Containment Challenges & Engineering Solutions for Low Containment

National Centers for Animal Health
Ames, Iowa
Dennis Jones, Facility Engineer
NCAH Missions

- Conduct **basic and applied research** on selected diseases of economic importance to the U.S. livestock and poultry industries (ARS National Animal Disease Center).

- **Diagnostic testing, training, reference assistance, and production of reagents**. To protect the health of animals (APHIS National Veterinary Service Laboratories).

- **Ensure that veterinary biologics** available for the diagnosis, prevention, and treatment of animal diseases are **pure, safe, potent, and effective** (APHIS Center for Veterinary Biologics).
NCAH Site
Ames, Iowa

- 475 acre combined site
- 100 buildings
- BSL-2 & BSL-3 Laboratories
- BSL-2 Large Animal Facility
- BSL-3Ag Large Animal Bldg
- Adm & Support Facilities
- Central Utility Plant
- Wastewater Pre-treatment Plant
- Field barns & pastures
BSL-2 Large Animal Bldg
Features:

- 103K gsf
- Group housing rms
- 5 isolated suites w/ various rm sizes & #
- Each suite w/change & shower, feed, work rooms.
- Each animal room has entry vestibule

- Painted steel animal penwork (semi-flexible)
- Manure to be washed down or scraped up
Features:

- Wastewater collection tank room for chemical pre-treatment
- Wastewater pumped to heat pre-treatment plant
- Steam & Chilled water supplied from Utility Plant
- HVAC provides directional air flow into animal rooms
- Fixed Ventilation (12 cph)
- Zone temperature control
- Animal rooms have hoisting hooks in ceiling for carcass handling
- Building corridors are connected to necropsy/incinerator facility
Budget Challenges

$$
Animal Care & Space Requirements
HVAC System Requirements
Flooring & Wall surfaces
Waste Management
# Animal Rooms
Penwork
Budget Solutions
(Cuts to meet the budget $$)

- Cut the building size in ½ and continue to use 2 existing animal buildings
- Accept fixed ventilation rates
- Accept zone temperature control
- Accept limited humidity control
- Accept sealed concrete vs high-quality floor finish
Engineering Solutions

- Sealed floors can be updated with high-quality finish in the future
- Pre-cast concrete & masonry walls & ceiling construction provided cost savings
- Painted animal penwork can be replaced with better quality in future (also will know what works)
- Wastewater chemical pre-treatment & pumping systems can be automated in future
- Large penthouse constructed on top of pre-cast structure provides space to add additional reheat coils and gain individual room temperature & humidity control
Operational Challenges

- **Waste Management in Animal Rooms**
  - Conventional floor drains with solids baskets
  - Manure scraping does not happen
  - All wastes are flushed down the drains
  - Wastewater system limits roughage in feed

- **Caretaker Comfort in the building**
  - Temperatures dictated by caretaker comfort
  - Design assumed warmer temperatures
  - Cooler temperatures raise the indoor humidity
Engineering Questions
Directional Air Flow

- 4’x7’ walk doors
- 100 cfm leakage
- No door interlocks
- Sliding feed room door
- Feed room does not have an airlock. When corridor door is open Rm air pressure = outside air pressure
Engineering Questions
Directional Air Flow

- Designer set-up
- Air flow from Animal Room Corridor to Suite Workroom & Dressing Rooms?
- Exposed HVAC ductwork in change rooms – *get adjusted!*
Unresolved Issue
Waste Management – Floor Drains

- Manure clogs filter basket
- Caretakers remove basket & wash manure (+) down the drain vs. scraping up solids
Future Engineering Changes
HVAC Systems

- Add floor drains in the penthouse
- Add RH coils
- BAS controls
- Add SA & EA control valves

- Change SA & EA fan speed control from flow control to SP control (already done).
Future Engineering Changes
Waste Management – Piping Bends

Change piping bends to radius that can be cleaned with jetting tool

Need dble 45° elbows or sweep bends
Future Engineering Changes
Waste Management – Collect Tank

- Change wastewater collection tank configuration
- Requires additional water to keep from clogging
- No real water savings (as estimated by designer).

Water hose set on timer to operate 5am-11am (Room washdown)
Future Engineering Changes
Waste Management – Pump Piping

- Waste transfer pump piping configuration packs solids into piping.
- Temporary relief by cycling between lead/lag/standby pumps daily.
- Will reconfigure piping with Y-Joints.
Thank you.

Overall Good Facility
Provides capability to improve
Similar problems to other facilities