Locust Trace AgriScience Center

Fayette County Public Schools – Lexington, KY

"Sustainability & Resiliency"

the greening of our Built Environment

Susan Hill – AIA, LEED AP

March 29 - 2016

TATE HILL JACOBS architects

It's about kids.

FAYETTE COUNTY PUBLIC SCHOOLS

Lexington KY's 1st NET ZERO School

OWNER'S VISION

- *82 acres of federal land within Fayette County ...outside the Urban Services Boundary*

- ***Model for "Green Collar" education & sustainable principles.***

➢ *Equine + Agriculture + Pre-Vet Science education programs*

➢ *State-of-the-art AgriScience Education Center*

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TEAM PROCESS = Integrated Design Team

Establishing - Sustainability GOALS & STRATEGIES

All team members -
at the table…
from the beginning…

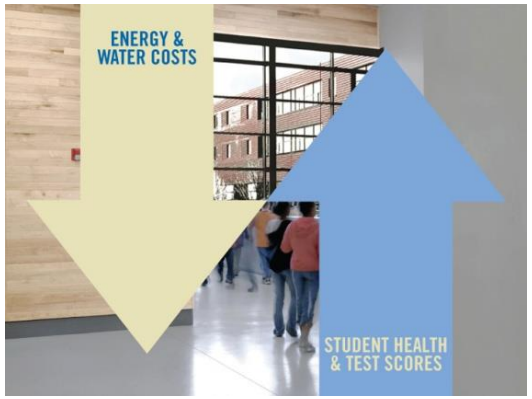
- **Owner**
- **End users – Teachers + Students**
- **Community Partners**
- **Design Consultants**
  - **Architect**
  - **Landscape Architect**
  - **Engineers – MEP**
  - **Engineers – Civil**
  - **Engineers - Structural**

PROCESS – full collaboration

TEAM PROCESS = Setting Goals

Using National Guidelines & Performance Benchmarks of Sustainable Principles

- ASHRAE
- EnergyStar
- KY Green & Healthy Schools
- AIA 2030 Challenge
- Am Society of Landscape Architects
- US Mayors' Climate Protection Agreement



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SUSTAINABILITY GOALS

1. **Education + Inspiration**
   - Site and Building as Teaching Tools

2. **Regional Identity + Ecology**
   – appropriate to place.

3. **Site Capacity and Use**
   – sitting lightly on a greenfield.

4. **Energy - Net Zero: On-Site Renewable Energy Generation**

5. **Water – Net Zero: Rainwater Capture/Reuse + Well Water**

6. **Waste - Net Zero: Constructed Wetlands + Composting**

Strategies to Reduce Energy Consumption

- Integrated Design Process (IDP)
- **Must Reduce Energy before Generate Energy**
- Energy Triangle
  - Thermal Envelope/Orientation
  - MEP Systems
  - Operations

