

First published in the March 1987 School Executive's Bulletin, this article is still relevant with the addition of HEPA filtered exhaust air, HEPA filtered recirculated air if any, and the strong suggestion to eliminate the use of lead projectiles. 3/15/02

- American Conference of Governmental Industrial Hygienists (ACGIH) industrial ventilation guide.
- Minimum volumetric air is $50 \text{ cfm} \times H \times W$.
- Recalculated air is a major health problem.
- Showers or protective clothing are strongly recommended to limit tracking pollution through the building and home.
- The best system so far is a large body of air moving slowly with a top jet of air to knock down the burble at the shooter's body.
- The ventilation must be adjusted to the specific range. Rifle stock interferes with the cartridge and is very difficult.

PISTOL/RIFLE RANGE. GUIDELINE EVALUATION

The Nassau County Department of Health has evaluated a number of indoor pistol and rifle ranges and found conditions, which pose a variety of unacceptable

health risks. These risks include the potential for exposure to high levels of lead, asbestos, noise, carbon monoxide and oxides of nitrogen.

As a result, Nassau County Health officials have provided the Education Department with guideline criteria for use in evaluating rifle ranges located in school district facilities. The criteria are reprinted below.

Design Considerations

1. Optimum air supply should provide a velocity of 75 fpm at the firing line. The minimum acceptable air velocity is 50 fpm at the firing line.
2. Filtered and conditioned air should be introduced behind the firing line with a distribution system to ensure even flow of air across the shooting positions.
3. Supplied air inlets should be located approximately 15 feet behind the shooter's position.
4. The entire range facility should be maintained at a slightly negative pressure with respect to adjacent areas to prevent the migration of air contaminants to adjacent areas. This criteria suggests that air should be exhausted at a rate 10% higher than the rate of air supply.
5. For maximum efficiency exhaust ducts should be located behind and at the apex of the bullet trap. An alternative location is to place the exhaust ducts on the side walls slightly in front of the apex of the bullet trap.
6. A minimum down-range conveying velocity of 35 fpm must be maintained.
7. When 75 fpm air velocity is provided a minimum 25% of the air should be exhausted 15-20 feet down-range of shooting position with remaining 75% at the bullet trap.
8. When 50 fpm air velocity is provided, 100% of the air should be exhausted down-range at the bullet trap.

9. All ranges should have their own ventilation systems to prevent the circulation of contaminated air to other areas of the building.
10. The supply and exhaust systems should be electrically interlocked, to ensure that both systems are operational when the range is in use.
11. Each range should be equipped with a floor drain and trap to facilitate cleaning by wet methods. The drain location should be approximately 20 feet down-range of the firing line. The floor should slope 2-3 inches toward the drain.
12. To minimize the effect of peak sound-pressure levels on individuals in the indoor range all reflecting walls should be covered with high efficiency sound absorbing material such as fiberglass insulation covered with perforated aluminum or steel sheets with openings equivalent to 10-15% of the area to permit sound absorption. The coverings should be designed to permit easy access to the acoustical material for periodic replacement. The floors directly behind the shooting booths should be covered with acoustical flooring (carpet that has good acoustical absorption characteristics).
13. Range officer quarters should be acoustically treated to minimize noise infiltration.
14. The bullet trap should never be anchored or attached to any structural support for the building. The energy of the bullet striking the trap can be transmitted as noise and vibration throughout the building.
15. The walls and surroundings should be painted in soft, contrasting pastel colors to reduce the dungeon-like effect.
16. The range should be equipped with range officers quarters, areas for cleaning of weapons and storing materials, and with toilet and washing facilities.
17. All air being exhausted from the range should be filtered using a High Efficiency Particulate Filter (HEPA) or equivalent.
18. Friable asbestos material should be removed from the range and replaced with non-toxic materials.

WORK PRACTICES

1. The ventilation system should be in operation at all times while the range is in use and during clean up.
2. Sweeping the range should be accomplished by vacuum cleaning or wet methods. Use of a hand broom, even with dust suppression compounds, should be prohibited.
3. At all times while cleaning, repairing, or reclaiming lead in the bullet trap, a NIOSH approved respirator should be worn to prevent the inhalation of lead dust and fumes.

4. Proper ear protection should be provided for and be worn by all individuals inside the firing area. The ear protectors should be selected on the basis of offering maximum protection.
5. Earplugs if used must be properly fitted.
6. In case of extremely loud weapons, both plugs and muffs should be worn simultaneously.
7. A hearing conservation program should be instituted and yearly audiometric examinations should be given to range personnel.
8. A rotation system is desirable for the range officer position. It is suggested that, where possible, a one month of duty be followed by three months of alternate activity. This rotation of duties is suggested not only to alleviate any possible lead absorption and prevent its accumulation, which should be minimum if proper design characteristics are incorporated in the range construction, but also to prevent undue physiological stresses associated with the position.
9. Eating, drinking, and smoking in the range should be prohibited.
10. A specific schedule should be established to perform maintenance and repair work to keep the range facilities operational with a minimum of potentially hazardous conditions.