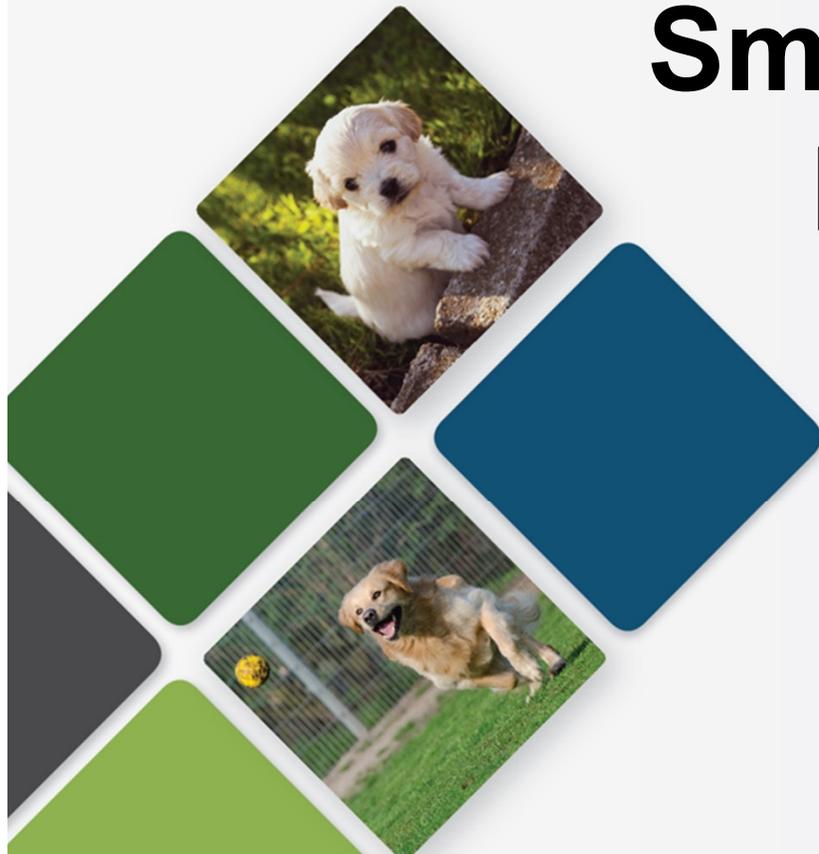




Small Animal Facility Ventilation



Presented by
Brent Brown
Osborne Industries, Inc.

About



- **Brent Brown, Presenter**

- Engineering Manager at Osborne Industries, Inc., Osborne, KS
- Began career 26 years ago as Project Engineer
- Primary focus on ventilation product and system design for animal facilities
- Degree in Mechanical Engineering from KSU
- State of Kansas Professional Engineer

- **Osborne Industries, Inc.**

- Diversified manufacturer
 - Animal management equipment (feeding, weighing ventilation)
 - Custom thermosetting-composite parts for other companies
- 242,000+ ft² manufacturing, office, warehousing space
- 100% Employee Owned
- 100+ employees in manufacturing, administration, sales, engineering, etc.



Types of Facilities

- Indoor housing for dogs, cats, other small animals
- Boarding kennels
- Training kennels
- Pet stores
- Rescue shelters
- Veterinary clinics
- Grooming facilities



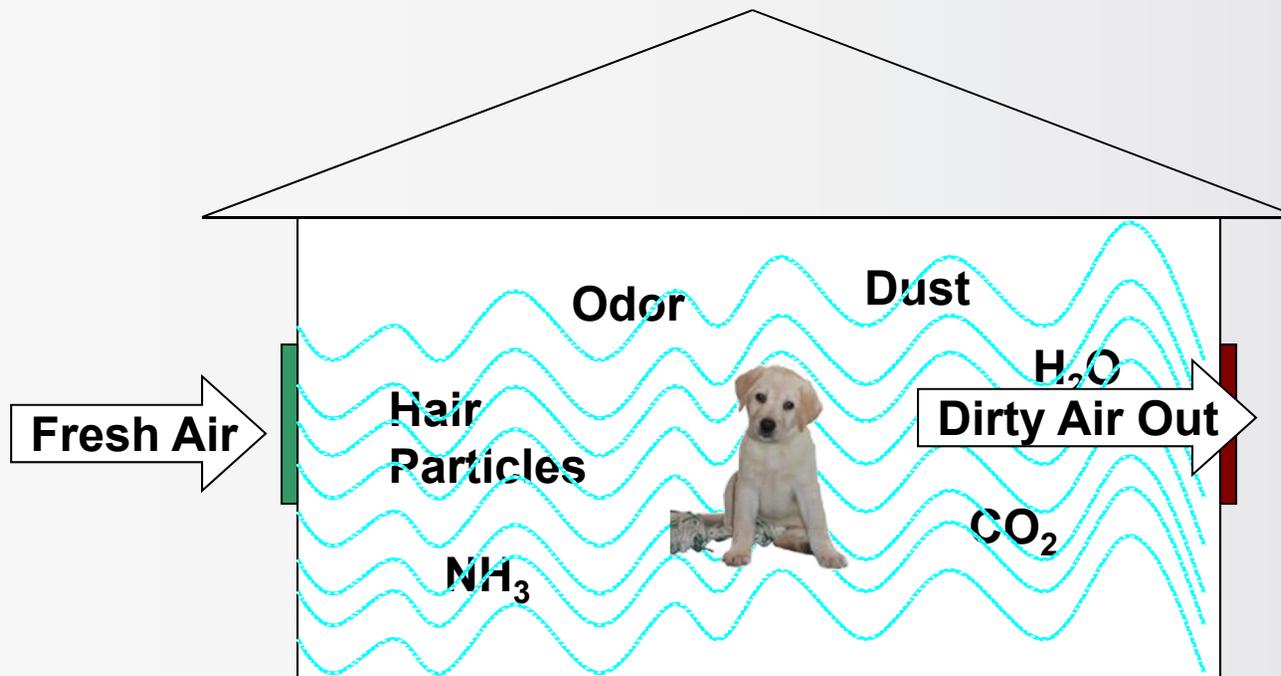
Making Ventilation a Priority

- Often overlooked when constructing new facility or converting existing structure.
- Emphasis put on size, layout, building materials, lighting, insulation, heating and cooling systems.
- Non-ventilated spaces occupied with animals experience excessive condensation and moisture, odors and overall poor air quality.
 - Especially problematic in tightly sealed buildings.

