: 05/04/15
Data Analyzed: 05/04/15 – 05/05/15
Date Issued: 05/05/15

The wipe samples were hot plate digested. The samples were run on a Perkin Elmer 200 flame atomic absorption spectrophotometer (AA).

General Lab Comments:
All quality control criteria have been met.
* All samples received in condition acceptable for analysis unless otherwise noted.
** Sample results have not been corrected for contamination based on the field blank or other analytical blank unless otherwise noted.

Analytical results are given on the enclosed tables. Results relate only to items tested. If you have any questions about these results, feel free to phone the Laboratory at (312) 886-0413.

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

FOH ENVIRONMENTAL LABORATORY
536 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

LEAD on WIPE RESULTS

SAMPLE NUMBER*	LABORATORY NUMBER	CONCENTRATION (µg)	CONCENTRATION (µg/ft²)
W-1	TM-15-80005	<10	<10
W-2	TM-15-80006	258	409
W-3	TM-15-80007	51	61
W-4	TM-15-80008	<10	<10
W-5	TM-15-80009	<10	<10
W-6	TM-15-80010	187	187
W-7	TM-15-80011	<10	<91
W-8	TM-15-80012	<10	<91
W-9	TM-15-80013	27	243
W-10	TM-15-80014	81	737
W-11	TM-15-80015	90	822
W-12	TM-15-80016	53	480
W-13	TM-15-80017	481	4370
W-14	TM-15-80018	235	2135
W-15	TM-15-80019	304	2765
W-16	TM-15-80020	618	5616
W-17	TM-15-80021	5905	53682
W-18	TM-15-80022	21635	196682
W-19	TM-15-80023	68	617
W-20	TM-15-80024	1577	14336
W-21	TM-15-80025	63	568
W-22	TM-15-80026	4980	45273
W-23	TM-15-80027	16165	146955
W-24	TM-15-80028	247	2250
W-25**	TM-15-80029	<10	

Surface Wipe Sampling Criteria

Metal	Acceptable Surface Level µg/ft²	Basis for Criteria
Lead	200 for facilities (all surfaces)	NG Pam 420-15, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 November 2006, http://www.ngbpdc.ngb.army.mil/pubs/420/ngpam420_15.pdf
Lead	40 for any potentially child occupied areas of facility (all surfaces); used for armories with public access, family services offices, or other routine use by children	NG Pam 420-15, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 November 2006, http://www.ngbpdc.ngb.army.mil/pubs/420/ngpam420_15.pdf

Metals in Wipe Limits
(based on one ft² sampled area)

Analyte	Analytical Method	Method Detection Limit	Minimum Reporting Limit
Lead – Flame AA	OSHA ID-121	5.0 µg/ft²	10 µg/ft²

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

Project 12801
Page 2 of 2

Page 1 of 2

US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN-OF-CUSTODY / FIELD DATA SHEET

Environmental Laboratory
536 S. Clark Street South, Suite 714
Chicago, IL 60605-1521
Tel: (312)-886-0413 Fax: (312)-886-0434
Non-Responsive
Non-Responsive

PROJECT REFERENCE
Agreement No.: A 106644
Statement of Work No.: S 188318
Project No: P 188319
Agency ARNG
Proj. Manager IFR
Location (City, State): Fargo ND

For Lab Use Only
Project /Report #: 12891
Due Date: 5/11/15
Samples Received Chilled? YES (NO) (circle one)
Conditions on Receipt with Name & Date
Rev. 07/2010

Water Sample Codes*
Container Types: P-Plastic, G-Glass, V-VOC
Preservatives: A-None, B-H_2SO_4, C-HNO_3, D-NaOH

Turn Around Time Codes*
STD- Standard
3D- Three Day Rush@
WH Weekend/Holiday*

Analysis Requested: Lead

Sample ID #	Type*	Media*	Collected Date	Collected Time	Sample Location / Description	Air Flow (LPM)	Air Time (Min.)	Air Volume (Liters)	Wipe Area	Water Volume (Liters)	Water Code*	Turn Around Time*	Lab ID #
W-1	7	5	April	30					144			STD	IM-15-80005
W-2									90				80006
W-3									120				80007
W-4									144				80008
W-5									144				80009
W-6									144				80010
W-7									16				80011
W-8									16				80012
W-9									16				80013
W-10									16				80014
W-11									16				80015
W-12									16				80016
W-13									16				80017

Sample Type Codes*
1-Air 2-Water 3-Paint 4-Soil 5-Dust 6-Bulk 7-Wipe 8 - Other

Sample Media Codes*
1-Charcoal 2-Matched Weight, 0.8um 3-PVC filter 4-M CE 0.8 um , 37 mm 5 -Ghost Wipes™ 6. Passive badge 7. Other

Non-Responsive

COMMENTS:

* Applied to organic and inorganic analysis in cases of an emergency only. @ Applied to inorganic and organic samples, SD: Applied to organic and inorganic samples 7-10 business days.

page 2 of 2

US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN-OF-CUSTODY / FIELD DATA SHEET

Environmental Laboratory
536 S. Clark Street South, Suite 714
Chicago, IL 60605-1521
Tel: (312)-886-0413 Fax: (312)-886-0434

Non-Responsive

Non-Responsive

PROJECT REFERENCE

Agreement No.:	A 106644
Statement of Work No.:	S 158315
Project No:	P 18-8-319
Agency	ARNG
Proj. Manager	IFR
Location City, State):	Fargo ND

For Lab Use Only
Project /Report #: 12801
Due Date: 5 days
Samples Received Chilled? YES NO (circle one)
Conditions on Receipt with Name & Date

Rev. 07/2010

Water Sample Codes[2]
Container Types: P-Plastic, G-Glass, V-VOC
Preservatives: A-None, B-H_2SO_4, C-HNO_3, D-NaOH

Turn Around Time Codes[1]
STD- Standard
3D- Three Day Rush[#]
WH Weekend/Holiday*

Analysis Requested: Lead

Sample ID #	Type[1]	Media[2]	Collected Date	Collected Time	Sample Location / Description	Air Flow (LPM)	Air Time (Min.)	Air Volume (Liters)	Wipe Area (sq ft)	Water Volume (Liters)	Water Code[3]	Turn Around Time*	Lab ID #
W-14	7	5	April 30						16			STD	TM-15-80018
W-15									16				80019
W-16									16				80020
W-17									16				80021
W-18									16				80022
W-19									16				80023
W-20									16				80024
W-21									16				80025
W-22									16				80026
W-23									16				80027
W-24									16				80028
W-25					blank				—				80029

Sample Type Codes[1]
1-Air 2-Water 3-Paint 4-Soil 5-Dust 6-Bulk 7-Wipe 8 - Other

Sample Media Codes[2]
1-Charcoal 2-Matched Weight, 0.8um 3-PVC filter 4-M CE 0.8 um , 37 mm 5 -Ghost Wipes™ 6. Passive badge 7. Other

Non-Responsive

COMMENTS:

* Applied to organic and inorganic analysis in cases of an emergency only. # Applied to inorganic and organic samples, SD: Applied to organic and inorganic samples 7-10 business days.

National Guard Bureau

Mid-West Regional Industrial Hygiene Office
301-IH Old Bay Lane
Havre de Grace, MD 21078

ARNG-CSG-P June 15, 2015

MEMORANDUM FOR: The Adjutant General for North Dakota

SUBJECT: Ventilation and Lead Surface Testing Survey at the Indoor Firing Range, Readiness Center, Grand Forks, North Dakota

National Guard Bureau (NGB) Mid-West Regional Industrial Hygiene (IH) Office field personnel conducted a survey on April 28, 2015 at the North Dakota Army National Guard Indoor Firing Range, Readiness Center, located Grand Forks, North Dakota. The site point of contact was Non-Responsive. This survey included surface wipe sampling for lead and ventilation testing in the firing range.

Occupational health risk assessment codes (RACs) are assigned to quantify health risks to personnel IAW DOD Letter of Instruction 6055.1, *DOD Safety and Occupational Health Program*. Risk assessment is an expression of health hazard severity and mishap probability, described in terms of route of exposure, actual exposure, exposure limit standards, potential health effects, duration of exposure, and number of exposed personnel. Guidance for RAC determination is attached to this report.

Surface Wipe Sampling
Twenty-four surface wipe samples were collected from representative areas in and adjacent to the firing range. Wipe samples were collected in the kitchen to assess migration of lead into food handling spaces and on the basketball backstop in the drill room. Fourteen of the twenty-four samples were above NGB recommended standards for lead. Surface wipe samples collected down-range from the firing line are not regulated because the range is in use. Within the range but behind the firing line (rooms 98 and 101), four samples were above 1,000 µg/ft^2. A sample collected from a hearing muff contained 438 µg/ft^2 but should be less than 40 µg/ft^2 because it is a personal protective equipment. A barbeque grill stored in mechanical room 96 had a surface lead level of 5,823 µg/ft^2 . Two samples collected in the Drill room were above the recommended level of 40 µg/ft^2 for areas occupied by children.

- Remove the barbeque grill from room 96 and prohibit any cooking on the grill unless the grill can be completely decontaminated of lead. (RAC 1)

- Because of the high levels of surface lead in the firing range, the range should be decontaminated according to the guidelines and procedures in NG Pam 420-15. (RAC 2)
- Utilizing workers trained in the hazards of lead dust and in safe cleaning work practices. (RAC 2)
- Maintenance and housekeeping workers must be provided with proper personal protective equipment. (RAC 2)
- Workers assigned to lead decontamination work are required to be in a medical surveillance program for lead exposure. (RAC 2)
- Clean surfaces with high-efficiency particulate air (HEPA) filter vacuums or wet methods.
- Remove brooms and equipment from the exhaust air mechanical room 96 and replace with a HEPA vacuum. (RAC 3)
- Post-cleaning surface wipe sample results must be less than 200 micrograms per square foot ($\mu g/ft^2$) (40 micrograms in the case of child exposure). (RAC 2)

Ventilation
The ventilation in the firing range appears to be adequate for safely operating the range. There is a question concerning the presence of lead on surfaces in mechanical room 96 that may or may not be related to the ventilation system.

The NGB conducted this survey in the interest of preventing employee illness and to meet legal obligations where applicable. Results and recommendations are based on information provided by site personnel, field measurements, and conditions observed during the survey. For any further questions, please contact Non-Responsive

[redacted]

Non-Responsive

Regional Industrial Hygienist

Ventilation and Lead Surface Testing Survey at the Indoor Firing Range

Readiness Center – Grand Forks, North Dakota

Firing Range Design

Firing ranges are to be designed to prevent lead exposure to the occupants. This is mainly accomplished by room ventilation and clean areas with hand washing facilities. The firing range (room 98) at this facility has a separate control room (room 101) and hand washing/restroom adjacent to the range. Supply air to the range is through mechanical room 100. Air flows from this room into the range through a perforated metal plenum wall that provides laminar airflow past the firing line toward the target/bullet trap. From the plenum behind the bullet trap air is pulled by an exhaust fan in mechanical room 96 through filters and vented outdoors. The firing range is open for used at this time.

Standards and Criteria for Indoor Firing Ranges

The following policy guides are used for the renovation and safe use of indoor firing ranges.

- *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges NGR 385-15*
- *Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges NG Pam 420-15*
- *Indoor Firing Range Design Guidance DG 415-1, 2-3.3*

Lead on Surfaces

Although OSHA does not have published exposure standards for metal surface contamination, 29 CFR 1910 requires that all surfaces must be kept as free as practicable of accumulations of toxic metal dusts. In addition, DOD has instituted a policy to minimize surface contamination levels of heavy metals (*Control and Management of Surface Accumulations from Lead, Hexavalent Chromium, and Cadmium Operations*, DTM 12-003, 18 April 2012). The NGB Mid-West Regional IH Office has adopted target housekeeping guidelines for lead dust in firing ranges. Any results that exceed 1,000 micrograms per square foot ($\mu g/ft^2$) for lead behind the firing line should be considered significant. For areas where children may be present, NG PAM 420-15 requires lead levels to be less than 40 $\mu g/ft^2$. All other work areas in the building should be less than 200 $\mu g/ft^2$ for lead.

Surface Wipe Sampling

Twenty-four surface wipe samples were collected from representative areas in and adjacent to the range using Environmental Express Ghost™ Wipes and templates (OSHA Technical Manual, Appendix II, 2-1). Wipe samples were collected in the kitchen to assess migration of lead into food handling spaces and on the basketball backstop in the drill room. The samples were analyzed for lead by OSHA Analytical Method ID-121. Fourteen of the twenty-four samples were above NGB recommended standards for lead. Surface wipe samples collected down-range from the firing line are not regulated because this area is restricted access. Within the range but behind the firing line (rooms 98 and 101), four samples were above 1,000 $\mu g/ft^2$. A sample collected from a hearing muff contained 438 $\mu g/ft^2$ but should be less than 40 $\mu g/ft^2$ because it is personal protective equipment. A barbeque grill stored in mechanical room 96 had a surface lead level of 5,823 $\mu g/ft^2$. Two samples collected in the Drill room were above the recommended level of 40 $\mu g/ft^2$ for areas occupied by children. The results and photos are contained in Table 1.

