WEBCAST

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PORKcast ONLINE SEMINARS

Emergency Ventilation for Hog Barns

Mike Brumm, Brumm Swine Consultancy

Manure application season will arrive soon—and it's never too early to consider ventilation maintenance and procedures that can improve worker and animal safety. This PorkCast will address ventilation management during manure pit agitation and pump-out.

Emergency Ventilation for Hog Barns will address:

- Causes and prevention of ventilation failure
- Recommended ventilation procedures during manure agitation and pumping
- Causes of pig death during ventilation failure
- Safety measures during manure agitation and pumping
- Emergency procedures and action plans

Pig Deaths During Pumping

- Only 22% of barns with deaths had curtains open
- Only 43% of barns with deaths had pit fans on
- 94% of deaths at medium to high agitation
- 67% of deaths on relatively calm days
- 29% of deaths on days with >20 mph wind

UMN survey

Pit Pumping Protocols

- **NEVER** allow people in a building being pumped
  - Lockout Tags
  - Yellow warning tape?
  - Physical barrier?

Lockout Tag Contacts:

Minnesota Pork Board
Iowa Pork Producers Assn
Illinois Pork Producers Assn

Pit Pumping Protocols

- Someone on site at all times
  - Emergency Address of site

57903 841 Rd, Hogtown, MN

vs

Jones Tunnel Site 2 miles west of Hogtown

Pit Pumping Protocols

- Someone on site at all times
  - Emergency plan

Emergency Action Plans for Minnesota Pork Producers

A pork producer's Emergency Action Plan provides detailed information on what to do if there is an accident or emergency at your livestock facility, such as a manure spill. While an emergency action plan is not a state or federal requirement, it is a good idea because a well-designed and implemented emergency action plan can…

- Reduce the severity of the emergencies
- Reduce risk to humans and animals
- Reduce economic loss
- Reduce potential environmental pollution

Keep a copy of the plan with your manure management plan, production record, or somewhere else that is easily remembered and assessible to you, employees and family members.

ACTION PLAN PIECES

An emergency action plan has four elements: 1) plan of action to prevent the release of manure, or prevent environmental contamination; 2) detailed map of the site and application fields; 3) list of contact names and numbers that is posted near the phone; 4) and a clean-up plan.

Pit Pumping Protocols

- Someone on site at all times
  - Emergency contact information

    MPCA/DNR/DEQ

    Dirt work

    Sheriff

    Rescue

Pit Pumping Protocols

- All fans in facility work!

