

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 Users will destroy interim changes on their expiration date unless sooner superseded or rescinded.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.

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Glossary

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 Respiratory 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 replacement 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.

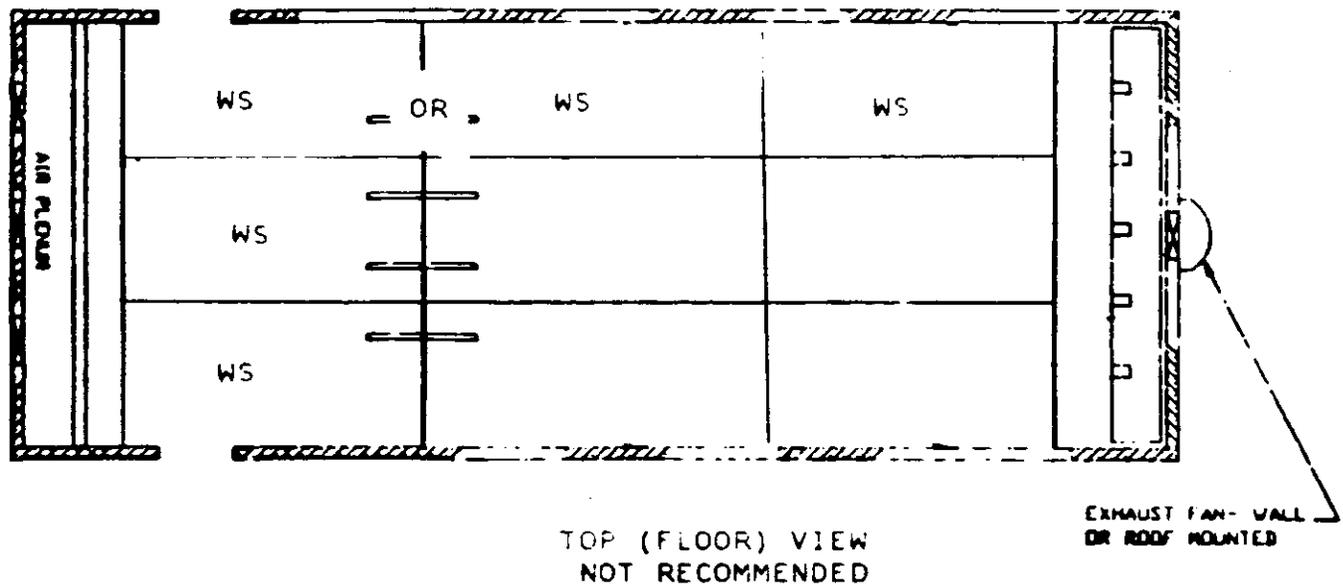
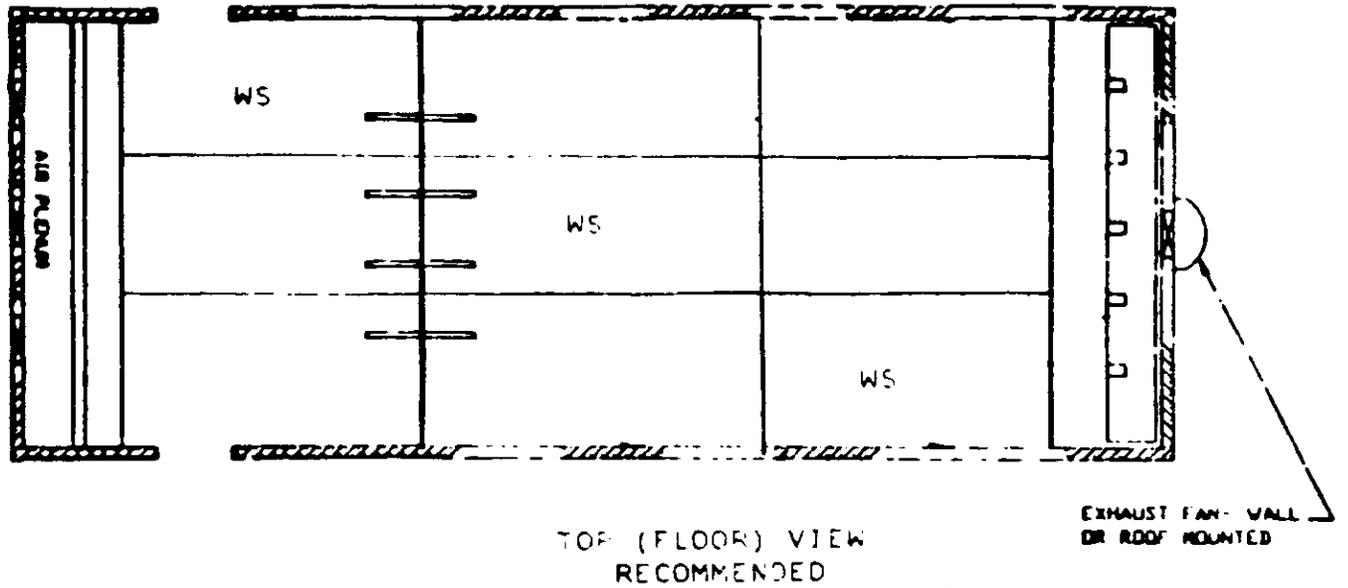
Appendix A
SAMPLING STRATEGY FOR COLLECTION OF WIPE SAMPLES

