ZERO HEROES

ASHRAE LowDown Showdown

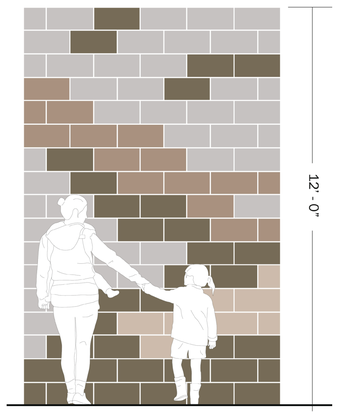
2022 Building Performance Analysis Conference

Building Type: K-5 Elementary School

Nominal Floor Area: 72,700sf

Location: Albuquerque, NM

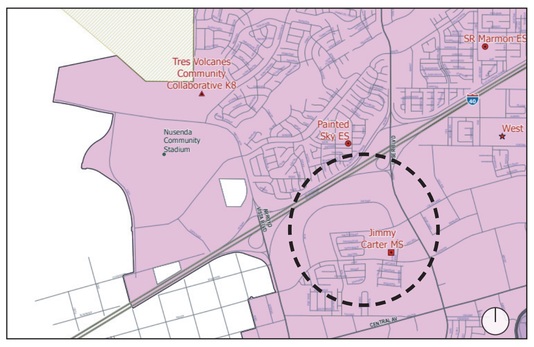
STEM Learning Courtyard



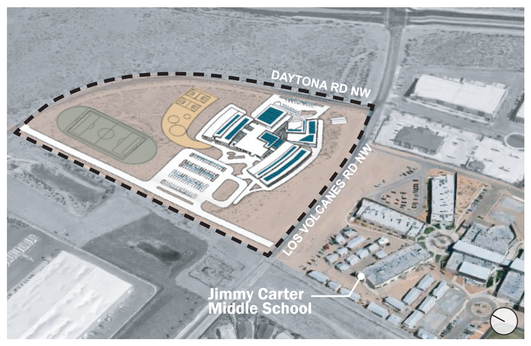
CONCEPT
Arroyo & Maize

Program Organization
K-5 + STEM

CONTEXT
Albuquerque Public School District #5



SITE
K-8 Campus Connector



Total Site Energy Usage

1,536,599 kBtu

Site EUI

20.4 kBtu/ft² yr

Source EUI

66 kBtu/ft² yr

Annual Operational Carbon

-0.8 kgCO2e/ft² yr

Total Embodied CO2e

2,570,000 kg CO2e

Annual Water Usage

172,292 Gallons

Annual Energy Costs

0.4 $/ft²

Annual Water Costs

0.7 $/ft²

Total Annual Costs

1.1 $/ft²

Total Energy Generation

2,234,402 kBtu

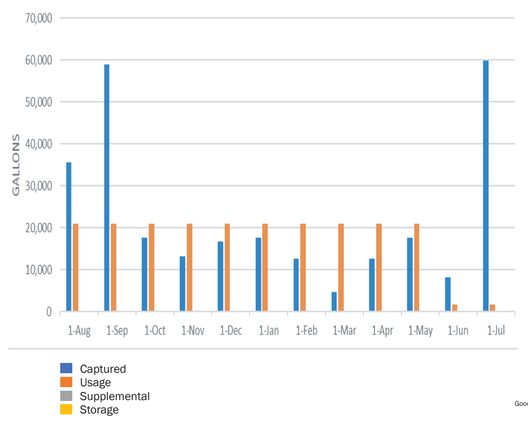
Design Description

The site was chosen based on our research into Albuquerque Public School District's strategic plans to build shared campuses that support students from elementary to middle school. Located in District Five, we discovered Jimmy Carter Middle School which is currently utilizing modular classrooms. Locating our project North of Los Volcanes Road NW, alleviates the Middle School's limited space and enables the sharing of educational resources for both the Middle School and surrounding neighborhood to use. Through research, the team reduced the total square footage to 72,700 SF (from 75,000 SF) while still satisfying the requirements of the Albuquerque Public Schools Design Standards and exemplifying STEM-based programming.

