SOWING SEEDS ACADEMY
Miami University • Elementary School • Team Red Hot Chili Bs
TEAM PROFILE

KATIE MITCHELL
4th year
BA Architecture
Certified Passive House

JAMES MUSTILLO
3rd year
BA Architecture

GRAZIELLA PILKINGTON
3rd year
BA Architecture

DI LI
4th year, BA Architecture

AUSTIN J CARF
4th year
BA Architecture
& Environmental Science

ALEC FISETTE
3rd year, BA Architecture

NATE CONLEY
4th year
BS Engineering

EMMA PEVOAR
1st year
M. Architecture
LEED AP BD+C.
DESIGN GOALS

- LEARNING SUSTAINABILITY
- SAFETY & INCLUSION
- ADAPTATION
- SYNERGY WITH COMMUNITY
- PASSIVE HOUSE
SITE INFORMATION

Ohio

Oxford, OH

Site Plan

- Forest
- Wild Grasslands
- Harvest Village
- Pollinator Prairie
- School Proposal

SITE INFORMATION

Introduction
Energy Performance
Engineering
Financial Feasibility
Resilience
Architecture
Operations
Market Potential
Environmental Quality
Innovation
Closing Remarks
CLIMATE ZONE 5A

Temperature By Month

Sun Path

Water Runoff

Degrees
THE COMMUNITY

Goals For School Users

Interaction with natural ecosystems

Respect for the environment

Learning to read building systems and adjusting settings

Incorporating system use and environmental lessons into the curriculum

Utilizing outdoor learning spaces

Showing students how to understand feedback technology

Understanding maintenance schedules and what needs to be outsourced

Reading feedback dashboards and adjusting systems accordingly

Becoming properly trained or qualified
ENERGY OVERVIEW

- Renewable Systems
- Photovoltaic
- Green Roof
- Natural Light
- Airtight Envelope
PHOTO VOLTAIC SYSTEM

134,216 kWh/yr

Derating Factors

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<td>Soiling</td>
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<td>Shading</td>
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<td>Snow</td>
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<tr>
<td>Mismatch</td>
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<tr>
<td>Wiring</td>
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<td>Nameplate</td>
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<tr>
<td>Availability</td>
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Energy Consumption vs. Production

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<td>2.75</td>
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<td>Annual</td>
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GREEN ROOF

Green Roof Tray System

Green Roof Section

Green Roof Terrace
ENVELOPE

Energy Performance

Control Layers

- Thermal
  - Gutex Multitherm Wood Fiberboard Insulation

- Water, Air, Vapor
  - Pro Clima DA Wrap
  - Tescon Vana Tape
NATURAL LIGHTING

Zola Thermoclad

Selected window:
Zola Thermo Clad
Overall U-Value: 0.14
Center-of-glass U-Value: 0.09
SHGC: 0.5
VT: 71%
2 Low-e Coatings
Triple Pane, Argon
60 years expected service life

Annual Sun Angle

Clerestory Windows

Hallways: Bilateral lighting

Northern Light

Photovoltaics

Exterior Sun Shading

Breakout Space

Classroom

Classroom

Interior Street

Equinox

Summer

Winter
PRELIMINARY SEFAIRA MODELING

Sefaira Heating and Cooling Loads

Sefaira Energy Profile

Sefaira Natural Light Analysis
### PASSIVE HOUSE CRITERIA

#### Heating

- **Demand**
  - PHIUS+ 2018 Standards
  - [Bar chart showing heating demand levels]

- **Load**
  - [Bar chart showing heating load levels]

#### Cooling

- **Winter Energy Balance**
  - [Bar chart showing winter energy balance]

- **Summer Energy Balance**
  - [Bar chart showing summer energy balance]

#### Source Energy

- [Bar chart showing source energy levels]

#### Air Tightness

- [Bar chart showing air tightness levels]

### PHIUS+ 2018 Standards

<table>
<thead>
<tr>
<th>Category</th>
<th>Demand (KBtu/ft²yr)</th>
<th>Load (KBtu/ft²yr)</th>
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<td>Air Tightness</td>
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**Note:**
- The charts and data represent the criteria and standards for passive house design as outlined by PHIUS+. The color-coded diagrams illustrate the energy balance and source energy distribution in a passive house design.
ENERGY USAGE COMPARISON

Traditional School Energy Usage

- Space Heating: 35%
- Lighting: 30%
- Cooling: 20%
- Water Heating: 5%
- Plug Loads: 5%
- Ventilation: 5%