A-1. A template measuring 10 centimeters by 10 centimeters square, approximately 4 inches square, (see App E, 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.

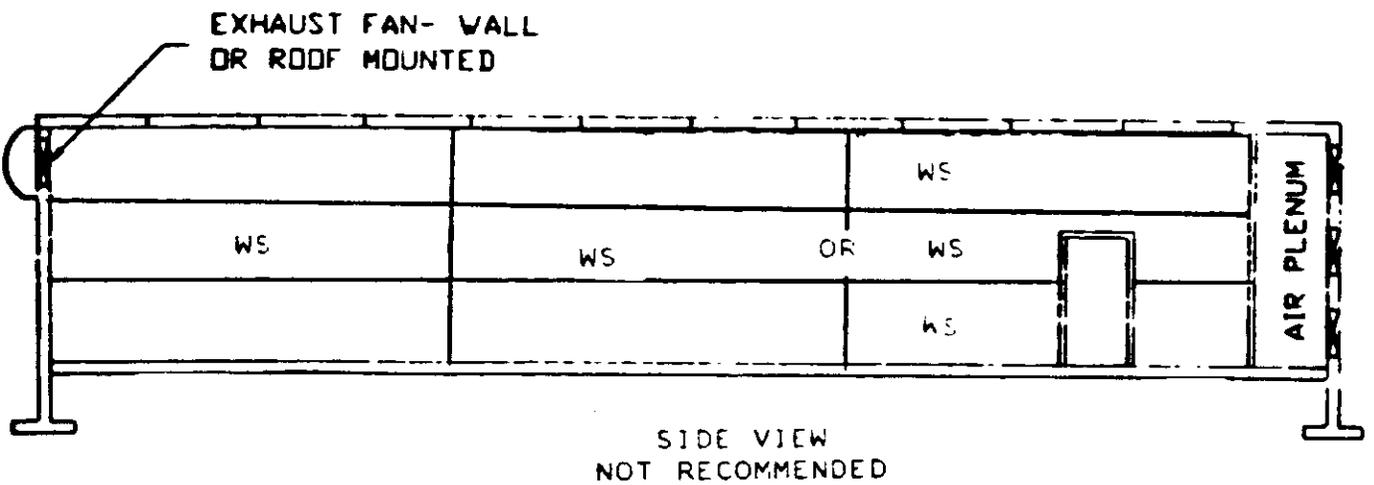
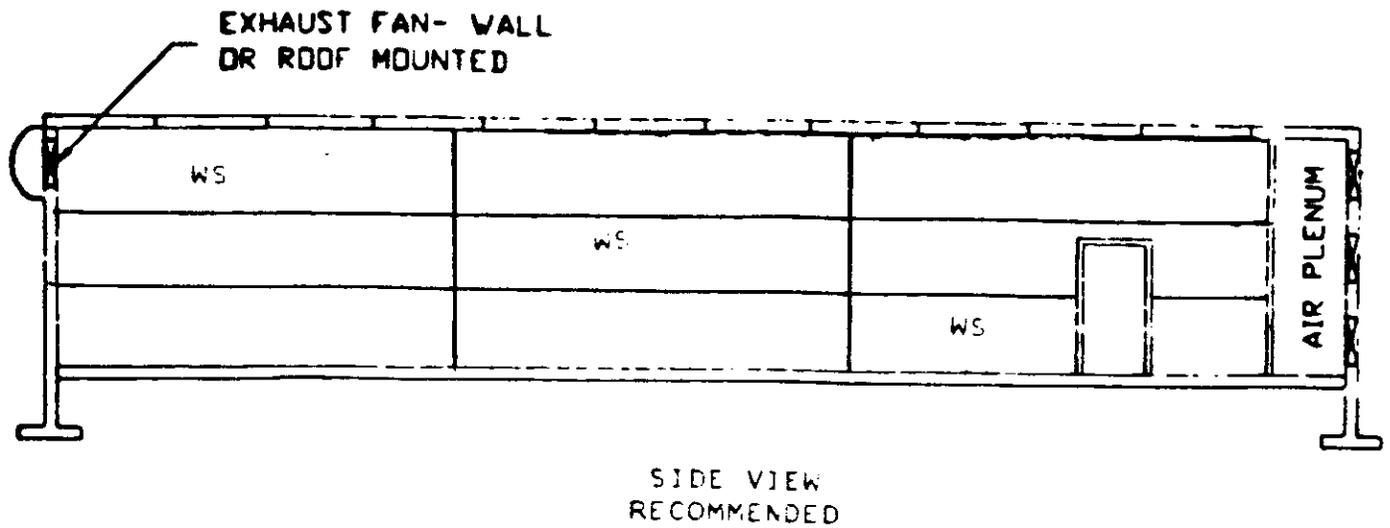
SAMPLING STRATEGY FOR COLLECTION OF WIPE SAMPLES