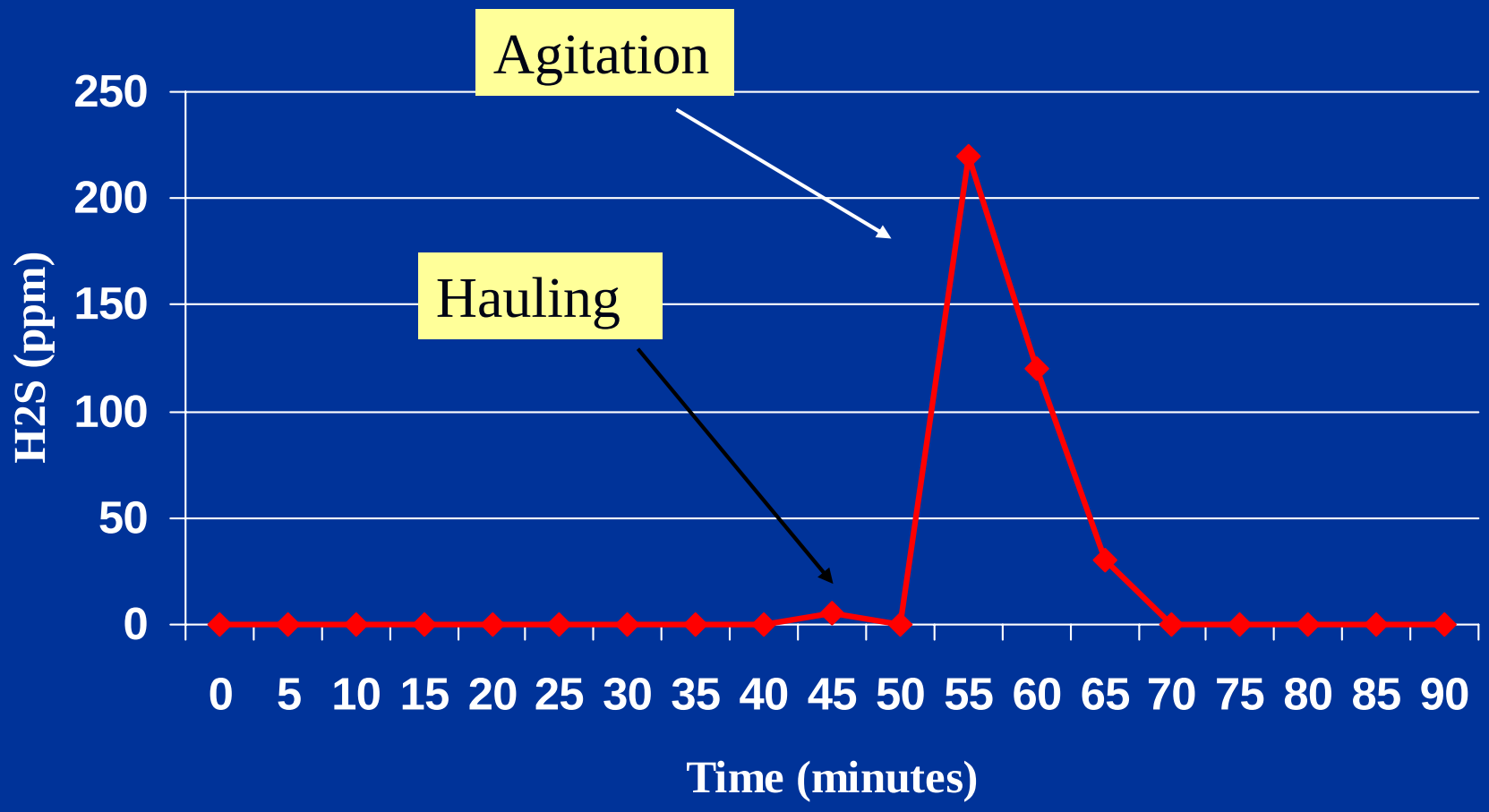
Pit Pumping Protocols

- Agitation
  - Avoid "rooster-tailing" & splashing
  - Uncover only one port at a time
  - Cover port with a tarp

Pit Pumping Protocols

- Agitation
  - Consider **NO AGITATION** until 1-1.5 ft of removal

Hydrogen Sulfide Spikes



Patni & Clarke, 1991

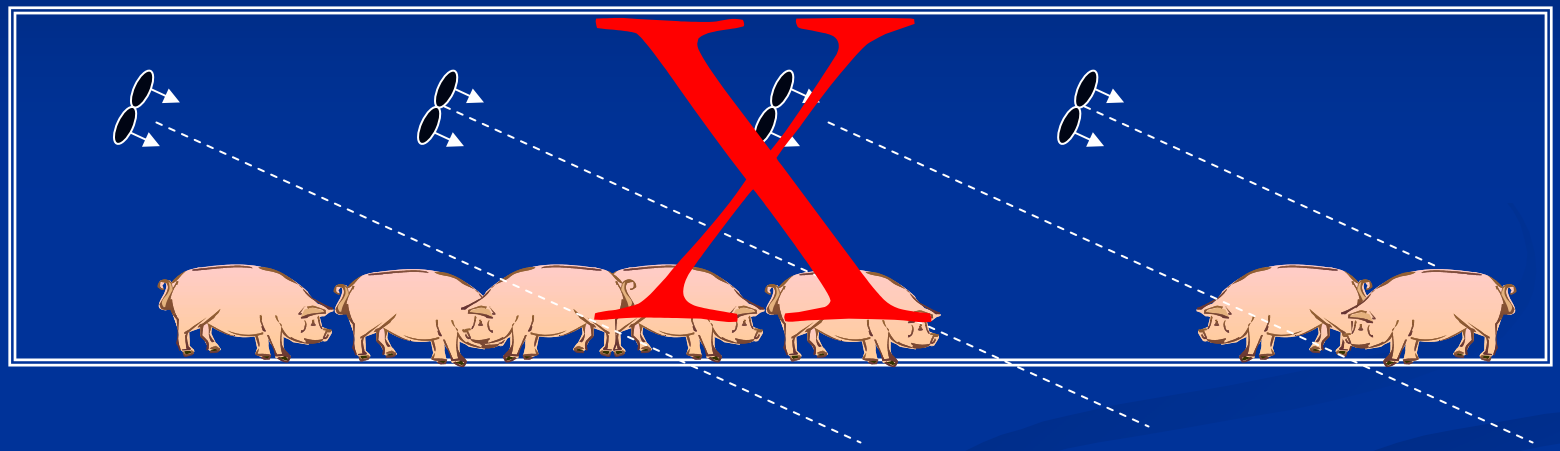
Pit Pumping Protocols

- **Curtain Barn Ventilation**
  - Cold Weather
    - Big Pigs – close curtain
      - all fans ON
    - Little Pigs – 50% of fan capacity minimum
    - Reduce static pressure to reduce pit pulling of air – 400 vs 800 fpm inlet velocity

