



DEPARTMENT OF THE ARMY
WASHINGTON, D C 20310



HQDA LTR 385-91-1

DACS-SF (31 July 1990)

26 March 1991

Expires 26 March 1993

SUBJECT: Inspection and Evaluation of U.S. Army Indoor
Firing Ranges

SEE DISTRIBUTION

1. Purpose. This letter publishes guidance for the safe operation and maintenance of U.S. Army indoor firing ranges. In particular, it addresses airborne lead concentrations. This letter expires on the date indicated above or upon publication of the policy in an appropriate Army regulation.

2. References.

a. Related publications.

(1) AR 385-63, Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat.

(2) Industrial Ventilation, A Manual for Recommended Practice, 19th edition, 1985, American Conference of Governmental Industrial Hygienists (ACGIH), Lansing, Michigan.

(3) Department of Health, Education, and Welfare Publication Number 76-130, Lead Exposure and Design Considerations for Indoor Firing Ranges, Technical Information, December 1975, National Institute for Occupational Safety and Health (NIOSH).

(4) Section 1025, Part 1910, Title 29, Code of Federal Regulations, 1983 Revised Edition.

b. Prescribed forms.

(1) DA Form 5687-R (Initial Inspection Checklist for Indoor Ranges).

(2) DA Form 5688-R (Detailed Checklist for Indoor Ranges).

3. Explanation of abbreviations.

- a. fpm ----- feet per minute
- b. HEPA ----- high efficiency particulate air
- c. m ----- meter(s)
- d. mg ----- milligram(s)
- e. NIOSH ----- National Institute for Occupational Safety and Health

4. Lead intoxication.

a. Indoor firing ranges must comply with Occupational Safety and Health Administration standards, including medical surveillance requirements. Personnel exposures which are intermittent will be controlled per the criteria provided in table 1 on page 7.

b. The criteria in table 1 were developed to control intermittent lead exposure and establish maximum hours of exposure based on the airborne lead concentration and the number of days firing per year. These criteria are to be used as interim control measures only. Maximum effort will be made to reduce the airborne lead levels to 0.03 milligrams per cubic meter (0.03mg/m³) or less.

c. Lead exposures for personnel are determined by a sampling strategy that employs general-area and breathing-zone samples. Paragraph 5b contains guidance for air sampling. Once an airborne lead concentration is determined, the table is used to set maximum allowable hours of exposure for each category of range user. Other potential lead exposures, including off-duty firing, may contribute to an individual's overall exposure and should be considered in establishing maximum allowable exposure time. The maximum allowable exposure hours should be halved for intermittent range users under 17 years of age.

d. Medical surveillance is not required for intermittent users if the maximum allowable exposure hours from the table are enforced.

5. Air sampling.

a. Collect all lead samples on cellulose ester filters with a pore size of 0.8 micron, 37 millimeters in diameter, three-piece cassette, and closed face. Sampling rate should be 1 to 4 liters per minute for a minimum volume of 500 liters.

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b. Sample on the firing line, 10 feet behind the firing line, and in adjacent area (such as, range office, supply room, or hallways). In small ranges (less than six firing positions), samples should be taken at each firing position on and off line. In larger ranges (six or more firing positions), breathing-zone and general-area samples should be taken in every other firing position and off line. Permanently assigned range personnel should have breathing-zone samples taken. Exposures to other personnel may be evaluated using data obtained from general-area and breathing-zone samples, if applicable. Take at least one air sample for lead in an area adjacent to the range as defined above during each monitoring period. This sample should indicate whether or not lead contamination is confined to the range.

c. The following factors are critical to proper range evaluation:

(1) Sample during periods of maximum use.

(2) If firing is over an extended period of time, allow time for possible buildup of airborne concentrations before sampling.

(3) Sample during the use of higher-caliber ammunition if more than one type of ammunition is used.

d. All pumps must be calibrated before and after use by a method traceable to a primary standard (for example, bubble burette).