Recommendations

1. Remove the barbeque grill from room 96 and prohibit any cooking on the grill unless the grill can be completely decontaminated of lead. (RAC 1)

2. Because of the high levels of surface lead in the firing range, the range should be decontaminated according to the guidelines and procedures in NG Pam 420-15. (RAC 2)

3. Utilizing workers trained in the hazards of lead dust and in safe cleaning work practices. (RAC 2)

4. Maintenance and housekeeping workers must be provided with proper personal protective equipment. (RAC 2)

5. Workers assigned to lead decontamination work are required to be in a medical surveillance program for lead exposure. (RAC 2)

6. Clean surfaces with high-efficiency particulate air (HEPA) filter vacuums or wet methods. (RAC 2)

7. Remove brooms and equipment from the exhaust air mechanical room 96 and replace with a HEPA vacuum. (RAC 3)

8. Post-cleaning surface wipe sample results must be less than 200 micrograms per square foot ($\mu g/ft^2$) (40 micrograms in the case of child exposure). (RAC 2)

Table 1
Surface Wipe Sampling Results for Lead
North Dakota Army National Guard
Indoor Firing Range
Grand Forks
April 28, 2015

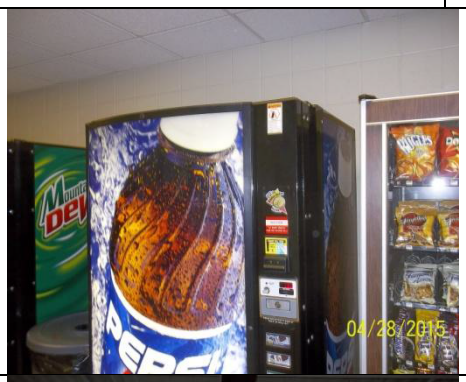
Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-1 Room 98 on desk PA system		200	**696**
W-2 Room 98 on table		200	**706**
W-3 Room 100 supply air mechanical room on floor		200	**1,306**

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-4 Room 101 at position 3 on floor		1,000	**1,987**
W-5 Room 101 at position 2 on arm/gun rest		1,000	**47,614**
W-6 Room 101 at position 4 on target motor return		1,000	**1,375**
W-7 Room 101 down range on floor		none	5,359

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-8 Room 96 on exhaust AHU duct		200	**18,382**
W-9 Room 96 on floor		200	**9,268**
W-10 Room 96 on barbeque grill		200	**5,823**
W-11 Room 96 inside plenum on floor before filters		none	24,750

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-12 Room 101 on floor on rubber mat		1,000	**3,895**
W-13 Room 101 on hearing muffs		40	**438**
W-14 Hallway outside room 98 on floor		200	<91
W-15 Drill room on floor		40	<10

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-16 Drill room on ceiling rafters		40	**135**
W-17 Drill room on basketball support		40	**73**
W-18 Kitchen on ice machine		40	<10
W-19 Family Assistance Office on desk		40	<10

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-20 Room 113 on soda machine		40	26
W-21 Room 83 Locker room on locker		200	<91
W-22 Room 134 Office on desk		200	<91
W-23 Hallway outside room 96 on floor		200	<91

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-24 Room 97 on metal shelf		200	**435**
W-25 blank			ND

Notes: 1) $\mu g / ft^2$ = micrograms per square foot of surface area. 2) N/A = not applicable. 3) ND = none detected. 4) "<" means less than the reporting limit for the analytical method.

Ventilation

Face velocity measurements were made and smoke emitters were used to visually inspect airflow patterns at the firing line. A TSI Alnor Model AVM430A thermal anemometer calibrated according to the manufacturer's specifications was used to evaluate airflow at the firing line. All five lanes met the average face velocity requirement of 50 feet per minute (fpm) specified in NGR 385-15. (Table 2) The smoke emitter testing demonstrated the required laminar flow downrange for all five lanes. There was no turbulence that resulted in airflow moving back behind the firing line at the five firing stations. (Figures 1-4)

The exhaust ventilation for the range is vented through pre-filters and sock filters in mechanical room 96 and then exhausted outdoors. Surface wipe samples in this room show surface contamination from lead dust. It is unclear if the contamination is from improper removal of the old filters or if air from the range is by-passing the filters.

Table 2
Firing Line Ventilation Measurements
North Dakota Army National Guard
Indoor Firing Range
Grand Forks
April 28, 2015

Shooting Position >>>	Standing	Kneeling	Prone	Average of all 3 positions	Standard Met?
	Face Velocity in feet per minute (FPM)				
Lane 1	120	135	107	117	Yes
Lane 2	101	102	118	107	Yes
Lane 3	125	105	98	109	Yes
Lane 4	91	105	94	97	Yes
Lane 5	102	110	109	107	Yes

Figure 1

Figure 2

Figure 3

Figure 4

Laboratory Result Reports and Chain of Custody Sheets

FOH ENVIRONMENTAL LABORATORY
536 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

ANALYTICAL REPORT

Submitted To: USPHS / Federal Occupational Health
Denver Federal Center
Denver, CO 80225

Attention: Non-Responsive

Submitted By:

Reference Data: Lead
Sampling Site: NGB: Grand Forks, ND (IFR)
Sample Media: Ghost Wipe(s)®
Method Reference: OSHA ID-121
Project ID: Project 12805
DFOH Lab Nos.: TM-15-80067 through TM-15-80091
Date Received: 05/04/15
Data Analyzed: 05/05/15
Date Issued: 05/06/15

The wipe samples were hot plate digested. The samples were run on a Perkin Elmer 200 flame atomic absorption spectrophotometer (AA).

General Lab Comments:
All quality control criteria have been met.
* All samples received in condition acceptable for analysis unless otherwise noted.
** Sample results have not been corrected for contamination based on the field blank or other analytical blank unless otherwise noted.

Analytical results are given on the enclosed tables. Results relate only to items tested. If you have any questions about these results, feel free to phone the Laboratory at (312) 886-0413.

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

FOH ENVIRONMENTAL LABORATORY
536 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

LEAD on WIPE RESULTS

SAMPLE NUMBER*	LABORATORY NUMBER	CONCENTRATION (µg)	CONCENTRATION (µg/ft²)
W-1	TM-15-80067	77	696
W-2	TM-15-80068	78	706
W-3	TM-15-80069	144	1306
W-4	TM-15-80070	219	1987
W-5	TM-15-80071	5238	47614
W-6	TM-15-80072	151	1375
W-7	TM-15-80073	590	5359
W-8	TM-15-80074	2022	18382
W-9	TM-15-80075	1020	9268
W-10	TM-15-80076	641	5823
W-11	TM-15-80077	2723	24750
W-12	TM-15-80078	428	3895
W-13	TM-15-80079	48	438
W-14	TM-15-80080	<10	<91
W-15	TM-15-80081	<10	<10
W-16	TM-15-80082	135	135
W-17	TM-15-80083	73	73
W-18	TM-15-80084	<10	<10
W-19	TM-15-80085	<10	<10
W-20	TM-15-80086	26	26
W-21	TM-15-80087	<10	<91
W-22	TM-15-80088	<10	<91
W-23	TM-15-80089	<10	<91
W-24	TM-15-80090	48	435
W-25**	TM-15-80091	<10	

Surface Wipe Sampling Criteria

Metal	Acceptable Surface Level µg/ft²	Basis for Criteria
Lead	200 for facilities (all surfaces)	NG Pam 420-15, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 November 2006, http://www.ngbpdc.ngb.army.mil/pubs/420/ngpam420_15.pdf
Lead	40 for any potentially child occupied areas of facility (all surfaces); used for armories with public access, family services offices, or other routine use by children	NG Pam 420-15, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 November 2006, http://www.ngbpdc.ngb.army.mil/pubs/420/ngpam420_15.pdf

Metals in Wipe Limits
(based on one ft² sampled area)

Analyte	Analytical Method	Method Detection Limit	Minimum Reporting Limit
Lead – Flame AA	OSHA ID-121	5.0 µg/ft²	10 µg/ft²

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

Project 12805
Page 2 of 2

Page 1 of 2

US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN-OF-CUSTODY / FIELD DATA SHEET

Environmental Laboratory
536 S. Clark Street South, Suite 714
Chicago, IL 60605-1521
Tel: (312) 886-0413 Fax: (312) 886-0434

Non-Responsive

Non-Responsive

PROJECT REFERENCE

Agreement No.:	A 106644
Statement of Work No.:	S 188318
Project No:	P 188319
Agency	ARNG
Proj. Manager	JFR
Location (City, State):	Grand Forks ND

For Lab Use Only
Project /Report #: 12805
Due Date: 5/11/15
Samples Received Chilled? YES / NO (circle one)
Conditions on Receipt with Name & Date
Rev. 07/2010

Water Sample Codes[3]
Container Types:
P-Plastic, G-Glass, V-VOC
Preservatives:
A-None, B-H_2SO_4, C-HNO_3, D-NaOH

Turn Around Time Codes[4]
STD- Standard
3D- Three Day Rush[@]
WH Weekend/Holiday*

Analysis Requested: Lead

ID #	Type[1]	Media[2]	Collected Date	Collected Time	Sample Location / Description	Air Flow (LPM)	Air Time (Min.)	Air Volume (Liters)	Wipe Area (sq ft)	Water Volume (Liters)	Water Code[3]	Turn Around Time*	Lab ID #
W-1	7	5	April 28						16			STD	1415-80067
W-2									16				80068
W-3									16				80069
W-4									16				80070
W-5									16				80071
W-6									16				80072
W-7									16				80073
W-8									16				80074
W-9									16				80075
W-10									16				80076
W-11									16				80077
W-12									16				80078
W-13									16			↓	80079

Sample Type Codes[1]
1-Air 2-Water 3-Paint 4-Soil 5-Dust
6-Bulk 7-Wipe 8 - Other

Sample Media Codes[2]
1-Charcoal 2-Matched Weight, 0.8um
3-PVC filter 4-M CE 0.8 um , 37 mm
5 -Ghost Wipes™ 6. Passive badge
7. Other

Relinquished By | Date & Time | Received By | Date & Time

Non-Responsive

COMMENTS:

* Applied to organic and inorganic analysis in cases of an emergency only. @ Applied to inorganic and organic samples, SD: Applied to organic and inorganic samples 7-10 business days.

page 2 of 2

US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN-OF-CUSTODY / FIELD DATA SHEET

Environmental Laboratory
536 S. Clark Street South, Suite 714
Chicago, IL 60605-1521
Tel: (312) 886-0413 Fax: (312) 886-0434

Non-Responsive

Non-Responsive

PROJECT REFERENCE

Agreement No.:	A 106644
Statement of Work No.:	S 155315
Project No:	P 158319
Agency Proj. Manager	ARNG IFR
Location (City, State):	Grand Forks ND

For Lab Use Only
Project /Report #: 18805
Due Date: 5/6/15
Samples Received Chilled? YES / NO (circle one)

Conditions on Receipt with Name & Date

Rev. 07/2010

Water Sample Codes[2]
Container Types:
P-Plastic, G-Glass, V-VOC
Preservatives:
A-None, B-H_2SO_4,
C-HNO_3, D-NaOH

Turn Around Time Codes[4]
STD- Standard
3D- Three Day Rush[5]
WH Weekend/Holiday*

Analysis Requested: Lead

Sample ID #	Type[1]	Media[2]	Collected Date	Collected Time	Sample Location / Description	Air Flow (LPM)	Air Time (Min.)	Air Volume (Liters)	Wipe Area (ft²)	Water Volume (Liters)	Water Code[3]	Turn Around Time*	Lab ID #
W-14	7	5	Ap.	28					16			STD	TM45-80080
W-15									144				80081
W-16									144				80082
W-17									144				80083
W-18									144				80084
W-19									144				80085
W-20									144				80086
W-21									16				80087
W-22									16				80088
W-23									16				80089
W-24									16				80090
W-25									—				80091

Sample Type Codes[1]
1-Air 2-Water 3-Paint 4-Soil 5-Dust
6-Bulk 7-Wipe 8 - Other

Sample Media Codes[2]
1-Charcoal 2-Matched Weight, 0.8um
3-PVC filter 4-M CE 0.8 um , 37 mm
5 -Ghost Wipes™ 6. Passive badge
7 Other

Relinquished By	Date & Time	Received By	Date & Time
Non-Responsive			

COMMENTS:

* Applied to organic and inorganic analysis in cases of an emergency only. [5] Applied to inorganic and organic samples, SD: Applied to organic and inorganic samples 7-10 business days.

National Guard Bureau

Mid-West Regional Industrial Hygiene Office
301-IH Old Bay Lane
Havre de Grace, MD 21078

ARNG-CSG-P June 12, 2015

MEMORANDUM FOR: The Adjutant General for North Dakota

SUBJECT: Ventilation and Lead Surface Testing Survey at the Indoor Firing Range, Readiness Center, Wahpeton, North Dakota

National Guard Bureau (NGB) Mid-West Regional Industrial Hygiene (IH) Office field personnel conducted a survey on April 29, 2015 at the North Dakota Army National Guard Indoor Firing Range, Readiness Center, located in Wahpeton, North Dakota. The site point of contact was Non-Responsive. This survey included surface wipe sampling for lead and ventilation testing in the firing range and adjacent rooms.

Occupational health risk assessment codes (RACs) are assigned to quantify health risks to personnel IAW DOD Letter of Instruction 6055.1, *DOD Safety and Occupational Health Program*. Risk assessment is an expression of health hazard severity and mishap probability, described in terms of route of exposure, actual exposure, exposure limit standards, potential health effects, duration of exposure, and number of exposed personnel. Guidance for RAC determination is attached to this report.

Surface Wipe Sampling
Twenty-four surface wipe samples were collected from representative areas in and adjacent to the firing range. Wipe samples were collected in the kitchen to assess migration of lead into food handling spaces and on the basketball backstop in the drill room. Five of the twenty-four samples were above NGB recommended standards for lead. One sample collected on the gun bench rest at position #3 contained 17,164 µg/ft^2, well above the recommended level of 200 µg/ft^2. Lead levels between the firing positions and the bullet trap were also very high but this is a restricted area not open to personnel. Surface wipe samples in the range exhaust mechanical room (room 86) were 1,200 and 1,387 µg/ft^2. It is unclear if the surface lead levels in this mechanical room are due to improper removal of the used filters or if air from the range is by-passing the filters and entering the room.