WS - WIPE SAMPLE

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

SAMPLING STRATEGY FOR COLLECTION OF WIPE SAMPLES



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 adhere 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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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).
- substances analyzed by Gas Chromatography (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.

B. GENERAL TECHNIQUE FOR WIPE SAMPLING

1. Filter Media and Solvents
- 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).
 - 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.
 - Generally, there are two types of filters recommended for taking wipe samples:
 - Glass fiber filters (GFF) (37 mm) are usually used for materials which are analyzed by High Performance Liquid Chromatography (HPLC), and often for
2. Procedures
- Follow these procedures when wipe samples are taken:
- 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.
 - 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.
 - 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 cm². (See Appendix 2-A)
- e. For surfaces smaller than 100 cm² 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.

BIBLIOGRAPHY

Adams, R.M. 1983. *Occupational Skin Disease*. New York: Grune and Stratton.

Benezra, C. *et al.* 1982. *Occupational Contact Dermatitis. Clinical and Chemical Aspect*. Philadelphia: Saunders. 1st ed.

Chaiyuth, C. and L. Levin. A Laboratory Evaluation of Wipe Testing Based on Lead Oxide Surface Contamination. *Am. Ind. Hyg. Assoc. J.* 45:311-317, 1984.

Clayton, G.D. and F.E. Clayton. 1981. *Patty's Industrial Hygiene and Toxicology*. New York: John Wiley & Sons. Vol. II.

Fisher, A.A. 1986. *Contact Dermatitis*. Philadelphia: Lea & Febiger. 3rd ed.

Gellin, G. and H.I. Malbach. 1982. *Occupational and Industrial Dermatology*. Chicago: Year Book Medical Publisher.

Lees, P.S.J. *et al.* Evidence for Dermal Absorption as the Major Route of Body Entry During Exposure of Transformer Maintenance and Repairman to PCBs. *Am. Ind. Hyg. Assoc. J.* 48:257-264, 1987.

