HEADQUARTERS
DEPARTMENTS OF THE ARMY AND THE AIR FORCE
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ANGPAM 91-101

Safety

GUIDELINES FOR CONVERTING INDOOR FIRING RANGES TO OTHER USES

Summary. This is a new pamphlet. This guidance prescribes policy, responsibilities, and procedures on how to convert lead-contaminated indoor firing ranges to other uses.

Applicability. This guidance applies to all persons responsible for the operation of Army National Guard (ARNG) and Air National Guard (ANG) indoor firing ranges. As no regulation/guidance can foresee all situations that might arise, the following is written in a broad scope and is intended to be interpreted as to the INTENT of the law by health professionals.

Supplementation. Supplementation of this guidance is prohibited without prior approval from Chief, National Guard Bureau (NGB-AVN-SI).

Impact on New Manning System. This guidance does not contain information that affects the New Manning System.

Interim changes. Interim changes are not official unless they are authenticated by the Chief, Administrative Services. Users will destroy interim changes on their expiration date unless sooner superseded or rescinded.

Suggested Improvements. The proponent of this publication is the National Guard Bureau. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Chief, National Guard Bureau, Attn: NGB-AVN-SI, 111 South George Mason Drive, Arlington, VA 22204-1382.

Distribution. Distribution of this publication is made in accordance with the requirements on DA Form 12-09-E.

CONTENTS *(Listed by paragraph numbers)*

1. Purpose

This pamphlet establishes policy and procedures for converting indoor firing ranges to other uses.

2. References

Related publications are listed below.

a. DODI 6055.1 (Department of Defense Occupational Safety and Health (OSH) Program).

b. AR 11-34 (The Army Respiratory Protection Program).

c. AR 40-5 (Preventive Medicine).

d. NGR (AR) 385-15 (Policy, Responsibilities, and Procedures for Inspection/Evaluation and Use of ARNG Indoor Firing Ranges).

e. TB MED 502 (Occupational and Environmental Health Repiratory Protection Program).

f. USAEHA TG 141 (Industrial Hygiene Air Sampling and Bulk Sampling Instructions).

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

h. Federal Register, 18 April 1990, Vol 55, No. 75 (Department of Housing and Urban Development, Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing, as amended, September 1990, Office of Public and Indian Housing, Department of Housing and Urban Development, 451 Seventh Street, SW, Washington, DC 20410).

I. OSHA Technical Manual, Vol VI

J. DHEW NIOSH 76-130 (Lead Exposure and Design Considerations for Indoor Firing Ranges).

3. Explanation of abbreviations and terms
Abbreviations and special terms used in this publication are listed in the **glossary.**

4. Policy and procedures
a. Conversion of Ranges. If a State wishes to convert an indoor firing range to another functional area, such as a storage area, kitchen, or office space, the following guidance must be adhered to--

b. No Equipment/Items Stored In Range. Wipe samples must be collected and analyzed prior to and after cleaning. Pre- and post-cleaning wipe sample results will be compared to ensure that a minimum 75 percent reduction in surface lead dust is achieved or sample results are 200 ug/sq ft or below which ever is less. The amount and location of wipe samples to be collected are provided in **appendix A.** Interpretation of sample results are contained in **appendices B** and **C.** Occupational Safety and Health Administration (OSHA) Instruction CPL 2-2.20B **(app D)** provides the necessary guidance on the technique needed to collect wipe samples.

c. Equipment/Items Stored In Range. In addition to the samples that must be collected in the above paragraph, samples must also be collected from equipment/items stored in the range. Sample selection is important. The number of items stored and length of storage differs from range to range. The decision on how many samples to collect will be determined by the individual collecting the samples. The more samples collected, the better the statistical comparison of the results. Samples must be collected from equipment/items with as smooth a surface as possible. Sample results collected from a rough surface would be inaccurate due to the minimal surface contact of the media. Also, the likelihood of tearing the media filter exists. Samples should also be collected on items which have been stored the longest and have not been disturbed. Items stored closest to the bullet trap and firing line are more likely to have higher concentrations of lead dust. Interpretations of sample results are contained in **appendices B** and **C.**

5. Goal
The ultimate goal of each State is to ensure every indoor firing range is as free of lead dust as possible before the area is used for other purposes. This can be accomplished if the following guidance is utilized.

6. Background
The Environmental Protection Agency (EPA) identifies lead as a highly toxic metal. Elemental lead is indestructible, and common in the environment. Lead can enter the body by inhalation (breathing) and ingestion (eating). In addition, lead is a cumulative poison. It accumulates in the blood, bones, and organs, including the kidneys, brain and liver. Effects include nervous and reproductive system disorders, delays in neurological and physical development, cognitive and behavioral changes, and hypertension. Symptoms include loss of appetite, difficulty sleeping, irritability, fatigue, headache, and inability to concentrate. It can stay in the bones for decades. Worker awareness and training are important so that employees can recognize the symptoms of exposure and get prompt medical attention.

7. Wipe Sample Media
a. OSHA Instruction CPL 2-2.20B (**app D**) provides the necessary guidance on the technique needed to collect wipe samples. Only distilled or deionized water will be used to saturate sample media. At least one field blank filter must be submitted with each sample sheet. The field blank must be from the same lot and labeled as a blank on the sample sheet. **Appendix E** identifies how to obtain and where to purchase sample media. Use the following guidance for determining media acceptability.

(1) Acceptable Media consists of--

(a) Thirty-seven (37) millimeter (mm) cellulose ester (CE) filters, with or without the cassette.

(b) Eleven (11) centimeter (cm) diameter Whatman #40 paper.

(c) Whatman smear tabs.

(2) Unacceptable Media consists of but is not limited to--

(a) Cotton balls.

(b) Baby wipes or wet wipes.

b. Documentation of Sample Collection. An AEHA Form 8-R (Bulk Sample Data) must be completed and submitted with samples to your supporting laboratory. A copy of this form is located in **appendix F.** Instructions on completing this form are in **appendix G.** Each sample must be individually marked. If CE filters with cassettes are used; write the sample number on a label and place the label on the outside of the cassette. Whatman paper, smear tabs, or CE filters without the cassette should be placed in a ziplock plastic bag or sterile glass container. Acid must be added to the samples and a glass container would assist the laboratory in analysis. If samples are placed in glass containers, ensure they are properly packed before shipment. A label with the sample number should be placed on the outside of the bag. In addition, a floor plan must be completed of each range which documents the locations of each sample collection point. Current blueprints may be used for this purpose. **DO NOT** repeat sample numbers; this may cause confusion when sample results are returned. Samples can be sent to USAEHA laboratories for analysis. See **appendix I** for the laboratory which serves your region.

8. Wipe Sampling Protocol
See appendix A.

9. Range Cleaning Instructions
Before a State begins decontaminating their ranges, they must ensure that procedures comply with all federal, state and local regulations. The range ventilation system will be in operation during all cleaning procedures to ensure a negative pressure environment is maintained. In the absence of a mechanical system, all doors and windows will be sealed to eliminate fugitive emissions. A HEPA filtered vacuum system is the preferred method of cleanup followed by wet wiping of the range. The HEPA vacuum is designed to collect loose surface lead dust particles. A cleaning solution containing Tri-Sodium Phosphate (TSP) should be added to all water containers. At least one ounce of five (5) percent TSP should be added to each gallon of HOT water. Mix new solutions of TSP frequently. Wet wiping will require dual containers of water; one container for wetting the applicator (mops, rags, sponge, etc.) and the other container is for rinsing the applicator after the dust has been wiped from surfaces. Waste water placed into containers can be left to evaporate. **PROPERLY DISPOSE OF ALL HAZARDOUS WASTE AND DO NOT PLACE ANY LEAD CONTAMINATED WASTE INTO THE SEWER SYSTEM OR ONTO THE GROUND.** Mop heads, sponges and rags will be discarded as hazardous waste following cleanup. Wet cleaning by a high pressure system is prohibited, as this method may embed the lead into the substratum and generate large quantities of unwanted hazardous waste. Dry sweeping may not be used. All surface areas of the range must be cleaned. If a surface area of the range is painted or coated with a sealant which is smooth, there is no need to paint over or remove this coated surface material. Wood floors should receive a coat of deck enamel or urethane, concrete floors should be sealed with deck enamel and linoleum or tile floors should be waxed. A progression of cleaning from top to bottom, and from behind the steel backstop to the firing line should be used. After removing the sand, if applicable, and the steel backstop, areas in front of and behind the bullet trap along with the steel backstop plate(s) should be cleaned. Next, clean the ceiling, lights, baffles, retrieval system, heating system(s), and ventilation duct(s). Acoustical material should be vacuumed and removed rather than painted over. A Toxic Characteristic Leaching Procedure (TCLP) test for lead only may need to be performed on the acoustical material. A TCLP test will determine if the material is classified as "hazardous" and can be disposed of in a sanitary landfill. Contact your environmental office for assistance before arranging for this laboratory testing. The floor should be the last surface cleaned, starting at the bullet trap and ending behind the firing line. Following the wet wiping of all surfaces, the area should be permitted to dry and a second HEPA vacuuming of all surface area should take place until no dust or residue can be seen. A thorough visual inspection to detect surface dust should be made following cleanup and prior to resampling. As a variety of conditions exist in ranges, unique situations may arise and specific written guidance from your Regional Industrial Hygiene Office may be required.

10. Cleaning Stored Contaminated Equipment
If stored equipment is confirmed as being contaminated (sample result is higher than the 200 microgram/sq ft) with lead dust, it must be decontaminated before removing from the range. The stored equipment located next to the bullet trap and firing line should be cleaned first and removed. Depending on the size or material of the item, either HEPA vacuum or wet wipe will be used. Refer to paragraph 15 for additional guidance. Every attempt should be made to clean and reclaim the item since disposing of equipment as hazardous waste is costly and wasteful. Only as a last resort will the item be discarded as hazardous waste. Porous items, i.e., canvas tents can be laundered at local companies which specialize in industrial laundry services. Items, such as office partitions and carpet, that were present during firing should be considered grossly contaminated and be discarded unless analysis proves otherwise. Consult your environmental office before removing or disposing of items.

11. Contaminated Sand and Lead Waste
Consult your State's environmental office for specific disposal guidance to comply with local laws on this matter.

12. Medical Surveillance
a. A preplacement medical examination is required of all individuals involved with range cleanup operations. Consult 29 CFR 1910.1025 for additional information on medical surveillance requirements. A medical examination must include - -

(1) A detailed work and medical history.
(2) A thorough physical examination.
(3) A respirator use evaluation.
(4) A blood pressure measurement.
(5) Blood sample analysis to include:
  (a) A baseline blood lead level.
  (b) A complete blood count (CBC).
  (c) Blood urea nitrogen (BUN).
  (d) Serum creatinine.
  (e) Zinc protoporphyrin.
(6) A routine urine analysis.
(7) Recordkeeping.

b. Air Monitoring. Worker-breathing-zone air samples must be collected to ensure personnel are not overexposed to airborne lead during the cleanup phase. Daily air samples will be collected on all personnel involved in the cleanup operation. These exposure levels will be used to evaluate work practices and personal protective equipment. Within five (5) working days after receipt of monitoring results, each employee will be notified in writing of the results which represent that employee's exposure. Refer to USAEHA Technical Guide 141 (app A-6) for air sampling instructions and a blank air sample data form. Contact your Regional Industrial Hygiene Office for assistance.

13. Worker Education
OSHA 29 CFR 1910.1025 requires that those workers who are potentially exposed to any lead level shall be informed of the content of Appendices A and B of this standard. A training program must be instituted for all individuals who are subject to exposure to lead at or above the action level or for whom the possibility of skin or eye irritations exists. The training program shall be repeated for personnel currently involved in range cleanup operations, at least annually. This training must be documented on DD Form 1556 or DD Form 1556-1 and filed permanently in the employee's Official Personnel File (OPF) or the soldier's Official Military Personnel File (OMPF). As a minimum, complete blocks 1, 2, 3, 7, 8, 11, 12, 13, 17, 18, 24, 33, and 36 on DD Form 1556. Place the following statement in block 18, "Do not destroy, retain this record for the duration of employment/service plus 30 years." The employer will assure that each employee is informed of the following:

a. The content of the standard and its appendices.

b. The specific nature of operations that could result in exposure to lead above the action level.

c. The purpose, proper selection, fitting, use and limitations of respirators.

d. The purpose and a description of medical surveillance program.

e. Eating and drinking are prohibited in lead contaminated areas.

f. Smoking and smoking materials will not be permitted in contaminated areas.

g. Employees must wash their hands and other exposed skin whenever they leave the work area.

h. The engineering controls and work practices associated with the individual's job assignment.

i. The contents of any compliance plan in effect.