Recommendations

- Because of the very high levels of surface lead in the firing range, the range and mechanical room should be decontaminated according to the guidelines and procedures in NG Pam 420-15. (RAC 2)

- Utilizing workers trained in the hazards of lead dust and in safe cleaning work practices. (RAC 2)
- Maintenance and housekeeping workers must be provided with proper personal protective equipment. (RAC 2)
- Workers assigned to lead decontamination work are required to be in a medical surveillance program for lead exposure. (RAC 2)
- Clean surfaces with high-efficiency particulate air (HEPA) filter vacuums or wet methods. (RAC 2)
- Post-cleaning surface wipe sample results must be less than 200 micrograms per square foot ($\mu g/ft^2$). (RAC 2)

Ventilation

Face velocity measurements were made and smoke emitters were used to visually inspect airflow patterns at the firing line. All five lanes met the average face velocity requirement of 50 feet per minute (FPM) as specified in NGR 385-15. The smoke emitter testing demonstrated the required laminar flow downrange for all five lanes. There was no turbulence that resulted in airflow moving back behind the firing line at the five firing stations.

The NGB conducted this survey in the interest of preventing employee illness and to meet legal obligations where applicable. Results and recommendations are based on information provided by site personnel, field measurements, and conditions observed during the survey. For any further questions, please contact Non-Responsive [redacted]

[redacted]

Non-Responsive [redacted]

Regional Industrial Hygienist

Ventilation and Lead Surface Testing Survey at the Indoor Firing Range

Wahpeton, North Dakota

Firing Range Design

Firing ranges are to be designed to prevent lead exposure to the occupants. This is mainly accomplished by room ventilation and clean areas with hand washing facilities. The rifle range (room 82) at this facility has a separate control room (room 84) and hand washing/restroom adjacent to the range. Supply air to the range is through a mechanical room. Air flows from this room into the range through a perforated metal plenum wall that provides laminar airflow past the firing line toward the target/bullet trap. From the plenum behind the bullet trap air is pulled by an exhaust fan in mechanical room 86 through filters and vented outdoors. A storage/office space (room 85) is adjacent to the control room (room 84). The firing range is open for used at this time.

Standards and Criteria for Indoor Firing Ranges

The following policy guides are used for the renovation and safe use of indoor firing ranges.

- *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges NGR 385-15*
- *Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges NG Pam 420-15*
- *Indoor Firing Range Design Guidance DG 415-1, 2-3.3*

Lead on Surfaces

Although OSHA does not have published exposure standards for metal surface contamination, 29 CFR 1910 requires that all surfaces must be kept as free as practicable of accumulations of toxic metal dusts. In addition, DOD has instituted a policy to minimize surface contamination levels of heavy metals (*Control and Management of Surface Accumulations from Lead, Hexavalent Chromium, and Cadmium Operations*, DTM 12-003, 18 April 2012). The NGB Mid-West Regional IH Office has adopted target housekeeping guidelines for lead dust in firing ranges. Any results that exceed 1,000 micrograms per square foot ($\mu g/ft^2$) for lead are considered significant. For areas where children may be present, NG PAM 420-15 requires lead levels to be less than 40 $\mu g/ft^2$. All other work areas in the building should be less than 200 $\mu g/ft^2$ for lead.

Surface Wipe Sampling

Twenty-four surface wipe samples were collected from representative areas in and adjacent to the range using Environmental Express Ghost™ Wipes and templates (OSHA Technical Manual, Appendix II, 2-1). Wipe samples were collected in the kitchen to assess migration of lead into food handling spaces and on the basketball backstop in the drill room. The samples were analyzed for lead by OSHA Analytical Method ID-121. Five of the twenty-four samples were above NGB recommended standards for lead. One sample collected on the gun bench rest at position #3 contained 17,164 $\mu g/ft^2$, well above the recommended level of 200 $\mu g/ft^2$. Lead levels between the firing positions and the bullet trap were also very high but this is a restricted area not open to personnel. Surface wipe samples in the range exhaust mechanical room (room 86) were 1,200 and 1,387 $\mu g/ft^2$. It is unclear if the surface lead levels in this mechanical room are due to improper removal of the used filters or if air from the range is by-passing the filters and entering the room. The results and photos are contained in Table 1.

Recommendations

1. Because of the very high levels of surface lead in the firing range, the range and mechanical room should be decontaminated according to the guidelines and procedures in NG Pam 420-15. (RAC 2)

2. Utilizing workers trained in the hazards of lead dust and in safe cleaning work practices. (RAC 2)

3. Maintenance and housekeeping workers must be provided with proper personal protective equipment. (RAC 2)

4. Workers assigned to lead decontamination work are required to be in a medical surveillance program for lead exposure. (RAC 2)

5. Clean surfaces with high-efficiency particulate air (HEPA) filter vacuums or wet methods. (RAC 2)

6. Post-cleaning surface wipe sample results must be less than 200 micrograms per square foot ($\mu g/ft^2$). (RAC 2)

Table 1
Surface Wipe Sampling Results for Lead
North Dakota Army National Guard
Indoor Firing Range
Wahpeton, ND
April 29, 2015

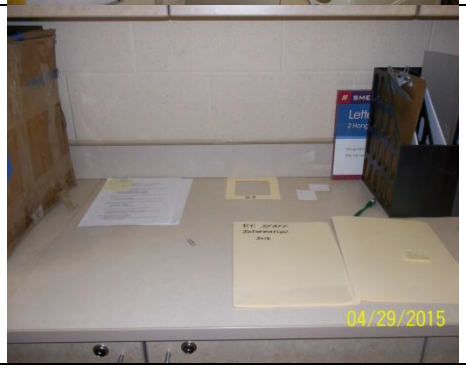
Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-1 Drill room on ceiling rafter		40	<17
W-2 Drill room on floor		40	<10
W-3 Drill room on bleachers		40	<10

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-4 Kitchen on ice machine		40	<10
W-5 Men's locker room on locker #100		200	<91
W-6 Break room on table		40	<10
W-7 Break room on refrigerator		40	<10

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-8 Hallway outside room 84 Range Control on floor		200	<91
W-9 Room 84 Range Control on floor		200	**948**
W-10 Room 84 Range Control on metal shelf-table		200	<91
W-11 Room 82 Rifle Range on floor		1,000	**5,311**

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-12 Room 82 Rifle Range firing line position 4		1,000	<91
W-13 Room 82 Rifle Range on floor at target end		None	192,545
W-14 Room 82 Rifle Range on bench gun/rest position 3		1,000	**17,164**
W-15 Room 82 Rifle Range on target return motor position 2		1,000	535

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-16 Room 84 on mouse pad		200	<91
W-17 Range toilet on paper towel box		200	99
W-18 Room 86 Mechanical Room on floor		200	**1,200**
W-19 Room 86 on exhaust vent		200	**1,387**

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-20 Room 92 ARNG Unit Admin office desk		200	<91
W-21 Room 86 behind targets on floor		None	83,409
W-22 Room 85 Storage/Office on metal file cabinet		200	169
W-23 Room 85 on white bench/counter		200	<91

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-24 Room 85 on floor		200	<91
W-25 blank			ND

Notes: 1) $\mu g / ft^2$ = micrograms per square foot of surface area. 2) N/A = not applicable. 3) ND = none detected. 4) "<" means less than the reporting limit for the analytical method.

Ventilation

Face velocity measurements were made and smoke emitters were used to visually inspect airflow patterns at the firing line. A TSI Alnor Model AVM430A thermal anemometer calibrated according to the manufacturer's specifications was used to evaluate airflow at the firing line. All five lanes met the average face velocity requirement of 50 feet per minute (fpm) specified in NGR 385-15. (Table 2) The smoke emitter testing demonstrated the required laminar flow downrange for all five lanes. There was no turbulence that resulted in airflow moving back behind the firing line at the five firing stations. (Figures 1-4)

Table 2
Firing Line Ventilation Measurements
North Dakota Army National Guard
Indoor Firing Range
Wahpeton, ND
April 29, 2015

Shooting Position >>>	Standing	Kneeling	Prone	Average of all 3 positions	Standard Met?
	Face Velocity in feet per minute (FPM)				
Lane 1	71	75	62	69	Yes
Lane 2	62	74	78	71	Yes
Lane 3	95	81	87	88	Yes
Lane 4	120	127	115	121	Yes
Lane 5	114	134	120	123	Yes

Figure 1

Figure 2

Figure 3

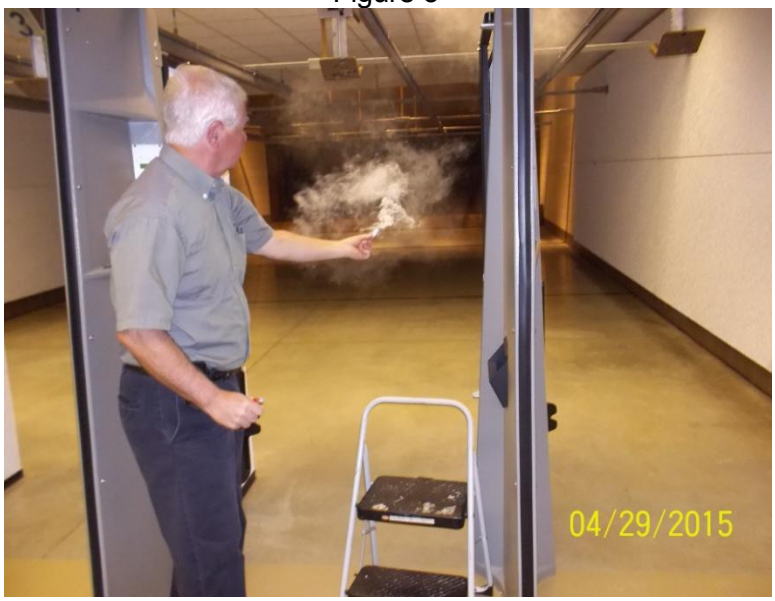


Figure 4

Laboratory Result Reports and Chain of Custody Sheets

FOH ENVIRONMENTAL LABORATORY
536 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

ANALYTICAL REPORT

Submitted To: USPHS / Federal Occupational Health
Denver Federal Center
Denver, CO 80225

Attention: Non-Responsive

Submitted By:

Reference Data: Lead
Sampling Site: NGB: Wahpeton, ND
Sample Media: Ghost Wipe(s)®
Method Reference: OSHA ID-121
Project ID: Project 12804
DFOH Lab Nos.: TM-15-80042 through TM-15-80066
Date Received: 05/04/15
Data Analyzed: 05/04/15 – 05/05/15
Date Issued: 05/05/15

The wipe samples were hot plate digested. The samples were run on a Perkin Elmer 200 flame atomic absorption spectrophotometer (AA).

General Lab Comments:
All quality control criteria have been met.
* All samples received in condition acceptable for analysis unless otherwise noted.
** Sample results have not been corrected for contamination based on the field blank or other analytical blank unless otherwise noted.

Analytical results are given on the enclosed tables. Results relate only to items tested. If you have any questions about these results, feel free to phone the Laboratory at (312) 886-0413.

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

FOH ENVIRONMENTAL LABORATORY
536 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

LEAD on WIPE RESULTS

SAMPLE NUMBER*	LABORATORY NUMBER	CONCENTRATION (µg)	CONCENTRATION (µg/ft²)
W-1	TM-15-80042	<10	<17
W-2	TM-15-80043	<10	<10
W-3	TM-15-80044	<10	<10
W-4	TM-15-80045	<10	<10
W-5	TM-15-80046	<10	<91
W-6	TM-15-80047	<10	<10
W-7	TM-15-80048	<10	<91
W-8	TM-15-80049	<10	<91
W-9	TM-15-80050	104	948
W-10	TM-15-80051	<10	<91
W-11	TM-15-80052	584	5311
W-12	TM-15-80053	<10	<91
W-13	TM-15-80054	21180	192545
W-14	TM-15-80055	1888	17164
W-15	TM-15-80056	59	535
W-16	TM-15-80057	<10	<91
W-17	TM-15-80058	11	99
W-18	TM-15-80059	132	1200
W-19	TM-15-80060	153	1387
W-20	TM-15-80061	<10	<91
W-21	TM-15-80062	9175	83409
W-22	TM-15-80063	19	169
W-23	TM-15-80064	<10	<91
W-24	TM-15-80065	<10	<91
W-25**	TM-15-80066	<10	

Surface Wipe Sampling Criteria

Metal	Acceptable Surface Level µg/ft²	Basis for Criteria
Lead	200 for facilities (all surfaces)	NG Pam 420-15, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 November 2006, http://www.ngbpdc.ngb.army.mil/pubs/420/ngpam420_15.pdf
Lead	40 for any potentially child occupied areas of facility (all surfaces); used for armories with public access, family services offices, or other routine use by children	NG Pam 420-15, Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges, 3 November 2006, http://www.ngbpdc.ngb.army.mil/pubs/420/ngpam420_15.pdf

Metals in Wipe Limits
(based on one ft² sampled area)

Analyte	Analytical Method	Method Detection Limit	Minimum Reporting Limit
Lead – Flame AA	OSHA ID-121	5.0 µg/ft²	10 µg/ft²

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

Project 12804
Page 2 of 2

page 1 of 2

US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN-OF-CUSTODY / FIELD DATA SHEET

Environmental Laboratory
536 S. Clark Street South, Suite 714
Chicago, IL 60605-1521
Tel: (312)-886-0413 Fax: (312)-886-0434

Non-Responsive

Contact Information

Non-Responsive

PROJECT REFERENCE

Agreement No.: A 106644
Statement of Work No.: S 188318
Project No: P 188319
Agency: ARNG
Proj. Manager: IFR
Location (City, State): Wahpeton ND

For Lab Use Only
Project /Report #: 12804
Due Date: 5/11/15
Samples Received Chilled? YES / NO (circle one)
Conditions on Receipt with Name & Date
Rev. 07/2010

Water Sample Codes*
Container Types: P-Plastic, G-Glass, V-VOC
Preservatives: A-None, B-H_2SO_4, C-HNO_3, D-NaOH

Turn Around Time Codes*
STD- Standard
3D- Three Day Rush@
WH Weekend/Holiday*

Analysis Requested: Lead

ID #	Type¹	Media²	Collected Date	Collected Time	Sample Location / Description	Air Flow (LPM)	Air Time (Min.)	Air Volume (Liters)	Wipe Area (sq ft)	Water Volume (Liters)	Water Code³	Turn Around Time*	Lab ID #
W-1	7	5	Apr	29					82			STD	114-15-80042
W-2									144				80043
W-3									144				80044
W-4									144				80045
W-5									16				80046
W-6									144				80047
W-7									16				80048
W-8									16				80049
W-9									16				80050
W-10									16				80051
W-11									16				80052
W-12									16				80053
W-13									16				80054