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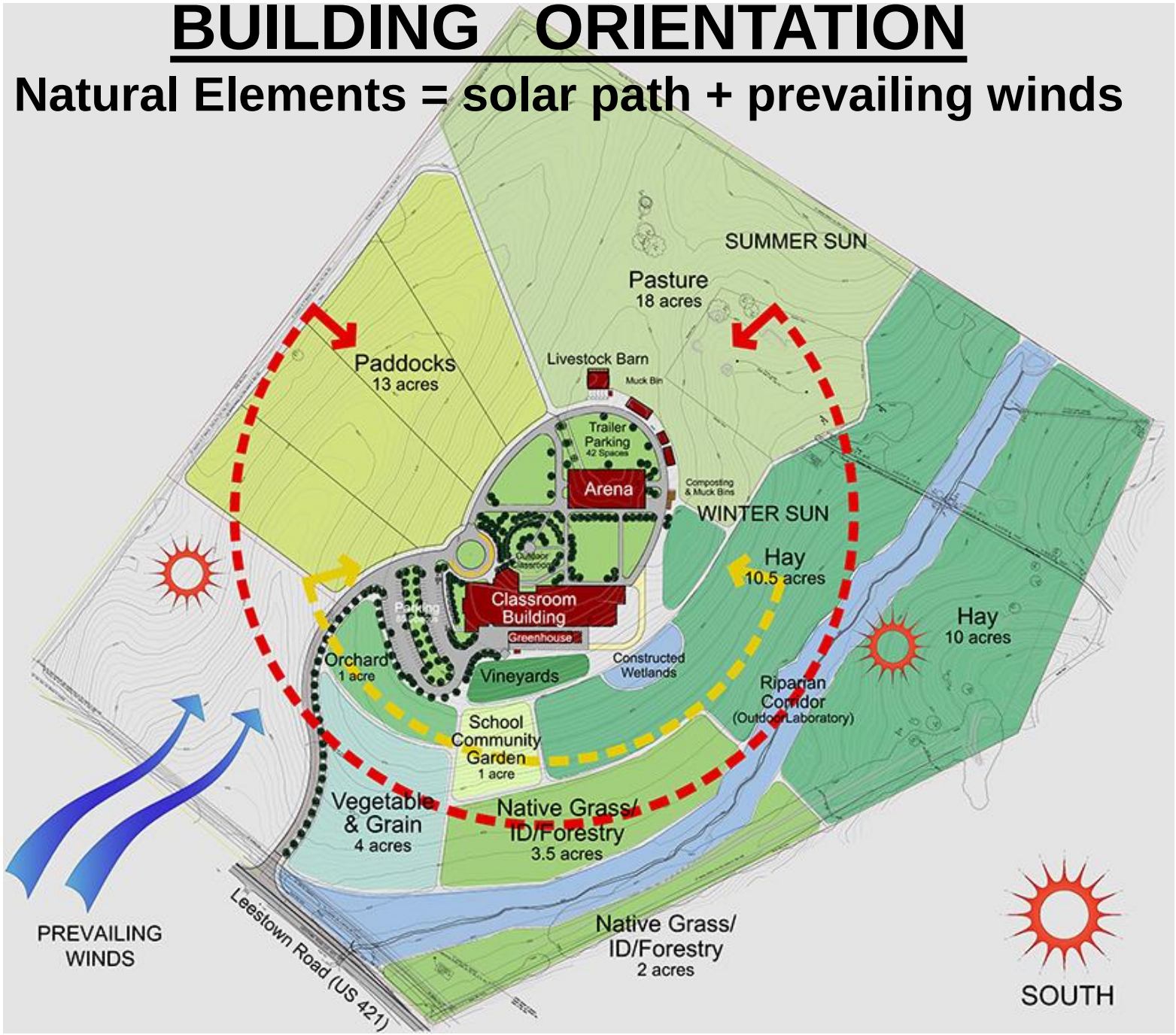
BUILDING ORIENTATION

Natural Elements = solar path + prevailing winds



Net Zero - Energy: Renewable Energy Use

IMPLEMENTED Strategies

- ✓ ICF Construction
- ✓ Geothermal Water Source Heat Pumps
- ✓ Customized Temperature Zoning
- ✓ Demand Control Ventilation
- ✓ Tubular Daylighting
- ✓ Daylighting Controls
- ✓ Plug Load Controls

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BUILDING ENVELOPE

Strategies

- **ICF Construction R-23**
- **Roof R-30**
- **East - West Orientation**
  - **for solar orientation**

