CORDOBA SUSTAINABILITY VOCATIONAL SCHOOL

University of Cincinnati
Solar Decathlon Educational Building
TEAM

Architecture
Anna Mueller
Jessica Meissner
Paul Tully

Energy
Nehemiah Perkins
Vivian Garmann

Engineering
John Stephen
Peter Cooper

Constructability
Jason Bracy
Ryan Sidloski
GOALS

STEM Based Vocational High School
Focus on Sustainability
Conscious of Local Vernacular
SITE

Cordoba, Argentina

Climate of Cordoba

- Classified as Cfa which is a humid, subtropical climate
- Mild temperatures: highs around 75°F, lows around 50°F
- Between 10.5 and 6 hours of sunshine daily
ARCHITECTURE

Proposed School
Site Strategies

Community Access

Allowable Volume

Surrounding Materials
Program Strategies

Education

Lobby

Gathering
Environmental Strategies

North Oriented

Solar Access

Outdoor Areas
Landscape Strategies

- Park
- Outdoor Rooms:
  - Outdoor dining
  - Plaza
  - Soccer pitch
- Site Views

Circulation N

Community
Student
Plans
Passive Design Strategies

- Outdoor Spaces
- South Facing Clerestory
- Sawtooth Roof for Solar Access
- Thermal Chimney
- Compact Classrooms
- Open Lab Spaces
- Trombe Wall

Section through Educational Wing
Trombe Wall

**Summer:**
- Operable windows prevent overheating
- Creates breezy hybrid space
- Overhang shades portion of glazing

**Winter:**
- Windows closed to warm corridor
- Sun angle reaches glazing under overhang
- Thermal Mass matches local vernacular
Occupant Experience

- Easy access to HVAC and electric equipment
- Educational benefits

- Open Ceiling:
- Rainwater management
- Landscape irrigation
- Extra heat dumping

- Rooftop Water Harvesting:
- Extra heat dumping

- Sawtooth Roof System:
- Blocks direct sun exposure
- Uniform natural light in classrooms
- Optimized angle for solar panels

- Efficient Lighting System:
- Occupancy sensors
- Bright task lighting

- Community Spaces:
- Soccer Pitch
- Park access/Plaza
- Hybrid work spaces

Section through Cafeteria
ENGINEERING

Section Cut of Lobby
Mechanical System Design

- Multi-level Hot Water Heat Pump HVAC System
- Each room receives fresh, clean, and tempered outdoor air flow
- 2.5 times more efficient than a traditional electric water heater
Structural System Design

- Foundations
- Column and Beam Systems
- Load Bearing Walls
- Exterior Cladding
Electrical System Design

- **Inverter:** Converts solar panel DC supply to AC
- **Battery Bank:** Stores excess energy
- **Main Distribution Panel:** Allocates power to designated panel

Electrical Single Line Diagram
ENERGY PERFORMANCE
**Energy Usage**

- **Total Yearly Energy Usage:** 129,778 kWh/yr
- **Average Weekly Usage:** 2,496 kWh/week
- **Amount of Solar Panels:** 410 arrays (340 W)
- **Initial EUI:** 15 kBTU/ft²
- **Total Yearly Energy Created:** 199,342 kWh/yr
THANK YOU