Why is Ventilation Important?

- For good health of animals / humans inside facility
 - Help prevent respiratory problems and spread of disease
 - Healthy = Happy
- To create a comfortable indoor environment
 - For animals, workers, customers / visitors
 - Less stress
 - More productive
 - Better eating habits
- To control moisture and odors
 - Remove toxic gases (ammonia, methane, carbon dioxide, hydrogen sulfide)
 - Remove water vapor
 - Prevent condensation on walls, penning, equipment
 - Prevent corrosion of facilities

What is a Ventilation System?



Exchanging foul, indoor air with toxic gases, dust, and odors for fresh, clean outside air while distributing and mixing fresh air to prevent uncomfortable drafts.

Goals of a Ventilation System



Photo: PineTree Pet Care Center, Guelph, ON, Canada

1. Provide evenly distributed fresh air at all times without drafts or “dead spots”
2. Maintain steady room temperature – all year long
3. Remove gases, odor, moisture from water supplies, feces, urine, animal respiration

Evenly-Distributed Fresh Air Without Drafts

- **Fresh air is important to success of operation.**
 - Low air quality can adversely affect animal productivity and health of those who care for animals
 - Fresh air keeps animals healthy and raises the spirits of employees
- **Good ventilation makes good sense.**
 - Bringing fresh, clean air in is very important, but it must be introduced into room and mixed properly for most benefit to animals and employees.
- **System must be designed to control speed and direction of movement of fresh air**
 - Especially important in wintertime.
 - In warm weather conditions, creating air movement past occupants can prove to be beneficial, but must be carefully controlled.
 - Too much air movement creates undesirable drafts, but cold drafts in winter are especially detrimental to health of animals.

Maintain Steady Room Temp.

- Controlling temperature inside facility is most obvious function
 - If room temp. rises, system must be able to detect change and automatically respond to control rise.
- Control especially important in wintertime
 - Must conserve heat / room temp., while maintaining enough air exchange to expel gases and moisture.
 - Must provide replacement air that mixes incoming cold, fresh air with room air before reaching occupant level – avoid creating cold drafts.
- Control most difficult in Spring / Fall
 - High variation in daytime and nighttime temps.

Seasonal Ventilation

- All systems must be designed for seasonal temperature changes – especially in Kansas
 - Winter
 - Provide minimum amount of air exchange required to remove toxic gases and moisture.
 - Spring/Fall
 - Most critical of all seasons due to constant day and night temperature variation. Requires automatic variation of airflow.
 - Summer
 - Move large volume of air over animal or activate air conditioning system. If AC is used, air exchange must be lowered to not exhaust too much cooling.

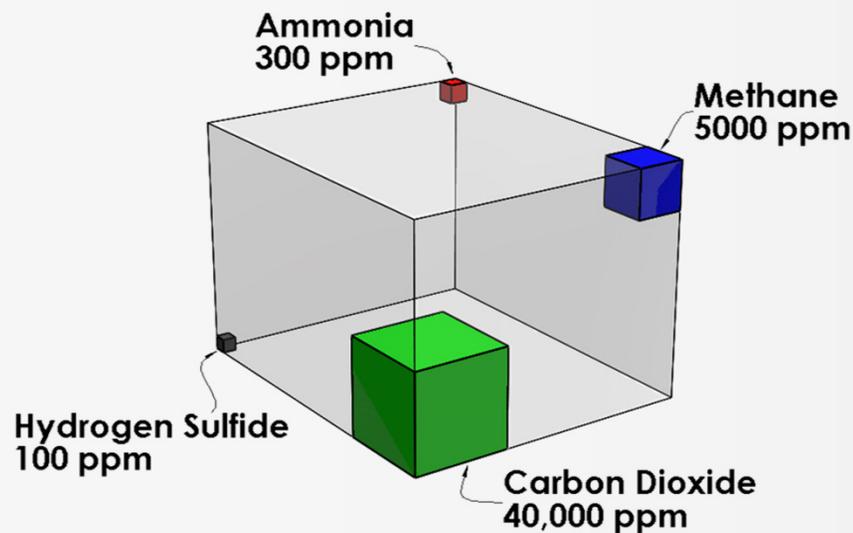
Remove Moisture

- Water vapor must be removed to minimize humidity
 - Not usually toxic, but continuous, high-humidity is harmful.
 - Causes stress
 - Corrodes facility and equipment
 - Consider effects of humidity before reducing / eliminating ventilation in winter
 - Beware: turning off ventilation costs **more** than immediate savings in heating bills



Remove Gases & Odor

- Don't let gas concentrations reach dangerous levels

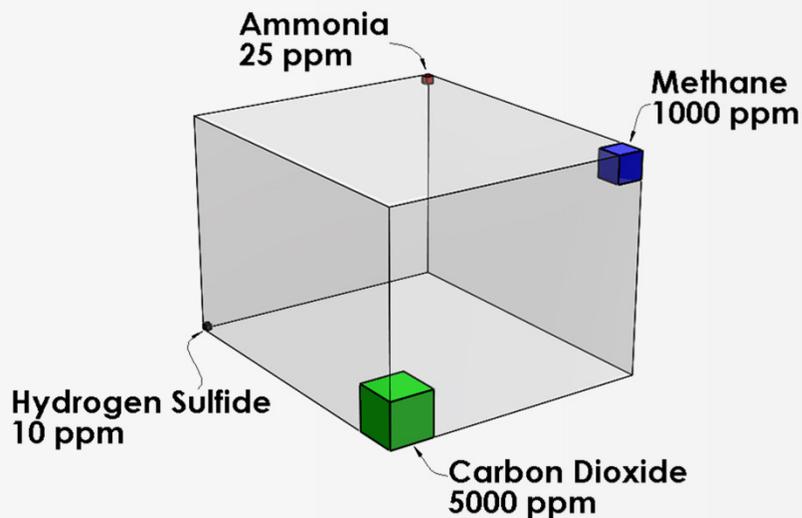


IDLH (Immediately Dangerous to Life and Health)

- Feces emit methane, ammonia, hydrogen sulfide, carbon dioxide
- High concentration can be toxic
- Ammonia 0.03%
- Methane 0.50%
- Carbon Dioxide 4%
- Hydrogen Sulfide 0.01%

Remove Gases & Odor

- Toxic gases must be removed to minimize respiratory problems in animals and employees



REL (Recommended Exposure Limit)

- Keep gas concentrations at or below safe exposure levels
- Ammonia 0.0025%
- Methane 0.1%
- Carbon Dioxide 0.5%
- Hydrogen Sulfide 0.0001%

Achieve Goals Simultaneously

If any one goal of system is achieved, but at expense of others, then must find another way to accomplish total ventilation task.

