

## Feasibility of enclosing the Charlotte County Firing Range and possible challenges

### Civil Engineering

1. Review civil engineering component for additional retention area required.
2. Consider a Chiller Yard location

### Architecture/Structural

3. The existing structure would need to be enveloped by a new structure. A PEMB system might work here to clear span the width of the range. The PEMB would have insulations and openings as needed for access, maintenance, and HVAC requirements (louvers)
4. Add Lobby and vestibules for safe access to and from the range.
5. Add ancillary spaces for MEP and restrooms, etc.
6. Coordinate Life Safety and egress.
7. Additional soundproofing likely required.

### HVAC System Design Recommendations:

8. **100% Outside Air Supply:**  
ASHRAE recommends **100% outside air** for the supply system in indoor firing ranges. This prevents recirculation of contaminated air, which is critical in environments where lead dust and other harmful particulates are generated.
9. **No Air Recirculation:**  
Air from the range must **not be recirculated** back into the HVAC system or other occupied spaces. It should be **exhausted directly outdoors**.
10. **Minimum of 10 to 12 air changes per hour** for the entire firing range area.
11. **System Type:** Given the facility size and the large amount of outside air, a chilled water system is recommended. This will provide better dehumidification and comfort control over a DX type system.
12. Consider creating a chiller system large enough for the site and its future build out

### Fire Protection

13. Determine if FP is required. Infrastructure requirements to be confirmed.

### Electrical

14. Lighting upgrades for Range and other interior spaces.
15. We will be affecting the electrical (is the service size adequate?): The expectation is that the AC equipment required to ventilate the space and cool it will add too much electrical load for the existing electrical service capacity, and we'd need to add more electrical capacity. If they "ventilate only" the electrical may be able to handle the added fans.

ASHRAE provides specific guidelines for the design and operation of enclosed indoor gun firing ranges, focusing on ventilation, air quality, and safety.

**Key ASHRAE Recommendations:**

**1. Ventilation and Airflow:**

- **Supply Air:** Introduce supply air near the shooter's breathing zone, ideally about 15 feet behind the firing line, using a laminar-flow plenum wall or ceiling-mounted diffusers. This ensures smooth, unidirectional airflow away from the shooter.
- **Exhaust Air:** Exhaust air should be removed at or behind the bullet trap, with a minimum duct air velocity of 2,500–3,000 feet per minute (fpm) to effectively capture contaminants.
- **Air Velocity:** Maintain a minimum of 50 fpm at each firing lane, with 75 fpm being optimal. Downrange airflow should be at least 35 fpm to ensure contaminants are carried away from the shooting area.

**2. Negative Pressure:**

- The range should operate under a slight negative pressure, exhausting approximately 3% to 7% more air than is supplied. This helps prevent the escape of contaminants into adjacent areas.

**3. Filtration:**

- **Supply Air:** Use MERV 7 prefilters for once-through systems.
- **Recirculated Air:** Employ MERV 14 prefilters and HEPA filters (with bag-out removal) for systems that recirculate air.
- **Exhaust Air:** Utilize MERV 6 prefilters and HEPA filters to capture airborne particles before exhausting air outside.

**4. System Operation:**

- The ventilation system must operate during all shooting activities, cleanup, and for at least 30 minutes after shooting.
- Supply and exhaust fans should be interlocked to ensure simultaneous operation.
- If heat recovery systems are used, they must be designed to prevent the reintroduction of lead fumes and toxic gases into the facility.

**5. Acoustic Considerations:**

- Install sound traps and acoustic lining in supply and return ductwork to minimize noise transmission.
- Use low-velocity, low-static-pressure fan systems and special low-noise diffusers to control noise during all modes of operation.

**6. Independent HVAC System:**

- Design the range's HVAC system to be completely independent from the building's general HVAC to prevent cross-contamination of air.

**7. Additional Safety Measures:**

- Ensure that weapon cleaning and ammunition storage areas are exhausted and maintained at negative pressures.
- Maintain positive pressure in other areas of the facility to prevent the infiltration of contaminants.
- Install alarms to indicate when the ventilation system is not operating properly.