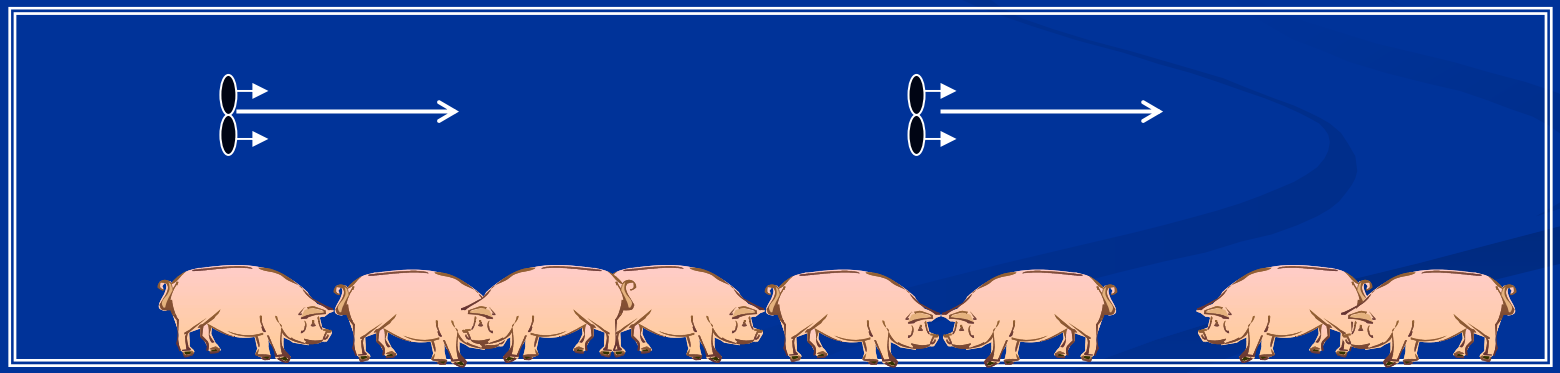
Stirring Fans

Stirring Fans

Fans Used for Supplemental Cooling

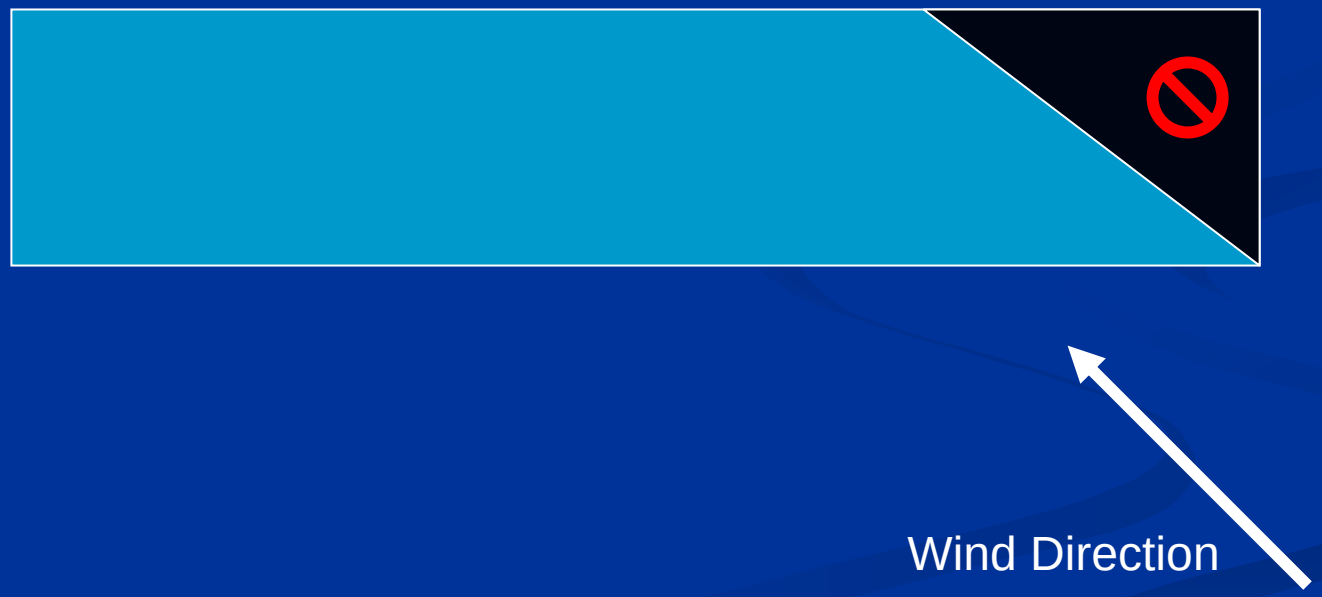


Fans Used for Distributing Air



Pit Pumping Protocols

- Ventilation – Curtain Barns



Pit Pumping Protocols

- **Curtain Barn Ventilation**
  - Warm Weather
    - > 5 mph breeze
      - Open curtains + all fans ON
    - < 5 mph breeze
      - Winter ventilation strategy

Pit Pumping Protocols

- **Tunnel Barn Ventilation**
  - Cold Weather
    - All pit fans + 36” at minimum
    - Partially open tunnel curtain
      - 400 fpm velocity at curtain/inlets
      - Reduced static pressure