High Performance Schools

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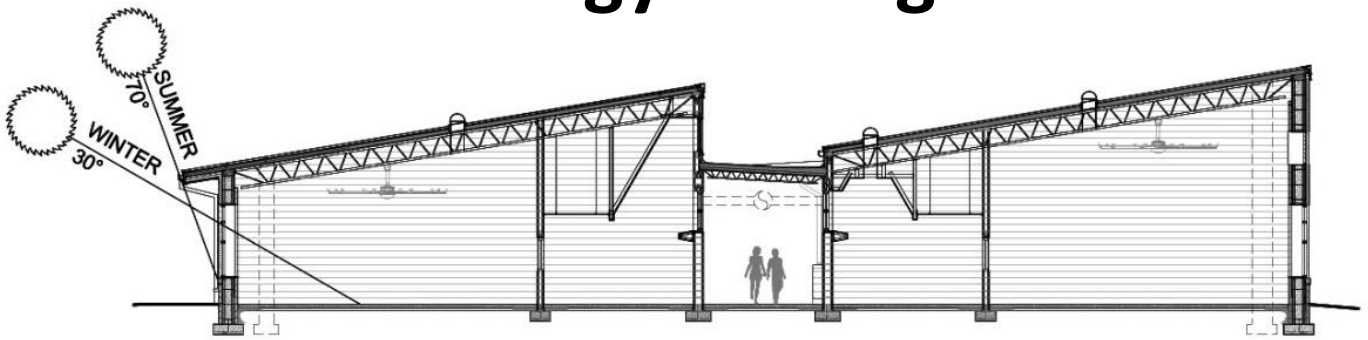
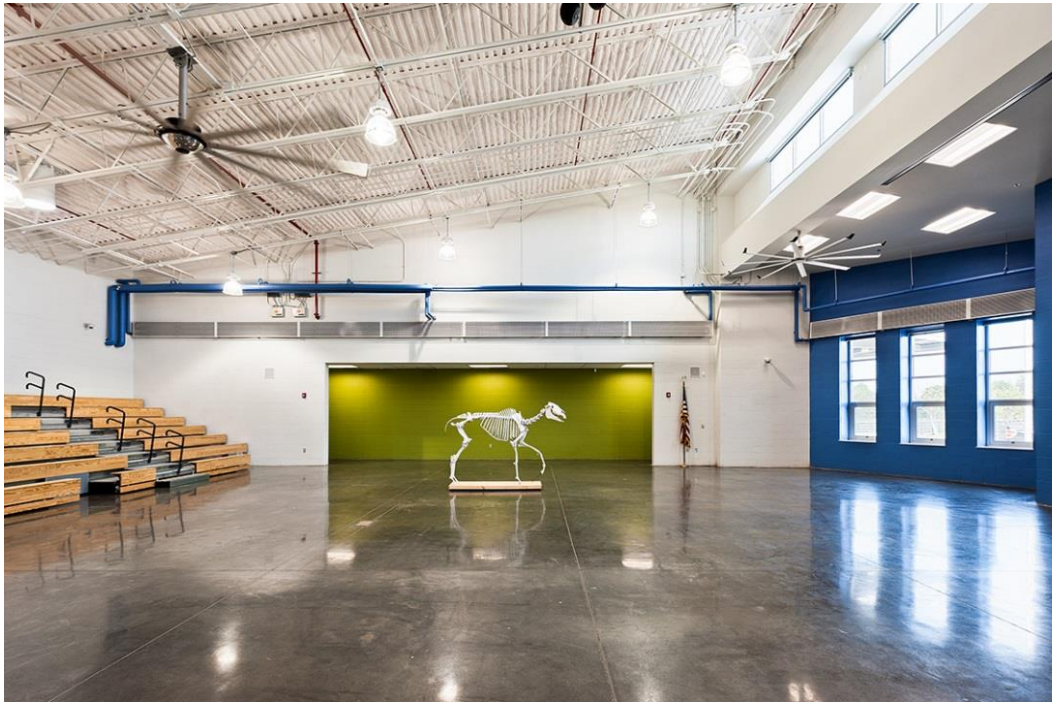
NATURAL DAY-LIGHTING