Total Energy Usage: 5,085,115 kBTU/yr

Sowing Seeds Energy Usage

- Space Heating: 16%
- Lighting: 21%
- Cooling: 14%
- Water Heating: 4%
- Plug Loads: 43%
- Ventilation: 2%

Total Energy Usage: 452,977 kBTU/yr
MECHANICAL SYSTEM INTEGRATION

Integration Plan

- Electric Switchbox
- VRF Branch Boxes
- PSZ
- DOAS Unit A
- DOAS Unit B
- Hot Water
- Main Water Areas

Diagram showing various zones and equipment placements.
Mitsubishi City Multi VRF Water Source Units
Nominal Cooling Capacity (BTU/h):..............(2) 192,000 BTU/hr; (1) 288,000 BTU/hr
Nominal Heating Capacity (BTU/h):..............(2) 215,000 BTU/hr; (1) 320,000 BTU/hr
Flow Rate Nominal / Actual (gpm):............(2) 31.7; (1) 63.4
DEDICATED OUTDOOR AIR SYSTEM

Mitsubishi PremiSys Dedicated Outdoor Air System
Outdoor Air Volume............. 6,000 CFM
Exhaust Air Volume............. 5,000 CFM
WATER SYSTEM

- Rainwater Collection Cistern
- Rainwater Group Toilets
- Hot Water Areas
- Waste Water

- Hot Water Line
- Cold Water Connection
- Hot Water Connection
- Hot Water Line

- Combined water service
- 6”
- 2”
- 1.5”
- 1.25”
- 4”
- Automatic Sprinkler System *runs to every room
- Heat Pump
- Drinking Fountain
- Underground
- Sewer (Underground)
- Filtration
- Solenoid Valve (if tank is low)
- Each cistern is 10,000g
- ARG (automatic grease removal)
- Main water connection. Combined water service 6”
RAIN WATER REUSE

- Gutter
- Cistern
- Rainwater
- Natural Filtration
- Cold Water
- Solenoid Valve
- UV Filter
- Variable Speed Pump
- Low-Level Vented Tank
LIGHTING PLAN
STRUCTURE

Envelope Section

CLT & Glulam Construction

Structural Plan

- Glulam Beam
- CLT Panel
- Other
FINANCIAL ANALYSIS

Price Breakdown

- Non-Construction Costs: 12%
- Total Hard Costs: 8%
- Cost Before Fees: 80%

Construction Costs

- Minimally Compliant Code: $226.69/sf
- New Net Zero Construction: $264.40/sf
# Financial Analysis

## Marshall Elementary vs. Sowing Seeds

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<td>Payment and Performance Bonds (1%)</td>
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<td>Construction Management and Contract Administration</td>
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<td>$283,37</td>
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SAFETY

Safety Plan

KEY
- Means of Egress
- Egress Paths
- Fire-rated walls
- Fire extinguisher & pull
- Fire Alarm Control Panel
- Fire Alarm
- Armoured One Glass
- Gun Violence Barrier
- Panic Button
- Visitor circulation path

Armoured One Glazing
STORM SAFETY

Storm Shelter Location

Storm Window

Storm Shelter Construction

4" Concrete Slab

8" Insul-Deck Panel

The Bautex Block Wall

Shoring Beam

Shoring Columns
MATERIALS

Exterior Rendering of Academic Wing

Green Wall
Latham Limestone
Standing Seam Metal Roof
Recycled Aluminium Panels
MATERIALS SOURCING

- High Concrete Group
- Gillman Home Center
- Pioneer Cladding & Glazing Systems
- EAP Inc.
- Revere Roofing Company
- Jurgenisen Companies