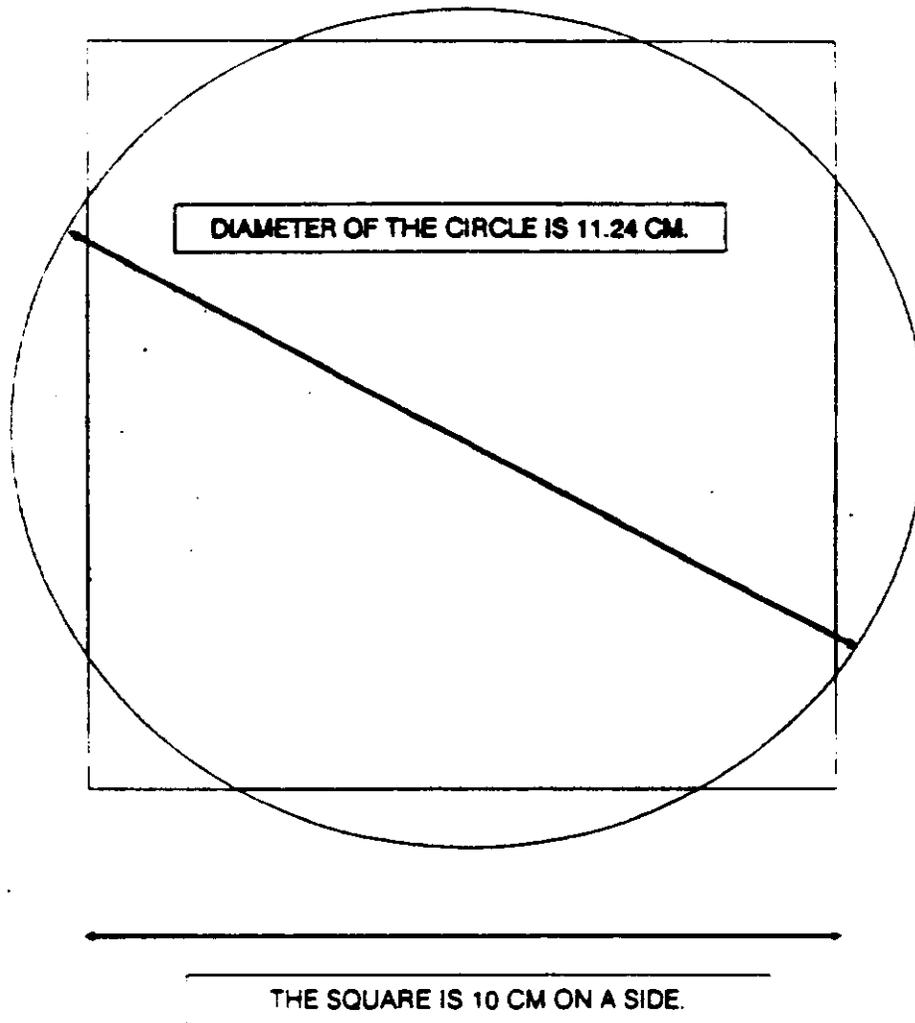
Occupational Safety and Health Administration (OSHA), U.S. Dept. of Labor. 1987. *Chemical Information Manual*. Washington, D.C.:U.S. Government Printing Office.

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APPENDIX 2-A

Template samples which cover 100 square centimeters.



Appendix D

OSHA Instruction CPL 2-2.20B

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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 cm² 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 fluorescamine *blank*.
6. A discoloration indicates surface contamination, possible 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 -Naphthylamine β -Naphthylamine

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.

<u>Order From</u>	<u>Catalog Number</u>
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.

<u>Order From</u>	<u>Catalog Number</u>
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.

<u>Order From</u>	<u>Catalog Number</u>
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.

<u>Order From</u>	<u>Catalog Number</u>
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.

<u>Order From</u>	<u>Catalog Number</u>
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									
<i>For use of this form see USAEBA TG 141; the proponent is BSHB-LO.</i>									
Return Address (complete address including Zip Code)			Point of Contact (name/AUTOYON)						
Sampled Installation		Project Number		ARLOC <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;"></td> </tr> </table>					
Samples Collected By		Date Collected		Date Shipped					
Description of Operation				Location (BLDG/AREA)					
Associated Complaints (be specific)									
Associated Air Samples If yes, list sample numbers									
<input type="checkbox"/> Yes <input type="checkbox"/> No									
Label Information									
Trade Name		NSN	Manufacturer						
Address			MSDS Attached						
<input type="checkbox"/> Yes <input type="checkbox"/> 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:							

Appendix G

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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.

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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:

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

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

OR

$$\frac{75\text{ug}}{16\text{in}^2} \quad \frac{144\text{ in}^2}{1\text{ sq ft}} \quad \frac{\text{ug}}{\text{sq ft}}$$

$$75 \times 9 = 675\text{ug/sq ft}$$

ug - microgram
cm² - centimeters squared
sq ft - square foot
in² - inches squared

Appendix I

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Supporting Laboratories and Areas Served

Supporting laboratory

Commander
U.S. Army Environmental Hygiene
Activity-South
Fort McPherson, GA 30330-5000
DSN 572-3234

Commander
U.S. Army Environmental Hygiene
Activity-West
Fitzsimons Army Medical Center
Aurora, CO 80045-5001
DSN 943-8288

Commander
U.S. Army Pacific Environmental
Health Engineering Agency
Sagami
APO San Francisco 96343
Camp Zama 228-4111

Commander
10th Medical Laboratory
ATTN: AEMML-PM-LAB
APO New York 09180
Landstuhl Military (2223-)7272

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)

Areas served

Alabama, Arkansas, Florida, Georgia,
Western Kentucky, Louisiana,
Mississippi, Oklahoma, Panama,
Puerto Rico, South Carolina,
Tennessee, Central & Eastern Texas

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

Hawaii, Japan, Korea, Okinawa,
Philippines, Thailand, and all other
Far East countries

Europe, Africa, Middle East, Western
Europe, Turkey, Africa, and Middle
East countries

- 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