14. Personal Protective Equipment
As a minimum, personnel conducting the decontamination of the range will be provided with the following personal protective equipment:

a. Full face air purifying respirator with HEPA cartridges. The requirements outlined in 29 CFR 1910.134 must be met prior to placing workers in respiratory protection.

b. Protective coveralls with hood and shoe covers or disposable Tyvek TM full body suit. Protective clothing will be changed at least daily at the end of shift and more frequently if it should become grossly contaminated. If cotton coveralls are used by the employees, then the employer will provide for maintaining and laundering of protective clothing. Protective clothing will not be taken home by personnel. Prior to leaving the work area, employees will thoroughly HEPA vacuum clothing to prevent lead dust from leaving the area. If disposable clothing is used, it will be HEPA vacuumed before removal and placed in a proper disposal container. Work and street clothing will not be stored together.

c. Disposable rubber gloves will be provided.

15. Point of Contact
Deviations from this guidance will require a written exception to policy from your Regional Industrial Hygiene Office. Questions and/or comments regarding this subject should be directed to your Regional Industrial Hygiene Office or Chief, National Guard Bureau, Attn: NGB-AVN-SI, 111 South George Mason Drive, Arlington, VA 22204-1382.

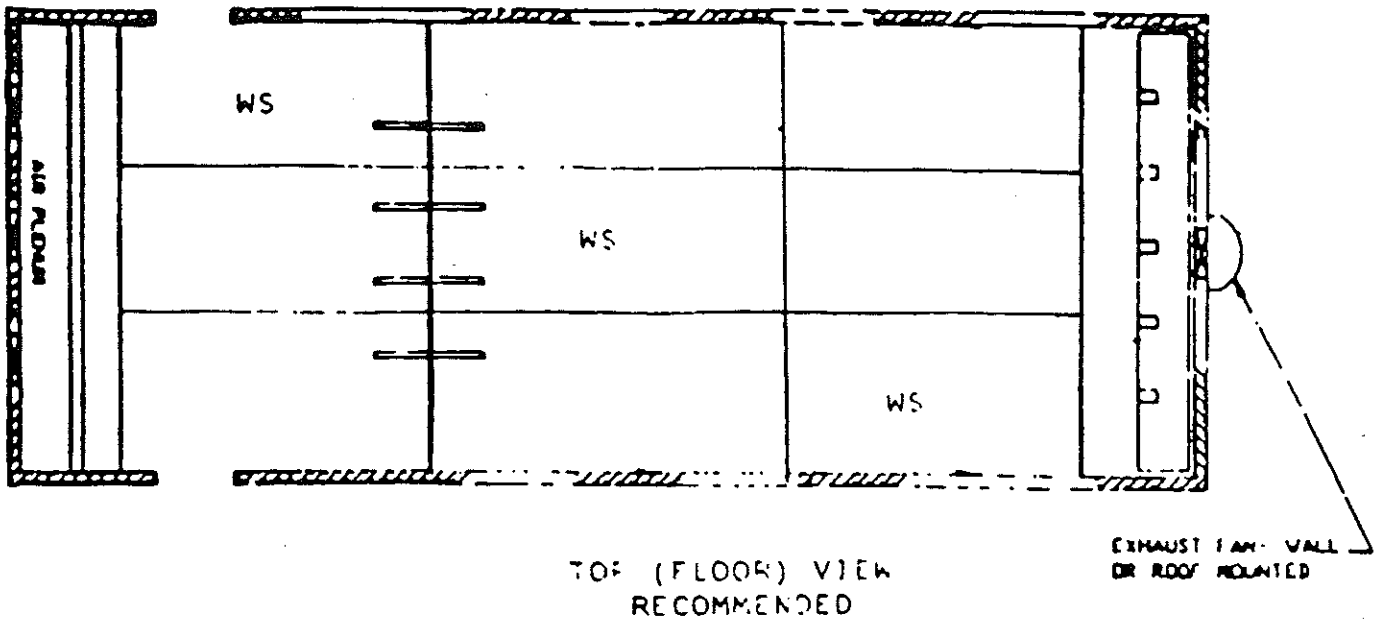
Appendix A
SAMPLING STRATEGY FOR COLLECTION OF WIPE SAMPLES

A-1. A template measuring 10 centimeters by 10 centimeters square, approximately 4 inches square, (see App D, app 2-A) should be used to accurately measure and mark the area before collecting wipe samples.

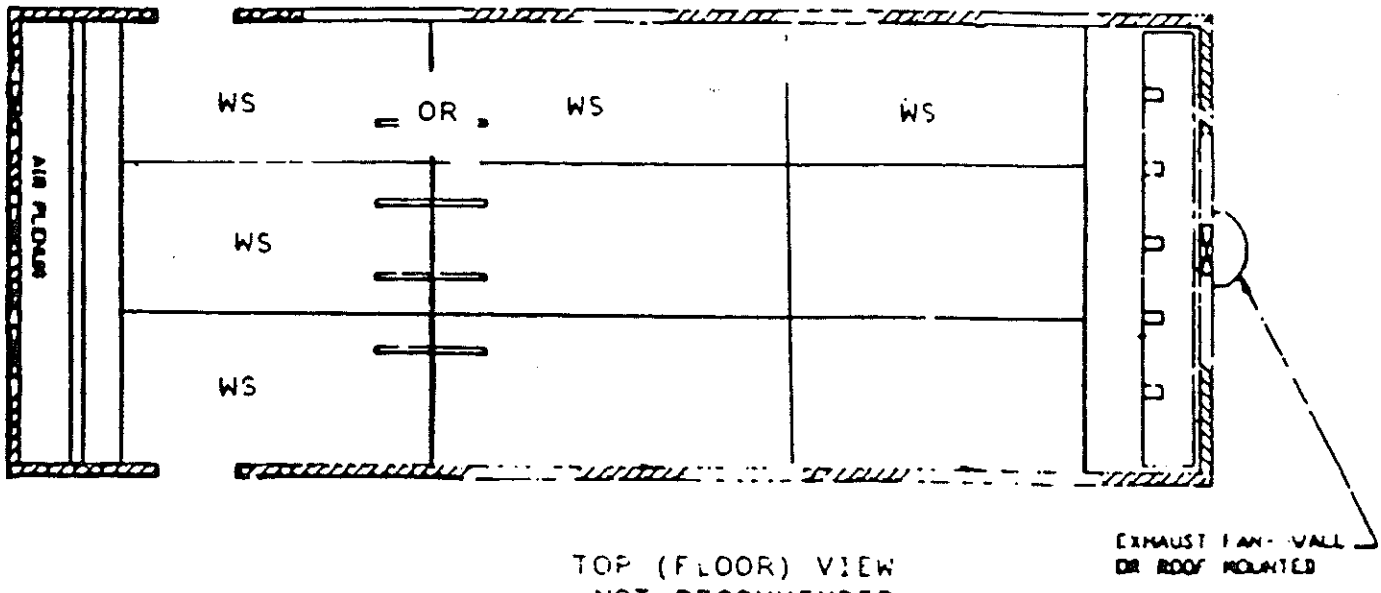
A-2. Prior to cleaning the range, three samples must be collected and analyzed for total lead dust on each surface, i.e., floor, ceiling, backstop, and each wall to include the plenum wall, if applicable. In addition, a total of 3 samples should be collected from the fixtures, i.e., gas/electric heaters, lights, baffles. As a minimum, 18 samples will be collected. Samples should be collected from areas which have been least disturbed by airflow. Established walkways should be avoided.

A-3. Samples should be staggered to different areas of the range. A grid system should be utilized. Each range surface area should be divided evenly into 3 sections by 3 sections. A wipe sample should be collected as illustrated in **figures A-1** and **A-2**. Samples should not be collected on all one section of a wall or end of the building.

SAMPLING STRATEGY FOR COLLECTION OF WIPE SAMPLES



TOP (FLOOR) VIEW
RECOMMENDED

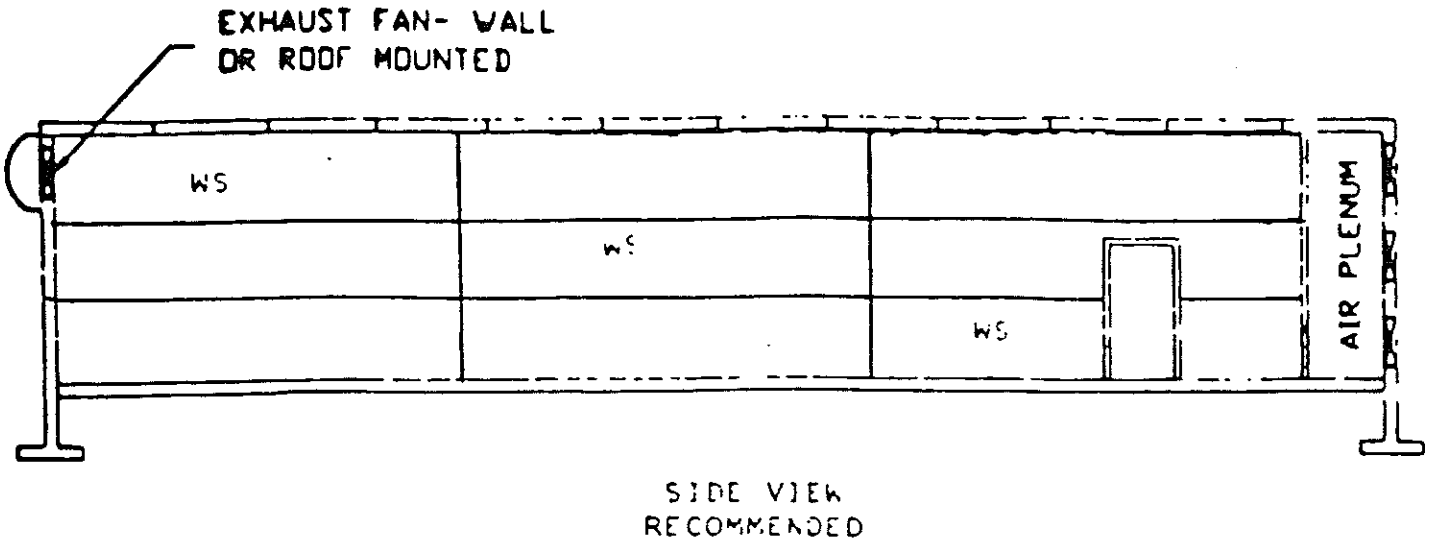


TOP (FLOOR) VIEW
NOT RECOMMENDED

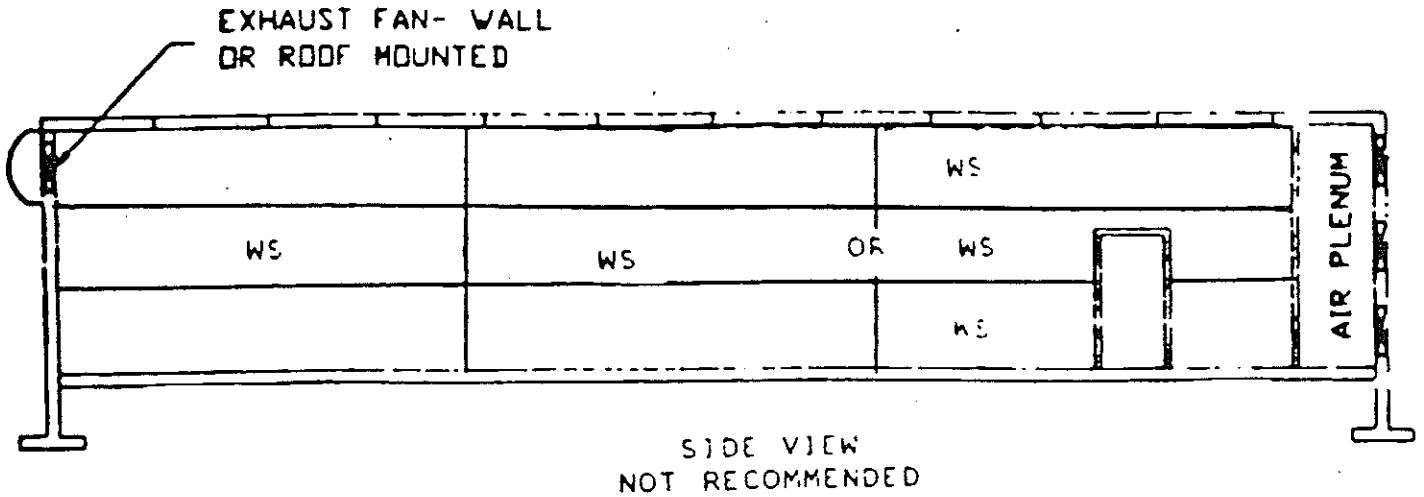
WS - WIPE SAMPLE

Figure A-1. Sampling Strategy for Collection of Wipe Samples

SAMPLING STRATEGY FOR COLLECTION OF WIPE SAMPLES



SIDE VIEW
RECOMMENDED



SIDE VIEW
NOT RECOMMENDED

WS - WIPE SAMPLE

Figure A-2. Sampling Strategy for Collection of Wipe Samples

APPENDIX B
INTERPRETATION OF SAMPLE RESULTS (PRIOR TO CLEANING)

B-1 200 micrograms/sq ft or LESS
If all sample results are 200 micrograms/sq ft or less, the range can be converted and/or used for any purpose.