Figure 3. Air Intake Velocity and Static Pressure Relationship

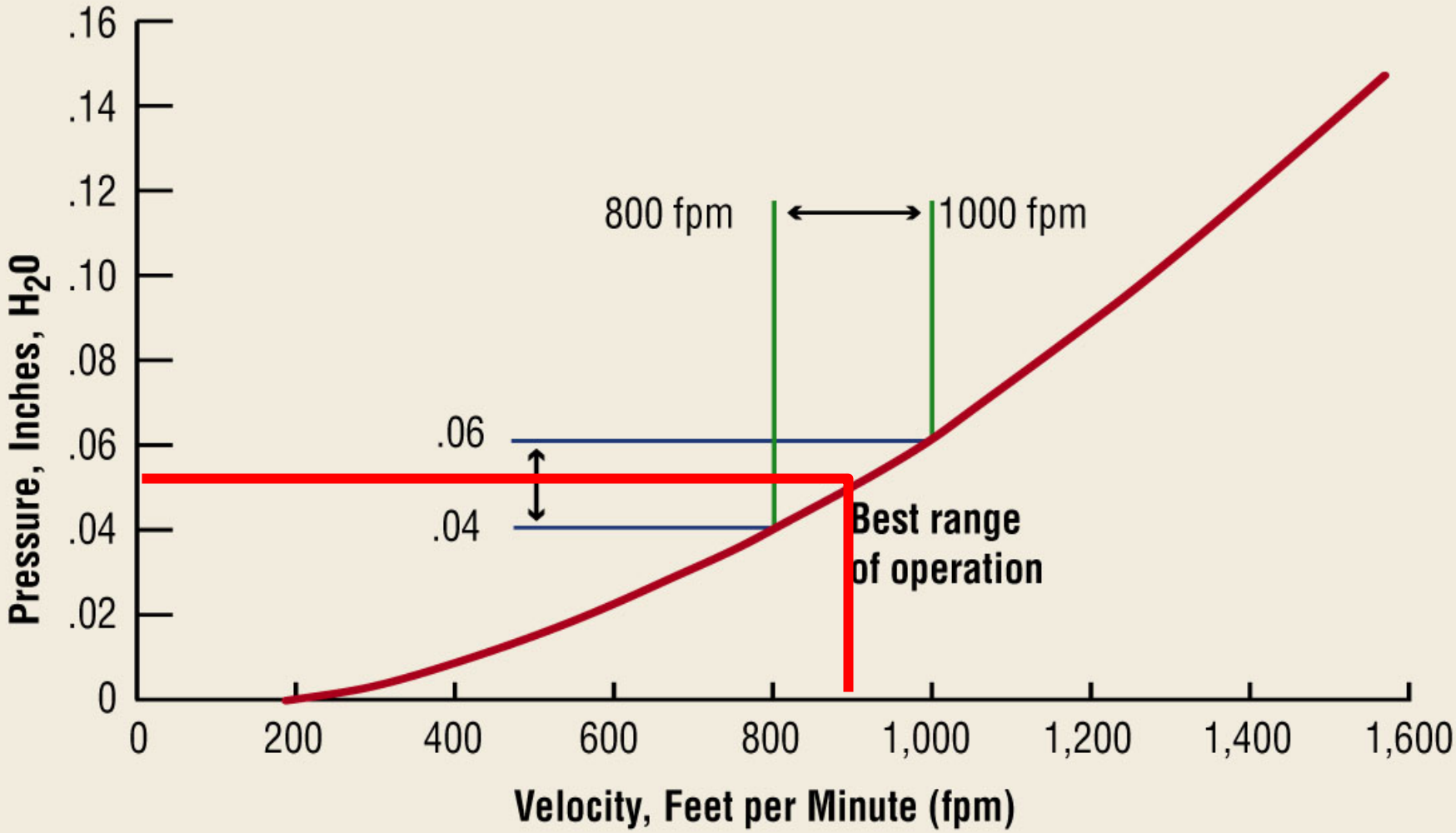
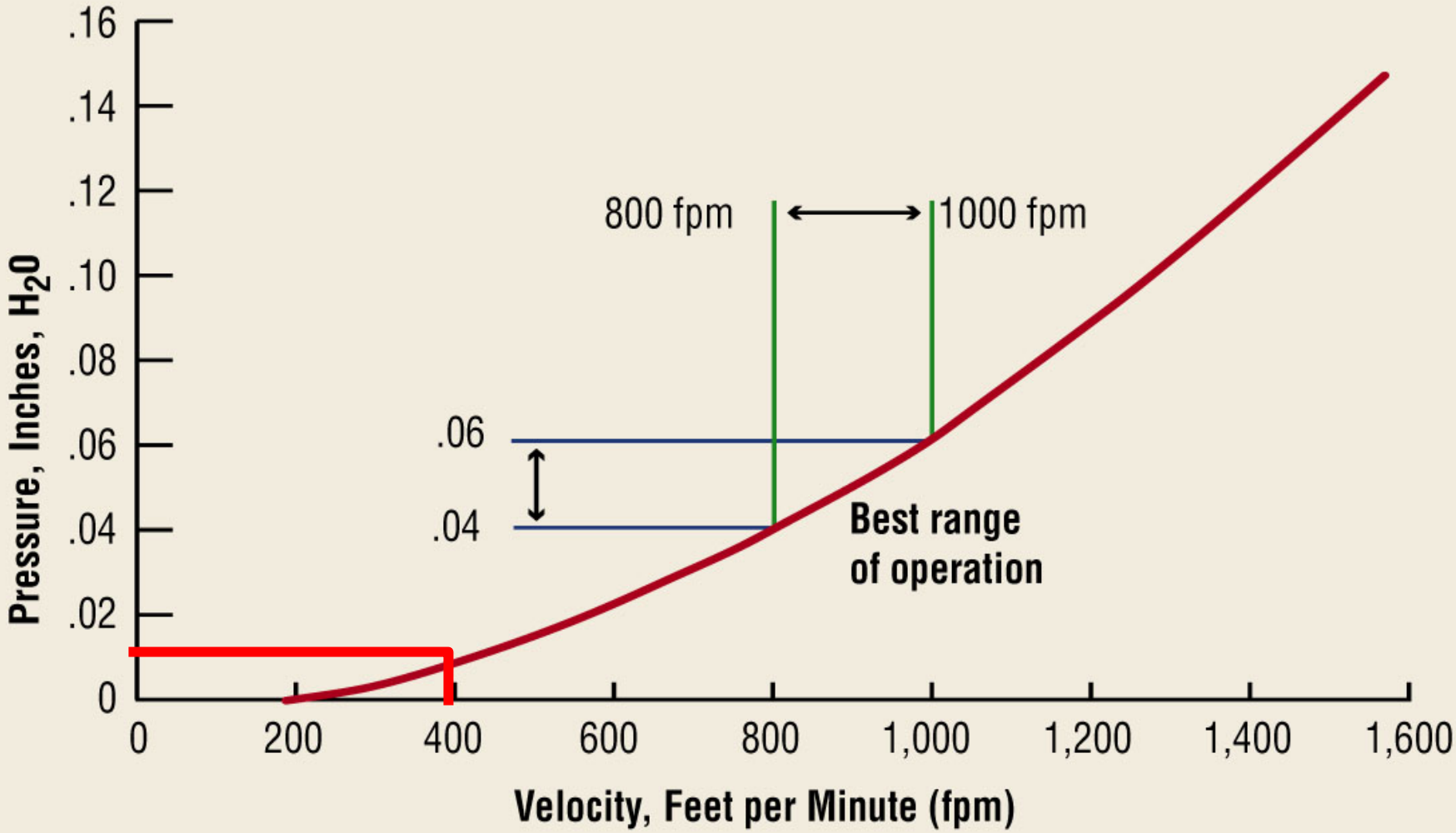