6. Ventilation.

a. Contaminants occur as byproducts of firing (that is, lead, carbon monoxide, and aldehydes) and must be removed from the range through an adequate ventilation system. The maximum concentration of lead acceptable for an 8-hour daily exposure (time-weighted average) is 0.05 milligrams per cubic meter. A ventilation system designed to provide this protection is sufficient to remove the other byproducts of firing.

b. Optimum ventilation systems should include make-up air behind the firing line and exhausted air at the target line or bullet trap.

c. Down-range air velocity can be measured or approximated by using a 30-second smoke candle and stop watch. Ignite the smoke candle behind the firing line, and time the smoke from the moment the first plume crosses the firing line until it reaches

the bullet trap. Calculate the air velocity in feet per minute (fpm) by dividing the range distance of length (from firing line to bullet trap) (D) by the time (T), or $D/T = \text{fpm}$. A minimum of 35 fpm is required. This is equal to 35 cubic feet per minute per square foot of cross-sectional area. During the smoke evaluation, observe the range for any "dead spots," swirling of smoke uprange, or other turbulent airflow motions that may allow for increased exposure at or behind the firing line.

d. Air velocities must be measured at the firing line.

(1) Minimum velocity at the firing line is 50-75 fpm. When this velocity is provided, 100 percent of the air should be exhausted downrange at the bullet trap.

(2) Air flow should be measured with a calibrated air velocity meter.

e. Make-up and exhaust air velocities can be measured with a calibrated velocity meter.

f. Exhaust or make-up volume can be determined by using a pitot tube traverse.

g. Exhaust air should exceed make-up air by 10 percent to provide a slightly negative pressure in relation to adjacent areas.

h. Recirculation of air is not advised unless lead and carbon monoxide are controlled by high-efficiency particulate filtration and alarm systems, respectively.

i. It may be necessary to filter range exhaust air with high efficiency particulate air (HEPA) filters or equivalent filters to meet State air pollution regulations for airborne lead.

j. Ventilation grilles or diffusers should have a maximum velocity of 400 fpm. They should also be sized for uniform distribution.

k. Make-up and exhaust air systems must be electrically interlocked. Variable speed fans should not be used.

l. Range air temperature should be between 65 degrees and 80 degrees Fahrenheit.

7. Housekeeping.

a. The ventilation system must be in operation during all cleanup operations.

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b. Dust, fume, and mist respirators approved by NIOSH for lead exposure must be used during cleanup operations.

c. Wet methods or vacuum (supplied with HEPA filter), not dry sweeping, must be utilized during cleanup.

8. Inspection of indoor firing ranges.

a. Initial, detailed, and annual inspections will be performed on all indoor ranges to ensure compliance with current health and safety standards.

b. Initial inspections are one-time inspections made by qualified and competent safety or engineer personnel to determine the status of the indoor range for use. DA Form 5687-R will be used as a minimum for conducting the inspection. Indoor ranges will be classified as safe, limited, or unsafe based on the initial inspection findings. DA Form 5687-R will be locally reproduced on 8 1/2- by 11-inch paper. A copy of the form is located at the back of this letter.

(1) An indoor range classified as safe permits authorized firing for military and civilian use.

(2) An indoor range classified as limited permits only limited use under controlled conditions. The personnel exposure limits for intermittent atmospheric lead exposure will be used for limited operation of the indoor range.

(3) An indoor range classified as unsafe is not authorized for use under any conditions.

c. Detailed inspections will be made by the support installation team, composed of safety, facility engineer, and medical department activity representatives. Detailed inspections are in addition to the initial inspection. DA Form 5688-R will be used as a minimum for conducting the inspection. Findings from the detailed inspection will determine complete range retrofit requirements. A detailed inspection will be made within 120 days of the initial inspection. DA Form 5688-R will be locally reproduced on 8 1/2- by 11-inch paper. A copy of this form is located at the back of this letter.

d. Annual inspections will be made by safety or engineer personnel to ensure safety standards and procedures are maintained in the operation of the range. The annual inspection will be made within 45 days of the anniversary date of the last annual inspection.

e. Special inspections may be required when a limiting range condition has worsened to the point that the range may be considered unsafe. Special inspections will be made by safety and engineer personnel.

9. Disposition of inspection and evaluation results.

a. Inspection and evaluation results will be provided to the next higher headquarters for action as appropriate. Supporting installation safety managers will maintain an information copy.

b. The Supporting Facility Coordinator will maintain a record of each inspection. Subsequent inspections will be made as a followup check against previous inspection results to assure required corrective action(s) noted has/have been accomplished, and that there are not adverse changes to the building envelope, environmental conditions, and/or safe operating procedures.

10. Inquiries pertaining to indoor range safety. All inquiries pertaining to the information provided in the checklists and indoor range safety in general should be directed to TRADOC, ATOS, AV 680-3257/3930.