B-2 BETWEEN 201 and 200,000 micrograms/sq ft.
Range must be decontaminated. Continue with cleaning instructions listed in paragraph 15. Sample results will be used to establish a baseline. The baseline sample results will be used to ensure the 75 percent reduction is achieved.

B-3 OVER 200,000 micrograms/sq ft.
Your sample media may not be capable of collecting additional lead dust and results that are above 200,000 micrograms/sq ft should be considered suspect. Larger concentrations of lead dust may exist on surfaces tested other than results indicate. If the initial sampling results are above 200,000 micrograms/sq ft, the range should be cleaned by either HEPA vacuuming and/or wet wiping to establish a baseline. After the cleaning procedure is completed, resampling should occur until sample results are under the 200,000 micrograms/sq ft limit.

B-4 High sample results may exist due to personnel walking or moving equipment/vehicles over the range surfaces causing the lead dust to be "ground" into the substratum. For example, a maintenance activity may have oversprayed paint or spilled solvents onto the surface which would bond with the lead dust. Consult your Regional Industrial Hygiene Office for specific guidance.

APPENDIX C
INTERPRETATION OF SAMPLE RESULTS (AFTER CLEANING)

C-1 200 micrograms/sq ft or LESS
If all sample results are less than 200 micrograms/sq ft, the range can be converted and/or used for any purpose after a coat of lead-free latex paint is applied. The paint color must contrast the color of the present substratum.

C-2 ABOVE 200 micrograms/sq ft
As a minimum, a 75 percent reduction should occur from your initial sample results or the samples should be under the 200 microgram/sq ft level. If all sample results meet this criteria, a contrasting color of lead-free latex paint must be applied before the area is utilized for other purposes. The room can only be used as a storage area. Storage of kitchen equipment and food is prohibited. The room cannot be used for a child care or nursery area. If sample results are not below the 75 percent reduction, a more thorough cleaning of the range is required along with resampling until criteria are met.

* **PLEASE NOTE**, that if your original wipe sample results were, i.e., 175,000 ug/sq ft then you would have to reduce the lead level below 13,125 ug/sq ft. This would meet the 75 percent reduction criteria; however, this is an enormous amount of lead dust and care should be taken to ensure a heavy coat of paint seals the lead dust. It is unknown at this time whether or not the remaining amount of lead dust will allow the latex paint to adhered to the substratum. If the paint peels, falls to the floor and is crushed over a period of time, it will create another respirable lead hazard. If this happens, contact your Regional Industrial Hygiene Office for guidance. Periodically monitor the converted range for signs of peeling paint. Paint chips can be analyzed for lead content. **DO NOT IGNORE PEELING PAINT IN A CONVERTED INDOOR FIRING RANGE.**

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OSHA Instruction CPL 2-2 208
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CHAPTER 2

SAMPLING FOR SURFACE CONTAMINATION

A. GENERAL

1. The terms "wipe sampling," "swipe sampling" and "smear sampling" are all used synonymously to describe the techniques used for assessing surface contamination. However, the term "wipe sampling" is one which will be used in this chapter.

2. "Wipe sampling" is most often used to screen for asbestos, lead, other metals, and PCBs.

3. The uses are:
   a. Skin Sampling
      1) Potential contact with skin irritants may be evaluated by wiping surfaces, which may be touched by workers.
      2) Skin wipes are not recommended for those substances which absorb rapidly through the skin. Biological monitoring for these substances or their metabolites, or biological markers, is often the only means of assessing their absorption. Wipe the inside surfaces of protective gear or other surfaces which may contact skin, instead.
   b. Surfaces
      1) Surfaces which may be contacted by food or other materials which are ingested or placed in the mouth (e.g., chewing tobacco, gum, cigarettes) may be wipe sampled (including hands and fingers) to show contamination.
      2) Contaminated smoking materials may allow the toxic materials, or their combustion products, to enter the body via the lungs (e.g., lead, mercury). Wiping of surfaces which smoking materials may touch (e.g., hands and fingers) may be useful in evaluating this possible route of exposure.
      3) Accumulated toxic materials may become suspended in air, and may contribute to airborne exposures (e.g., asbestos, lead or beryllium). Bulk and wipe samples may aid in determining this possibility.
   c. Personal Protective Equipment Sampling
      1) Effectiveness of personal protective gear (e.g., gloves, aprons, respirators, etc.) may sometimes be evaluated by wipe sampling the inner surfaces of the protective gear (and protected skin).
      2) Effectiveness of decontamination of surfaces and protective gear (e.g., respirators) may sometimes be evaluated by wipe sampling.

4. When accompanied by close observation of the operation in question, wipe sampling can help identify sources of contamination and poor work practices.

5. Evaluation of Sampling Results
   a) False negative results, i.e., surface contamination is not detected by a wipe sample, are possible.
   b) The CSHO must use professional judgment on a case-by-case basis when evaluating the significance of positive wipe sampling results.

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c) Consider the toxicity, contribution of skin absorption and/or gastrointestinal absorption to the total dose. Other factors are the ambient air concentrations, skin irritation, etc., when evaluating sample results.

6. The Chemical Information Manual, lists substances which represent a potential for ingestion toxicity, skin absorption, and/or have a hazardous skin effect. This information may be found under the "Health" notation. Additional toxicological information concerning chronic skin absorption, dermatitis, etc. should be used in determining if the resulting exposure presents a potential employee hazard (see bibliography).

B. GENERAL TECHNIQUE FOR WIPE SAMPLING

1. Filter Media and Solvents
   a. Consult the Chemical Information Manual, for appropriate filter media and solvents (dry wipes may be used; solvents are not always necessary but may enhance removal).
   b. Direct skin wipes should not be taken when high skin absorption of a substance is expected. Under no conditions should any solvent other than distilled water be used on skin, personal protective gear which directly contacts the skin, or surfaces which contact food or tobacco products.
   c. Generally, there are two types of filters recommended for taking wipe samples:
      1) Glass fiber filters (GFF) (37 mm) are usually used for materials which are analyzed by High Performance Liquid Chromatography (HPLC), and often for substances analyzed by Gas Chromatogaphy (GC). The Chemical Information Manual specifies when GFFs are to be used.
      2) Paper filters are generally used for metals, and may be used for anything not analyzed by HPLC. For convenient usage, the Whatman smear tab (or its equivalent) is commonly used. (see Chemical Information Manual for details).
   d. Preloading a group of vials with appropriate filters is a convenient method. (The Whatman smear tabs should be inserted with the tab end out.) Always wear clean plastic gloves when handling filters. Gloves should be disposable and should not be powdered.

2. Procedures
   Follow these procedures when wipe samples are taken:
   a. If multiple samples are to be taken at the worksite, prepare a rough sketch of the area(s) or room(s) which are to be wipe sampled.
   b. A new set of clean impervious gloves should be used with each individual sample. This avoids contamination of the filter by the hand and the subsequent possibility for false positives, and prevents contact with the substance.
   c. Withdraw the filter from the vial. If a damp wipe sample is desired, moisten the filter with distilled water (or other solvent as recommended in the Chemical Information Manual).

   CAUTION:
   Skin, personal protective equipment or surfaces which contact food or tobacco products must either be wiped DRY, or wiped with distilled water, never with organic solvents. Skin wipes should not be done for materials with high skin absorption.

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It is recommended that hands and fingers be the only skin surfaces wiped. Before any skin wipe is taken, explain why you want the sample and ask the employee about possible skin allergies to the chemicals in the sampling filter or media. If the employee refuses, do not force the issue.

c. Wipe a section of the surface to be sampled using a template with an opening exactly 100 cm^2. (See Appendix 2-A)

e. For surfaces smaller than 100 cm^2 use a template of the largest size possible. Be sure to document the size of the area wiped. For curved surfaces, the wiped area should be estimated as accurately as possible and then documented.

f. Maximum pressure should be applied when wiping.

g. To insure that all portions of the partitioned area are wiped, start at the outside edge and progress toward the center making concentric squares of decreasing size.

h. If the filter dries out during the wiping procedure, discard the filter, reduce area to be wiped by half, and repeat wiping procedure with a new filter.

i. Without allowing the filter to contact any other surface, fold the filter with the exposed side in, then fold it over again. Place the filter in a sample vial, cap the vial, number it, and place a corresponding number at the sample location on the sketch. Include notes with the sketch giving any further description of the sample (e.g., "Fred Employee's respirator, inside;" "Lunch table;" etc.).

j. At least one blank filter treated in the same fashion, but without wiping, should be submitted for each sampled area.

k. Submit the samples to the Salt Lake City Analytical Laboratory with the appropriate OSHA 91.

C. SPECIAL TECHNIQUES FOR WIPE SAMPLING

1. Acids and Bases

When examining surfaces for contamination with strong acids or bases, (e.g., hydrochloric acid and sodium hydroxide), pH paper moistened with water may be used. However, these results should be viewed with caution due to potential interferences.

2. Direct Reading Instruments

For some types of surface contamination (e.g., mercury sniffer for mercury), direct reading instruments may be used.

3. Aromatic Amines

Screening may be done to determine the precise areas of carcinogenic aromatic amine contamination. This is an optional procedure. (See Appendix 2-B)

D. SPECIAL CONSIDERATIONS

1. Due to their volatile nature, most organic solvents are not suitable for wipes. If necessary, surface contamination can be judged by other means, (e.g., by use of detector tubes, photoionization analyzers, or other similar instruments). Consult the Chemical Information Manual.

2. Some substances are not stable enough as samples to be wipe sampled reliably. Consult the Chemical Information Manual.

3. Some substances should have solvent added to the vial as soon as the wipe sample is placed in the vial (e.g., Benzidine). These substances will be indicated with an "X" next

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to the solvent notation in the Chemical Information Manual.

4. Do not take surface wipe samples on skin if:
   a) OSHA or ACGIH shows a "skin" notation, the substance has a skin LD50 of 200 mg/kg or less, or an acute oral LD50 of 500 mg/kg or less.
   b) The substance is an irritant, causes dermatitis, contact sensitization, or is termed corrosive.