Figure 3. Air Intake Velocity and Static Pressure Relationship



Reduce velocity to 400 fpm

Pit Pumping Protocols

- **Tunnel Barn Ventilation**
  - > 100 lb and > 45 F
    - 2 tunnel fans @ minimum
    - Open tunnel curtain to 400 fpm velocity

Pit Pumping Guidelines

Developed by
Mike Brumm, Brumm Swine Consultancy, Inc. and Jay Harmon, Iowa State University

Hydrogen sulfide can spike quickly and without warning during pit pumping. Aggressive agitation can contribute to the risk of gas spikes when agitation first begins and when the pit becomes nearly empty.

The following guidelines are suggested to improve safety and ventilation performance during manure pit agitation and pumping:

- **People should NEVER enter a building being pumped.**
  - Consider the addition of a physical barrier to entry doors—such as yellow caution tape, large warning placards, and/or lockout tags on doors during pumping.
- **A person should be at the site during pumping. This person should have a copy of the emergency action plan and emergency contact information for the site.**
- **Agitation Strategy**
  - Consider minimal or no agitation until the manure level is at least 1-foot to 1 ½-feet

Minnesota Pork Board

Pit Pumping Protocols

- **When the Pumpers Leave**
  - Secure all pit covers after
  - Higher rate for 1-2 hours after