- For example:
 - If kennel is too cool in wintertime, reducing / interrupting rate of air exchange will raise room temperature, but also humidity and odor/gas concentrations.
 - Solution? Phase-in properly sized heater that is integrated into total ventilation system.
 - Should be controlled to automatically adjust to preserve heat
 - Continue to provide the winter minimum air exchange so temperature is controlled without sacrificing air quality.

Components of Complete Ventilation Systems

- Exhaust Fans
- Circulation Fans
- Fresh Air Inlets
- Controls
- Manager

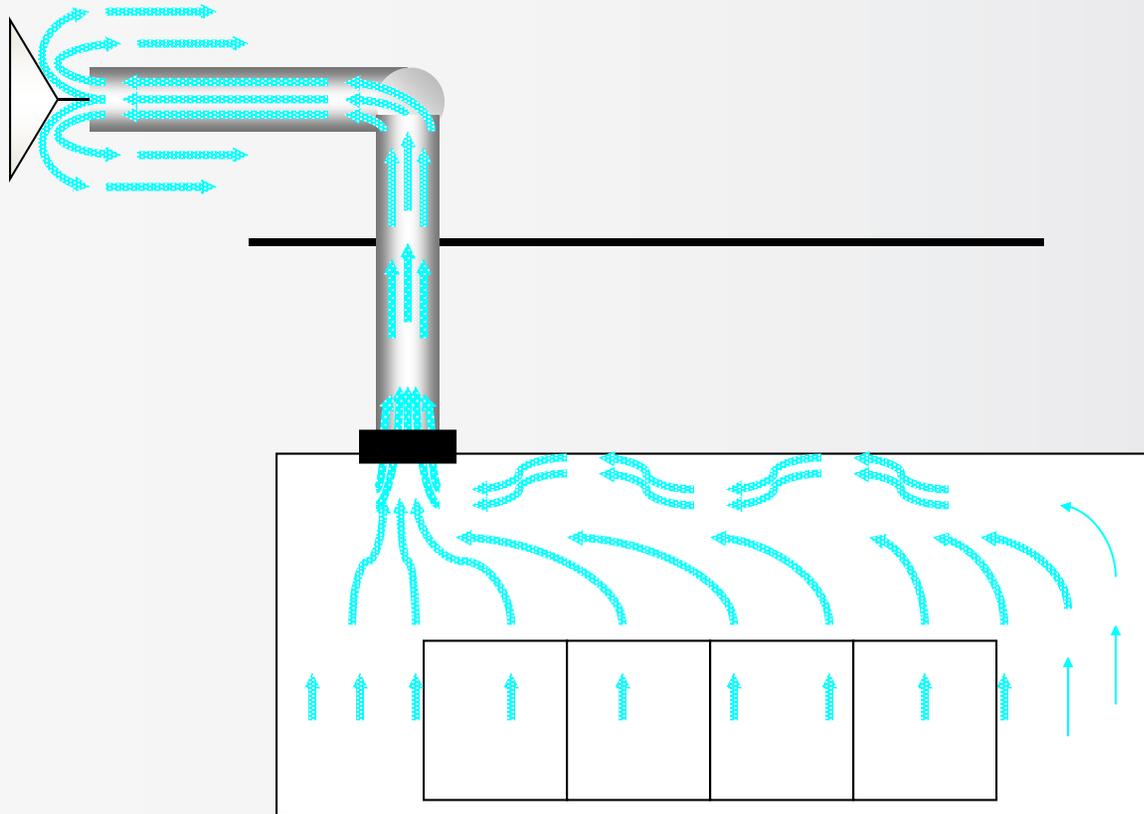


Exhaust Fans

- **Pump out contaminated air from space**
 - Single or multiple fans, depending on size of space
 - Must work reliably in corrosive environment – long-term performance
 - Provide smooth, uniform air exchange – high-quality construction (non-porous fiberglass-reinforced composite)