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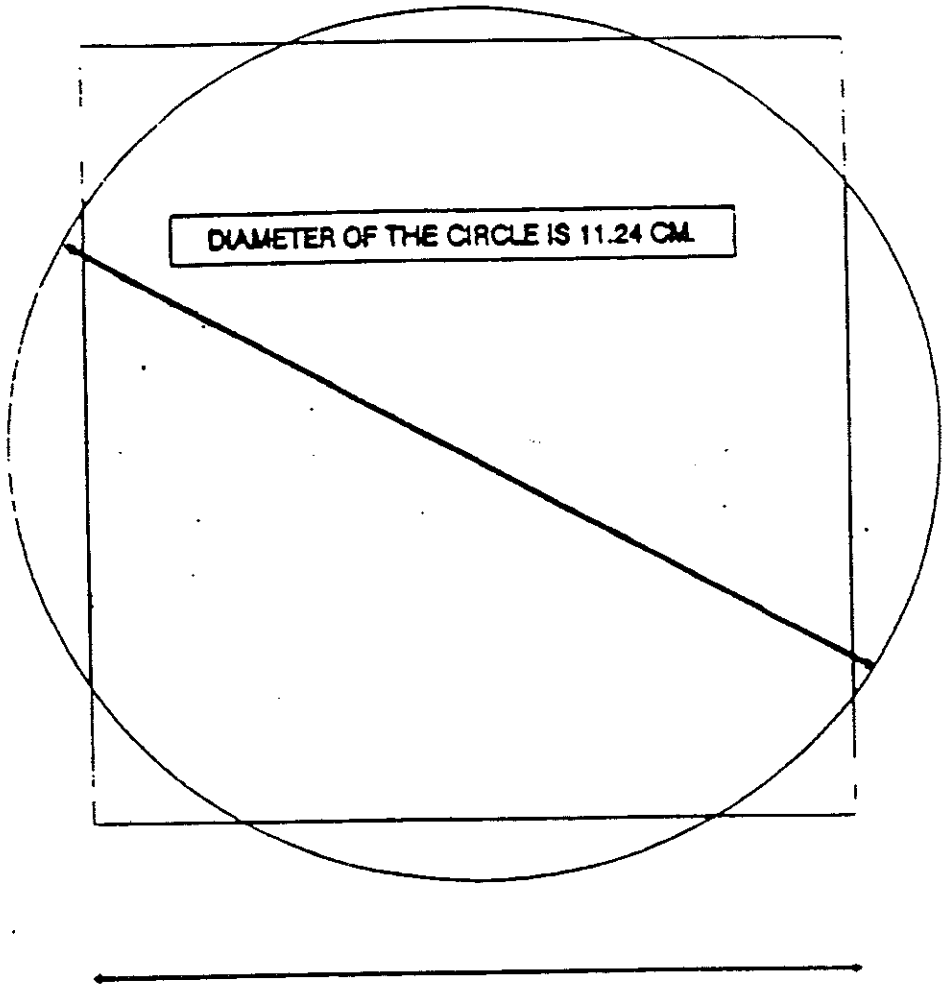
OSHA Instruction CPL 2-2.208
FEB 5 1990
Directorate of Technical Support

APPENDIX 2-A

Template samples which cover 100 square centimeters.



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APPENDIX 2-B

Screening for Carcinogenic Aromatic Amines

1 As in the case of routine wipe sampling, wear clean, disposable impervious gloves. Wipe an area of exactly 100 cm^2 with a sheet of filter paper moistened in the center with 5 drops of methanol.

2. After wiping the sample area, apply 3 drops of fluorescamine (a visualization reagent supplied by SLCAL upon request) to the contaminated area of the filter paper.

3 Place a drop of the visualization reagent on an area of the filter paper which has not contacted the surface. This marks a non-sample area or *blank* on the filter paper adjacent to the test area.

4 After a reaction time of 6 minutes, irradiate the filter paper with 366 nm ultraviolet light.

5. Compare the color development of the contacted area with the non-sample area or *blank*. A positive reaction will show a discoloration as a yellow color darker than the yellow color of the fluoroescamine *blank*.

6. A discoloration indicates surface contamination, possble aromatic amine carcinogen. Repeat a wipe sampling of the contaminated areas using the regular surface contamination procedure.

7. The following compounds are some of the suspected carcinogenic agents that can be detected by this screening procedure:

4,4'-Methylene bis(2-chloroaniline)
Benzidine
α-Napthylamine
β-Napthylamine
4-Aminobiphenyl

APPENDIX E
Where to Purchase Sample Media and Containers

E-1. The following is a list of vendors which supply the media and containers necessary to collect air and lead surface wipe samples. The information is provided to assist States in obtaining the proper media and containers. Alternative vendors are available and may be utilized, if known. Contact your Regional Industrial Hygiene Office for additional assistance or clarification.

E-2. Pre-loaded 3 piece cassette with cellulose ester (CE) filter and pad, 37 millimeter (mm), pore size 0.8 microns, breathing zone (BZ) and general area (GA) air samples.

Order From	Catalog Number
a. Millipore Corp. Ashby Road Bedford, MA 01730 617-275-9200 800-225-1380	MAWP-037-A0
b. Gelman Sciences 600 South Wagner Rd Ann Arbor, MI 48106 313-665-0651 800-521-1520	64678 (GN-4)
c. Supelco, Inc. Supelco Park Bellefonte, PA 16823 800-247-6628 800-359-3041	2-3368M

E-3. 37 mm CE filter with pad, no cassette included, for lead surface wipe samples.

Order From	Catalog Number
a. Supelco, Inc. Supelco Park Bellefonte, PA 16823 800-247-6628 800-359-3041	2-3381M
b. Millipore Corp. Ashby Road Bedford, MA 01730 617-275-9200 800-225-1380	AAWP-037-00
c. SKC,Inc. 334 Valley View Rd Eighty Four, PA 15330 412-941-9701 800-752-8472	225-5

E-4. Smear tabs are used for lead surface wipe samples.

Order From	Catalog Number
a. SKC,Inc. 334 Valley View Rd Eighty Four, PA 15330 412-941-9701 800-752-8472	225-24

E-5. Number 40 Whatman paper, 11.0 centimeters in diameter, used for surface wipe samples.

Order From	Catalog Number
a. Cole-Parmer 7425 North Oak Park Ave Chicago, IL 60648 708-647-7600 800-323-4340	L-06647-13
b. Thomas Scientific 99 High Hill Rd at I-95 P.O. Box 99 Swedesboro, NJ 08085-0099 609-467-2000 800-524-0027	4716-E25
c. Fisher Scientific 711 Forbes Avenue Pittsburgh, PA 15219 412-562-8300	09-845-D

E-6. Glass container (25 milliliter) for collection and shipment of media.

Order From	Catalog Number
a. Pierce Chemical Company P.O. Box 117 Rockford, IL 61105 815-968-0747 800-874-3723	13219 (screw cap)
b. Alltech Associates, Inc. Applied Science Labs 2051 Waukegan Rd Deerfield, IL 60015 312-948-8600 800-255-8324	95321 (screw cap)

E-7. Plastic ziplock bags can be obtained through the Army logistics system. Many sizes are available. Contact your supporting logistics branch for assistance.

E-8. Distilled water can be purchased at larger grocery stores, usually by the gallon, at a cost of approximately $1.25. Deionized water can be obtained at local and state water labs or a hospital.

E-9. Tri-Sodium Phosphate (TSP) can be purchased at almost any hardware store.

Appendix F

BULK SAMPLE DATA

For use of this form see USAEHA TG 161; the proponent is HSHB-LO.

Return Address *(complete address including Zip Code)*	Point of Contact *(name/AUTOVON)*

Sampled Installation	Project Number	ARLOC

Samples Collected By	Date Collected	Date Shipped

Description of Operation	Location *(BLDG/AREA)*

Associated Complaints *(be specific)*

Associated Air Samples ☐ Yes ☐ No — If yes, list sample numbers

Label Information

Trade Name	NSN	Manufacturer

Address	MSDS Attached
	☐ Yes ☐ No

Analysis Desired

Lab Use Only	Sample No.	Constituents	Results	Remarks

Comments to Lab:

Lab Use Only

Analyst *(initials)*	Reviewed By *(initials)*	Date Received	Date Reported

Procedures Performed	Comments:

AEHA Form 8, 1 Oct 84

Appendix G

USAEHA TG No. 141 **December 1990**

Instructions for Completing AEHA Form 8-R, Bulk Sample Data

1. **Return address:** Self-explanatory.

2. **Point of contact.** Name and DSN of person in charge of sampling/project.

3. **Sampled installation:** Self-explanatory.

4. **Project number:** For USAEHA and OSA use only.

5. **ARLOC:** Army location code - reference DA Pam 525-12 (CONUS) and 525-13 (Foreign).

6. **Samples collected by:** Self-explanatory.

7. **Date collected:** Self-explanatory.

8. **Date shipped:** Date samples sent for analysis.

9. **Description of operation:** Brief description of the industrial operation (for example, degreasing metal parts, spray painting vehicles, etc.).

10. **Location (bldg/area):** Self-explanatory.

11. **Associated complaints:** Worker complaints about exposure problems arising from operation (for example, dizziness, nausea, skin irritation, etc.).

12. **Associated air samples:** If air samples corresponding to these bulks are submitted for analysis, please so indicate and list the sample numbers which identify these air samples. Ship air samples separately from bulk samples.

13. **Label information:**

a. **Trade name:** Self-explanatory; if unknown, indicate.

b. **NSN:** If available, so indicate.

c. **Manufacturer:** Self-explanatory; if unknown, so indicate.

d. **Address:** Self-explanatory; if unknown, so indicate.

e. **MSDS:** Attach the MSDS whenever possible and so indicate.

14. **Analysis desired:** List specific parameters when they are known or suspected to be present otherwise, indicate general type of analysis desired (for example, unknown solvents, etc.).

15. **Lab use only:** Leave blank.

16. **Sample number:** Number that field personnel assigns to the sample number. Use a consecutive numbering system so there is no duplication of numbers from batch-to-batch samples.

17. **Constituents:** Leave blank.

18. **Results:** Leave blank.

19. **Remarks:** Leave blank.

20. **Comments to lab:** Use for any general information or remarks you wish to include.

21. **Lab use only:** Leave blank.

APPENDIX H

Examples of Computation of Lead Levels From Wipe Sample Results

Sample results will be returned in the form of micrograms. The results must be converted to micrograms per square foot. This can be accomplished by following the examples listed below:

$$\frac{\frac{75ug}{100\ cm2} \times \frac{929\ cm2}{1\ sq\ ft}}{\frac{ug}{sq\ ft}}$$

$$\frac{75 \times 929}{100} = \frac{69675}{100} = 696.75ug/sq\ ft$$

OR

$$\frac{\frac{75ug}{16in2} \times \frac{144\ in2}{1\ sq\ ft}}{\frac{ug}{sq\ ft}}$$

$$75 \times 9 = 675ug/sq\ ft$$

ug - microgram
cm2 - centimeters squared
sq ft - square foot
In2 - inches squared

Appendix I

USAEHA TG NO. 141 December 1990

Supporting Laboratories and Areas Served

Supporting laboratory	Areas served
Commander U.S. Army Environmental Hygiene Activity-South Fort McPherson, GA 30330-5000 DSN 572-3234	Alabama, Arkansas, Florida, Georgia, Western Kentucky, Louisiana, Mississippi, Oklahoma, Panama, Puerto Rico, South Carolina, Tennessee, Central & Eastern Texas
Commander U.S. Army Environmental Hygiene Activity-West Fitzsimons Army Medical Center Aurora, CO 80045-5001 DSN 943-8288	Alaska, Arizona, California, Colorado, Idaho, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oregon, South Dakota, West Texas, Utah, Washington, Wisconsin, Wyoming
Commander U.S. Army Pacific Environmental Health Engineerng Agency Sagami APO San Francisco 96343 Camp Zama 228-4111	Hawaii, Japan, Korea, Okinawa, Philippines,Thailand, and all other Far East countries
Commander 10th Medical Laboratory ATTN: AEMML-PM-LAB APO New York 09180 Landstuhl Military (2223-)7272	Europe, Africa, Middle East, Western Europe, Turkey, Africa, and Middle East countries
Commander U.S. Army Environmental Hygiene Agency ATTN: HSHB-ML-A Bldg E2100 Aberdeen Proving Ground, MD 21010-5422 DSN: 594-2619 (metals, quartz, asbestos) DSN: 584-2208 (solvents, organics, acid mists, pesticides)	a. Worldwide support to laboratories listed above b. Connecticut, Delaware, District of Columbia, Eastern Kentucky, Indiana, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia

Glossary

Section I
Abbreviations

ANG
Air National Guard

ARNG
Army National Guard

BUN
Blood urea nitrogen

BZ
breaking zone

CBC
Complete blood count

CE
cellulose ester

CFR
Code of Federal Regulations

cm
centimeter

DHEW
Department of Health, Education, and Welfare

EPA
Environmental Protection Agency

GA
general area

OMPF
Official Military Personnel File

mm
millimeter

OPF
Official Personnel File

OSHA
Occupational Safety and Health Administration

TCLP
Toxic Characteristic Leaching Procedure

TSP
Tri-Sodium Phosphate

ug/sq ft
microgram per square foot

USAEHA
US Army Environmental Hygiene Agency

Section II
Terms

HEPA
Refers to high efficiency particulate air filter system capable of capturing up to 99.97 percent of particles 0.3 microns in size or larger.