Secure Pit Covers – inlet for fans

1200 hd wean-finish

Double stocked

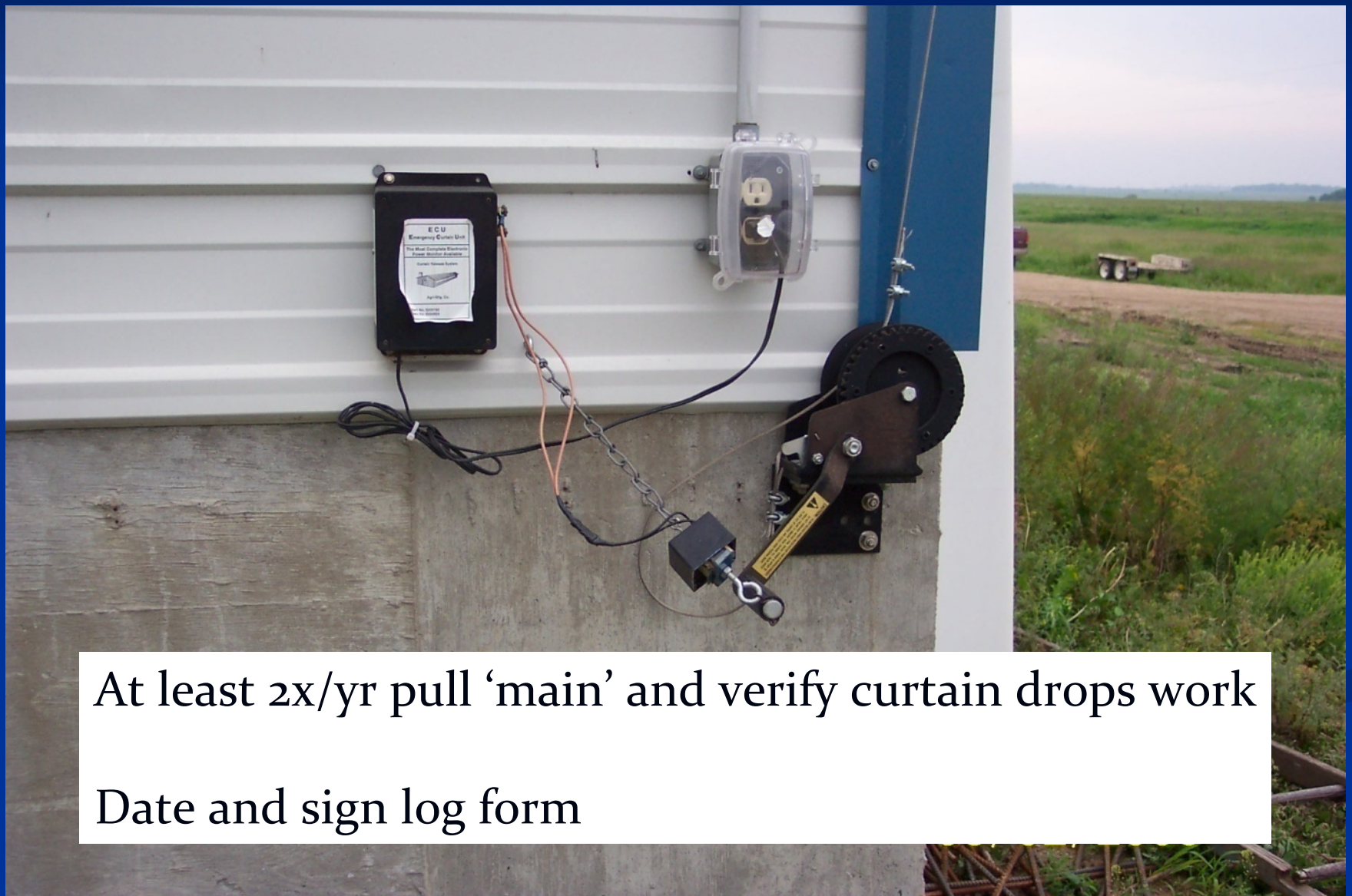
7.5 ft^2 inlet at start

Disaster Strikes !

Emergency Alarm Systems

Include long distance or cell phone number – proof of call may be an issue in some claims