Energy Strategies



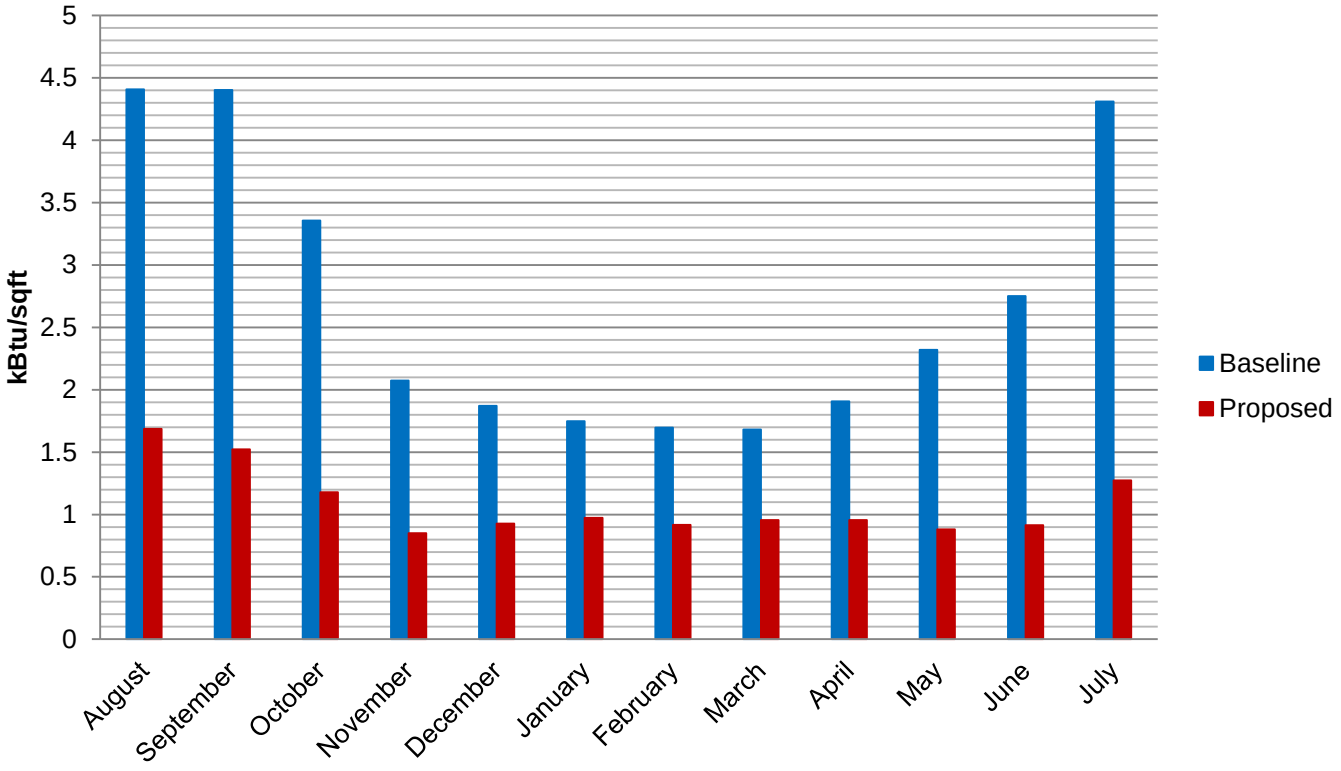
AG SCIENCE ACADEMIC BUILDING SECTION B - B



OPERATIONAL Strategies

- Building Climate Zones
- Thermal Breaks in Building
- “Cultural Change”

Modeled Energy Performance



Baseline: 34 kBtu/sf yr

Proposed: 16 kBtu/sf yr

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SOLAR RENEWABLE
Energy Strategies

Cost/Performance of PV Energy in 2011

- 175 KW Solar PV
  - 574 Sunpower 305 Panels
- 3 Inverters
  - 100KW SatCon PowerGate Plus
  - 2-50KW SatCon PowerGate Plus
- $5.71/W Installed
- Average Production (Aug-Nov)

  1.57 kBtu/sqft Month

  16.85 kBtu/sqft Projected Annually (PVWatts)