Lead-Contaminated Range
It is assumed that all indoor ranges which have been fired in are lead-contaminated.

Wipe Sample
The terms wipe, swipe, or smear sample are used synonymously to describe the techniques utilized for assessing lead surface contamination.

By Order of the Secretaries of the Army and the Air Force:

PHILIP G. KILLEY
Major General, USAF
Acting Chief, National Guard Bureau

Official:

DAVID MISKELL
Acting Chief
Administrative Services

Distribution: A/F

DEPARTMENT OF THE ARMY
Arlington, Virginia 22204-1382
23 July 2003

*NG Pamphlet 385-15

Safety

GUIDELINES AND PROCEDURES FOR INDOOR FIRING RANGE (IFR) REHABILITATION, CONVERSION, AND CLEANING

By Order of the Secretaries of the Army and Air Force:

H STEVEN BLUM
Lieutenant General, US Army
Chief, National Guard Bureau

Official:

MICHAEL S. MILLER
COL, USAF
Chief, Office of Policy and Liaison

History. This pamphlet supercedes NG Pam 385-16, 31 January 1994.

Applicability. This pamphlet applies to Army National Guard (ARNG) elements.

Proponent. The proponent is NGB-AVS-S.

Management Control System. This pamphlet is subject to the requirements of AR 11-2, Management Controls, but does not contain Management Control Checklists, or internal control provisions.

Supplementation. Supplementation of this pamphlet requires the approval of the National Guard Bureau Aviation and Safety Division, NGB-AVS, 111 South George Mason Drive, Arlington, VA 22204-1382.

Interim Changes. Interim changes to this pamphlet are not official unless authenticated by, Chief, Office of Policy Liaison, National Guard Bureau. Interim changes will be destroyed on their expiration dates, unless sooner superseded or rescinded.

Suggested Improvements. Users of this pamphlet are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to the Army National Guard, ATTN: NGB-AVS-S, 111 South George Mason Drive, Arlington, VA 22204-1382.

Distribution. A.

Table of Contents.

* This pamphlet supercedes NG Pam 385-16, 31 January 1994.

1-1. Purpose

This pamphlet establishes the guidelines and procedures for rehabilitation, conversion, and cleaning of ARNG indoor firing ranges.

1-2. References

Related publications are listed below.

a. DODI 6055.1 (Department of Defense Instruction), Occupational Safety and Health (OSH) Program.
b. AR 11-34, The Army Respiratory Protection Program.
c. AR 40-5, Preventive Medicine.
d. DA Pam 385-63, Range Safety.
e. 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Standards
f. OSHA (Occupational Safety and Health Administration), Technical Manual, Edition VII.
g. DHEW NIOSH (Department of Health, Education, and Welfare National Institute for Occupational Safety and Health) 76-130, Lead Exposure and Design Considerations for Indoor Firing Ranges.

1-3. Explanation of Abbreviations and Terms

Abbreviations and special terms used in this publication are listed in the glossary.

1-4. Policy and Procedures

Conversion of Ranges. Indoor firing ranges can be safely rehabilitated or converted for other uses, such as a storage area, kitchen, or office space, provided the following –

a. Previously active ranges must be thoroughly decontaminated and cleaned to acceptable levels.

b. The level of cleanliness is to be determined by sampling. The Occupational Safety and Health Administration's (OSHA) Technical Manual, 5th Edition, provides guidance on the methods and techniques needed to collect wipe samples (Appendix A).

(1) Wipe samples must be collected and analyzed prior to and after cleaning.

(2) Post-cleaning surface wipe sample results must be less than or equal to 200 micrograms per square feet (ug/sq ft). The sampling strategy, which is the amount and location of wipe samples to be collected, is provided in Appendix B. Methods for interpreting the sample results are contained in Appendices C and D.

c. Equipment/Items previously stored in the range must be decontaminated and cleaned to acceptable levels.

(1) Samples must be collected from equipment/items stored in the range. Sample selection is critical, because the number of items stored, length of storage, and level of contamination differs from range to range. The amount and location of the samples, should be representative of the areas where lead dust is most likely to accumulate. The more samples collected, the better the statistical comparison of the results.

(2) Samples must be collected from the smooth surfaces of the equipment/items, as much as possible. Results of samples collected from a rough surface will be inaccurate due to the minimal surface contact of the media. Further, the likelihood of tearing the media filter is greater on rough surfaces.

(3) Samples should also be collected on items stored the longest period of time, and which have not been disturbed. Items stored closest to the bullet trap and firing line are likely to have higher concentrations of lead dust. Methods for interpreting the sample results are contained in Appendices C and D.

1-5. Goal
To ensure every indoor firing range is free of lead dust, and to reduce the number of unsafe ARNG indoor firing ranges.

1-6. Health Effects
The Environmental Protection Agency (EPA) identifies lead as a highly toxic metal. Elemental lead is indestructible, and common in the environment. Lead can enter the body by inhalation (breathing), ingestion (eating), or absorption through contact with the skin or mucus membranes. In addition, lead is a cumulative poison. It accumulates in the blood, bones, and organs, including the kidneys, brain and liver. Effects include nervous and reproductive system disorders, delays in neurological and physical development, cognitive and behavioral changes, and hypertension. Symptoms include loss of appetite, difficulty sleeping, irritability, fatigue, headache, and inability to concentrate. It can stay in the bones for decades. Worker awareness and training are important to ensure that employees can recognize the symptoms of exposure and get prompt medical attention.

1-7. Wipe Sampling Protocol and Media
a. OSHA Technical Manual provides the necessary guidance on the technique needed to collect wipe samples (Appendix A). Only distilled or deionized water will be used to saturate dry sample media. At least one field blank filter must be submitted with each sample sheet. The field blank must be from the same lot, and labeled as a blank on the sample sheet. Appendix E identifies how and where to obtain sample media. Use the following guidance for determining media acceptability.
(1) Acceptable Media consists of –
(a) Ghost Wipes™ (**PREFERRED METHOD**)- Pre moistened
(b) Thirty-seven (37) millimeter (mm) mixed cellulose ester (MCE) filters, with or without the cassettes.
(2) Unacceptable Media consists of but is not limited to --
(a) Cotton balls.
(b) Baby wipes or wet wipes.
b. Documentation of Sample Collection. A Surface Wipe Sample Sheet must be completed and submitted with samples to your supporting laboratory. A copy of this form is located in Appendix G. Refer to Appendix B for sampling strategy and collection of wipe samples.

1-8. Ranges Cleaning Instructions
a. Written procedures, such as a scope of work, statement of work, or Standing Operating Procedure (SOP) that complies with all federal, state and local regulations must be established prior to decontamination operations.
b. The range ventilation system will be in operation during range cleaning to ensure that a negative pressure environment is maintained. In the absence of mechanical ventilation system, all doors and windows will be sealed to eliminate fugitive emissions.
c. A High Efficiency Particulate Air (HEPA) filtered vacuum system, which is designed to collect loose surface lead dust particles, is the preferred method of cleanup. If a HEPA filtered vacuum is not available; the range can be cleaned using a wet method.
d. Prohibited methods include:
(1) Wet cleaning using high-pressure systems, since this method may embed the lead into the substratum and generate large quantities of hazardous waste.
(2) Dry sweeping is not permitted.
e. All surface areas of the range must be cleaned. Do not remove the coating on smooth painted surfaces that are properly sealed.
f. The preferred progression of cleaning is from top to bottom and from behind the steel backstop to the firing line.
(1) Clean the steel backstop, areas in front of and behind the bullet trap, and the steel backstop plate(s), after removing the sand (if applicable).
(2) Clean the ceiling, lights, baffles, retrieval system, heating system(s), and ventilation duct(s).
(3) Vacuum and remove acoustical material. *Painting over this material is not recommended.*
(4) Clean the floor the last, starting at the bullet trap and ending behind the firing line.

g. When using a HEPA filtered vacuum, vacuum all surface areas until no dust or residue is visible.

h. Any general purpose cleaning solutions can be used for the wet method. However, Spic and Span™ has been found to be an effective cleaning solution by other Army organizations. Mix new solutions of cleaning solution frequently. Wet wiping will require dual containers of water; one container for wetting the applicator (mops, rags, sponge, etc.) and the other container for rinsing the applicator after the dust has been wiped from the surfaces. After wet wiping all surfaces, permit the area to dry.

i. PROPERLY DISPOSE OF ALL HAZARDOUS WASTE. DO NOT PLACE LEAD CONTAMINATED WASTE INTO THE SEWER SYSTEM OR ONTO THE GROUND.

(1) Wash water containers should be sealed when not in use to prevent evaporation or spillage.

(2) Mop-heads, sponges and rags will be discarded as hazardous waste following cleanup.

(3) A Toxic Characteristic Leaching Procedure (TCLP) test for lead may only need to be performed on the acoustical material. A TCLP test will determine if the material is classified as "hazardous" and can be disposed of in a sanitary landfill. Contact your State Environmental Office for assistance before arranging for this laboratory testing.

j. A thorough visual inspection to detect dust should be made following cleanup and prior to collecting post surface wipe samples.

k. Wood floors should receive a coat of deck enamel or urethane; concrete floors should be sealed with deck enamel; and linoleum or tile floors should be waxed.

l. As a variety of conditions exist in ranges, unique situations may arise and specific written guidance from your Regional Industrial Hygiene Office may be required.

1-9. Cleaning Stored Contaminated Equipment

a. Equipment contaminated (sample result is higher than 200 micrograms/sq ft) with lead dust must be decontaminated before it is removed from the range.

b. Equipment located near the bullet trap and firing line should be cleaned first and then removed. The cleaning method depends on the size of the equipment and the material it is comprised of, i.e. metal, wood, concrete, porous, non-porous, smooth or rough finish etc. However, either HEPA vacuum or the wet wipe method will be used. Refer to paragraph 1-8 for additional guidance.

c. Every attempt should be made to clean and reclaim items since disposing of equipment, as hazardous waste is costly and wasteful. Only as a last resort will the item be disposed of as hazardous waste. Porous items, such as office partitions and carpet that were present during firing should be considered grossly contaminated and be disposed of properly unless analysis proves otherwise. Consult your State Environmental Office for the proper hazardous waste disposal methods.

1-10. Contaminated Sand and Lead Waste

Consult your State Environmental Office for specific disposal guidance to ensure compliance with local laws and regulations.

1-11. Air Monitoring

Worker breathing zone (BZ) air samples must be collected to ensure personnel are not overexposed to airborne lead during the cleanup phase. Representative air samples will be collected on all personnel involved in the cleanup operation. These exposure levels will be used to evaluate work practices and personal protective equipment. Within five (5) working days after receipt of monitoring results, each employee will be notified in writing of the air sampling results. Contact your Regional Industrial Hygiene Office for additional information pertaining to air sampling.

1-12. Medical Surveillance

A pre-placement medical examination is required for all individuals involved with range cleanup operations. Consult 29 CFR 1910.1025 for additional information on medical surveillance requirements. IAW 29 CFR 1910.1025(j), Appendix C, Section III, the medical examination must include --

a. A detailed work and medical history.

b. A thorough physical examination.

c. A respirator use evaluation.

d. A blood pressure measurement.

e. Blood sample analysis to include:

(1) A baseline blood lead level.

(2) A complete blood count (CBC).

(3) Blood urea nitrogen (BUN).

(4) Serum creatinine.

(5) Zinc protoporphyrin.
(6) Hemoglobin and hematocrit determinations, red cell indicies, and examination of peripheral smear morphology.
(8) Recordkeeping.
f. A routine Urinalysis.
g. Recordkeeping.

