POINT PRESENT

DOE Solar Decathlon 2022
Team: Cloud 10
Division: Education Building

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FACULTY
Susan Piedmont-Palladino
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DATA CENTER LOCATIONS
ASHBURN, VIRGINIA

40 MILES
Potomac Yard
1980’s Railyard
DESIGN CONSTRAINTS AND GOALS

Potomac Yard
2000’s Shopping Mall

Credit: North Potomac Yard Aerial, JBG SMITH Properties
PROPOSED POTOMAC YARD MASTER PLAN (2017)

DESIGN CONSTRAINTS AND GOALS

Credit: North Potomac Yard Redevelopment, StreetSense
PROPOSED POTOMAC YARD MASTER PLAN (2017)
POTOMAC YARD DEVELOPMENT

INNOVATION CAMPUS
SMITHGROUP

PARCEL A
PARCEL B

DESIGN CONSTRAINTS AND GOALS
INTEGRATED PERFORMANCE

SOLAR ORCHARD

DURABILITY AND RESILIENCE

INTEGRATED PERFORMANCE
Pervious Pavers

Durability and Resilience

Integrated Performance
PV PAVERS

DURABILITY AND RESILIENCE

INTEGRATED PERFORMANCE
SOLAR ORCHARD
STORMWATER INFILTRATION BASIN
COOLING POND
PERVIOUS PAVERS
PV PAVERS
SOLAR ORCHARD
AMPHITHEATER
SITE RAINWATER COLLECTION
EXTENSIVE GREEN ROOF
DURABILITY AND RESILIENCE
INTEGRATED PERFORMANCE
DESIGN CONSTRAINTS AND GOALS

CLIMATE ZONE

YEARLY RELATIVE HUMIDITY

ZONE 4A
ALEXANDRIA, VA
Current High School Enrollment: 4,118
Projected Enrollment: 4,605

Source: https://www.acps.k12.va.us/Domain/794
**DESIGN OBJECTIVES**

01. Normalize high performance building

02. Utilize the building as a teaching tool

03. Distribute heat and energy

04. Implement microgrid

05. Maximize passive design strategies
PROGRAM

ARCHITECTURE
FALL EQUINOX
8 am - 3 pm
ANNUAL SOLAR EXPOSURE WITHOUT SOLAR STRATEGIES

SOUTH FACADE ITERATIONS

01  02  03  04  05  06  07  08  09
INTEGRATED PERFORMANCE  ENERGY PERFORMANCE
ANNUAL SOLAR EXPOSURE WITH SOLAR STRATEGIES

- SOUTH: Horizontal PV Louvers
- EAST: Vertical PV Louvers
- ROOF: Raised PV Array
TYPICAL WALL SECTION
CLT AND GLULAM

HIGH SCHOOL
CLT PANELS
GLULAM BEAMS AND COLUMNS

DATA CENTER
ICF WITH LOW CARBON CONCRETE

ARCHITECTURE
EMBODIED ENVIRONMENTAL IMPACT
TYPICAL CLASSROOM

- GREEN LIGHT
- EXPOSED MASS TIMBER
- PV FINS
- HABITABLE BALCONY
- FIBERGLASS STOREFRONT
- WINDOW TO HALLWAY
- ACCESS FLOOR FOR VENTILATION AND HEATING

ARCHITECTURE
INTEGRATED PERFORMANCE
COMFORT AND ENVIRONMENTAL QUALITY
MEDIA CENTER

VERTICAL SHADE FINS

EXPOSED MASS TIMBER STRUCTURE

VERTICAL PV FINS

COLOR CODED CONDUITS

MEZZANINE

INSULATED METAL PANELS

ARCHITECTURE

OCCUPANT EXPERIENCE

COMFORT AND ENVIRONMENTAL QUALITY

01 02 03 04 05 06 07 08 09
1ST FLOOR
LAB SPACE
CIRCADIAN LIGHTING

INTEGRATED PERFORMANCE

COMFORT AND ENVIRONMENTAL QUALITY

8 am
INTEGRATED PERFORMANCE

DAYLIGHT + OCCUPANCY LIGHTING

8 am

01 02 03 04 05 06 07 08 09

COMFORT AND ENVIRONMENTAL QUALITY
HEAT DISTRIBUTION

POTOMAC RIVER

FOUR MILE RUN

DETENTION COOLING POND

GEOTHERMAL FIELD

DATA HEAT PRODUCTION

RADIANT HEATED PLAZAS FOR SNOWMELT

DISTRICT HOT WATER

SUMMER

DISTRICT HOT WATER

WINTER

FOUR MILE RUN

DETENTION POND

GEOTHERMAL
DATA CENTER HEAT EXCHANGE
HIGH SCHOOL EUI SOURCE METRICS (kBtu/ft²/yr)

- **EUI TARGET**: 56
- **EUI (NO RENEWABLES)**: 37.04
- **NET ZERO**
  - **EUI (WITH RENEWABLES)**: -33.28

**CO₂ REDUCTION**

89%

**ON-SITE GENERATION**

-70.32
ENGINEERING

OCCUPANT EXPERIENCE

ARCHITECTURE

ELECTRICAL ROOMS

3.5 MW LEASABLE DATA SPACE

1.5 MW TRAINING DATA SPACE

HYDROGEN GENERATORS

01 ARCHITECTURE
02 ENGINEERING
03 OCCUPANT EXPERIENCE
DATA CENTER = INTERNET + ELECTRICITY

POWER USE EFFICIENCY

- POINT PRESENT: 1.08 PUE
- INDUSTRY STANDARD: 1.67 PUE

DATA CENTER INFRASTRUCTURE EFFICIENCY

- POINT PRESENT: 93% DCIE
- INDUSTRY STANDARD: 47% DCIE

FIRST FLOOR DIAGRAM

ENGINEERING

INTEGRATED PERFORMANCE
INDUSTRY MENTORS & ADVISORS

David Baker, Director
Virginia Tech

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Photo Credit: Andarge Asfaw
SUPPLEMENTAL DRAWINGS
THIRD FLOOR PLAN - TYPICAL