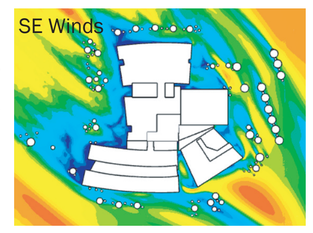
Energy Savings Strategies

- High Thermal Mass Wall Construction
- GSHP
- Night Flush
- Sorbent Filter (ASHRAE 62.1 compliant)
- Solar Hot Water to preheat OA and WWR
- Optimal WWR and glazing spec
- Orientation and solar shading
- Minimal internal gains (0.46 W/SF LPS; 0.57 W/SF EPD)

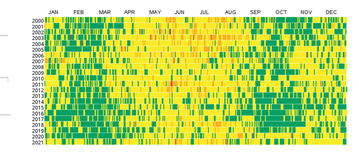
Water Monthly Volumes



EXTERIOR WIND COMFORT



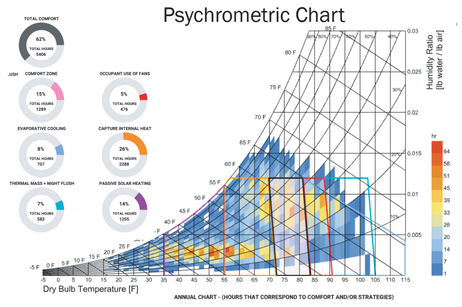
Daily AQI Values, Albuquerque, NM,2000 to 2021[1]

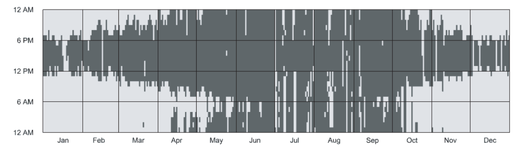


1 U.S EPA AirData

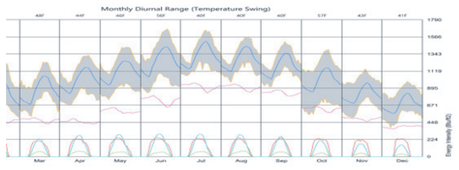
CLIMATE ANALYSIS

Psychrometric Chart



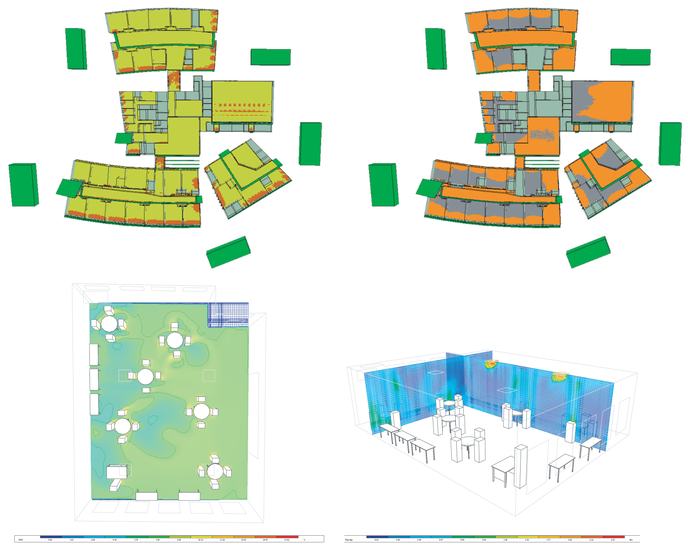


Monthly Diurnal Range (Temperature Swing)