1-13. Worker Education

a. OSHA 29 CFR 1910.1025(l) requires that workers who are potentially exposed to any lead level shall be informed of the content of Appendices A and B of this standard. A training program must be instituted for all individuals who are subject to exposure to lead at or above the action level or for whom the possibility of skin or eye irritations exists. The training program shall be repeated for personnel currently involved in range cleanup operations, at least annually.
b. The employer will assure that each employee is informed of the following:
(1) The content of the standard and its appendices.
(2) The specific nature of operations that could result in exposure to lead above the action level.
(3) The purpose, proper selection, fitting, use and limitations of respirators.
(4) The purpose and a description of the medical surveillance program.
(5) Eating and drinking are prohibited in lead contaminated areas.
(6) Smoking and smoking materials will not be permitted in contaminated areas.
(7) Employees must wash their hands and other exposed skin whenever they leave the work area.
(8) The engineering controls and work practices associated with the individual's job assignment.
(9) The contents of any compliance plan in effect.
c. This training must be documented on DD Form 1556 or DD Form 1556-1 and filed permanently in the employee's Official Personnel File (OPF) or the soldier's Official Military Personnel File (OMPF). As a minimum, complete blocks 1, 2, 3, 7, 8, 11, 12, 13, 17, 18, 24, 33 and 36 of DD Form 1556. Place the following statement in block 18, "Do not destroy, retain this record for the duration of employment/service plus 30 years".

1-14. Personal Protective Equipment

For housekeeping and rehabilitation the employer shall institute a respiratory protection program in accordance with 29 CFR 1910.134. As a minimum, personnel conducting the decontamination of the range will be provided with the following personal protective equipment.
a. The employer shall provide at no cost to the employee, and assure that the employee uses appropriate protective work clothing and equipment such as, but not limited to:
(1) Protective coveralls with hood and shoe covers or disposable Tyvek ™ full body suit.
(2) Disposable rubber gloves; and disposable shoe coverlets (If necessary).
(3) NIOSH approved full-face air purifying respirator with N, R, or P-100 cartridges.
b. The employer shall provide the clothing required in a clean and dry condition at least daily to employees engaged in the conversion of indoor firing ranges.
c. The employer shall provide for the cleaning, laundering, or disposal of used or contaminated protective clothing and equipment.
d. The employer shall assure that all protective clothing is removed at the completion of a work shift and only in areas designated for that purpose (Change Areas or Change Rooms).
e. The employer will ensure that contaminated protective clothing that is to be cleaned, laundered, or disposed of, is placed in a closed container in the change area that seals sufficiently enough to prevent dispersion of lead dust.
f. The employer will further inform in writing any person who cleans or launders protective clothing or equipment of the potentially harmful effects of exposure to lead.

1-15. Housekeeping

This paragraph applies to all active indoor ranges classified as "safe" for use. Routine housekeeping and maintenance is essential to keeping the range operating properly, and to controlling associated hazards.
a. The employer must establish a housekeeping program sufficient to maintain all surfaces as free as practicable of accumulations of lead dust.
b. The range ventilation system will be in operation during all cleaning operations, to ensure a negative pressure environment is maintained.

c. Ranges will be cleaned by using the wet method or by vacuuming. A HEPA (High Efficiency Particulate Air) filtered vacuum system is the preferred method. The use of compressed air to clean floors is expressly prohibited.

(1) When the wet method is utilized in a facility equipped with a floor drain, ensure that the lead contaminated water is not allowed to enter the floor drain during range cleaning operations. Spill kits that contain artificial dykes/barriers can be used to control and collect the wash water.

(2) Wash water and other contaminated materials generated from the range cleaning operation, shall then be collected, placed in suitable containers, and stored for future delivery to an authorized hazardous waste disposal site, as prescribed by 40 CFR 262 and applicable state regulations.

(3) Waste containers must be labeled to identify the contents, in accordance with the hazardous waste program requirements.

d. A NIOSH approved respirator (N, R, or P-100) for protection against lead dust, fume, and mist will be worn at all times while cleaning.

e. When cleaning start behind the firing line and work toward the bullet trap, cleaning the floor and horizontal surfaces. The area behind and 15 feet in front of the firing line should be cleaned.

1-16. Maintenance

The following are the minimum maintenance requirements, which must be performed quarterly by the range custodian, or by a person designated by the facility commander.

a. Inspect the ventilation system fan for condition of belts to ensure that they are not frayed or slipping.

b. Evaluate static pressure and compare to the baseline static pressure reading. Any changes will be reported through the safety manager to the Regional Industrial Hygienist.

c. Inspect louvers, if applicable, to ensure they are opening fully.

d. Inspect the bullet trap for pitting or other damage and for sharp edges on venetian blind type bullet traps.

e. The bullet trap will be cleaned every 480 hours of operation at a minimum, or when the trap is three quarters full.

f. The range ventilation system will be operational during all bullet trap cleaning procedures.

g. All personnel involved in cleaning of the bullet trap will wear a NIOSH approved respirator (N, R, or P-100), and proper personal protective equipment as prescribed in paragraph 1-14 above.

h. All debris from the bullet trap will be collected, packaged and turned in, IAW guidance from the environmental office.

1-17. Range Rehabilitation

This paragraph applies to all indoor firing ranges that have been identified as candidates for rehabilitation. It provides further guidance for cleaning and/or sampling that might be required prior to the start of rehabilitation.

a. The portion(s) of the range to under go rehabilitation must be sampled to determine the level of lead contamination. Wipe samples will be taken per the established sampling protocol. See Appendix A.

b. All personnel involved in range rehabilitation will wear a NIOSH approved respirator (N, R, or P-100) and proper personal protective equipment as prescribed in paragraph 1-14 above.

c. Prior to the start of rehabilitation, the environmental office must be notified to determine the disposition of any debris containing lead contaminated material.

1-18. Conversion of Indoor Ranges

Prior to the start of decontamination, employers must ensure that all procedures to be used comply with Federal, State, and local regulations. To ensure that all lead contamination is removed, the following procedure is established.

a. All ranges slated for conversion will be inspected and evaluated.

b. All equipment stored in the range, if applicable, prior to the start of decontamination must be sampled, decontaminated, re-sampled and removed or turned in as lead contaminated material. See paragraph 1-9 above.

c. All acoustical tiles and/or sound proofing material (if applicable) must be removed and turned in as lead contaminated material through the environmental office.

d. The backstop, bullet trap, target retrieval system, and firing line stations must be removed and turned in as lead containing material through the environmental office.

e. Light fixtures and ventilation system grills must be removed and decontaminated.

f. Ventilation system ducts need to be decontaminated or removed and replaced.

g. The exhaust fans and/or the complete ventilation air-handling unit (if applicable) must be decontaminated or removed.

h. Cover all openings of any component previously decontaminated prior to start of interior decontamination of the firing range.

1-19. Deviation

Deviations from this guidance will require a written exception to policy from your Regional Industrial Hygiene Office. Questions and/or comments regarding this subject should be directed to your Regional Industrial Hygiene Office or Chief, National Guard Bureau, Attn: NGB-AVS-S, 111 South George Mason Drive, Arlington, VA 22204-1382.

APPENDIX A

PROTOCOL FOR COLLECTING WIPE SAMPLES

A-1 If multiple samples are to be collected at the work site, prepare a rough sketch of the area(s) or room(s), which are to be wipe sampled. To maintain Quality Control of the samples, the chain of custody shall be annotated on a separate log sheet, or included in the remarks section of the Surface Wipe Sampling Sheet, Appendix G.

A-2 A new set of clean, impervious gloves should be used for each sample to avoid contamination of the media by previous samples and to prevent contact with the substance.

A-3 (1) If using Ghost Wipes™, tear open the individually sealed package. Remove the moistened wipe. Unfold the wipe.

(2) If using a dry media such as MCE or Whatman™ filter, moisten the filter with distilled or deionized water prior to sampling.

A-4 Place a 10 cm by 10 cm template on the area to be wiped.

A-5 Apply uniform firm pressure while wiping the area inside the template.

A-6 To insure that all portions of the partitioned area are wiped, start at the outside edge and progress toward the center making concentric squares decreasing in size.

A-7 After collecting a sample, fold the filter or wipe inward and place into a container and number it. Note the number at the sample location on the sketch.

A-8 At least one blank filter treated in the same fashion but without wiping, should be submitted to the laboratory.

APPENDIX B

SAMPLING STRATEGY FOR COLLECTION OF WIPE SAMPLES

B-1 Prior to cleaning the ranges, three samples must be collected and analyzed for total lead dust on each surface, i.e., floor, ceiling, backstop, and wall to include the plenum wall, if applicable. In addition, a total of three samples should be collected from areas which have been least disturbed by airflow. Established walkways should be avoided.

B-2 Samples should be collected from different areas of the range. A grid system should be utilized. Each range surface areas should be divided evenly into 3 by 3 sections. Samples should not be collected from only one section of a wall or end of the building.

APPENDIX C

INTERPRETATION OF SAMPLE RESULTS (PRIOR TO CLEANING)

C-1 200 micrograms/sq ft or LESS
If all sample results are 200-micrograms/sq ft or less, the range can be converted and/or used for any purpose.

C-2 BETWEEN 201 and 200,000 micrograms/sq ft
Range must be decontaminated. Continue with cleaning instructions listed in paragraph 1-8. Sample results will be used to establish a baseline.

C-3 OVER 200,000 micrograms/sq ft
Your sample media may not be capable of collecting additional lead dust and results that are above 200,000-micrograms/sq ft, should be considered suspect.

C-4 High sample results may exist due to personnel walking or moving equipment/vehicles over the range surface causing the lead dust to be "ground" into the substratum. Additionally, there may be paint over spray or solvents spilled onto the floor as a result of maintenance activities. Contact the Regional Industrial Hygiene Office for specific guidance.

APPENDIX D

INTERPRETATION OF SAMPLE RESULTS (AFTER CLEANING)

D-1 200 micrograms/sq. ft or less
If all sample results are less than 200 micrograms/sq ft, the range can be converted and/or used for any purpose after a coat of lead-free latex paint is applied.

APPENDIX E

RECOMMENDED SAMPLE MEDIA AND CONTAINERS

E-1 The following is a list of vendors, which supply the media and containers necessary to collect air and lead surface wipe samples. The information is provided to assist in obtaining the proper media and containers. Alternative vendors are available and may be utilized, if known. Contact your Regional Industrial Hygiene Office for additional assistance or clarification.

E-2 Pre-loaded 3 piece cassette with mixed cellulose ester (MCE) filter and pad, 37 millimeter (mm), pore size 0.8 microns, breathing zone (BZ) and general area (GA) air samples.

Order From	Catalog Number
a. Millipore Corp. Ashdy Road Bedford, MA 01730 617-275-9200 800-225-1380	MAWP-037-A0
b. Gelman Sciences 600 South Wagner Rd Ann Arbor, MI 48106 313-665-0651 800-521-1520	64678 (GN-4)
c. Supelco. Inc. Supelco Park Bellefonte, PA 16823 800-247-6628 800-359-3041	2-3368M

E-3 37 mm MCE Filter with pad, no cassette included, for lead surface wipe samples.

Order From	Catalog Number
a. Supelco Inc. Supelco Park Bellefonte, PA 16823 800-247-6628 800-359-3041	2-3381IM
b. Millipore Corp. Ashdy Road Bedford, MA 01730 617-275-9200 800-225-1380	AAWP-037-00

c. SKC, Inc. 225-5
334 Valley View Rd.
Eighty Four, PA 15330
412-941-9701
800-752-8472

E-4. Glass container (25 milliliter) for collection and shipment of media.

Order From	Catalog Number

a. Pierce Chemical Co. 13219 (screw cap)
P.O. Box 117
Rockford, IL 61105
815-968-0747
800-874-3723

b. Alltech Associates, Inc. 95321 (screw cap)
Applied Science Labs
2051 Waukegan Rd.
Deerfield, IL 60015
312-948-8600
800-255-8324

E-5. Ghost Wipes™.

Order From	Catalog Number
Environmental Express	SC4200
490 Wando Park Blvd.	
Mt. Pleasant, SC 29464	
1-800-343-5319	

E-6. Ghost Wipe™ Containers

Order From	Catalog Number
Environmental Express	SC499
490 Wando Park Blvd.	
Mt. Pleasant, SC 29464	
1-800-343-5319	

E-7. Plastic ziplock bags can be obtained through the Army logistics system. Many sizes are available. Contact your supporting logistics branch for assistance.

E-8. Distilled water can be purchased at larger grocery stores, usually by the gallon. Deionized water can be obtained at local and state water labs or a hospital.

