

FEFPA 2021 Summer Conference Continuing Education Provider-Approved # 666

# ROLE OF MANAGERS IN HIGH PERFORMANCE FACILITIES

Tony Shahnami, Bobby Shahnami & Jose Murguido

July 13<sup>th</sup>, 2021



**SGM** ZYSCOVICH  
ENGINEERING

# YOUR PRESENTERS

---



**Tony Shahnami**  
PE, CxA, CES, FE, CHS-III  
*SGM Engineering*



**Bobby Shahnami**  
PE, CxA, LEED AP  
*SGM Engineering*



**Jose Murguido**  
AIA, NCARB, ALEP  
*Partner, Zyscovich Inc.*

Changing Times

# **THE NEW NORMAL**

---



# PROJECT MANAGER

...the buck stops here!

---

## 1. WHAT IS PROJECT MANAGER?

- The person responsible to make the project a reality and sees the project from inception to completion.
- They will have close communication, teamwork, complete on time and within budget.



# PROJECT MANAGER

...no existing app, sorry!

---

## 2. SUCCESS MAP...CHANGE PATHWAYS

- Develop quality scope validation
- Ensuring budget is maintained
- Ensuring design time accommodates construction schedule
- Allocating resources
- Communication
- Response time

# A SCHOOL FOR THE CHANGING TIMES

---

## HIGH PERFORMANCE FACILITY

**Name:** New School Facility – Grades 6-8 and Workforce Housing

**Owner:** Miami-Dade County Public Schools

**Design Team:** Zyscovich, Inc.

**MEP/FP Engineers:** SGM

**Budget:** \$24.5M

**Square Footage:** 88,000 SF

**Student Capacity:** 610 student stations; 10 residential 1-bedroom units

**Completion Date:** August 2023



# A SCHOOL FOR THE CHANGING TIMES

---

## OBJECTIVES

- The mixed-use facility combines integrated housing for teachers with a multi-story middle school (grades 6-8) provides a unique opportunity to address the need for both affordable housing and primary education
  - 21<sup>st</sup> Century Learning Environment
  - First Net-Zero ready school (EUI < 25) for the District.
  - State-of-the-art technology infrastructure as per MDCPS *Building Envelope - Advanced strategies to reduce/eliminate exfiltration energy losses - moisture seals wrap into all door and window openings.*
  - *Impact Insulated glazing with low SHGC and U value factors*
  - *Enhanced roofing insulation.*
  - *Volatile Organic Compound (VOC) content restrictions.*



# A SCHOOL FOR THE CHANGING TIMES

## THE CHALLENGES

- West Brickell presented many challenges however SGM overcome these challenges along with help of architects and other consultants. Listed below are the highlighted challenges of this project:

- Floor to floor height
- High rise structure
- Mechanical Intakes and Discharge points
- Kitchen equipment
- HVAC redundancy
- Noise criteria
- Exposed Equipment to Elements







**MIAMI...A WORLD CITY GATEWAY TO THE CARIBBEAN, CENTRAL & SOUTH AMERICA**

---



New, **9-story (or 14-story)** building to accommodate up to **610 student stations** (which may include 4 levels of parking for school staff and visitors);

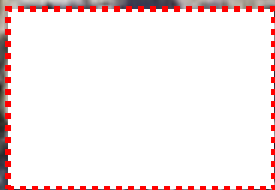
**Secondary School Facilities List** includes General Purpose Classrooms (English, Mathematics and Social Studies), Science Demo Classrooms, ESE Classroom, Health Education, Skills Development Lab, Art, Music, Physical Education, Media Center, Administration, Food Service, Textbook Storage, Student and Staff Restrooms and Custodial areas;

All related ancillary, support and Mechanical/Electrical equipment spaces for each area; **Roof-level Play Area**, PE equipment space(s), and hard courts; Ground-level service drive(s) and drop-off(s); and all required on-site and off-site improvements;

One level of **10 Workforce Housing** units with independent entrance, exits, safety-to-life systems and utilities (including mechanical and electrical systems, water, sewer and communication services);

One level of Workforce Housing parking with **independent entrance(s) and exit(s)**; and Roof-level penthouse for HVAC System Chillers.