Exhaust Fans



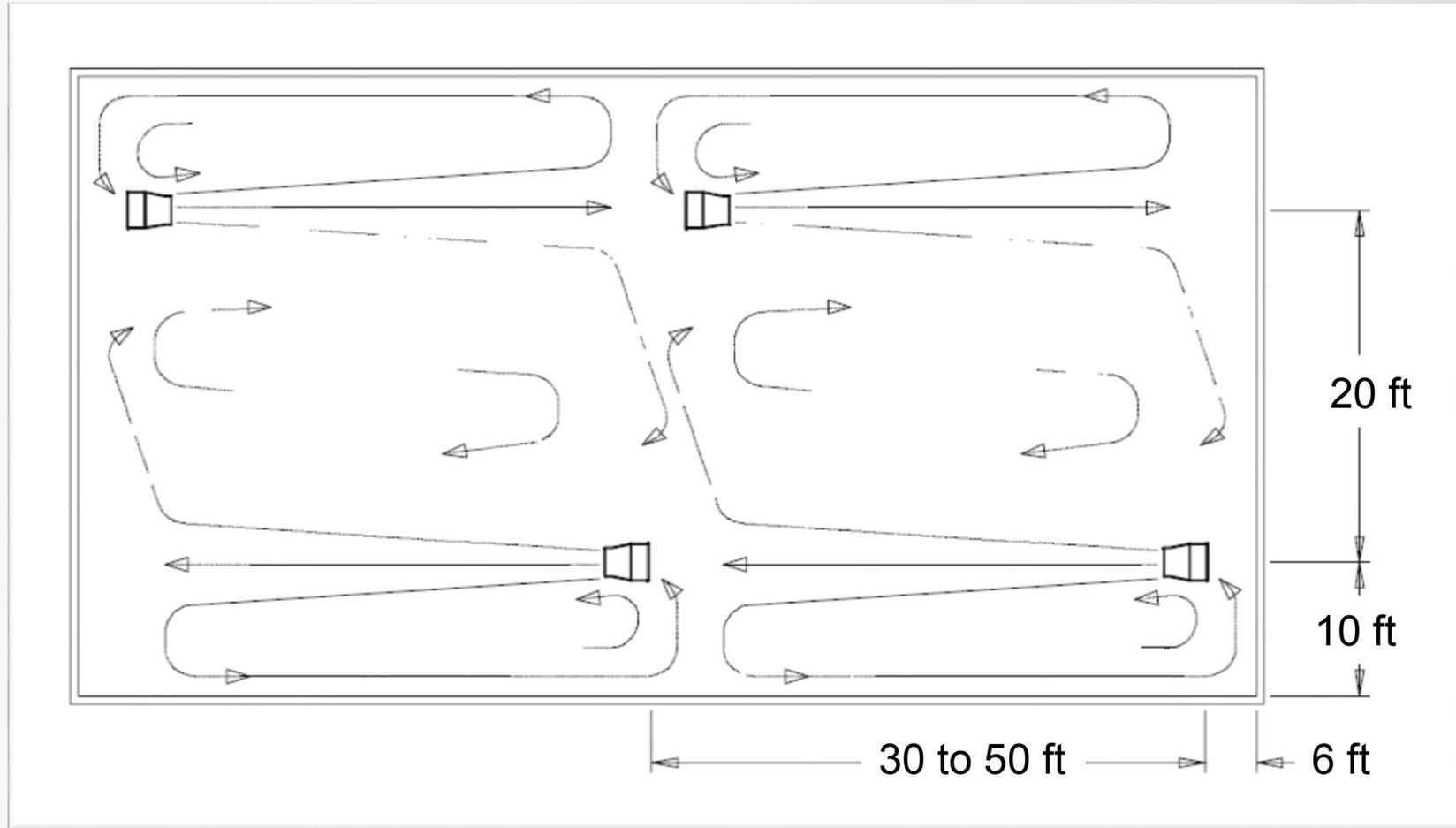
Remove contaminated air with smooth, uniform air exchange throughout the room.

Circulation Fans

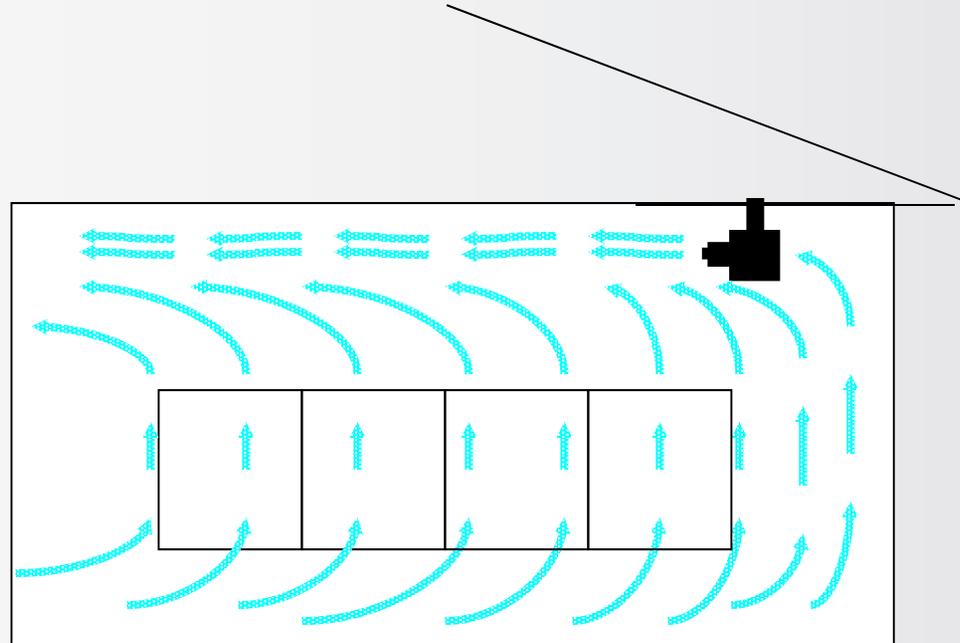


- **Distribute fresh air**
 - Mixing of room air results in more uniform floor to ceiling temperatures
 - Improves removal of gasses and humidity
 - Improves animal / worker comfort, health, heat removal
- **Provide cooling during periods of heat**
 - Reduces cycling of heater or air conditioner

Typical Circulation Fan Placement



Circulation Fans



Circulation Fans blend air evenly throughout room and moves it toward Exhaust Fans where contaminated air is removed.

Fresh Air Inlets

- **Control entry of outdoor air**
 - Most important component
 - Exhaust fans create vacuum or “negative pressure” (air pressure inside is less than air pressure outside)
 - Negative pressure causes air inlets to work by opening and controlling the flow rate, direction and speed of the incoming fresh, clean air.
 - Direction and speed of air is very important
 - Ensures mixing, distribution and tempering of the incoming air before it reaches animals
 - Controlled response matches rate of incoming fresh air to the rate of outgoing room air (being expelled by exhaust fans).