Sample Type Codes¹
1-Air 2-Water 3-Paint 4-Soil 5-Dust 6-Bulk 7-Wipe 8 - Other

Sample Media Codes²
1-Charcoal 2-Matched Weight, 0.8um 3-PVC filter 4-M CE 0.8 um , 37 mm 5 -Ghost Wipes™ 6. Passive badge 7. Other

Relinquished By: Non-Responsive
Date & Time
Received By
Date & Time

COMMENTS:

* Applied to organic and inorganic analysis in cases of an emergency only. @ Applied to inorganic and organic samples, SD: Applied to organic and inorganic samples 7-10 business days.

page 2 of 2

US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN-OF-CUSTODY / FIELD DATA SHEET

Environmental Laboratory
536 S. Clark Street South, Suite 714
Chicago, IL 60605-1521
Non-Responsive

PROJECT REFERENCE
Agreement No.: A 106644
Statement of Work No.: S 185318
Project No: P 185319
Agency: ARNG
Proj. Manager: IFR
Location (City, State): Wahpeton ND

For Lab Use Only
Project /Report #: 12804
Due Date: 5/11/15
Samples Received Chilled? YES / NO (circle one)
Conditions on Receipt with Name & Date
Rev. 02/2010

Water Sample Codes*
Container Types: P-Plastic, G-Glass, V-VOC
Preservatives: A-None, B-H_2SO_4, C-HNO_3, D-NaOH

Turn Around Time Codes*
STD- Standard
3D- Three Day Rush@
WH Weekend/Holiday*

Analysis Requested: Lead

Contact Information
Non-Responsive

Sample ID #	Type*	Media*	Collected Date	Collected Time	Sample Location / Description	Air Flow (LPM)	Air Time (Min.)	Air Volume (Liters)	Wipe Area	Water Volume (Liters)	Water Code*	Turn Around Time*	Lab ID #
W-14	7	5							16			STD	MM15-80055
W-15									16				80056
W-16									16				80057
W-17									16				80058
W-18									16				80059
W-19									16				80060
W-20									16				80061
W-21									16				80062
W-22									16				80063
W-23									16				80064
W-24									16				80065
W-25					blank				—				80066

Sample Type Codes*
1-Air 2-Water 3-Paint 4-Soil 5-Dust 6-Bulk 7-Wipe 8 - Other

Sample Media Codes*
1-Charcoal 2-Matched Weight, 0.8um 3-PVC filter 4-M CE 0.8 um , 37 mm 5 -Ghost Wipes™ 6. Passive badge 7. Other

Relinquished By | Date & Time | Received By | Date & Time
Non-Responsive

COMMENTS:

* Applied to organic and inorganic analysis in cases of an emergency only. @ Applied to inorganic and organic samples, SD: Applied to organic and inorganic samples 7-10 business days.

National Guard Bureau

Mid-West Regional Industrial Hygiene Office
301-IH Old Bay Lane
Havre de Grace, MD 21078

ARNG-CSG-P April 1, 2015

MEMORANDUM FOR: The Adjutant General for North Dakota

SUBJECT: Ventilation and Lead Surface Testing Survey at the Indoor Firing Range, Raymond Bohn Armory, Bismarck, North Dakota

National Guard Bureau (NGB) Mid-West Regional Industrial Hygiene (IH) Office field personnel conducted a survey on October 22, 2014 at the North Dakota Army National Guard, Raymond Bohn Armory and Indoor Firing Range located in Bismarck, North Dakota. This survey included surface wipe sampling for lead and ventilation testing in the firing range.

Occupational health risk assessment codes (RACs) are assigned to quantify health risks to personnel in accordance with DOD Letter of Instruction 6055.1, *DOD Safety and Occupational Health Program*. Risk assessment is an expression of health hazard severity and mishap probability, described in terms of route of exposure, actual exposure, exposure limit standards, potential health effects, duration of exposure, and number of exposed personnel. Guidance for RAC determination is attached to this report.

Surface Wipe Sampling
Eight surface wipe samples were collected from representative areas in the armory and the firing range. Wipe samples were collected in the kitchen to assess migration of lead into food handling spaces and on the ceiling rafter in the drill room. Seven of the eight samples were above NGB recommended standards for lead. Two wipe samples collected in room 221 adjacent to the range had lead levels of 982 and 1,715 µg/ft^2 . It appears that lead containing dust is being tracked from the range into adjacent rooms. A sample collected inside the range behind the firing line contained 3,120 µg/ft^2 of lead. The highest lead levels were found on the floor in room 269 containing the range exhaust fan and HEPA filters. Lead levels were 8,286 and 15,400 µg/ft^2 . These high levels may be due to the removal of the filter and spilling of the lead containing dust or exhaust air by-passing the filters. A wipe sample collected from a ceiling rafter in the drill room contained 1,369 µg/ft^2 of lead.

Recommendations:

- Because of the very high levels of surface lead in the firing range, the range should be decontaminated according to the guidelines and procedures in NG Pam 420-15. (RAC 2)

- Utilize workers trained in the hazards of lead dust and in safe cleaning work practices. (RAC 2)

- Maintenance and housekeeping workers must be provided with proper personal protective equipment. (RAC 2)

- Workers assigned to lead decontamination work are required to be in a medical surveillance program for lead exposure. (RAC 2)

- Clean surfaces with high-efficiency particulate air (HEPA) filter vacuums or wet methods. (RAC 2)

- Post-cleaning surface wipe sample results must be less than 200 micrograms per square foot (µg/ft^2) (40 micrograms in the case of child exposure). (RAC 2)

- The HEPA filters in room 170 should be considered as hazardous waste and removed with proper personal protective equipment. (RAC 2)

- Since the drill room is open to public events, clean all surfaces to reduce lead levels to less than 40 µg/ft^2 . (RAC 2)

Ventilation

Three airflow measurements were made at the firing line at; standing position, kneeling position, and prone position. Smoke emitters were also used to observe if laminar airflow occurs in the range or if air turbulence is resulting in air back flows behind the firing line. All seven firing lanes met the average face velocity requirement of 50 feet per minute (fpm) specified in NGR 385-15. However, the smoke emitters showed air flowing above the standing position and back behind the firing line. Smoke at floor level did move down the range toward the bullet stop. The exhaust air for the range is then filtered through HEPA filters in room 269 before release to the outdoors.

Recommendations

- The entire range ventilation system (supply and exhaust) should be evaluated by a ventilation engineering company to insure the system is working properly and lead containing dust is captured and disposed as hazardous waste. (RAC 2)

- The HEPA filters in room 269 should be considered as hazardous waste and removed with proper personal protective equipment. (RAC 2)

- Room 269 should be part of any lead decontamination process. (RAC 2)

- Develop and update the site-specific SOP for the firing range in accordance with NGR 385-15. (RAC 2)

At this time, the range is classified as: “Unsafe” due to high surface levels of lead in the range and the back flow of air behind the firing line.

The NGB conducted this survey in the interest of preventing employee illness and to meet legal obligations where applicable. Results and recommendations are based on information provided by site personnel, field measurements, and conditions observed during the survey. For any further questions, please contact Non-Responsive

Non-Responsive

Regional Industrial Hygienist

Ventilation and Lead Surface Testing Survey at the Indoor Firing Range

Raymond Bohn Armory

Bismarck, North Dakota

Firing Range Design

The armory was built in 1989 and has an active firing range with seven firing positions. The exhaust ventilation for the range is filtered through HEPA filters in a room adjacent to the range before being vented to the outdoors. There is a separate control room for the range where personal items can be placed. The drill room for the armory is open to public events.

Standards and Criteria for Indoor Firing Ranges

The following policy guides are used for the renovation and safe use of indoor firing ranges.

- *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges NGR 385-15*
- *Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges NG Pam 420-15*
- *Indoor Firing Range Design Guidance DG 415-1, 2-3.3*

Lead on Surfaces

Although OSHA does not have published exposure standards for metal surface contamination, 29 CFR 1910 requires that all surfaces must be kept as free as practicable of accumulations of toxic metal dusts. In addition, DOD has instituted a policy to minimize surface contamination levels of heavy metals (*Control and Management of Surface Accumulations from Lead, Hexavalent Chromium, and Cadmium Operations*, DTM 12-003, 18 April 2012). The NGB Mid-West Regional IH Office has adopted target housekeeping guidelines for lead dust in firing ranges. Any results that exceed 1,000 micrograms per square foot ($\mu g/ft^2$) for lead are considered significant. For areas where children may be present, NG PAM 420-15 requires lead levels to be less than 40 $\mu g/ft^2$. All other work areas in the building should be less than 200 $\mu g/ft^2$ for lead.

Airborne Lead

The OSHA Permissible Exposure Limit for lead is 0.05 mg/m3 and the Action Level is 0.03 mg/m3 based on an 8-hour time-weighted average. Exposures above the Action Level will require additional exposure monitoring, medical surveillance, and training under the OSHA lead standard (29 CFR 1910.1025). Based on the OSHA standard, Publication NGR 385-15, *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges* allows for intermittent lead level exposures. Personnel are allowed to use the range for the maximum period (up to 8 hours per day for adults and up to 4 hours per day for users under 17 years of age).

Surface Wipe Sampling

Eight surface wipe samples were collected from representative areas in the armory and the firing range using Environmental Express Ghost™ Wipes and templates (OSHA Technical Manual, Appendix II, 2-1). Wipe samples were collected in the kitchen to assess migration of lead into food handling spaces and on the ceiling rafter in the drill room. The samples were analyzed for lead by OSHA Analytical Method ID-121. Seven of the eight samples were above NGB recommended standards for lead. Two wipe samples collected in room 221 adjacent to the range had lead levels of 982 and 1,715 $\mu g/ft^2$. It appears that lead containing dust is being

tracked from the range into adjacent rooms. A sample collected inside the range behind the firing line contained 3,120 µg/ft^2 of lead. The highest lead levels were found on the floor in room 269 containing the range exhaust fan and HEPA filters. Lead levels were 8,286 and 15,400 µg/ft^2 . These high levels may be due to the removal of the filter and spilling of the lead containing dust or exhaust air by-passing the filters. A wipe sample collected from a ceiling rafter in the drill room contained 1,369 µg/ft^2 of lead. The results and photos are contained in Table 1.

Recommendations

Because of the very high levels of surface lead in the firing range, the range should be decontaminated according to the guidelines and procedures in NG Pam 420-15. (RAC 2)

Utilize workers trained in the hazards of lead dust and in safe cleaning work practices. (RAC 2)

Maintenance and housekeeping workers must be provided with proper personal protective equipment. (RAC 2)

Workers assigned to lead decontamination work are required to be in a medical surveillance program for lead exposure. (RAC 2)

Clean surfaces with high-efficiency particulate air (HEPA) filter vacuums or wet methods. (RAC 2)

Post-cleaning surface wipe sample results must be less than 200 micrograms per square foot (µg/ft^2) (40 micrograms in the case of child exposure). (RAC 2)

The HEPA filters in room 170 should be considered as hazardous waste and removed with proper personal protective equipment. (RAC 2)

Since the drill room is open to public events, clean all surfaces to reduce lead levels to less than 40 µg/ft^2 . (RAC 2)

Table 1
Surface Wipe Sampling Results for Lead
North Dakota Army National Guard
Indoor Firing Range & Armory
Bismarck, ND
October 22, 2014

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-1 Drill room on floor		40	<10
W-2 Kitchen on ice machine		40	**44**
W-3 Drill room on ceiling rafter		40	**1,369**

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-5 Outside firing range Room 221 in hallway on floor		200	**982**
W-6 Room 221 on floor		200	**1,715**
W-7 Inside firing range		200	**3,120**
W-8 Room 269 on floor		200	**15,400**

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-9 Room 269 on floor		200	**8,286**
W-10 Blank			ND

Notes: 1) µg / ft^2 = micrograms per square foot of surface area. 2) N/A = not applicable. 3) ND = none detected. 4) "<" means less than the reporting limit for the analytical method.

Ventilation

A TSI Alnor Model AVM430A thermal anemometer calibrated according to the manufacturer's specifications was used to evaluate airflow at the firing line. Three airflow measurements were made at the firing line at; standing position, kneeling position, and prone position. Smoke emitters were also used to observe if laminar airflow occurs in the range or if air turbulence is resulting in air back flows behind the firing line. All seven firing lanes met the average face velocity requirement of 50 feet per minute (fpm) specified in NGR 385-15. (Table 2) However, the smoke emitters showed air flowing above the standing position and back behind the firing line. (Figures 1- 5) Smoke at floor level did move down the range toward the bullet stop. The exhaust air for the range is then filtered through HEPA filters in room 269 before release to the outdoors.

Recommendations

The entire range ventilation system (supply and exhaust) should be evaluated by a ventilation engineering company to insure the system is working properly and lead containing dust is captured and disposed as hazardous waste. (RAC 2)

The HEPA filters in room 269 should be considered as hazardous waste and removed with proper personal protective equipment. (RAC 2)

Room 269 should be part of any lead decontamination process. (RAC 2)

Develop and update the site-specific SOP for the firing range in accordance with NGR 385-15. (RAC 2)

Table 2
Firing Line Ventilation Measurements
North Dakota Army National Guard
Indoor Firing Range & Armory
Bismarck, ND
October 22, 2014

Shooting Position >>>	Standing	Kneeling	Prone	Average of all 3 locations	Standard Met?
	Face Velocity in feet per minute (FPM)				
Lane 1	25	40	102	55	Yes
Lane 2	53	53	44	50	Yes
Lane 3	67	56	90	71	Yes
Lane 4	30	45	95	56	Yes
Lane 5	46	106	127	93	Yes
Lane 6	32	33	98	54	Yes
Lane 7	13	148	108	89	Yes

Figure 1 – Firing range, air turbulence above firing line

Figure 2 – Laminar flow at floor level

Figure 3 – Air turbulence resulting back flow

Figure 4 – Firing position

Figure 5 – Firing line and supply air wall

Laboratory Result Reports and Chain of Custody Sheets

FOH ENVIRONMENTAL LABORATORY
536 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

ANALYTICAL REPORT

Submitted To: USPHS / Federal Occupational Health
Denver Federal Center
Denver, CO 80225

Attention: Non-Responsive

Submitted By:

Reference Data: Lead
Sampling Site: NGB: Bismarck, ND (Armory)
Sample Media: Ghost Wipe(s)®
Method Reference: OSHA ID-121
Project ID: Project 12457
DFOH Lab Nos.: TM-15-74890 through TM-15-74899
Date Received: 10/28/15
Data Analyzed: 11/03/14 – 11/04/14
Date Issued: 11/05/14

The wipe samples were hot plate digested. The samples were run on a Perkin Elmer 200 flame atomic absorption spectrophotometer (AA).