APPENDIX F

EXAMPLES OF COMPUTATION OF LEAD LEVELS FROM WIPE SAMPLE RESULTS

Sample results will be returned expressed in micrograms per sample size (100 square cm in this case). The results must be converted to micrograms per square foot. This can be accomplished by following the examples listed below:

$$\frac{75 \text{ ug}}{100 \text{ cm}^2} \quad \frac{929 \text{ cm}^2}{1 \text{ sq ft}}$$

$$\frac{75 \times 929}{100 \times 1} = \frac{69675}{100} = 696.75 \text{ug/sq ft}$$

ug – Microgram

Cm^2 – Centimeters squared

Sq ft – Square foot

APPENDIX G

SURFACE WIPE SAMPLING SHEET

Industrial Hygiene Surface Wipe Sample Sheet

Return Address			Point of Contact (i Samples Collecte
Sampled Facility	City	State	Lo
Description of Operation			Date Collected
Analysis Desired			

Sampling Data

Lab Use Only	Sample #	Results	

Comments to Lab:

APPENDIX H

AIR SAMPLING SHEET

Industrial Hygiene Air Sample Sheet

Return Address		**Point of Contact** *(name/phone #)*	
		Samples Collected By	
Sampled Facility	**City**	**State**	**Location** *(building/area)*
Description of Operation	___ Persons Exposed	___ Hrs/Day	**Method of Collection**
Analysis Desired		**Date Collected**	

Sampling Data

Sample No.								
Pump No.								B
Time On								L
Time Off								A
Total Time (min)								N
Flow Rate (LPM)								K
Volume (liters)								
GA/BZ								
Employee Name/ID								
Laboratory No.								

Calibration Information

Pump No.	Calibration (LPM)		Rotameter Setting	Date
	Pre-Use	Post-Use		

Name of Calibrator	**Calibration Date**	**Pump Manufacturer**

Comments to Lab:

APPENDIX I

Indoor Firing Range Visitor and Limited Use Log

NAME (print) First, Mi, Last	RANGE IN	TIMES OUT	# ROUNDS FIRED	CALIBER

RANGE CUSTODIAN

DATE OF RANGE USE

UNIT DESIGNATION

-Limited Use Log

-Visitor Log

APPENDIX J

GLOSSARY

Section I
Abbreviations

ARNG
Army National Guard

BUN
Blood urea nitrogen

BZ
Breathing zone

CBC
Complete blood count

CFR
Code of Federal Regulations

cm
Centimeter

DHEW
Department of Health, Education and Welfare

EPA
Environmental Protection Agency

GA
General area

OMPF
Official Military Personnel File

OPF
Official Personnel File

OSHA
Occupational Safety and Health Administration

TCLP
Toxic Characteristic Leaching Procedures

ug/sq ft
Micrograms per square foot

Section II
Terms

HEPA
Refers to high efficiency particulate air filter systems capable of capturing up to 99.97 percent of particles 0.3 microns in size or larger.

Lead-Contaminated Range
It is assumed that all indoor ranges, which have been fired in, are lead-contaminated.

Wipe Sample
The terms wipe, swipe, or smear samples are used synonymously to describe the techniques utilized for assessing lead surface contamination.

Departments of the Army and the Air Force ***NG Pam 420-15**
National Guard Bureau
Arlington, VA 22202-3231
3 November 2006

Facilities Engineering

Guidelines and Procedures for Rehabilitation and Conversion of Indoor Firing Ranges

By Order of the Secretaries of the Army and the Air Force:

H STEVEN BLUM
Lieutenant General, USA
Chief, National Guard Bureau

Official:

GEORGE R. BROCK
Chief, Plans and Policy Division

History. This printing publishes a revision of NG Pam (AR) 385-16/ANGPAM 91-101.

Summary. This pamphlet prescribes policy for rehabilitation and conversion of National Guard Indoor Firing Ranges (IFR).

Applicability. This guidance applies to all persons responsible for the operation of National Guard IFRs. As no regulation/guidance can foresee all situations that might arise, the following is written in a broad scope and is intended to be interpreted so as to ensure compliance with all applicable Federal and State laws and regulations.

Proponent and exception authority. The proponent of this regulation is Chief, NGB-SG-IH. The proponent has the authority to approve exceptions to this regulation that are consistent with controlling law and regulation.

Suggested Improvements. Users of this pamphlet are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to NGB-SG-IH, 1411 Jefferson Davis Highway, Arlington, VA 22202-3231.

Distribution. A.

Table of Contents

* This publication supersedes NP Pam (AR) 385-16/ANGPAM 91-101, dated 31 January 1994.

1-1. Purpose
This pamphlet establishes the policy and procedures for rehabilitation and conversion, of National Guard IFRs.

1-2. References
Required and related publications and referenced and prescribed forms are listed in Appendix A.

1-3. Explanation of abbreviations and terms
Abbreviations and special terms used in this publication are listed in the glossary.

1-4. Policy and Procedures
Indoor firing ranges can be safely rehabilitated or converted for other uses, such as a storage area, classrooms or office space, provided the following –

a. Prior to conversion active ranges must be thoroughly decontaminated and cleaned to acceptable levels. *All ranges converted prior to the publication date of this pamphlet, must be inspected and evaluated to determine lead contamination.* This will be accomplished by a certified National Guard Industrial Hygienist (IH) or a person certified to perform inspections, evaluations, and determinations of IFRs IAW with OSHA standards, other nationally accepted standards, and accepted IH practices for maintenance, cleaning, conversion, ventilation, and air sampling of IFRs.

b. The level of cleanliness is to be determined by sampling. The Occupational Safety and Health Administration's (OSHA) Technical Manual, 5th Edition, provides guidance on the methods and techniques needed to collect wipe samples (Appendix B).

(1) Wipe samples must be collected and analyzed prior to and after cleaning.

(2) Post-cleaning surface wipe sample results must be less than 200 micrograms per square foot (ug/ft^2) (40 micrograms in the case of child exposure). The sampling strategy, which is the amount and location of wipe samples to be collected, is provided in Appendix C.

c. Equipment/Items previously stored in the range must be decontaminated and cleaned to acceptable levels as determined by a person certified to perform inspections, evaluations, and determinations of IFRs IAW with OSHA standards, other nationally accepted standards, and accepted IH practices for maintenance, cleaning, conversion, ventilation, and air sampling of IFRs.

(1) Samples must be collected from equipment/items stored in the range. Sample selection is critical, because the number of items stored, length of storage, and level of contamination differs from range to range. The amount and location of the samples should be representative of the areas where lead dust is most likely to accumulate. The more samples collected, the better the statistical comparison of the results.

(2) Samples must be collected from the smooth surfaces of the equipment/items, as much as possible. Results of samples collected from a rough surface will be inaccurate due to the minimal surface contact of the media. Further, the likelihood of tearing the media filter is greater on rough surfaces.

(3) Samples should also be collected on items stored the longest period of time, and which have not been disturbed. Items stored closest to the bullet trap and firing line are likely to have higher concentrations of lead dust.

1-5. Goal
To ensure that every IFR is free of lead dust which means to test less than 200 micrograms and to reduce the number of unsafe National Guard IFRs.

1-6. Deviation
Deviations from this guidance will require a written exception to policy from your Regional Industrial Hygiene Office. Questions and/or comments regarding this subject should be directed to your Regional Industrial Hygiene Office or Chief, National Guard Bureau, Office of the Joint Surgeon, ATTN: NGB-SG-IH, 1411 Jefferson Davis Highway, Arlington, VA 22202-3231.

Chapter 2
Health and Medical Aspects

2-1. Health Effects
29 Code of Federal Regulations (CFR) 1910.1025, Appendix A, identifies lead as a highly toxic metal. Elemental lead is indestructible, and common in the environment. Lead can enter the body by inhalation (breathing) or

ingestion (eating). In addition, lead is a cumulative poison. It accumulates in the blood, bones, and organs, including the kidneys, brain and liver. Effects include nervous and reproductive system disorders, delays in neurological and physical development, cognitive and behavioral changes, and hypertension. Symptoms include loss of appetite, difficulty sleeping, irritability, fatigue, headache, and inability to concentrate. It can stay in the bones for decades. Worker awareness and training are important to ensure that employees can recognize the symptoms of exposure and get prompt medical attention.

2-2. Medical Surveillance for Occupational Exposure to Lead (Pb)

a. Per 29 CFR 1910.1025 (j)(i-ii), Medical Surveillance - General, "The employer shall institute a medical surveillance program for all employees who are or may be exposed above the action level for more than 30 days per year. The employer shall assure all medical examinations and procedures are performed by or under the supervision of a licensed physician."

b. The DOD 6055.5-M, Occupational Medical Surveillance Manual - Table 2-1 lists medical surveillance criteria for employees "who are or may be exposed above the action level for 30 days/year."

2-3. Air Monitoring

Worker breathing zone air samples must be collected to ensure that personnel are not overexposed to airborne lead during the cleanup phase. Daily air samples will be collected from all personnel involved in the cleanup operation. These exposure levels will be used to evaluate work practices and medical surveillance requirements.

2-4. Wipe Sampling Protocol and Media

A template measuring 10 centimeters by 10 centimeters square, approximately 4 inches square, should be used to accurately measure and mark the area before collecting wipe samples. Samples should be staggered to different areas of the range. A grid system should be utilized. Samples should not be collected all on one section of a wall, or end of the building. OSHA Technical Manual provides the necessary guidance on the technique needed to collect wipe samples (Appendix B). Only distilled or deionized water will be used to saturate dry sample media. At least one field blank must be submitted with every 10 samples. The field blank must be from the same lot, and labeled as a blank.

2-5. Personal Protective Equipment

29 CFR 1910.1025 (f) (2), for housekeeping and rehabilitation the employer shall select respirators from among those approved for protection against dust, fume, and mist by the National Institute for Occupational Safety and Health (NIOSH), under the provision of 42 CFR part 84. The employer shall institute a respiratory protection program in accordance with 29 CFR 1910.134 (b), (d), (e) and (f). As a minimum, personnel conducting the decontamination of the range will be provided with the following personal protective equipment.

a. Under 29 CFR 1910.1025 (g). For employees engaged in range rehabilitation and/or range conversion, the employer shall provide at no cost to the employee, and ensure that the employee uses appropriate protective work clothing and equipment such as, but not limited to:

(1) Protective coveralls with hood and shoe covers or disposable Tyvek ™ full body suit.
(2) Disposable rubber gloves; and disposable shoe coverlets (If necessary).
(3) Full-face air purifying respirator with P-100 cartridges.

b. The employer shall provide the clothing required in a clean and dry condition at least daily to employees engaged in the conversion of IFRs.

c. The employer shall provide for the cleaning, laundering, or disposal of used or contaminated protective clothing and equipment.

d. The employer shall assure that all protective clothing is removed at the completion of a work shift only in areas designated for that purpose (Change Areas or Change Rooms).

e. The employer will ensure that contaminated protective clothing that is to be cleaned, laundered, or disposed of, is placed in a closed container in the change area that seals sufficiently enough to prevent dispersion of lead dust.

f. The employer will further inform in writing any person who cleans or launders protective clothing or equipment of the potentially harmful effects of exposure to lead.

g. The employer will ensure that the containers of contaminated protective clothing and equipment are labeled as follows: CAUTION: *CLOTHING CONTAMINATED WITH LEAD. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS.*

Chapter 3
Education, Maintenance, Cleaning and Conversion

3-1. Worker Education

a. 29 CFR 1910.1025, Appendix B, requires an information and training program for all employees exposed to lead above the action level or who may suffer skin or eye irritation from lead. The program must inform the employees of the specific hazards associated with their work environment, protective measures which can be taken, the danger of lead to their bodies (including their reproductive systems), and their rights under the standard. In addition you must make readily available to all employees, including those exposed below the action level, a copy of this standard and its appendices. This training program will be repeated annually for personnel in range cleanup operations.

b. The commander/supervisor will ensure that each soldier or Army National Guard (ARNG) employee is informed of the following:

(1) The content of the standard and its appendices.

(2) The specific nature of operations that could result in exposure to lead above the action level.

(3) The purpose, proper selection, fitting, use and limitations of respirators.

(4) The purpose and a description of medical surveillance program.

(5) Eating and drinking are prohibited in lead contaminated areas.

(6) Smoking and smoking materials will not be permitted in contaminated areas.

(7) Soldiers and ARNG employees must wash their hands and other exposed skin whenever they leave the work area.

(8) The engineering controls and work practices associated with the individual's job assignment.

(9) The contents of any compliance plan in effect.