Wall Inlet



Roof Inlet



Ceiling Inlet

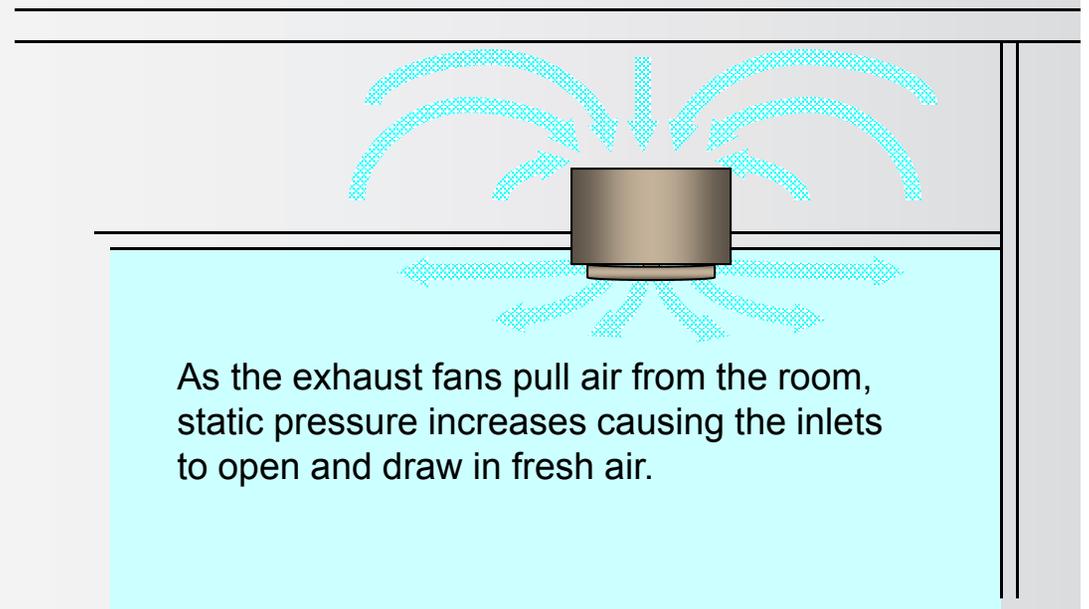
Fresh Air Inlets – Wall Inlets



- Unobstructed airflow opening
- Optimal exit air velocity
- Air directed toward ceiling
- Ideal air mixing w/o drafts
- Automatic operation
- Wind protection

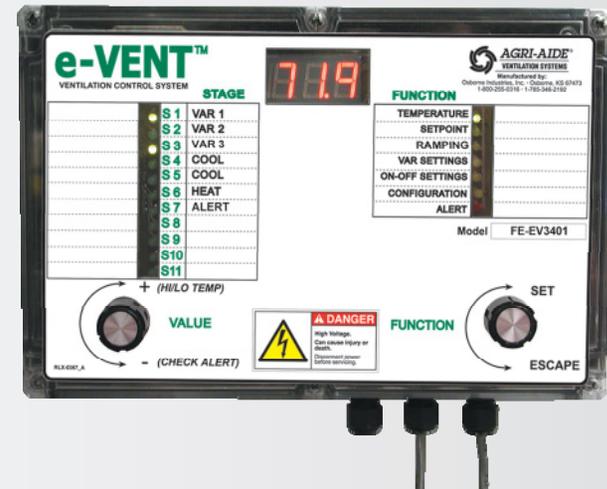
Fresh Air Inlets – Ceiling Inlets

- No condensation
- 360° unobstructed air discharge
- Optimal exit air velocity
- No cold air drafts
- Automatic operation
- Back draft protection
- Ideal air mixing design



Controls

- **Tell exhaust and/or circulation fans how to operate**
 - Simple on/off switch
 - Manual variable-speed unit
 - Fully-integrated type – manages exhaust fans, circulation fans, heaters and air conditioners
- Appropriate control ensures ventilation equipment works together to maintain optimum efficiency and comfort.

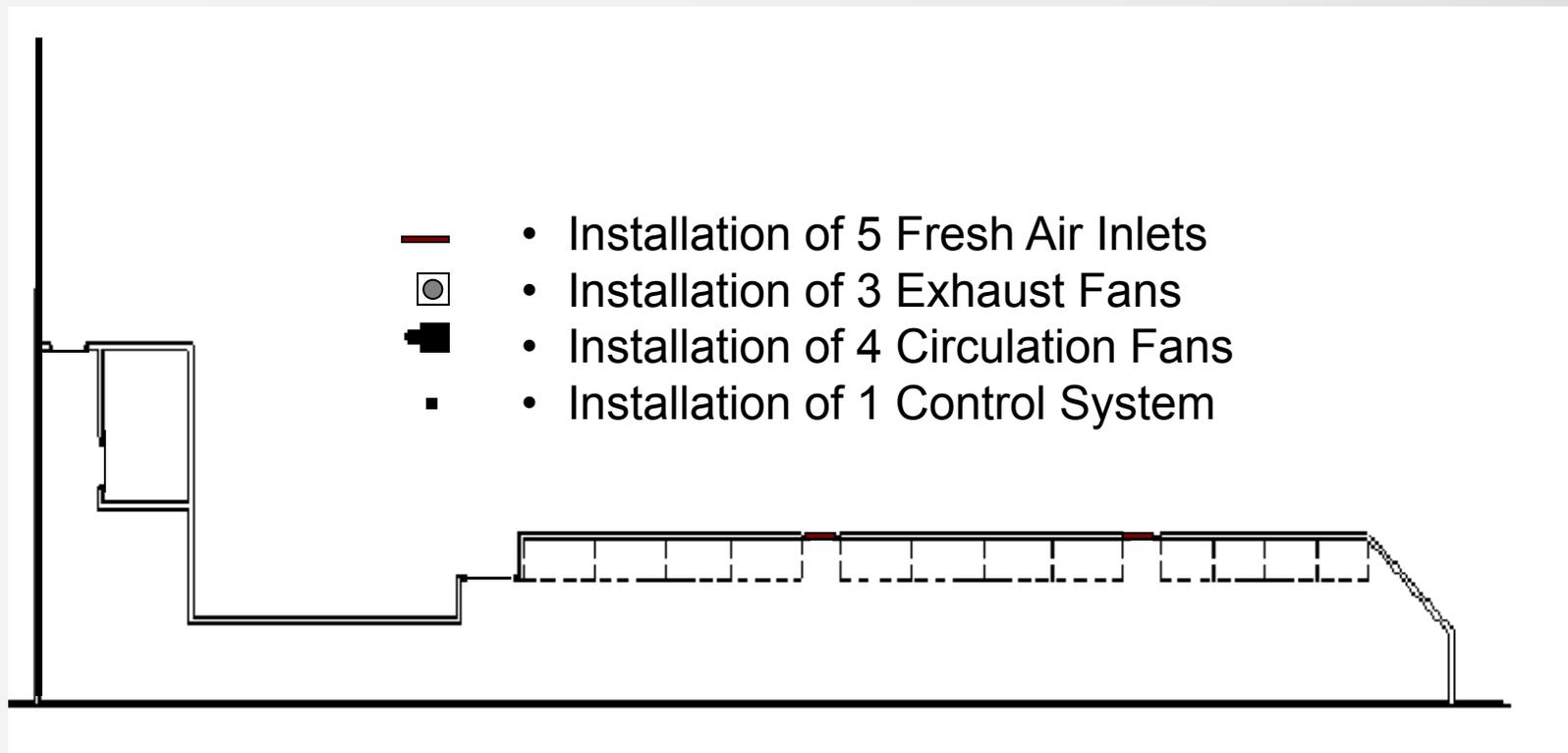


Manager

- Must understand ventilation system
- Have knowledge of system components, how they work together, how to necessary adjustments throughout the year
- Maintain equipment with periodic inspections

