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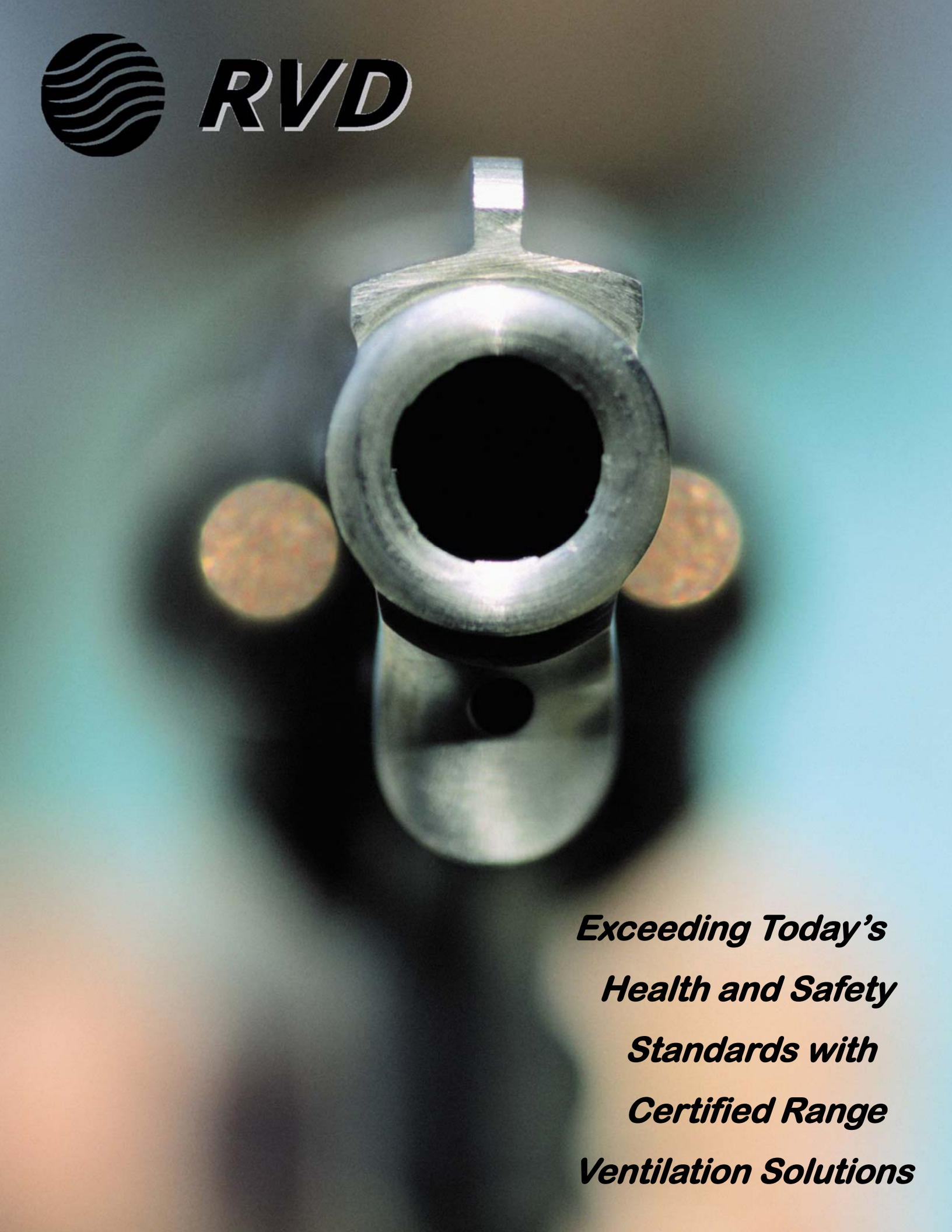


Exceeding Today's Health and Safety Standards with Certified Range Ventilation Solutions

The Silent Hazard: Airborne Lead Exposure

THE PROBLEM

Lead and Other Harmful Particulate/Gases Inhaled in the Breathing Zone

In today's day and age, law enforcement and military personal are facing ever-increasing challenges to their civic/military responsibilities. Firearms proficiency is necessary to insure their safety and the safety of the public/armed forces. To meet this objective, qualification shooting or training exercises are required over set time intervals to maintain firearm proficiency. Ironically, there is a negative consequence to additional training exercises which includes exposure to airborne lead, sulfur dioxide, carbon monoxide and other particulate/gas toxins which are all by-products of "live fire". These contaminants are produced and inhaled in the breathing zone of the shooter. Excess exposure to these contaminants can result in serious health concerns as documented by OSHA and medical field. Is not the occupation of law enforcement and active military duty not hazardous enough? Should they be subjected to the additional "silent hazard" of airborne lead exposure?