(10) Instructions to soldiers and ARNG employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician.

3-2. Range Cleaning Instructions

a. Written procedures, such as a scope of work, or standing operating procedure that complies with all Federal, State and local regulations must be established prior to decontamination operations.

b. The range ventilation system will be in operation during range cleaning to ensure that a negative pressure environment is maintained. In the absence of mechanical ventilation system, all doors and windows will be sealed to eliminate fugitive emissions.

c. A High Efficiency Particulate Air (HEPA) filtered vacuum system, which is designed to collect loose surface lead dust particles, is the preferred method of cleanup. If a HEPA filtered vacuum is not available, the range can be cleaned using a wet method.

d. Prohibited methods include:

(1) Wet cleaning using high-pressure systems, since this method may embed the lead into the substratum and generate large quantities of hazardous waste.

(2) Dry sweeping is not permitted.

e. All surface areas of the range must be cleaned. In addition, areas outside of the IFR where lead can be tracked must be cleaned.

f. The preferred progression of cleaning is from top to bottom and from behind the steel bullet trap to the firing line.

(1) Clean the steel bullet trap, areas in front of and behind the bullet trap, and the steel bullet trap plate(s), after removing the sand (if applicable).

(2) Clean the ceiling, floors, lights, baffles, retrieval system, heating system(s), and ventilation duct(s).

(3) Vacuum and remove acoustical material. *Painting over this material is not recommended.*

(4) Clean the floor the last, starting at the bullet trap and ending behind the firing line.

g. When using a HEPA filtered vacuum, vacuum all surface areas until no dust or residue is visible.

h. Any general purpose cleaning solutions can be used for the wet method. However, Spic and Span™ has been found to be an effective cleaning solution by other Army organizations. Mix new solutions of cleaning solution frequently. Wet wiping will require dual containers of water; one container for wetting the applicator (mops, rags, sponge, etc.) and the other container for rinsing the applicator after the dust has been wiped from the surfaces. After wet wiping all surfaces, permit the area to dry.

i. *Properly dispose of all hazardous waste. Do not place lead contaminated waste into the sewer system or onto the ground.*

(1) When placed in containers, wastewater should be left to evaporate.

(2) Mop-heads, sponges and rags will be discarded as hazardous waste following cleanup.

j. A thorough visual inspection to detect dust should be made following cleanup and prior to collecting post surface wipe samples.

k. Wood floors should receive a coat of deck enamel or urethane; concrete floors should be sealed with deck enamel.

l. As a variety of conditions exist in ranges, unique situation may arise and specific written guidance from your Regional Industrial Hygiene Office may be required.

m. Any cleaning activities must be under the supervision by a trained and competent personnel IAW with OSHA and other nationally accepted standards and the work shall be according to current industry engineering standards under the control of the State Construction and Facilities Management Officer. Cleaning must recognize that there likely will be "background" lead presence in the readiness center totally independent of the existence of an indoor range and that the method of cleaning is less important than achieving the goal of less than 200 micrograms (40 micrograms in the case of child exposure).

3-3. Cleaning Stored Contaminated Equipment

a. Equipment contaminated (sample result is higher than 200 ug/ft^2) with lead dust must be decontaminated before it is removed from the range.

b. Equipment located near the bullet trap and firing line should be cleaned first and then removed. The cleaning method depends on the size of the equipment and the material it is comprised of, i.e. metal, wood, concrete, porous, non-porous, smooth or rough finish etc. However, either HEPA vacuum or the wet wipe method will be used. Refer to paragraph 3-2 for additional guidance.

c. Every attempt should be made to clean and reclaim items since disposing of equipment, as hazardous waste is costly and wasteful. Only as a last resort will the item be discarded as hazardous waste. Porous items, such as office partitions and carpet that were present during firing should be considered grossly contaminated and be discarded unless analysis proves otherwise. Consult your State Environmental Office for the proper hazardous waste disposal methods.

3-4. Contaminated Sand and Lead Waste

Consult your State Environmental Office for specific disposal guidance to ensure compliance with local laws and regulations.

3-5. Range Rehabilitation

This chapter applies to all IFRs that have been identified as candidates for rehabilitation. It provides further guidance for cleaning and/or sampling that might be required prior to the start of rehabilitation.

a. The portion(s) of the range to under go rehabilitation must be sampled to determine the level of lead contamination. Wipe samples will be taken per the established sampling protocol. See Appendix B.

b. All personnel involved in range rehabilitation will wear a NIOSH approved respirator (P-100) and proper personal protective equipment as prescribed in paragraph 2-5 above.

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

d. Supervision shall be by a person who is certified to perform inspections, evaluations, and determinations of IFRs IAW with OSHA standards, other nationally accepted standards, and accepted IH practices for maintenance, cleaning, conversion, ventilation, and air sampling of IFRs. All work shall be according to current industry engineering standards under the control of the State Construction and Facilities Management Officer.

3-6. Conversion of Indoor Firing Ranges

Prior to the start of decontamination, employers must ensure that all procedures to be used comply with Federal, State, and local regulations. To ensure that all lead contamination is eradicated, the following procedure is established.

a. The State shall follow the project approval process as delineated in NGR 420-10 (or NGR 415-5 if the use of the military construction appropriation is required).

b. All ranges slated for conversion will be inspected and evaluated by the NGB Regional Industrial Hygiene Office.

c. All equipment stored in the range, if applicable, prior to the start of decontamination must be sampled, decontaminated, re-sampled and removed or turned in as lead contaminated material.

d. All acoustical tiles and/or sound proofing material (if applicable) must be removed and turned in as lead contaminated material through the environmental office.

e. The bullet trap, target retrieval system and firing line stations must be removed and turned in as lead containing material through the environmental office.

f. Light fixtures and ventilation system grills must be removed and decontaminated.

g. Ventilation system ducts need to be decontaminated or removed and replaced.

h. The exhaust fans and/or the complete ventilation air-handling unit (if applicable) must be decontaminated or removed to include roof fans.

i. Cover all openings of any component previously decontaminated prior to start of interior decontamination of the firing range.

j. Prior to start of washing, the interior of the range should be vacuumed with a HEPA filtered vacuum. The range should be washed using a cleaning solution of hot water and Spic and Span in five gallons of hot water. A progression of cleaning from top to bottom, and from back to front should be used. All surface areas of the range must be cleaned. Mix new solutions of water frequently. Washing will require dual containers of water; one container for wetting the applicators (mops, rags, sponges, etc.), and the other container for rinsing the applicators. Waste water placed into containers can be left to evaporate. *Properly dispose of all hazardous waste and do not place any lead contaminated waste into the sewer system or onto the ground.* Mop heads, sponges and rags will be discarded as hazardous waste following decontamination of the range. After completion of decontamination, and prior to taking clearance samples, the ventilation system must be run for a period of 36 hours. Wipe clearance samples will be taken from ceiling, walls and floors. The range will be considered clean if no clearance sample is greater than 200 ug/ft^2, if any sample is above 200 ug/ft^2, the range is not considered clean, the range will need to be re-washed until clearance samples are below 200 ug/ft^2.

k. The regional industrial hygienist will do quality assurance sampling as needed.

l After obtaining clearance, the walls of the range will be coated with a sealant (Not Paint), which is smooth, wood floors will receive a coat of deck enamel or urethane, concrete floors will be sealed with deck enamel. After sealing, floors will be tiled or covered with linoleum.

m. As a variety of conditions exist in ranges, unique situations may arise and specific written guidance from the Regional Industrial Hygiene Office may be required.

n. All personnel involved in the decontamination/conversion of IFRs as a minimum will be provided with the following personal protective equipment.

(1). Full Face air purifying respirator with HEPA cartridges. The requirements outline in 29 CFR 1910.134, must be met prior to placing workers in respiratory protection.

(2). Individuals will be provided personal protective equipment as required per paragraph 2-5, this pamphlet.

o. Any conversion must be supervised by a person certified to perform inspections, evaluations, and determinations of IFRs IAW with OSHA standards, other nationally accepted standards, and accepted IH practices for maintenance, cleaning, conversion, ventilation, and air sampling of IFRs. All work shall be according to current industry engineering standards under the control of the State Construction and Facilities Management Officer. Cleaning must recognize that there likely will be “background” lead presence in the readiness center totally independent of the existence of an indoor range and that the method of cleaning is less important than achieving the goal of less than 200 micrograms (40 micrograms in the case of child exposure).

p. After conversion, lead testing shall continue on an annual basis to verify that no lead migration from the substrate is occurring.

Appendix A
References

Section I
Required Publications

There are no entries in this section

Section II
Related Publications

ASTM E1792-03
Standard Specification for Wipe Sampling Materials for Lead in Surface Dust

AR 11-34
The Respiratory Protection Program

AR 40-5
Preventive Medicine

DODI 6055.5
Industrial Hygiene and Occupational Health

DOD 6055.5-M
Occupational Medical Surveillance Manual

29 CFR, Part 1910
Occupational Safety and Health Administration, Department of Labor

National Institute for Occupational Safety and Health (NIOSH) 76-130
Lead Exposure and Design Considerations for Indoor Firing Ranges, Department of Health, Education and Welfare

NGR 385-15
Policy and Responsibilities for Inspection, Evaluation and Operation Army National Guard National Guard Indoor Firing Ranges (IFRs).

NGR 415-5
Army National Guard Military Construction Program Development and Execution

NGR 420-10
Construction and Facilities Management Office Operations

Technical Manual, 5th Edition
Occupational Safety and Health Administration, Department of Labor

Section III
Prescribed Forms

There are no entries in this section

Section IV
Referenced Forms

There are no entries in this section

Appendix B
Protocol for Collecting Wipe Samples

B-1. If multiple samples are to be collected at the work site, prepare a rough sketch of the area(s) or room(s), which are to be wipe sampled.

B-2. A new set of clean, impervious gloves should be used for each sample to avoid contamination of the media by previous samples and to prevent contact with the substance.

B-3. Wipe Samples

a. If using Ghost Wipes™, tear open the individually sealed package. Remove the moistened wipe. Unfold the wipe.

b. If using a dry media such as MCE or Whatman™ filter, moisten the filter with distilled or deionized water prior to sampling.

B-4. Place a 10 centimeter by 10 centimeter template on the area to be wiped.

B-5. Apply uniform firm pressure while wiping the area inside the template.

B-6. To ensure that all portions of the partitioned area are wiped, start at the outside edge and progress toward the center making concentric squares decreasing in size.

B-7. After collecting a sample, fold the filter or wipe inward and place into a container and number it. Note the number at the sample location on the sketch.

B-8. At least one blank filter treated in the same fashion but without wiping, should be submitted to the laboratory.

Appendix C
Sampling Strategy for Collection of Wipe Samples

C-1. Prior to cleaning the ranges, three samples must be collected and analyzed for total lead dust on each surface, i.e., floor, ceiling, bullet trap, and wall to include the plenum wall, if applicable. In addition, a total of three samples should be collected from areas which have been least disturbed by airflow. Established walkways should be avoided.

C-2. Samples should be collected from different areas of the range. A grid system should be utilized. Each range surface areas should be divided evenly into 3 by 3 sections. Samples should not be collected from only one section of a wall or end of the building.

Glossary

Section I
Abbreviations

ARNG
Army National Guard

CFR
Code of Federal Regulations

HEPA
High Efficiency Particulate Air

IFR
Indoor Firing Range

NIOSH
National Institute for Occupational Safety and Health

OSHA
Occupational Safety and Health Administration

ug/ft^2
Micrograms per square foot

Section II
Terms

Air monitoring
The sampling for and measuring of pollutants in the atmosphere.

Breathing zone
The imaginary globe of two feet radius surrounding the head.

General area
Collection of and later analysis of airborne contaminants in a given work environment. As the sampling pump and collection media are not attached to a worker, the concentrations found represent average concentrations in that area but may not representative of the actual exposure of the worker.

HEPA
Refers to high efficiency particulate air filter systems capable of capturing up to 99.97 percent of particles 0.3 microns in size or larger.

Lead-Contaminated Range
It is assumed that all IFRs, which have been fired in, are lead-contaminated.

Respirator
A device designed to provide the wearer with respiratory protection against inhalation of airborne contaminants.

Wipe Sample
The terms wipe, swipe, or smear samples are used synonymously to describe the techniques utilized for assessing lead surface contamination.

Section III
Special Abbreviations and Terms

This section contains no entries