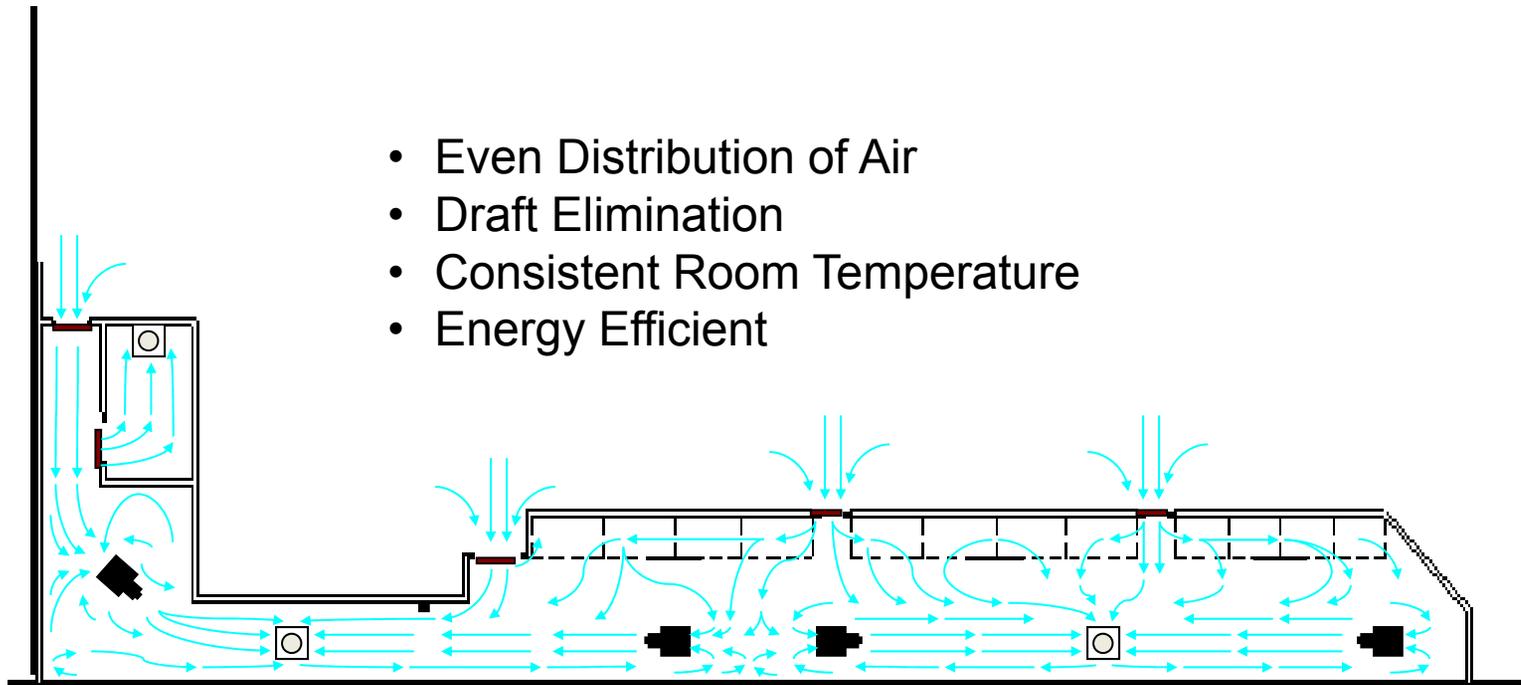


Retail Store Ventilation System Installation

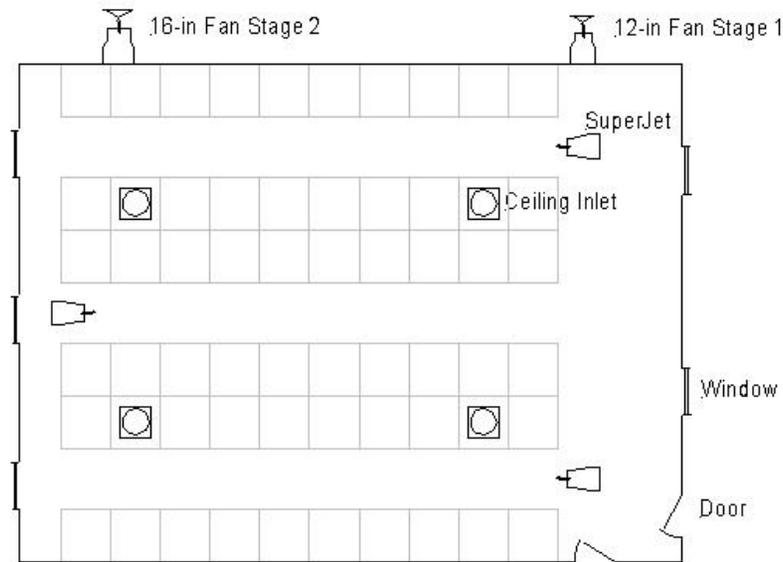


Retail Store Ventilation System Air Movement

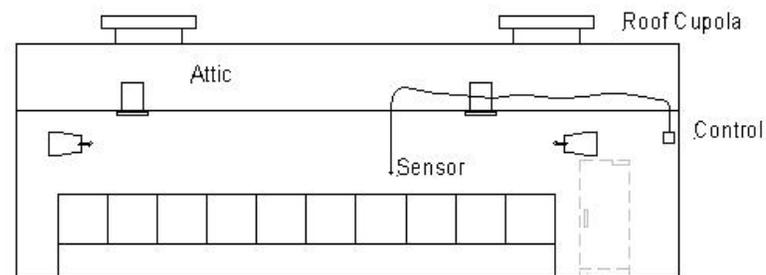
- Even Distribution of Air
- Draft Elimination
- Consistent Room Temperature
- Energy Efficient