Emergency Ventilation



At least 2x/yr pull ‘main’ and verify curtain drops work

Date and sign log form

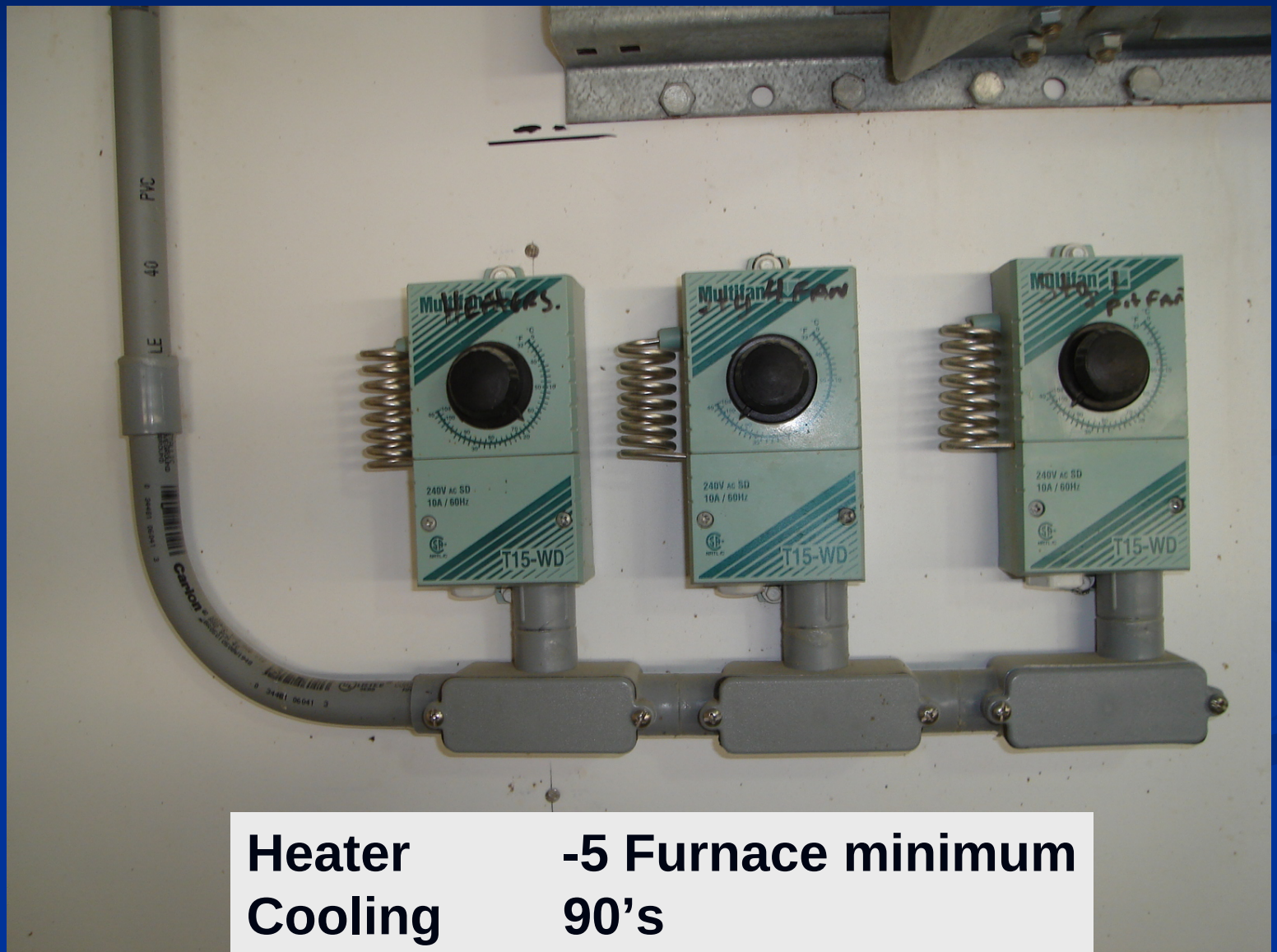
Emergency Ventilation

Monthly (?) Test and Written History of Test
Verify Transfer Switch Works

What would insurance pay at this site?

CURT-O-MATIC II
Emergency Ventilation System
MODEL NO. CM-240
240 VOLTS
OPERATING INSTRUCTIONS
WARNING
5-Year Warranty
HIRED-HAND

Emergency Thermostats



Heater	**-5 Furnace minimum**
Cooling	**90's**

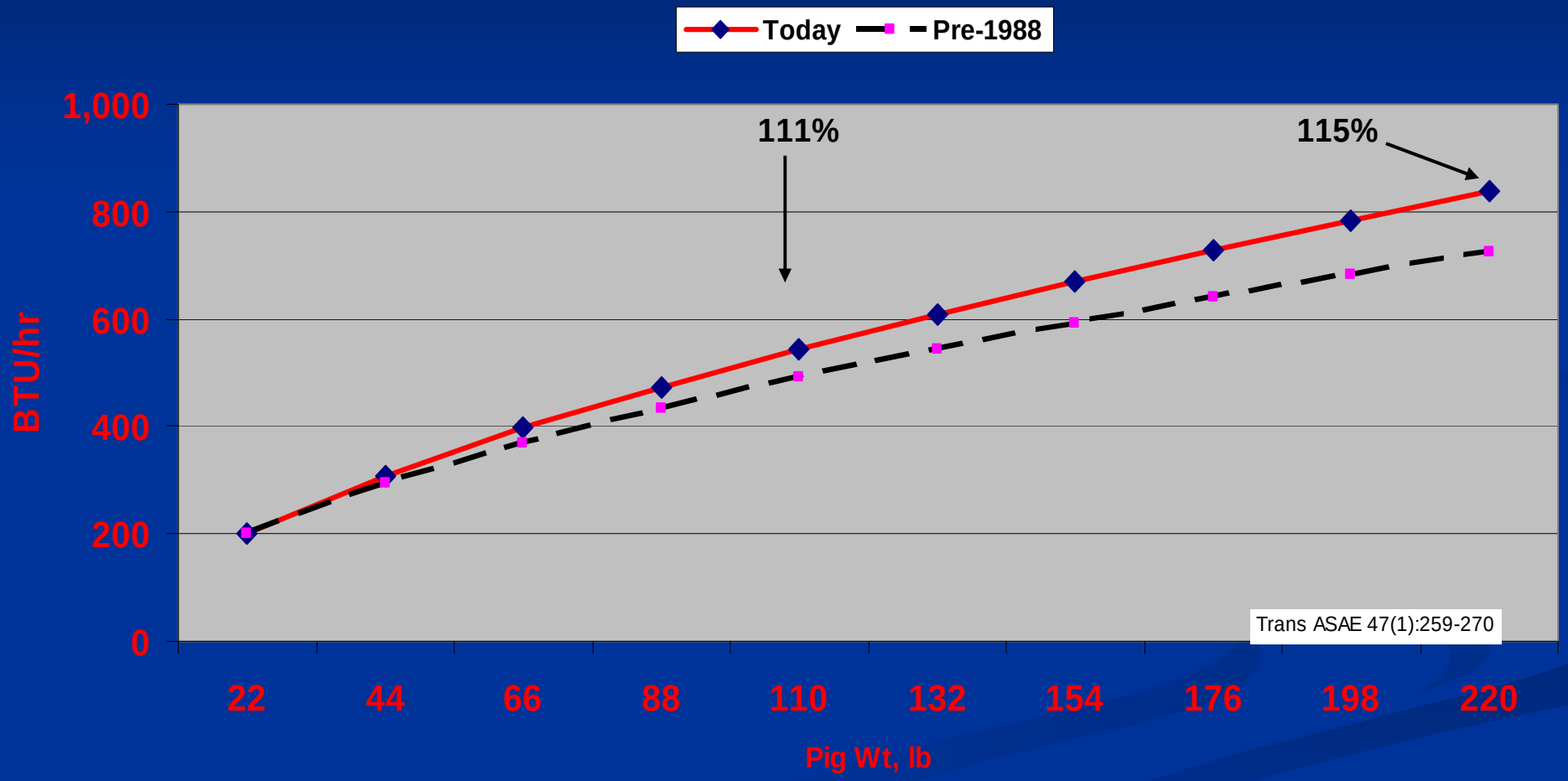
Emergency Thermostats

Location relative to tunnel curtain?