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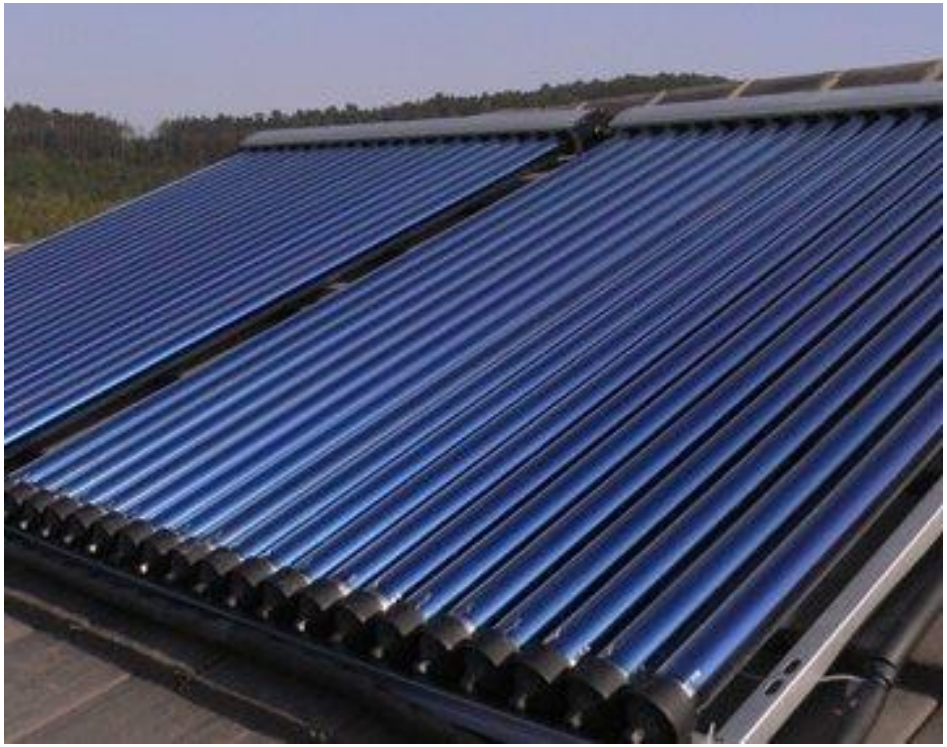
SOLAR RENEWABLE Thermal Strategies

- 7400 Square Feet Solar Thermal Panels
  - 168 Panels
  - 1 Million BTU's

3rd Largest Array In North America When installed.



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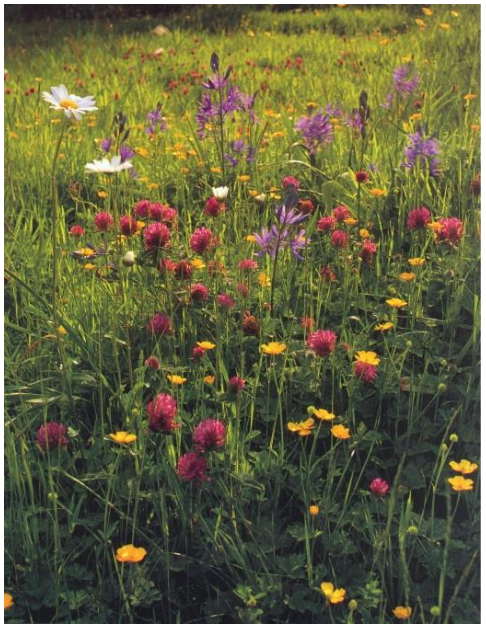
STORMWATER

Strategies

- **Permeable Pavers**
- **Vegetated Roof**
- **Rain Gardens**
- **Recycling**



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WATER

Strategies

- **Rainwater Harvesting from Building Roofs**
  - to irrigate crops and water livestock