Training Kennel with All-Season Ventilation

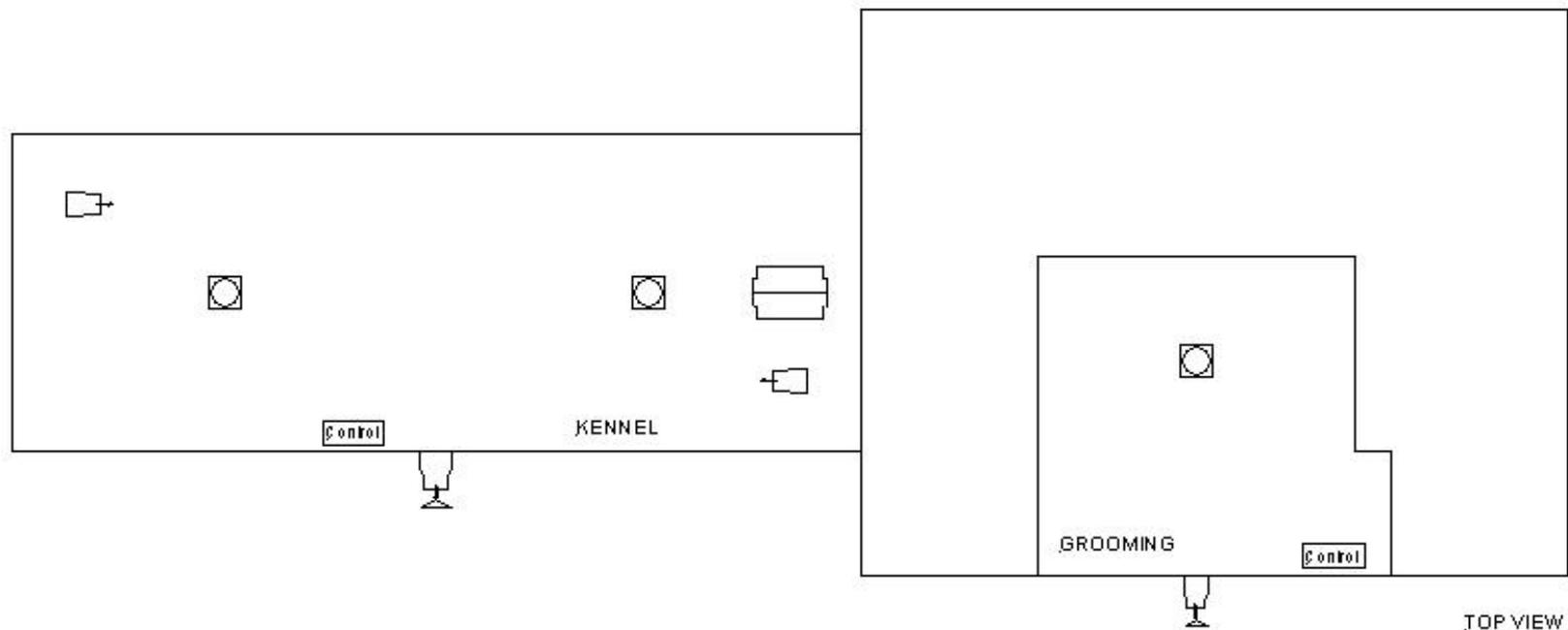


TOP VIEW

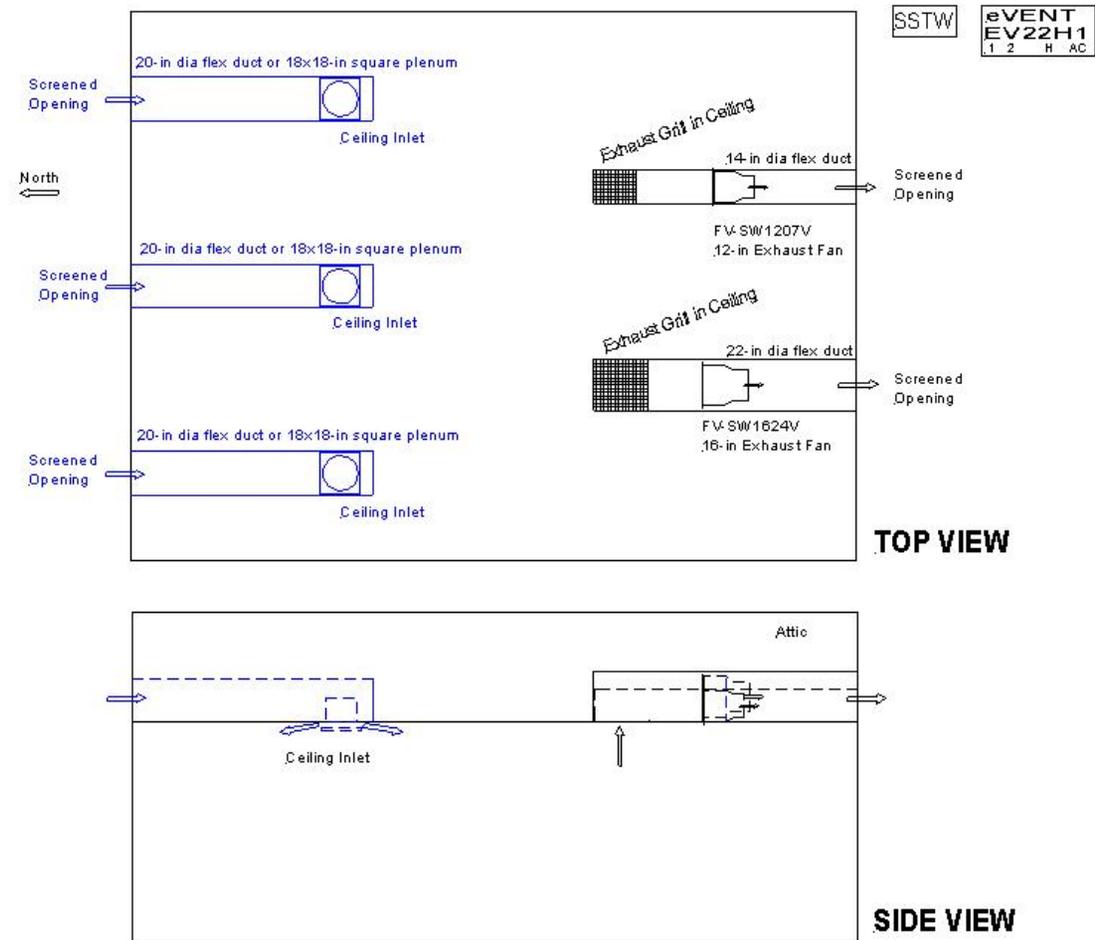


SIDE VIEW

Boarding/Grooming Kennel with Minimum Ventilation



Rescue Shelter with All-Season Ventilation



Features & Benefits

- Provides fresh air
- Removes toxic gases
- Removes odors
- No drafts
- Reduces moisture
- Maintains room temperature
- Happier and healthier animals
- Happier and healthier employees!