Inadequate Amount of Airflow

Many new construction and existing range ventilation systems do not introduce the correct *amount* of airflow into the firing range at the static and/or dynamic (tactical) firing lines. This is necessary to insure the contaminated air is removed from the breathing zone as quick as possible. Without the correct amount of airflow, even the most sophisticated range ventilation system may not meet the requirements of OSHA. It is also important that a range ventilation system engineer properly size and match the range ventilation system to accommodate any specific design requirements or unique condi-

Turbulent / Swirling Airflow in the Breathing Zone

Another common problem with range ventilation systems can be attributed to the range ventilation distribution system. This is the most important component of the range ventilation system and is typically located behind the shooting booths at the rear wall/ceiling. Incorrect design and placement can adversely affect its performance. A poorly designed range ventilation distribution system can introduce *turbulent* or *swirling airflow* into the firing range which can negatively affect the rate at which the contaminated air is removed from the breathing zone (even if there is a correct amount or quantity of airflow). Turbulent or swirling airflow has a tendency to recirculate contaminated air within the breathing zone of the shooter for an extended period. Extended exposure to contaminated air in the breathing zone only increases the likelihood of contaminated air being inhaled. A properly designed range ventilation distribution system will introduce airflow behind the shooter in a laminar or smooth fashion. Laminar airflow around the shooter and across the entire width and height of the firing range will increase the rate at which the contaminated air is

NIOSH, UFC, U.S. Navy, OSHA & EPA Compliance

Numerous range ventilation systems do not meet the design recommendations/standards established in the NIOSH 76-130 publication entitled "Lead Exposure and Design Considerations for Indoor Firing Ranges", the Department of Defense (DoD) Unified Facilities Criteria (UFC) and Technical Manual NEHC TM6290.99-10. Some range ventilation systems do not meet the OSHA, Occupational Safety and Health Administration, exposure limits for inorganic airborne lead. OSHA 29 CFR 1910.1025 establishes a permissible exposure limit (PEL) of 50 micrograms per cubic meter of air ($\upsilon g/m^3$) over an 8 hour time weighted average (TWA) with an "action level" of 30 micrograms per cubic meter ($\upsilon g/m^3$). In addition, range ventilation systems must meet the federal exhaust emission levels as established by EPA 40 CFR 50.12.

A Safe and Healthy Indoor Environment

THE SOLUTION

Correct Amount of Airflow

The correct amount of airflow must be introduced into the firing range to insure the lead contaminated air is removed from the breathing zone in a quick and efficient manner during “live fire” training exercises. A range ventilation system engineer will carefully analyze the range dimensions to insure the range ventilation system is properly sized for maximum performance both at the static and dynamic (tactical) firing lines. The range ventilation system engineer shall also accommodate any specific design requirements or unique conditions that may otherwise affect the amount of airflow introduced into the firing range.

Laminar Airflow

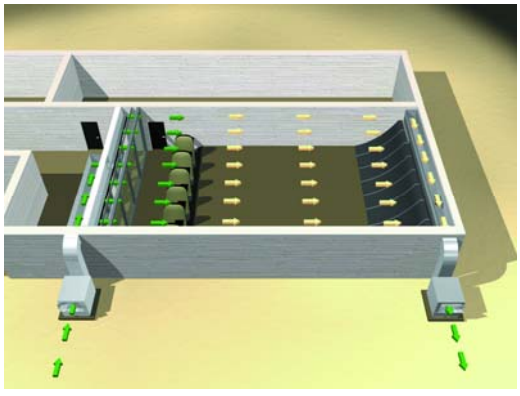
A range ventilation system engineer shall design a range ventilation system to provide laminar airflow at both the static and dynamic (tactical) firing lines. Laminar airflow at these firing lines will greatly enhance the performance of the system. Laminar airflow can be thought of as smooth or even airflow with only slight velocity variations at different levels and positions in space. Laminar airflow around the shooter and across the entire width and height of the firing range, at the optimal velocity of 75 feet per minute (fpm), will increase the rate at which the contaminated air is removed from the breathing zone.

Certified Solutions / Reduced Liability / Superior Design

A range ventilation system engineer shall design the range ventilation system to comply with NIOSH 76-130, UFC, Technical Manual NEHC TM6290.99-10, OSHA 29 CFR 1910.1025 and EPA 40 CFR 50.12. At the same time, they shall accommodate any specific design requirements or unique conditions. Our designers shall evaluate the total system design and its interaction with other mechanical systems in the building. They shall also evaluate the mechanical, electrical, plumbing, architectural, structural and civil requirements for the range ventilation system. We shall provide complete mechanical construction drawings along with as-built drawings after the project is complete. Range Ventilation Design has been designing range ventilation systems since 1996 with hundreds of successfully operating range ventilation systems worldwide.