- **Groundwater Well makeup in times of drought**

- **Future Use in Buildings**

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SANITARY WASTE

Strategies

- **Constructed Wetland for On-site Sanitary Sewage Treatment**

- **Traditional Septic Tank & Leachfield System *for Comparison***

View toward Campus

Daylighting + Permeable Surfaces


Natural Daylighting + Ventilation

Natural Daylighting + Views

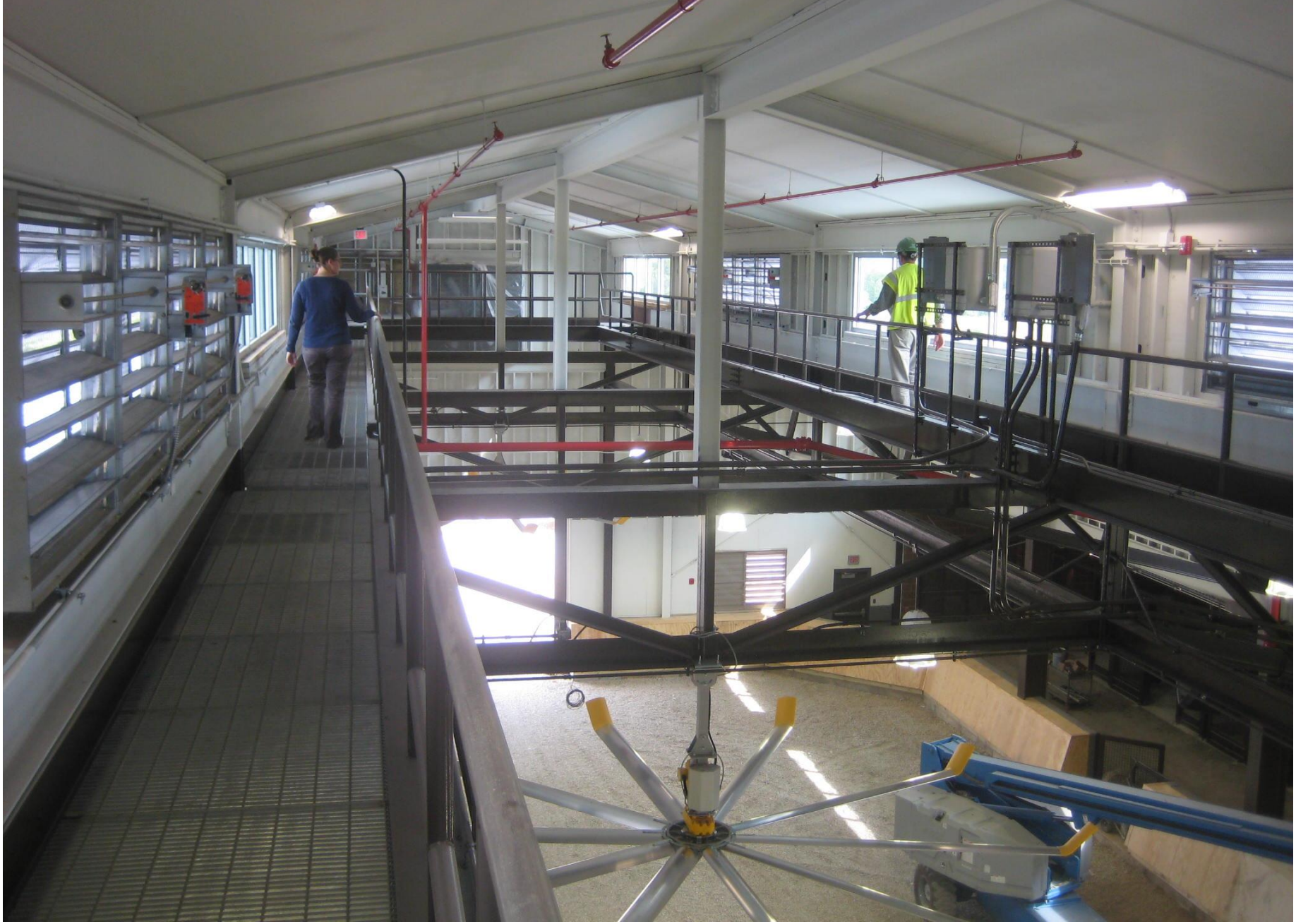
Learning Labs with hands-on discovery

Aqua-Culture

Veterinary Assistant Certification

View from Vegetated Roof Canopy

Arena - Ventilation & Daylighting



Arena - Ventilation & Daylighting

OWNER's Occupancy - Experiences

Paper recycling for bedding. Animal waste Composting for fertilizer…..

Observing a veterinarian during a dog check-up procedure…..

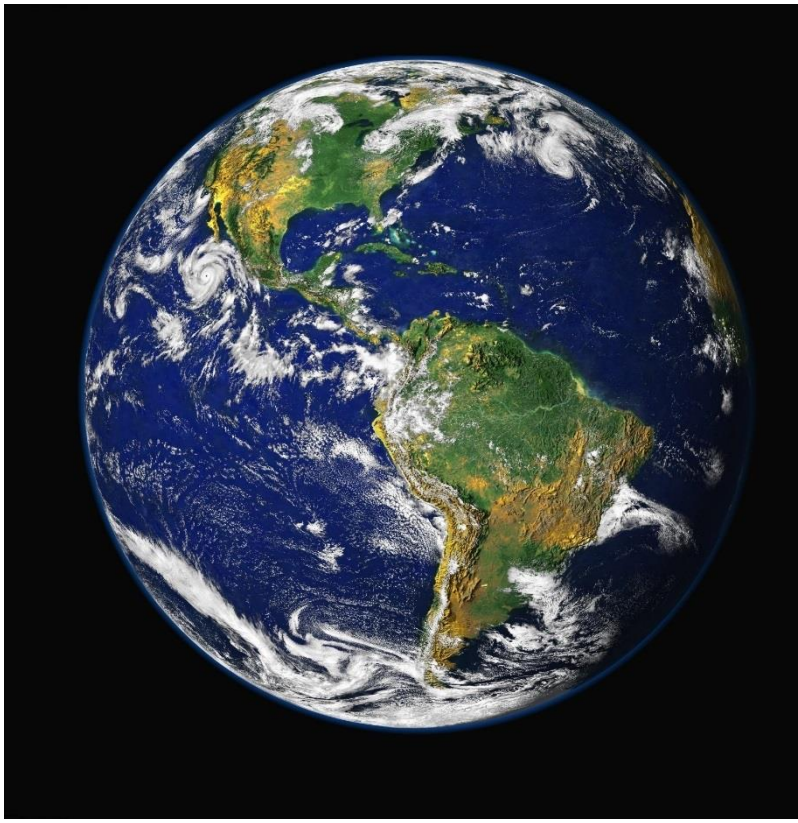
BUILDING PROGRAM

- **Opened August 2011**
- **250+ students**
- **High School**
- **½ day classes**
- **5 Major Labs**
  - Plant & Land Science
  - Biotechnology & Environmental Science
  - Agriculture Power Mechanics
  - Equine & Vet Science
  - Small & Large Animal Science
- **3 Core Classrooms**
- **Media Center**
- **Assembly**
- **Arena**
- **Veterinarian Clinic**

“The shape of the future is changing rapidly and education must keep pace.”

John Price, Chair – Fayette Co School Board

ENVIRONMENT + ECONOMIC + COMMUNITY



Health of Planet Earth –

- Global Warming
- Trash + Chemicals

Natural Resources –

- Depletion
- Economic Impact

Social (community)+ Economic

- Collaborative, Interdisciplinary
- Communication + Decision-making
- Equitable and Sustainable

“Sustainability & Resiliency”

How we plan and design the built environment from here on out will determine whether climate change is manageable or catastrophic.

- AIA 2030 Challenge

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