- Increased store traffic
- Customers stay longer (no odor!)
- Increase inventory turnover!

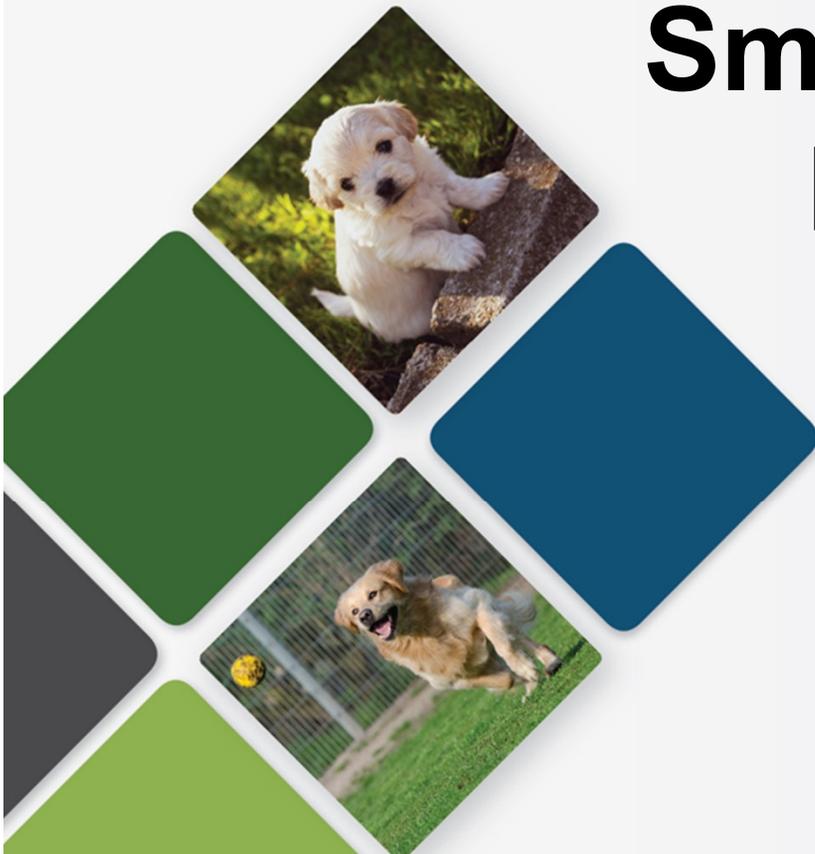
Summary

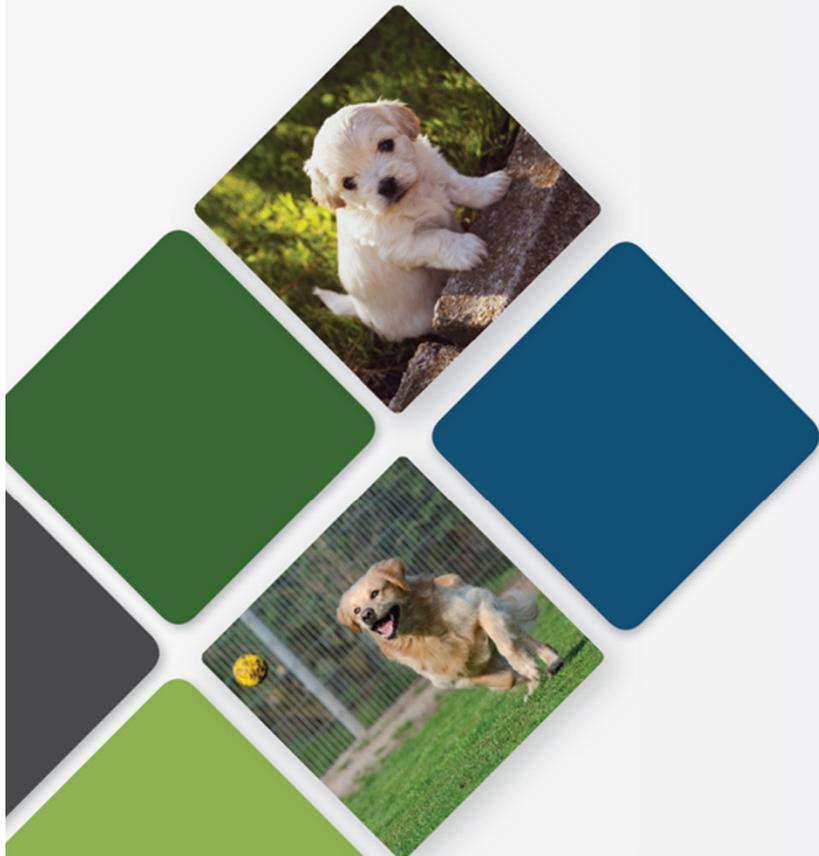
- Where ventilation is needed
- Why ventilation is important
- Definition of ventilation system
- Goals of ventilation system
- Components of ventilation system
- Features and benefits of a ventilation system



Small Animal Facility Ventilation

Questions?





Thank You