General Lab Comments:
All quality control criteria have been met.
* All samples received in condition acceptable for analysis unless otherwise noted.
** Sample results have not been corrected for contamination based on the field blank or other analytical blank unless otherwise noted.

Analytical results are given on the enclosed tables. Results relate only to items tested. If you have any questions about these results, feel free to phone the Laboratory at (312) 886-0413.

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

FOH ENVIRONMENTAL LABORATORY
536 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

LEAD on WIPE RESULTS

SAMPLE NUMBER*	LABORATORY NUMBER	CONCENTRATION (µg)	CONCENTRATION (µg/ft²)
W-1	TM-15-74890	<10	<10
W-2	TM-15-74891	44	44
W-3	TM-15-74892	151	1369
W-4	TM-15-74893	<10	<91
W-5	TM-15-74894	108	982
W-6	TM-15-74895	189	1715
W-7	TM-15-74896	343	3120
W-8	TM-15-74897	1694	15400
W-9	TM-15-74898	912	8286
W-10**	TM-15-74899	<10	

AGENCY	FLOORS	INTERIOR WINDOW SILLS	WINDOW TROUGHS
EPA	40 µg/ft²	250 µg/ft²	400 µg/ft²

Metals in Wipe Limits
(based on one ft² sampled area)

Analyte	Analytical Method	Method Detection Limit	Minimum Reporting Limit
Lead – Flame AA	OSHA ID-121	5.0 µg/ft²	10 µg/ft²

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN-OF-CUSTODY / FIELD DATA SHEET

Environmental Laboratory
536 S. Clark Street South, Suite 714
Chicago, IL 60605-1521
Tel: (312) 886-0412 Fax: (312)-886-0434

Non-Responsive

Non-Responsive

PROJECT REFERENCE

Agreement No.:	A 106644
Statement of Work No.:	S 180648
Project No:	P 180649
Agency	ARNG
Proj. Manager	Armory
Location (City, State):	Bismarck, ND

For Lab Use Only
Project /Report #: 18457
Due Date: 11/05/14
Samples Received Chilled? YES / NO (circle one)
Conditions on Receipt with Name & Date
Rev. 07/2010

Container Types:
P-Plastic, G-Glass, V-VOC

Preservatives:
A-None, B-H_2SO_4, C-HNO_3, D-NaOH

STD- Standard
3D- Three Day Rush[@]
WH Weekend/Holiday*

Analysis Requested: Lead

Sample ID #	Type*	Media*	Collected Date	Collected Time	Sample Location / Description	Air Flow (LPM)	Air Time (Min.)	Air Volume (Liters)	Wipe Area (ft^2)	Water Volume (Liters)	Code[3]	Turn Around Time*	Lab ID #
W-1	7	5	Oct	22					144			STD	TM15-74890
W-2									144				74891
W-3									36				74892
W-4									16				74893
W-5									16				74894
W-6									16				74895
W-7									16				74896
W-8									16				74897
W-9									16				74898
W-10					Blank				—				74899

Sample Type Codes: 1-Air 2-Water 3-Paint 4-Soil 5-Dust 6-Bulk 7-Wipe 8 - Other

Sample Media Codes: 1-Charcoal 2-Matched Weight, 0.8um 3-PVC filter 4-M CE 0.8 um , 37 mm 5 -Ghost Wipes™ 6. Passive badge 7. Other

Relinquished By | Date & Time | Received By | Date & Time

Non-Responsive

COMMENTS:

* Applied to organic and inorganic analysis in cases of an emergency only. @ Applied to inorganic and organic samples, SD: Applied to organic and inorganic samples 7-10 business days.

National Guard Bureau

Mid-West Regional Industrial Hygiene Office
301-IH Old Bay Lane
Havre de Grace, MD 21078

ARNG-CSG-P April 1, 2015

MEMORANDUM FOR: The Adjutant General for North Dakota

SUBJECT: Ventilation and Lead Surface Testing Survey at the Indoor Firing Range, Readiness Center, Minot, North Dakota

National Guard Bureau (NGB) Mid-West Regional Industrial Hygiene (IH) Office field personnel conducted a survey on October 20, 2014 at the North Dakota Army National Guard, Readiness Center and Indoor Firing Range located in Minot, North Dakota. This survey included surface wipe sampling for lead and ventilation testing in the firing range.

Occupational health risk assessment codes (RACs) are assigned to quantify health risks to personnel in accordance with DOD Letter of Instruction 6055.1, *DOD Safety and Occupational Health Program*. Risk assessment is an expression of health hazard severity and mishap probability, described in terms of route of exposure, actual exposure, exposure limit standards, potential health effects, duration of exposure, and number of exposed personnel. Guidance for RAC determination is attached to this report.

Surface Wipe Sampling
Ten surface wipe samples were collected from representative areas in the Readiness Center and the firing range. Wipe samples were collected in the kitchen to assess migration of lead into food handling spaces and on the ceiling rafter in the drill room. Five of the ten samples were above NGB recommended standards for lead. A wipe sample was collected in room 170 adjacent to the range exhaust ventilation HEPA filters. An apparent small spill of black dust was present where the filters were changed. The black dust contained 1,073,409 µg/ft^2 of lead. A wipe sample collected on the floor in room 162 (control room) contained 3,444 µg/ft^2 of lead. And a sample collected on the firing range floor near the bullet stop contained 16,836 µg/ft^2. It appears that lead containing dust is being tracked from the range into the control room. A wipe sample collected from a ceiling rafter in the drill room contained 190 µg/ft^2 of lead. <u>The following actions are required:</u>

- Because of the very high levels of surface lead in the firing range, the range should be decontaminated according to the guidelines and procedures in NG Pam 420-15. (RAC 2)

- Utilize workers trained in the hazards of lead dust and in safe cleaning work practices. (RAC 2)

- Maintenance and housekeeping workers must be provided with proper personal protective equipment. (RAC 2)

- Workers assigned to lead decontamination work are required to be in a medical surveillance program for lead exposure. (RAC 2)

- Clean surfaces with high-efficiency particulate air (HEPA) filter vacuums or wet methods. (RAC 2)

- Post-cleaning surface wipe sample results must be less than 200 micrograms per square foot (µg/ft^2) (40 micrograms in the case of child exposure). (RAC 2)

- The HEPA filters in room 170 should be considered as hazardous waste and removed with proper personal protective equipment. (RAC 2)

- Since the drill room is open to public events, clean all surfaces to reduce lead levels to less than 40 µg/ft^2 . (RAC 2)

Ventilation

Four airflow measurements were made at each firing line position. All five lanes met the average face velocity requirement of 50 feet per minute (fpm) specified in NGR 385-15. However, Lane 5 had low airflow near the floor. The exhaust air for the range is filtered through HEPA filters before release to the outdoors. A small spill of black dust from the filters was present on the floor. The following actions are required:

- The HEPA filters in room 170 should be considered as hazardous waste and removed with proper personal protective equipment. (RAC 2)

- Develop and update the site-specific SOP for the firing range in accordance with NGR 385-15. (RAC 2)

At this time, the range is classified as: “Unsafe” due to high surface levels of lead in the range control room.

The NGB conducted this survey in the interest of preventing employee illness and to meet legal obligations where applicable. Results and recommendations are based on information provided by site personnel, field measurements, and conditions observed during the survey. For any further questions, please contact Non-Responsive

Non-Responsive

Regional Industrial Hygienist

Ventilation and Lead Surface Testing Survey at the Indoor Firing Range

Readiness Center

Minot, North Dakota

Firing Range Design

The firing range in the Minot Readiness Center was built in 1991 and is currently active. In 2013, 3,652 rounds were fired. There is a separate control room for the range where personal items can be placed. The drill room for the Readiness Center is down the hallway from the range and open to public events.

Standards and Criteria for Indoor Firing Ranges

The following policy guides are used for the renovation and safe use of indoor firing ranges.

- *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges NGR 385-15*
- *Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges NG Pam 420-15*
- *Indoor Firing Range Design Guidance DG 415-1, 2-3.3*

Lead on Surfaces

Although OSHA does not have published exposure standards for metal surface contamination, 29 CFR 1910 requires that all surfaces must be kept as free as practicable of accumulations of toxic metal dusts. In addition, DOD has instituted a policy to minimize surface contamination levels of heavy metals (*Control and Management of Surface Accumulations from Lead, Hexavalent Chromium, and Cadmium Operations*, DTM 12-003, 18 April 2012). The NGB Mid-West Regional IH Office has adopted target housekeeping guidelines for lead dust in firing ranges. Any results that exceed 1,000 micrograms per square foot ($\mu g/ft^2$) for lead are considered significant. For areas where children may be present, NG PAM 420-15 requires lead levels to be less than 40 $\mu g/ft^2$. All other work areas in the building should be less than 200 $\mu g/ft^2$ for lead.

Airborne Lead

The OSHA Permissible Exposure Limit for lead is 0.05 mg/m3 and the Action Level is 0.03 mg/m3 based on an 8-hour time-weighted average. Exposures above the Action Level will require additional exposure monitoring, medical surveillance, and training under the OSHA lead standard (29 CFR 1910.1025). Based on the OSHA standard, Publication NGR 385-15, *Policy and Responsibilities for Inspection, Evaluation and Operation of Army National Guard Indoor Firing Ranges* allows for intermittent lead level exposures. Personnel are allowed to use the range for the maximum period (up to 8 hours per day for adults and up to 4 hours per day for users under 17 years of age).

Surface Wipe Sampling

Ten surface wipe samples were collected from representative areas in the Readiness Center and the firing range using Environmental Express Ghost™ Wipes and templates (OSHA Technical Manual, Appendix II, 2-1). Wipe samples were collected in the kitchen to assess migration of lead into food handling spaces and on the ceiling rafter in the drill room. The samples were analyzed for lead by OSHA Analytical Method ID-121. Five of the ten samples were above NGB recommended standards for lead. A wipe sample was collected in room 170 adjacent to the range exhaust ventilation HEPA filters. An apparent small spill of black dust was present where the filters were changed. The black dust contained 1,073,409 µg/ft^2 of lead. A wipe sample collected in room 162 (control room) on the floor contained 3,444 µg/ft^2 of lead. And a sample collected on the firing range floor near the bullet stop contained 16,836 µg/ft^2. It appears that lead containing dust is being tracked from the range into the control room. A wipe sample collected from a ceiling rafter in the drill room contained 190 µg/ft^2 of lead. The results and photos are contained in Table 1.

Recommendations

Because of the very high levels of surface lead in the firing range, the range should be decontaminated according to the guidelines and procedures in NG Pam 420-15. (RAC 2)

Utilize workers trained in the hazards of lead dust and in safe cleaning work practices. (RAC 2)

Maintenance and housekeeping workers must be provided with proper personal protective equipment. (RAC 2)

Workers assigned to lead decontamination work are required to be in a medical surveillance program for lead exposure. (RAC 2)

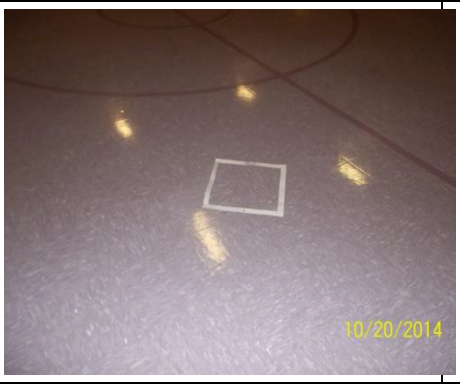
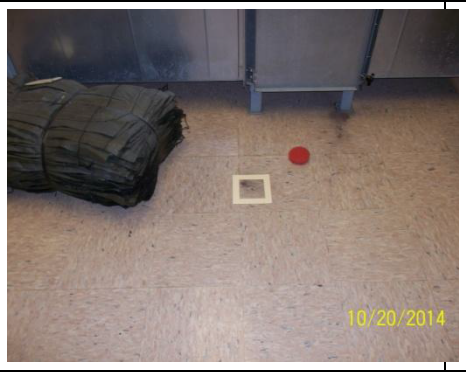
Clean surfaces with high-efficiency particulate air (HEPA) filter vacuums or wet methods. (RAC 2)

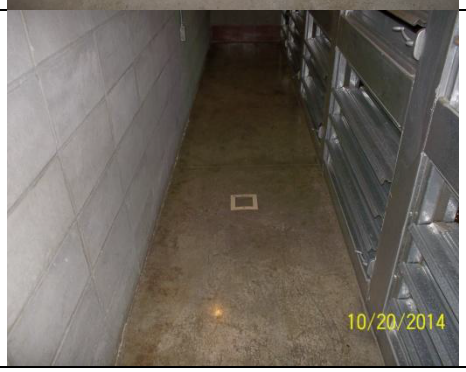
Post-cleaning surface wipe sample results must be less than 200 micrograms per square foot (µg/ft^2) (40 micrograms in the case of child exposure). (RAC 2)

The HEPA filters in room 170 should be considered as hazardous waste and removed with proper personal protective equipment. (RAC 2)

Since the drill room is open to public events, clean all surfaces to reduce lead levels to less than 40 µg/ft^2 . (RAC 2)

Table 1
Surface Wipe Sampling Results for Lead
North Dakota Army National Guard
Indoor Firing Range & Readiness Center
Minot, ND
October 20, 2014

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-1 Drill room on floor		40	<10
W-2 Kitchen on oven		40	<10
W-3 Room 170 Storage on floor		200	**1,073,409**

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-4 Firing range Room 162 on floor		200	**3,444**
W-5 Firing range Room 164 At firing line on floor		200	**603**
W-6 Firing range Room 164 Near bullet trap on floor		1,000	**16,836**
W-7 Firing range in supply air plenum on floor		200	<91

Sample No. Location	Photo	Surface Guideline Lead ($\mu g/ft^2$)	Lead ($\mu g/ft^2$)
W-8 Work bay room 227 on table		200	<91
W-9 Drill room on ceiling rafter		40	**190**
W-11 NE stair well on floor		200	<91
W-12 blank			ND

Notes: 1) $\mu g / ft^2$ = micrograms per square foot of surface area. 2) N/A = not applicable. 3) ND = none detected. 4) "<" means less than the reporting limit for the analytical method.