HVAC
LIMESTONE
Floor Plans
Entrance Rendering
Interior Design

Interior Street & Extended Learning Area

ELA Plan
USER INTERFACE

GOALS OF OPERATIONAL SYSTEMS

Interactive for Classes
- Adjustable
- Learning Sustainability

Readability for Maintenance
- Accessible
- Maintenance Plan

Use for Competitions
Custodian Education

M e c h a n i c a l  C e n t e r  E x t e r i o r

Mechanical Center Exterior

Mechanical Center Interior

Lighting Level Sensors
CO2 Occupant

PV Energy Production
Classroom Water Usage

Classroom Thermostat

Weekly Energy Consumption by Day

Adjustable
Readable
Accessible
Project name: Sowing Seeds Elementary

Climate: OXFORD, OH

Type: Non-residential

Interior conditioned floor area: 59,500 ft²

Number of units: 1

Occupants: 459

Site energy use: 6,030.8 kBtu/yr

Specific site energy use: 0.1 kBtu/ft²yr

Site energy use: 1,767.6 kWh/yr

Specific site energy use: 0 kWh/ft²yr

Site energy use per person: 3.9 kWh/Person yr

Net site energy use (with 100% renewables): 6,030.8 kBtu/yr

Specific net site energy use (with 100% renewables): 0.1 kBtu/ft²yr

Net site energy use (with 100% renewables): 1,767.6 kWh/yr

Specific net site energy use (with 100% renewables): 0 kWh/ft²yr

Net site energy use per person (with 100% renewables): 3.9 kWh/Person yr

OVERVIEW

ENERGY REDUCTION STRATEGIES
EXISTING GYM RENOVATION

Benefits
- Reduce carbon
- Reuse existing material and program space
- Upgrade to PHIUS+ standards
- Avoid costs associated with destruction and reconstruction
COMMUNITY USE

Talawanda HS Girls Basketball games and practices in the gymnasium

Miami Apiculture Society - Bee Keeping Demonstration in the outdoor classroom

Oxford Community Arts Center - Introduction to Watercolors class

Math and English tutoring open to all students in the library

Oxford Community Band regular practice in the music room
UNIVERSAL DESIGN

Handicap Accessible Restroom Design

If mirror is mounted over counter or lavatory, 40" max to bottom of reflective surface
35" max if not mounted

Special Education Room
Bouncy Balls
Cushioned Mats
Accessible Bathroom

Vertical Grab bar 18" long

16"-18" 24" max
36" max
60"-67"

18" min 14"-19"

48" max

18" min

60"-67" wheelchair turning space

59" min

36" min

12"-18"
FEASIBILITY

Sourcing Radius

Building Information Modeling

Return on Investment

- DOAS/ERV
- Geothermal
- PV
- GEOTHERMAL

Years to Pay Back
Savings
INDOOR ENVIRONMENT

Interior Street

Morning Light

Afternoon Light

Circadian Cycle
NOISE REDUCTION

Music Room Acoustics

- Folding panel partition
- CLT Floors/Walls
- Acoustical Ceiling Tile
- Sound Baffles
- Acoustical Wall-Mounted Baffle
AIR QUALITY

Classroom HVAC Diagram

Supply Register
VRF
Return
Supply Duct

Air Circulation

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<th>cfm/person</th>
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<td>400</td>
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<td>admin</td>
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<td>cafeteria</td>
<td>20</td>
<td>450</td>
<td>9,000</td>
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Interior Comfort
Factor Considerations:
- Variable Air Volume Box Dampers
- Demand Controlled Ventilation
- Bioclimatic Ionization

Interior Green

Environmental Quality
CAFETERIA

DOUBLE SKIN VENTILATION
During days when the outside air temperature is below 25 or above 75°, the lower return vent is open and air flows up through the double skin wall and is ducted back to the PSZ to be reused. This means the PSZ can lessen its supply intake to 50%, saving energy. The air inside the double skin also serves as to strengthen the R-value of the glazing system and acts as a barrier to abnormally high or low temperatures, aiding in envelope control.

ECONOMIZER DAYS
For days with an outside air temperature between 25-75°, the modulating damper senses the temperature and opens the ceiling return duct. When temperatures are close to being outside this range, the sensor can also operate at half its capacity, while the lower return vent also is open.

FOOD CONSIDERATIONS
- Fresh fruit and vegetables available
- Proper portions and optional menu items
- Left-overs given to Take-Home-Dinner program
- Allergy accommodations
GYM RETROFIT

GREEN WALL DETAIL

CMU Wall
Rigid Insulation
Air Gap
Brick Facade

Planter Box
Planter Frame
Rigid Insulation & airtight layer
Wire Ties

Existing Gym Wall
OUTDOOR ENVIRONMENT

Nature Hut

Prairie

Walking Path

Introduction
Energy Performance
Engineering
Financial Feasibility
Resilience
Architecture
Operations
Market Potential
Environmental Quality
Innovation
Closing Remarks
WELL BUILDING STANDARD

- Water
- Light
- Air
- Nourishment
- Thermal Comfort
- Mind
- Sound
- Materials
- Movement
- Community

Innovation
THANK YOU