Insurance Policies

- Verify exclusions in policy
  - ‘suffocation’
    - What does this mean?

Heat Production in Growing Pigs



Types of Heat

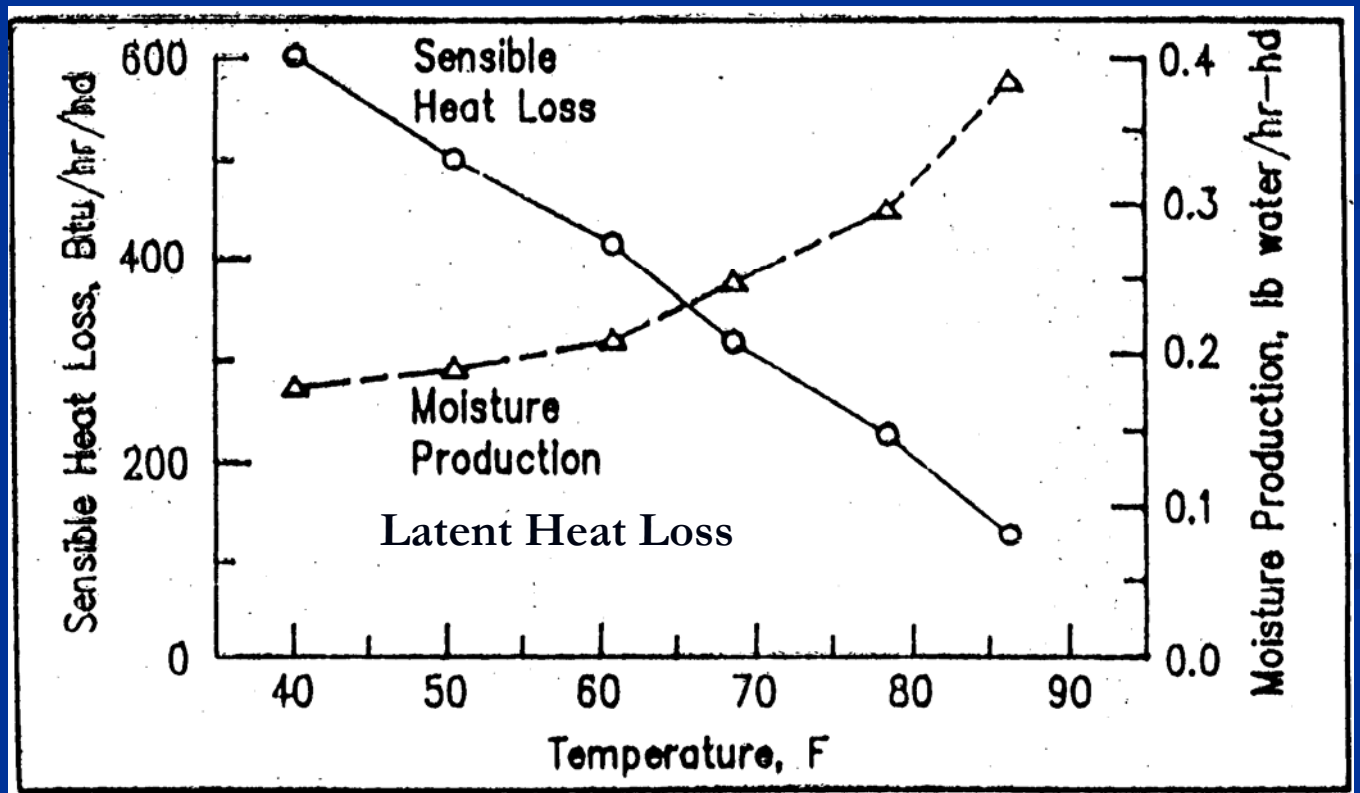
- **Sensible Heat** – dry bulb temperature
  - Measured with thermometer

- **Latent Heat** (evaporation)
  - Heat involved in holding water vapor in air

~1050 BTU/lb water

Cascade of Events

- At failure, air temperature rapidly rises
- As air temperature rises, pigs ability to lose heat to air decreases - heat loss becomes latent heat



Cascade of Events

- At failure, air temperature rapidly rises
- As air temperature rises, pigs ability to lose heat to air decreases - heat loss becomes latent heat
- Latent heat increases humidity in air
- Within 1 hour, 100% RH
  - No heat loss possible by latent heat
  - No heat loss to air at > 90 F air temp

- **Death is by organ failure due to heat!**

Cascade of Events

- With big pigs, less than 30 minutes response time
- 30-70 lb pigs – up to 1 hr response time

U of Illinois

- 15 lb pigs
  - CO_2 within 150 minutes
- 50 lb pigs
  - 60 minutes for temperature
  - CO_2 within 95 minutes

Ventilation Failure

34 F outside with NW wind
200+ lb liveweight
3 cfm/pig minimum

+ 5 F increase in 5 minutes

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