Ventilation

A TSI Alnor Model AVM430A thermal anemometer calibrated according to the manufacturer's specifications was used to evaluate airflow at the firing line. Four airflow measurements were made at the firing line at; 7 feet from the floor, standing position, kneeling position, and prone position. The 7 foot measurements were to determine if there was any airflow moving back behind the firing line. Smoke emitters were not available during this survey. All five lanes met the average face velocity requirement of 50 feet per minute (fpm) specified in NGR 385-15. (Table 2) However, Lane 5 had low airflow near the floor. (Figures 1-5) The exhaust air for the range is filtered through HEPA filters before release to the outdoors. The HEPA filters are located in room 170 which is also used for storage. (Figure 6)

Recommendations

The HEPA filters in room 170 should be considered as hazardous waste and removed with proper personal protective equipment. (RAC 2)

Develop and update the site-specific SOP for the firing range in accordance with NGR 385-15. (RAC 2)

Table 2
Firing Line Ventilation Measurements
North Dakota Army National Guard
Indoor Firing Range & Readiness Center
Minot, ND
October 20, 2014

Shooting Position >>>	7 feet from floor	Standing	Kneeling	Prone	Average of all 4 locations	Standard Met?
		Face Velocity in feet per minute (FPM)				
Lane 1	75	60	61	75	68	Yes
Lane 2	90	70	80	50	72	Yes
Lane 3	53	85	60	45	61	Yes
Lane 4	77	51	54	44	56	Yes
Lane 5	90	101	27	8	56	Yes

Figure 1 – Firing range control room 162

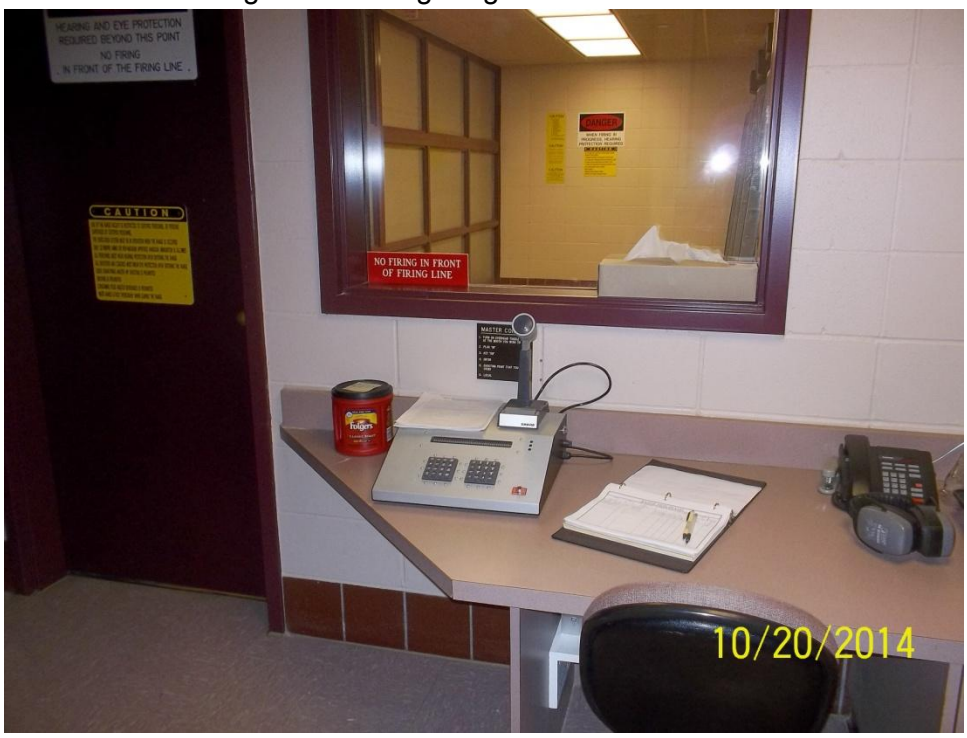


Figure 2 – Firing range

Figure 3 – Firing range

Figure 4 – Bullet Stop

Figure 5 – Firing range, supply air wall

Figure 6 – Room 170 containing range HEPA filters
(note black dust on floor from filters)

Laboratory Result Reports and Chain of Custody Sheets

FOH ENVIRONMENTAL LABORATORY
536 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

ANALYTICAL REPORT

Submitted To: USPHS / Federal Occupational Health
Denver Federal Center
Denver, CO 80225

Attention: Non-Responsive

Submitted By:

Reference Data: Lead
Sampling Site: NGB: Minot, ND (Armory)
Sample Media: Ghost Wipe(s)®
Method Reference: OSHA ID-121
Project ID: Project 12456
DFOH Lab Nos.: TM-15-74878 through TM-15-74889
Date Received: 10/28/15
Data Analyzed: 11/03/14 – 11/04/14
Date Issued: 11/05/14

The wipe samples were hot plate digested. The samples were run on a Perkin Elmer 200 flame atomic absorption spectrophotometer (AA).

General Lab Comments:
All quality control criteria have been met.
* All samples received in condition acceptable for analysis unless otherwise noted.
** Sample results have not been corrected for contamination based on the field blank or other analytical blank unless otherwise noted.

Analytical results are given on the enclosed tables. Results relate only to items tested. If you have any questions about these results, feel free to phone the Laboratory at (312) 886-0413.

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

FOH ENVIRONMENTAL LABORATORY
536 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

LEAD on WIPE RESULTS

SAMPLE NUMBER*	LABORATORY NUMBER	CONCENTRATION (µg)	CONCENTRATION (µg/ft²)
W-1	TM-15-74878	<10	<10
W-2	TM-15-74879	<10	<10
W-3	TM-15-74880	118075	1073409
W-4	TM-15-74881	379	3444
W-5	TM-15-74882	66	603
W-6	TM-15-74883	1852	16836
W-7	TM-15-74884	<10	<91
W-8	TM-15-74885	<10	<91
W-9	TM-15-74886	47	190
W-10	TM-15-74887	<10	<91
W-11	TM-15-74888	<10	<91
W-12**	TM-15-74889	<10	

AGENCY	FLOORS	INTERIOR WINDOW SILLS	WINDOW TROUGHS
EPA	40 µg/ft²	250 µg/ft²	400 µg/ft²

Metals in Wipe Limits
(based on one ft² sampled area)

Analyte	Analytical Method	Method Detection Limit	Minimum Reporting Limit
Lead – Flame AA	OSHA ID-121	5.0 µg/ft²	10 µg/ft²

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN-OF-CUSTODY / FIELD DATA SHEET

Environmental Laboratory
536 S. Clark Street South, Suite 714
Chicago, IL 60605-1521
Non-Responsive

PROJECT REFERENCE

Agreement No.:	A 106644
Statement of Work No.:	S 180648
Project No:	P 180649
Agency	ARNG
Proj. Manager	Readiness Center
Location (City, State):	Minot, ND

For Lab Use Only
Project /Report #: 124556
Due Date: 11/10/14
Samples Received Chilled? YES / NO (circle one)
Conditions on Receipt with Name & Date
Rev. 07/2010

Container Types:
P-Plastic, G-Glass, V-VOC

Preservatives:
A-None, B-H_2SO_4, C-HNO_3, D-NaOH

Turn Around Time Codes:
STD- Standard
3D- Three Day Rush*
WH Weekend/Holiday*

Analysis Requested
Lead

Name: Non-Responsive
Address:
Phone:
Email:

Sample ID #	Type¹	Media²	Collected Date	Collected Time	Sample Location / Description	Air Flow (LPM)	Air Time (Min.)	Air Volume (Liters)	Wipe Area (ft²)	Water Volume (Liters)	Water Code³	Turn Around Time⁴	Lab ID #
W-1	7	5	Oct	20					144			STD	TM-15-74878
W-2									144				74879
W-3									16				74880
W-4									16				74881
W-5									16				74882
W-6									16				74883
W-7									16				74884
W-8									16				74885
W-9									36				74886
W-10									16				74887
W-11									16				74888
W-12					blank				—				74889

Sample Type Codes: 1-Air 2-Water 3-Paint 4-Soil 5-Dust 6-Bulk 7-Wipe 8 - Other

Sample Media Codes: 1-Charcoal 2-Matched Weight, 0.8um 3-PVC filter 4-M CE 0.8 um , 37 mm 5 -Ghost Wipes™ 6. Passive badge 7. Other

Relinquished By: Non-Responsive | Date/Time | Received By | Date/Time

COMMENTS:

* Applied to organic and inorganic analysis in cases of an emergency only. ³ Applied to inorganic and organic samples, SD: Applied to organic and inorganic samples 7-10 business days.

Industrial Hygiene Survey Report

At

North Dakota Army National Guard
Raymond J. Bohn Armory
4200 East Divide Avenue
Bismarck, North Dakota

Survey date: July 22, 2011

For

Department of the Army
National Guard Bureau
Region West Industrial Hygiene Office
NGB-AVN-S1

Performed by
U.S. Public Health Service
Federal Occupational Health

October 22, 2011

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D. Occupational Health Risk Assessment Codes (RACs)

I. Executive Summary

At the request of the National Guard Bureau Region West Industrial Hygiene Office, field personnel representing the U.S. Public Health Service, Division of Federal Occupational Health (FOH) conducted an industrial hygiene survey at the North Dakota Army National Guard, Raymond J. Bohn Armory, located in Bismarck, North Dakota. This survey was conducted as part of the Army National Guard occupational safety and health program to evaluate potential personnel exposure to contaminants generated during typical activities performed at this facility.

The Bohn Armory was built in 1989. The facility has about 20,000 square feet of floor space that includes an indoor firing range that is 50 feet long and has seven firing positions. The indoor firing range (IFR) is used by state legislators; gate guards; law enforcement personnel and junior shooters. Site personnel reported that the IFR is used about 45-50 days per year. Each shooting session ranges from one to three hours in duration.

Fourteen samples were collected on representative surfaces in the facility and analyzed for lead. At present, there are no regulated or recommended levels for surface levels of lead in military facilities. There are no OSHA regulated levels for these heavy metals on surfaces. For the purposes of this report, any level of lead that exceeds 200 ug/ft^2 is considered significant.

Six of the surface wipe sample results exceeded the above criteria. A sample collected in the IFR, on the floor, at firing position 2 had a lead concentration of 2,188 ug/ft^2. A sample collected in the IFR, on the floor, at firing position 6 had a lead concentration of 1,513 ug/ft^2. A sample collected in the IFR, on the floor, twenty five feet downrange from the firing positions on the north side of the range had a lead concentration of 27,900 ug/ft^2. A sample collected in the IFR, on the floor, twenty five feet downrange of the firing positions on the south side of the range had a lead concentration of 9,600 ug/ft^2. A sample collected in the IFR forty feet downrange on the north wall had a lead concentration of 1,288 ug/ft^2. A sample collected in the IFR forty feet downrange on the south wall had a lead concentration of 500 ug/ft^2. None of the surface wipe samples collected outside of the IFR exceeded the lead criteria of 200 ug/ft^2. The results indicate that lead contamination of floor and surface areas is primarily limited to the indoor firing range.

Site personnel reported that range cleanup is performed by state facilities personnel or contractors and that an outside contractor removes the high efficiency particulate (HEPA) filter that has been installed in the firing range exhaust system. The Bohn Armory should continue to prohibit the presence of food and drink in the firing range, stress the importance of hand washing prior to the consumption of food items and continue to periodically clean all of the surface areas (floor, walls and ceiling) in the firing range. The floor areas at the firing positions should be cleaned frequently to prevent lead dust from migrating beyond the firing range into other parts of the armory. When weapons are cleaned, special attention should be given to cleaning up the work area to prevent potential lead contamination from ammunition. The ventilation at the firing line was measured and is considered adequate. The armory should perform personal exposure monitoring for lead when the firing range is in use.

II. Introduction

An Occupational Health and Industrial Hygiene Evaluation was conducted by the USPHS, FOH at the North Dakota Army National Guard, Raymond J. Bohn Armory, located in Bismarck, North Dakota. This work was conducted under the Interagency Agreement between the U.S. Public Health Service (USPHS) Federal Occupational Health (FOH) and the West Region of the Army National Guard. This survey was conducted in order to identify exposure levels to hazardous chemical, physical, and biological agents occurring to Army National Guard employees while engaged in a full range of work responsibilities and tasks. Non-Responsive, Certified Industrial Hygienist (CIH), Certified Professional Ergonomist (CPE) conducted this survey on July 22, 2011.

FOH conducted this survey in the interest of preventing employee illness and in meeting legal obligations where applicable. Based on information provided, every effort was made to conduct a comprehensive survey covering the parameters considered. Results and recommendations are based on information provided, field measurements, and conditions observed during the survey.

III. Site Description

The Bohn Armory was built in 1989. The facility has about 20,000 square feet of floor space that encompasses an indoor firing range, drill floor, four maintenance bays, offices, classrooms, kitchen, latrines, supply room and eleven weapons vaults.