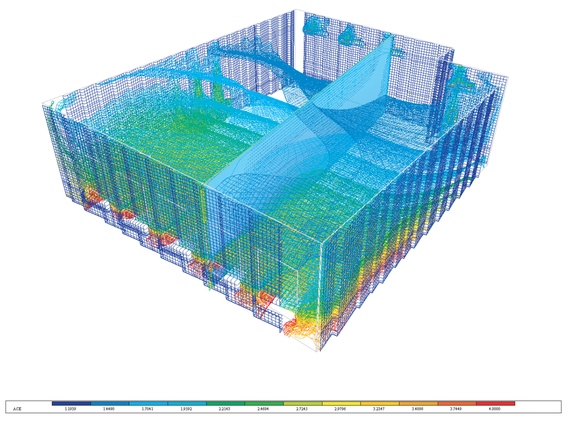


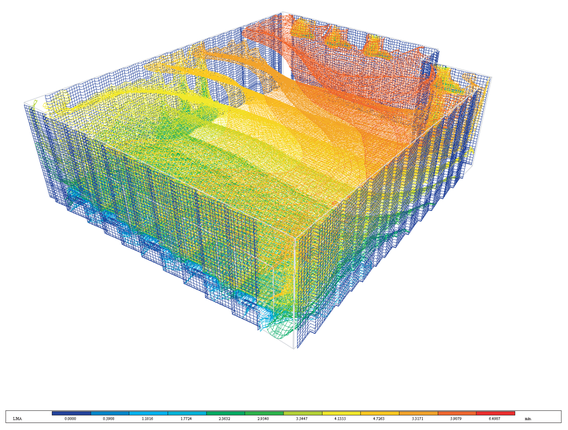
DAYLIGHT + VISUAL COMFORT

ASE (1000, 250) = 9.2 % sDA = 75%



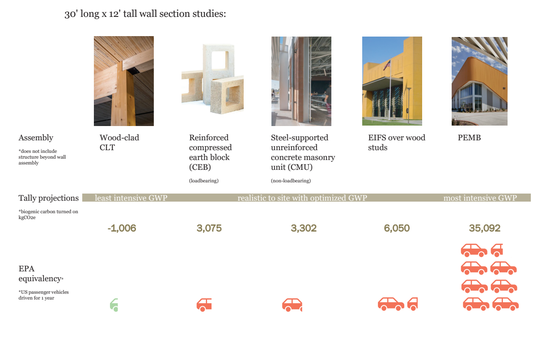
INDOOR AIR QUALITY + COMFORT



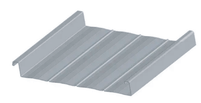


CARBON MITIGATION MEASURES

Embodied Carbon x Wall Assemblies



SELECTED MATERIALS

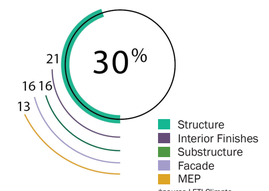


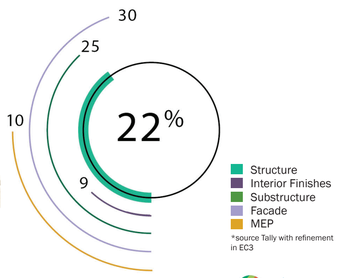
Standing Seam Metal Roof

CLT ceiling deck / structure

Reinforced compressed earth block (CEB) as enclosure and interior finish (load bearing)

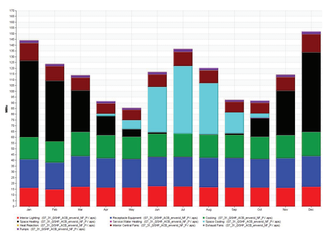
Traditional schools x Embodied Carbon



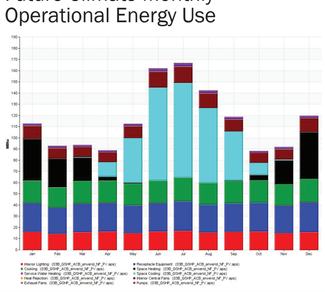


ENERGY

Current Climate Monthly Operational Energy Use



Future Climate Monthly Operational Energy Use



Team

High Performance Design Leader / Captain
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Building Performance Analyst / Energy Modeler
Rajat Wahdwa

Mechanical Engineer / Engineer
Anthony Montez

Mechanical Designer / Engineer
Andrew Eckhoff

Building Performance Analyst /Engineer
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High Performance Design Leader /Designer
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Architectural Designer / Desig ner
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Senior High Performance Designer /Architect
Jill Maltby-Abbot

Building Performance Analyst/Energy Modeler
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