System Types

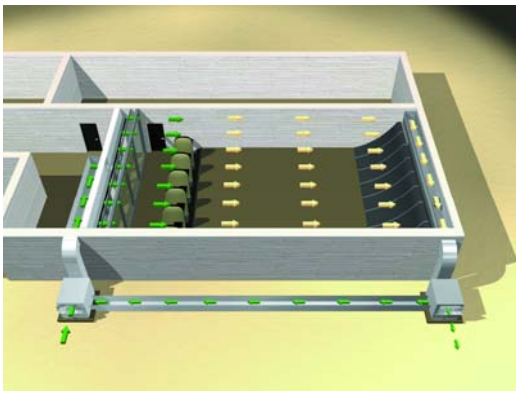
Purge System — 100% Outside Air



A *purge system* is the most common range ventilation system. This system introduces 100% outside air behind the shooter near the rear wall/ceiling at the range ventilation distribution system. The fresh outside air then travels across the firing line in a laminar or smooth fashion. At the firing line, the by-products of “live fire” introduce airborne lead, sulfur dioxide, carbon monoxide and other particulate/gas toxins which are all by-products of “live fire”. The laminar airflow quickly draws these contaminants away from the breathing zone and moves them downrange at 75 feet per minute (fpm). The contaminated air is then drawn into the exhaust system where 110% of the air is filtered and exhausted safely to the environment outdoors. A purge system is designed to maintain a 10% negative pressure or –0.04 inches of water column within the firing range at all times. This negative pressure insures that airborne lead, sulfur dioxide, carbon monoxide and other particulate/gas toxins do not “leak” or migrate outside the firing range and contaminate any adjacent areas or the environment outdoors. The exhaust air is filtered through two or ***three stages of filtration*** which includes 30% pre-filters, 90% intermediate filters (three stage only), and 99.97% final HEPA filters. Some purge system advantages include: lower installation cost, lower filter maintenance cost and an option for evaporative cooling. Some disadvantages include: higher operational utility costs and mechanical air conditioning is not feasible.

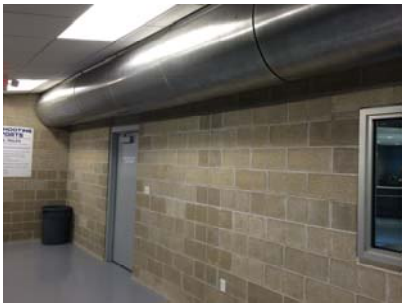
Recirculation System — 25% Outside Air with "*Eco Mode*"

A *recirculation system* will achieve the same results as a purge system but utilize different technology in achieving these results. A recirculation system shall filter and recirculate 75% of the airflow within the firing range, filter and exhaust 25%-30% of the airflow safely to the environment outdoors, and introduce 25% fresh outside air into the firing range. This system also delivers air behind the shooter near the rear wall/ceiling at the range ventilation distribution system. The filtered air then travels across the firing line in a laminar or smooth fashion. At the firing line, the by-products of "live fire" introduce airborne lead, sulfur dioxide, carbon monoxide and other particulate/gas toxins into the air stream. The laminar airflow quickly draws these contaminates away from the breathing zone and moves them downrange at 75 feet per minute. A recirculation system is designed to maintain a 10% negative pressure or –0.04 inches of water column within the firing range at all times. This negative pressure insures that airborne lead, sulfur dioxide, carbon monoxide and other particulate/gas toxins do not "leak" or migrate outside the firing range and contaminate any adjacent areas or the environment outdoors. The recirculated and exhaust air is filtered through 3-stages of filtration which includes 30% pre-filters, 90% intermediate filters, and 99.97% final HEPA filters. Some system advantages include: lower operational utility costs, an option for mechanical air conditioning and system application to existing firing ranges with construction restrictions. Some system disadvantages include: higher installation cost and higher filter maintenance cost.



RVD's recirculation systems do include our Revolutionary and Proprietary "Eco Mode" that limits the energy consumption directly to the number of shooters (less shooters, less energy consumption).

Laminar Airflow Systems and Controls



Radial Diffusers

The Laminar Airflow Radial Diffuser System is recommended when both performance and economy are required. It is available in various lengths but is typically 48 inches long. Radial Diffusers are specified when the distance from the rear wall to the shooter's booths' is 12 feet or more.

Airwalls

The Laminar Airflow Airwall System is the most advanced and accurate laminar airflow system available today. It is available with solid panels, clear vision panels and airdoor panels. An airwall is specified when the distance from the rear wall to the shooter's booths' is 12 feet or less.

Control Panels

The Range Ventilation Controls are an important and integral component that ensures the range ventilation system is operating safely and optimally. Illuminated indicators inform the user when it is "safe-to-shoot" or not. The control panels monitor and display all critical parameters. Range Ventilation Control panels are offered in direct digital controls (DDC) or standard analog controls.

Additional Literature Available Upon Request: CSI Specifications on all Systems & Equipment, Equipment Submittals, Design Guide and IOM

RVD

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Exceeding today's health and safety standards with certified range ventilation solutions

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