The Bohn Armory is the base of operations for: the NDARNG JFHQ; the State Medical Detachment; Recruiting and Retention Battalion; 2/191st MP Company; 1919th Contracting Team; 116th Public Affairs Detachment; 68th Troop Command; 814th Medical Company; 957th Engineering Company; 1/3662nd Maintenance Company; the state personnel office; and military funeral honors personnel. During the week, most of the activities at the armory involve administrative work. Site personnel reported that vehicle maintenance activities are mostly limited to: changing radios; fluid checks, and tire changes on drill weekends. Site personnel indicated that no major vehicle maintenance is performed at the armory. No vehicle maintenance was performed on the day of the survey. The Bohn Armory has an indoor firing range that is 50 feet long and has seven firing positions. Weapons may be cleaned on the firing range, in the vault, in the supply room, or on tables set up on the drill floor.

The armory is available for rental for community activities that include: traveling basketball teams that practice on the drill floor (girls 4th to 6th grade); annual earth day activities; and career days for 6th graders. The indoor firing range (IFR) is used by state legislators; gate guards; law enforcement personnel; and junior shooters. Site personnel reported that the IFR is used about 45-50 days per year. Each shooting session ranges from one to three hours in duration.

IV. Scope of Work

The industrial hygiene survey included a walkthrough of the facility and interviews with employees. The survey also included: collecting surface wipe samples for lead; a lighting survey; and a ventilation survey. Photographs were taken, as appropriate.

Figure 1 – Bohn Armory

V. Findings, Discussion, and Recommendations

The Bohn Armory is the base of operations for: the NDARNG JFHQ; the State Medical Detachment; Recruiting and Retention Battalion; 2/191st MP Company; 1919th Contracting Team; 116th Public Affairs Detachment; 68th Troop Command; 814th Medical Company; 957th Engineering Company; 1/3662nd Maintenance Company; the state personnel office; and military funeral honors personnel. During the week, most of the activities at the armory involve administrative work. Site personnel reported that vehicle maintenance activities are mostly limited to: changing radios; fluid checks, and tire changes on drill weekends. Site personnel indicated that no major vehicle maintenance is performed at the armory. No vehicle maintenance was performed on the day of the survey.

The Bohn Armory has an indoor firing range. The IFR was not in use on the day of the survey. Weapons may be cleaned on the firing range, in the vault, in the supply room, or on tables set up on the drill floor.

Figure 2 – Bohn Armory – Indoor Firing Range

Surface Wipe Samples

Fourteen samples were collected on representative surfaces in the facility and analyzed for lead. Some of the sample results were below the limit of detection for lead and other results indicated that lead was detected, mostly at lower levels. The results are contained in Table 1. Wipe sample locations are contained in Figure 3. At present, there are no regulated or recommended levels for surface levels of lead in military facilities. There are no OSHA regulated levels for lead on surfaces. For the purposes of this report, any level of lead that exceeds 200 ug/ft^2 is considered significant.

Six of the surface wipe sample results exceeded the above criteria. Sample ND7W2, which was collected in the IFR, on the floor, at firing position 2 had a lead concentration of 2,188 ug/ft^2. Sample ND7W3, which was collected in the IFR, on the floor, at firing position 6 had a lead concentration of 1,513 ug/ft^2. Sample ND7W4, which was collected in the IFR, on the floor, twenty five feet downrange from the firing positions on the north side of the range had a lead concentration of 27,900 ug/ft^2. Sample ND7W5, which was collected in the IFR, on the floor, twenty five feet downrange of the firing positions on the south side of the range had a lead concentration of 9,600 ug/ft^2. Sample ND7W6, which was collected in the IFR forty feet downrange on the north wall had a lead concentration of 1,288 ug/ft^2. Sample ND7W7, which was collected in the IFR forty feet downrange on the south wall had a lead concentration of 500 ug/ft^2. None of the surface wipe samples collected outside of the IFR exceeded the lead criteria of 200 ug/ft^2. The results indicate that lead contamination of floor and surface areas is primarily limited to the indoor firing range.

Site personnel reported that range cleanup is performed by state facilities personnel or contractors and that an outside contractor removes the high efficiency particulate (HEPA) filter that has been installed in the firing range exhaust system.

The Bohn Armory should continue to prohibit the presence of food and drink in the firing range, stress the importance of hand washing prior to the consumption of food items and continue to periodically clean all of the surface areas (floor, walls and ceiling) in the firing range. The floor areas at the firing positions should be cleaned frequently to prevent lead dust from migrating beyond the firing range into other parts of the armory. When weapons are cleaned, special attention should be given to cleaning up the work area to prevent potential lead contamination from ammunition.

Table 1
Surface Area Wipe Sampling Results for Metals
North Dakota Army National Guard
Bohn Armory
Bismarck, North Dakota
July 22, 2011

Sample Number/Location	Lead Concentration (ug/ft^2)
Sample ND7W1 Firing Range, Vestibule on Countertop	59
Sample ND7W2 Firing Position 2, On Floor	**2,188**
Sample ND7W3 Firing Position 6, On Floor	**1,513**
Sample ND7W4 North Side of Firing Range, 25' Downrange ,On Floor	**27,900**
Sample ND7W5 South Side of Firing Range, 25' Downrange, On Floor	**9,600**
Sample ND7W6 Firing Range, 40' Downrange, on North Wall	**1,288**
Sample ND7W7 Firing Range, 40' Downrange, on South Wall	**500**
Sample ND7W8 Firing Range, on Inside of Entry Door	35
Sample ND7W9 Drill Floor, on Floor, Center of Northeast Quadrant	52
Sample ND7W10 Drill Floor, on Floor, Center of Northwest Quadrant	<10
Sample ND7W11 Drill Floor, on Floor, Southwest Corner	<10
Sample ND7W12 Drill Floor, on Floor, Southeast Corner	<10
Sample ND7W13 Theater, on Podium	<10
Sample ND7W14 Kitchen, on Countertop	11
Sample ND7W15 Field Blank	ND

Note:
1) ug/ft^2= micrograms per square foot of surface area.
2) **Bold** indicates that concentration was "significant."
3) ND = None Detected

Recommendations:

1. Continue to prohibit the presence of food and drink in the firing range and stress the importance of hand washing prior to the consumption of food items. (**RAC 2**)

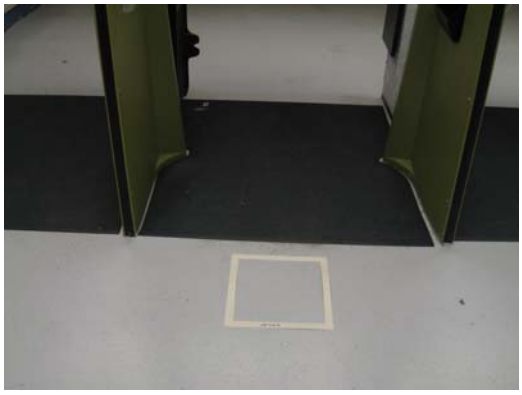
2. Continue to periodically clean all of the surface areas (floor, walls and ceiling) in the firing range. (**RAC 2**)

3. The floor areas at the firing positions should be cleaned frequently to prevent lead dust from migrating beyond the firing range into other parts of the armory. (**RAC 2**)

4. When weapons are cleaned, special attention should be given to cleaning up the work area to prevent potential lead contamination from ammunition. (**RAC 2**)

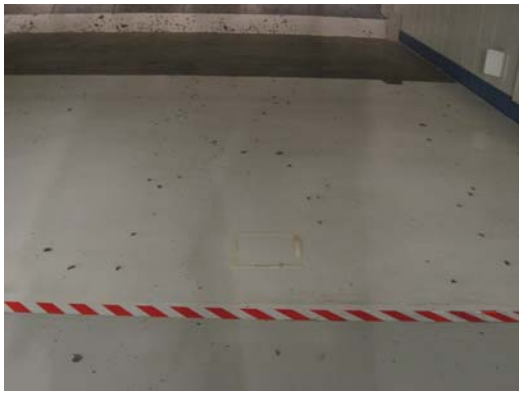
Figure 3 – Wipe Sample Locations (below)

Sample ND7W1


Sample ND7W2


Sample ND7W3


Sample ND7W4



Sample ND7W5

Sample ND7W6

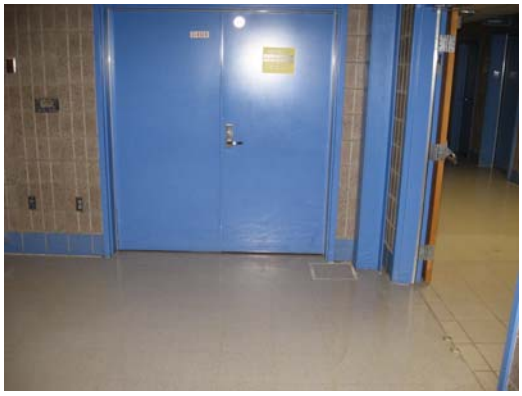
Sample ND7W7

Sample ND7W8

Sample ND7W9

Sample ND7W10

Sample ND7W11



Sample ND7W12

Sample ND7W13

Sample ND7W14

Ventilation Systems

Carbon Monoxide and Nitrogen Dioxide Detection System

Carbon monoxide is an odorless, colorless toxic gas that is a product of incomplete combustion. Maintenance activities at the Bohn Armory may require personnel to run engines while they are in the shop. During the winter months, maintenance may be performed with the maintenance bay doors closed. The maintenance bay area was equipped with a wall mounted Brasch carbon monoxide and nitrogen dioxide gas detector. The monitor provides an audible alarm when elevated carbon monoxide or nitrogen dioxide levels are detected. No records of calibration for the carbon monoxide and nitrogen dioxide gas detector were available for review on the day of the survey. Carbon monoxide and nitrogen dioxide gas detectors should be calibrated as specified by the manufacturer, and the records of calibration should be maintained at the site.

Tailpipe Local Exhaust Ventilation (LEV) Systems

The Bohn Armory is equipped with four tailpipe LEV systems. The tailpipe LEV systems had six inch diameter flexible exhaust ducts. Tailpipe local exhaust ventilation systems (Figure 4) in the maintenance bays were tested. The results are contained in Table 2.

Table 2
Tailpipe Local Exhaust Ventilation Measurements
North Dakota Army National Guard
Bohn Armory
Bismarck, North Dakota
July 22, 2011

Duct location	Duct diameter (inches)	Exhaust flow rate (cfm)
Bay 1	6	321
Bay 2	6	545
Bay 3	6	424
Bay 4	6	421

The Corps of Engineers Guide Specifications (CEGS) as well as the ACGIH ventilation manual recommends exhaust levels of at least 1400 cubic feet per minute (cfm) for turbocharged diesel engines up to 500 Hp. ACGIH recommends a vehicle local exhaust system that exhausts 400-1200 cfm for diesel-powered trucks and 1400-2200 cfm for turbocharged vehicles. See Table 3 below for the Corps of Engineers (COE) recommended exhaust flow rates.

Table 3
COE Recommended LEV Exhaust Flow Rates

Diesel Engines Hp Rating	Exhaust Flow Rate (cfm)
300	400
500	600
700	1000
Turbocharged Diesel Engines Up To: 500 Hp	1400

Notes: 1) Hp = horsepower 2) cfm = cubic feet per minute of exhaust airflow

None of the tailpipe LEV systems had sufficient exhaust air flow to be used for turbocharged diesel engines. The tailpipe LEV systems in bays 2, 3 and 4 met the guidelines to exhaust a 300 Hp diesel engine. The tailpipe LEV system in bay 1 should be upgraded to meet minimum Corps of Engineers standards of 400 cfm.

Figure 4 - Tailpipe LEV

Flammable Storage Room

The flammable room has a 10 inch by 24 inch exhaust duct that is located about 10 inches above the floor (Figure 5). The system exhausts 840 cfm from this 12 foot by 29 foot (348 square feet) room. The exhaust flow rate is 2.4 cfm per square foot which meets the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) TG-022 requirement of two cfm per square foot of room space.

Figure 5 – Flammable Room Exhaust Ventilation

Recommendations:

1. Carbon monoxide and nitrogen dioxide gas detectors should be calibrated as specified by the manufacturer, and the records of calibration should be maintained at the site. **(RAC 2)**

2. Observe COE recommended LEV exhaust flow rates when operating or testing engines in maintenance bays. **(RAC 2)**

3. The tailpipe LEV system in bay 1 should be upgraded to meet minimum Corps of Engineers standards of 400 cfm. **(RAC 2)**

Lighting Survey

A lighting survey was conducted in the offices, maintenance bays and storage areas in the Bohn Armory. The results are contained in Table 4. ANSI lighting standards are contained in Table 5.

Table 4
Lighting Survey
North Dakota Army National Guard
Bohn Armory
Bismarck, North Dakota
July 22, 2011

Location	Illumination (foot candles)
Room 100, Building Manager Office	44-52
Drill Floor	23-30
Kitchen	29-66
IFR Firing Range	108-112
Room 268, Physical Training	67-81
Room 263, Vending Room	8-10
Maintenance Bay	26-37
Maintenance Bay Mezzanine	29-33
Room 266, State Maintenance Shop	14-17
Room 227, Office	29-32
Room 238, Office	24-68
Room 235, Supply Room	20-25
Men's Locker Room	23-38
Room 178, Supply Room	26-28
Room 178, Vault	29-48
Room 386A, Classroom	24-36
Room 364, Office	13-15
Room 365, Office	32-39
Room 380, Office	41-46
Room 379, Dental Exam Room	31-36
Room 370, Office	41-44
Room 373, EKG	12-15
Room 387A, Classroom	15-19
Room 313, Chief of Staff	26-56
Room 313B	18-21
Room 394A, Distance Learning Classroom	22-29

Table 5
Lighting Standards
ANSI Standard RP-7-2001
Recommended Practice for Lighting Industrial Facilities

Location	Minimum foot candles required
Maintenance Bays and Shops	100
Battery Room (or any electrical equipment areas)	100
Offices/Library/Reading Areas	100
Supply or Storage Rooms	30
Break room	30
Inactive areas	5

Most of the areas surveyed did not meet minimum illumination requirements. Illumination levels should be improved in some office, maintenance bay, and storage areas.

Recommendation:

Increase the illumination levels in the areas that did not meet minimum illumination requirements. (**RAC 4**)

Indoor Firing Range

The Bohn Armory has an indoor firing range (IFR) that is 50 feet long and has seven firing positions. The IFR was not in use on the day of the survey. The firing range is equipped with a target carrier system. The target carrier system reduces foot traffic downrange of the firing line and reduces potential lead dust re-entrainment.

The IFR ventilation system provides diffused outside supply air behind the firing positions and exhausts air downrange behind the bullet trap. The exhaust air system is equipped with a high efficiency particulate air (HEPA) filter. Exhaust air exits the building and is not recirculated. Facilities personnel reported that the HEPA filter was installed about eight years ago, along with a larger fan.

Site personnel reported that range cleanup is performed by state facilities personnel or contractors, and that an outside contractor removes and replaces the HEPA filter. The air flow rate at the firing positions (about five feet above the floor) was measured. The results are contained in Table 6.

Table 6
Indoor Firing Range Ventilation Measurements
North Dakota Army National Guard
Bohn Armory
Bismarck, North Dakota
July 22, 2011

Firing Position	1	2	3	4	5	6	7
Air Flow Rate (fpm)	65	80	87	63	52	53	71

The minimum required air velocity at the firing line is 50-75 fpm. The ventilation at the firing line is considered adequate. The armory should perform personal exposure monitoring for lead when the firing range is in use.

Recommendations:

Perform personal exposure monitoring for lead when the firing range is in use. **(RAC 3)**

This survey was conducted by, and report written by Non-Responsive, CIH, CPE as a representative of Federal Occupational Health. This survey report was reviewed by Non-Responsive Regional Industrial Hygienist at the NGB ARNG Region West Industrial Hygiene Office.

Technical Assistance: For technical assistance regarding information found in this report or the performed survey please contact the Regional Industrial Hygienist at the NGB ARNG Region West Industrial Hygiene Office.

Appendix A

North Dakota Army National Guard State Points of Contact

Non-Responsive
Occupational Health Manager

Bohn Armory Point of Contact

Non-Responsive – POC

Appendix B

Methodology and Assessment Criteria

Methods used in this survey to collect surface wipe samples are listed below. The sampling strategy used in this survey was designed to characterize employee exposure to the various contaminants that could be generated from the various activities/tasks performed in the facility. It was based, in part, on information provided by site personnel.

Surface sampling reported in this survey represents the work conditions existing at the time of the survey. Changes in work practices and/or processes may change employee exposure levels. Use of different materials may result in exposure to a different air contaminant.

Surface Sampling – Lead

Surface samples were collected from representative areas using Environmental Express Ghost™ Wipes and templates that encompassed one square foot of surface area. The entire area was wiped using an "S" configured motion, the Ghost™ Wipe was then folded in half and the area was again wiped in a direction 90^0 to the first using an "S" motion. The wipe was folded again and the perimeter of the area was wiped. The wipe was then placed into a plastic cylinder, the cylinder was capped and sealed and the samples were sent to the FOH Laboratory in Chicago, Illinois, for analysis for lead. The lead samples were analyzed on a Perkin Elmer 200 flame atomic absorption spectrophotometer using the OSHA ID-121 method. At present there are no regulated or recommended levels for surface levels of lead in military facilities. For purposes of this report, any surface lead level that exceeds 200 ug/ft^2 is considered excessive (or significant).

Local Exhaust Ventilation Measurements

A TSI Velocicalc was used to measure general exhaust ventilation flow rates and the tailpipe exhaust systems. The TSI Velocicalc had been calibrated according to the manufacturer's specifications. Local exhaust ventilation findings were evaluated based on criteria established by the ACGIH in its publication *Industrial Ventilation, A Manual of Recommended Practices,* 27th Edition, by OSHA 29 CFR 1910.94, 106, and 252 ventilation requirements and recommendations made by the Corps of Engineers Guide Specifications.

Lighting Levels

Illumination levels were measured with a Sper Scientific 840022 Broad Range Lux/FC Meter that had been calibrated according to the manufacturer's specifications. Lighting levels were evaluated based on criteria established by the American National Standards Institute/Illuminating Engineering Society of North America (ANSI/IESNA) Recommended Practice for Lighting Industrial Facilities RP-7-2001 (ANSI/IESNA RP-7-2001).

Appendix C

FOH ENVIRONMENTAL LABORATORY

538 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

ANALYTICAL REPORT

Submitted To: USPHS / Federal Occupational Health
Denver Federal Center
Denver, CO 80225

Attention: Non-Responsive

Submitted By:

Reference Data: Lead

Sampling Site:	NGB: Bismark, ND (BOHN Armory)
Sample Media:	Ghost Wipe(s)®
Method Reference:	OSHA ID-121
Project ID:	Project 10125
DFOH Lab Nos.:	TM-11-50707 through TM-11-50721
Date Received:	07/29/11
Data Analyzed:	08/01/11 – 08/08/11
Date Issued:	08/09/11

The wipe samples were hot plate digested. The samples were run on a Perkin Elmer 200 flame atomic absorption spectrophotometer (AA).

General Lab Comments:
All quality control criteria have been met.
* All samples received in condition acceptable for analysis unless otherwise noted.
** Sample results have not been corrected for contamination based on the field blank or other analytical blank unless otherwise noted.

Analytical results are given on the enclosed tables. Results relate only to items tested. If you have any questions about these results, feel free to phone the Laboratory at (312) 886-0413.

Non-Responsive

AIHA LAP, LLC ACCREDITED LABORATORY

FOH ENVIRONMENTAL LABORATORY

538 S. CLARK STREET CHICAGO, IL 60605 PHONE: (312) 886-0413 FAX: (312) 886-0434

LEAD on WIPE RESULTS

SAMPLE NUMBER*	LABORATORY NUMBER	CONCENTRATION (µg)	CONCENTRATION (µg/ft²)
ND7W1	TM-11-50707	59	59
ND7W2	TM-11-50708	2188	2188
ND7W3	TM-11-50709	1513	1513
ND7W4	TM-11-50710	27900	27900
ND7W5	TM-11-50711	9600	9600
ND7W6	TM-11-50712	1288	1288
ND7W7	TM-11-50713	500	500
ND7W8	TM-11-50714	35	35
ND7W9	TM-11-50715	52	52
ND7W10	TM-11-50716	<10	<10
ND7W11	TM-11-50717	<10	<10
ND7W12	TM-11-50718	<10	<10
ND7W13	TM-11-50719	<10	<10
ND7W14	TM-11-50720	11	11
ND7W15**	TM-11-50721	<10	None Detected

AGENCY	FLOORS	INTERIOR WINDOW SILLS	WINDOW TROUGHS
EPA	40 µg/ft²	250 µg/ft²	400 µg/ft²

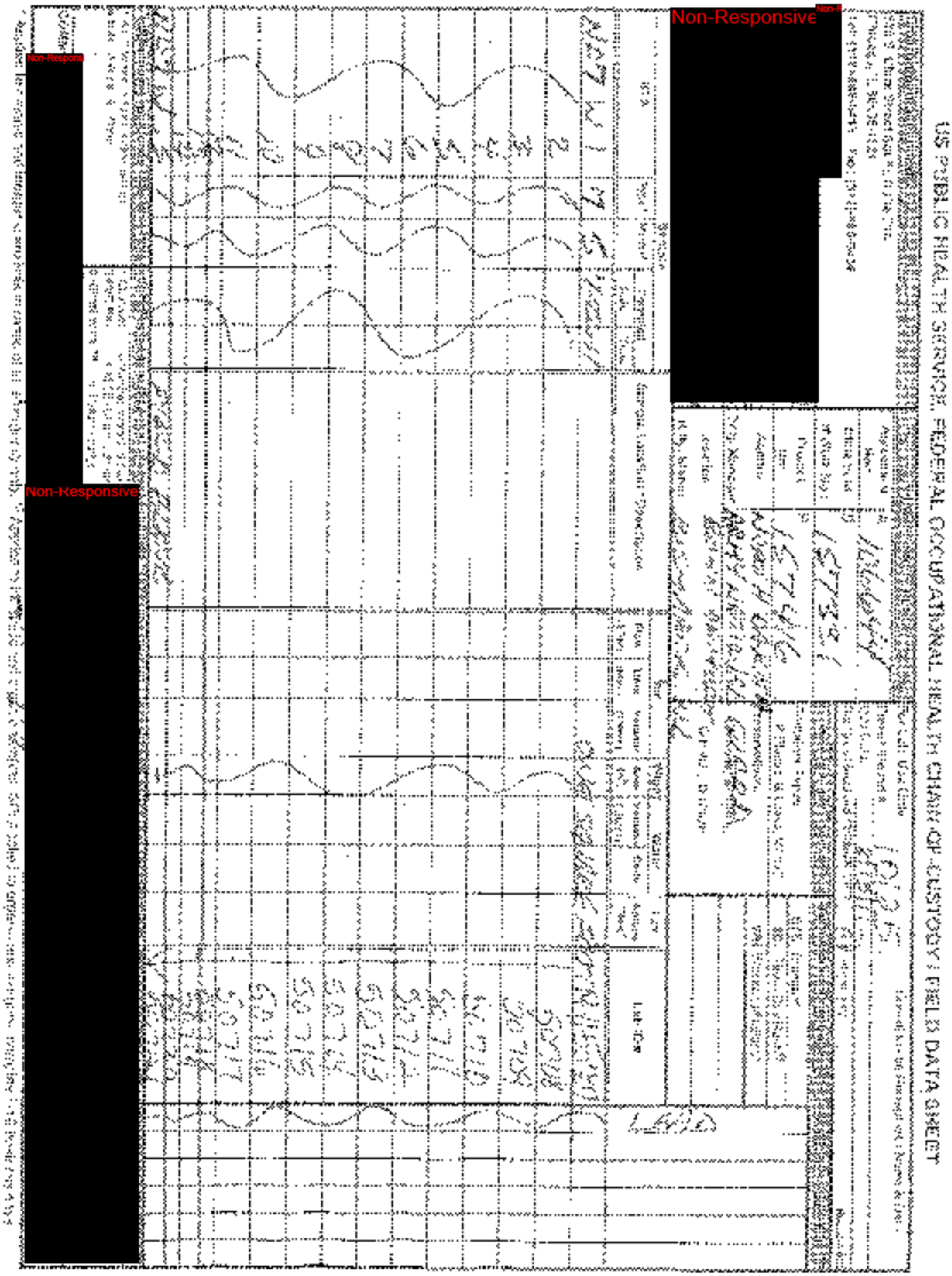
Metals in Wipe Limits
(based on one ft² sampled area)

Analyte	Analytical Method	Method Detection Limit	Minimum Reporting Limit
Lead	OSHA ID-121	5.0 µg/ft²	10 µg/ft²

Non-Responsive

AIHA LAP, LLC
ACCREDITED LABORATORY

Project 10125
Page 2 of 2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US PUBLIC HEALTH SERVICE, FEDERAL OCCUPATIONAL HEALTH CHAIN OF CUSTODY FIELD DATA SHEET

Appendix D

Occupational Health Risk Assessment Codes
(Reference: DOD Letter of Instructions 6055 1)

Occupational health risk assessment codes (RACs) are included in this report to quantify health risks to personnel risk assessment is an expression of health hazard severity and mishap probability, described in terms of route of exposure, actual exposure, exposure limit standards, potential health effects, duration of exposure, and number of exposed personnel The following procedure is used to determine the RACs:

STEP 1: This step assesses points to determine the health hazard severity category (HHSC) The HHSC reflects the magnitude of exposure to a physical, chemical, or biological agent and the medical effects of exposure

A Exposure Points Assessed

Alternate Route of Exposure		Exposure Conditions			
		<CT	Occasionally >CT	>CT	>STD
AER Possible	NO	0	3	5	7
	YES	1-2	4	6	8

Notes: 1) AER = Alternate exposure route, such as skin absorption or ingestion 2) CT = DoD component threshold that triggers surveillance actions, such as action level 3) STD = DoD exposure limit, such as TLV or PEL 4) > = Greater than 5) < = Less than 6) ≤ = Less than or equal to

B Medical Effects Points Assessed

Condition	Points
No medical effects, such as nuisance noise and nuisance odor	0
Temporary reversible illness requiring supportive treatment, such as eye irritation and sore throat	1-2
Temporary reversible illness with a variable but limited period of disability, such as metal fume fever	3-4
Permanent, nonsevere illness or loss of capacity, such as permanent hearing loss	5-6
Permanent, severe, disabling, irreversible illness or death, such as asbestosis or lung cancer	7-8

C The HHSC is determined by totaling the points assessed and using the following guide

Total Points*	HHSC
13-16	I
9-12	II
5-8	III
0-4	IV

* Sum of A and B above

STEP 2: This step uses the following guidelines to assess points to determine the mishap probability category (MPC) for health hazards The probability of mishap reflects the duration of exposure and the number of exposed personnel

A Duration of Exposure Points Assessed

Type of Exposure	Length of Exposure		
	1-8 hr/wk	>8 hr/wk/not continuous	Continuous
Irregular/Intermittent	1-2	4-6	NA
Regular/Periodic	2-3	5-7	8

B Number of Exposed personnel Points Assessed

Number of Exposed Personnel	Points
<5	1-2
5-9	3-4
10-49	5-6
>49	7-8

C The MPC for health hazards is determined by totaling the points assessed and using the following guide:

Total Points*	MPC
14-16	A
10-13	B
5-9	C
<5	D

* Sum of A and B above

STEP 3: The RAC is determined using the following matrix:

HHSC	MPC			
	A	B	C	D
I	1	1	2	3
II	1	2	3	4
III	2	3	4	5
IV	3	4	5	5