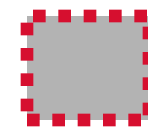
# 2020



U.S. Census Bureau

# 2,496,435

THE SITE

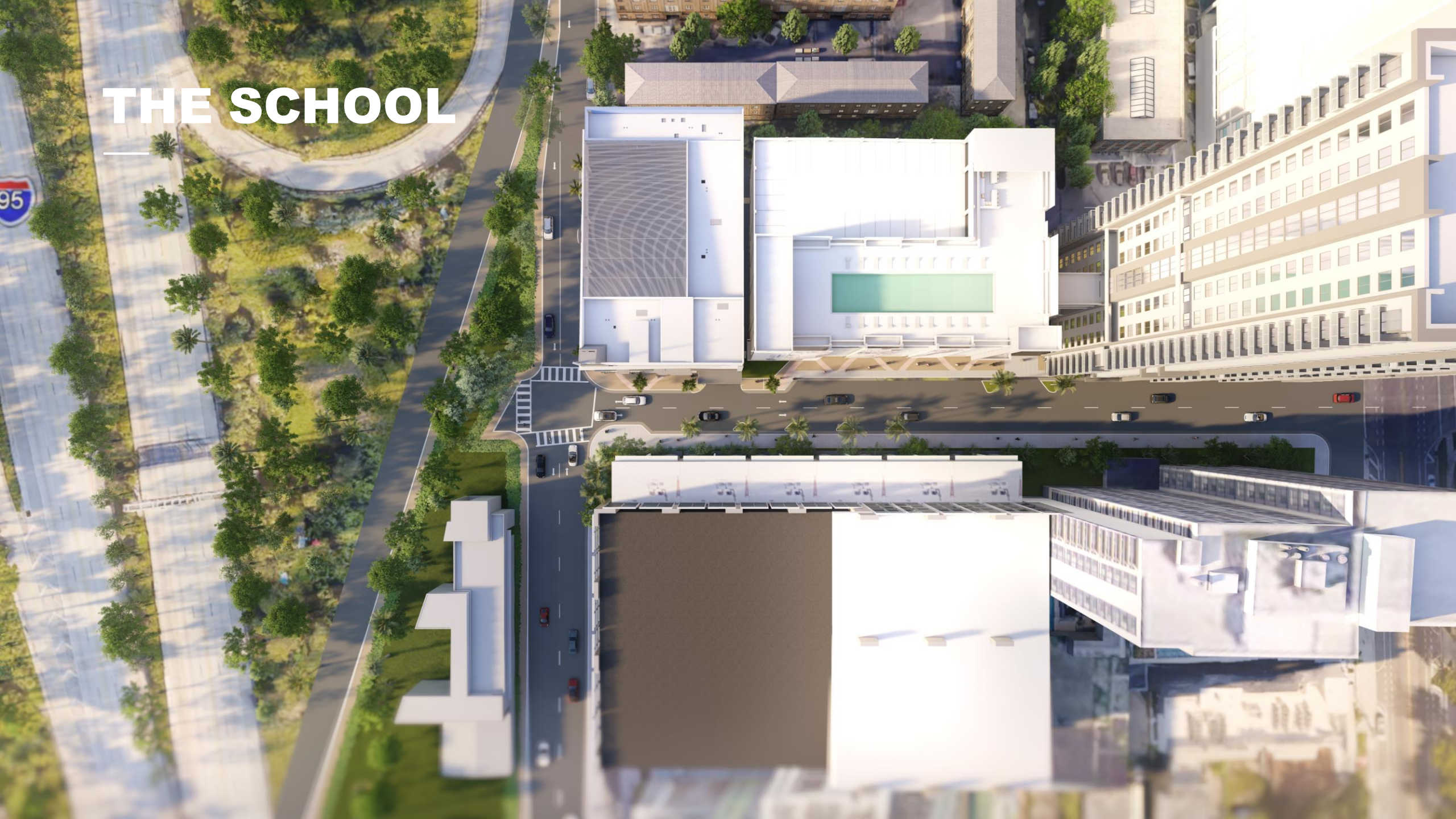


# SITE PARAMETERS

---



# THE SCHOOL



# New Urban Middle School with Integrated Workforce Housing



Third Avenue & 10<sup>th</sup> Street

# BUILDING ORGANIZATION

1st Floor

2nd Floor

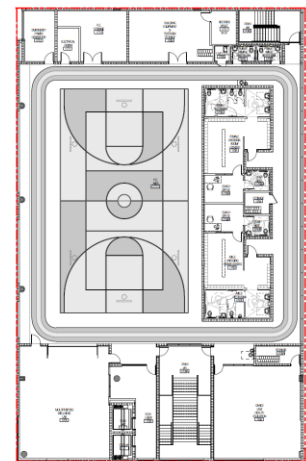
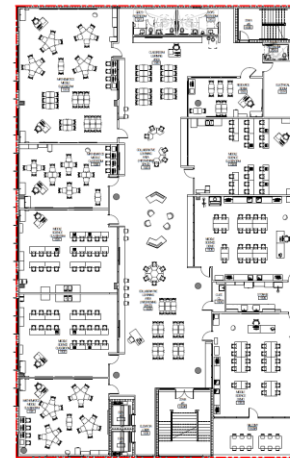
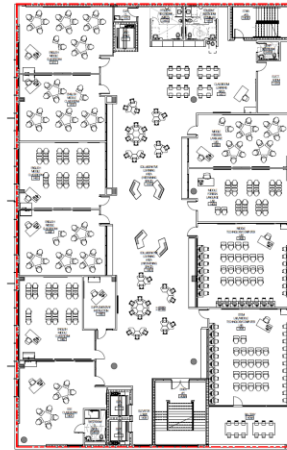
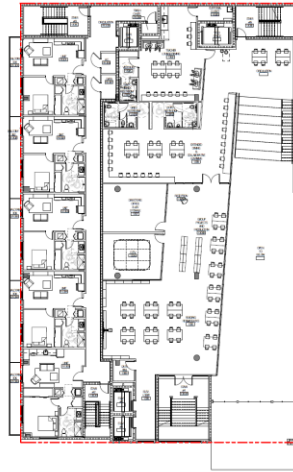
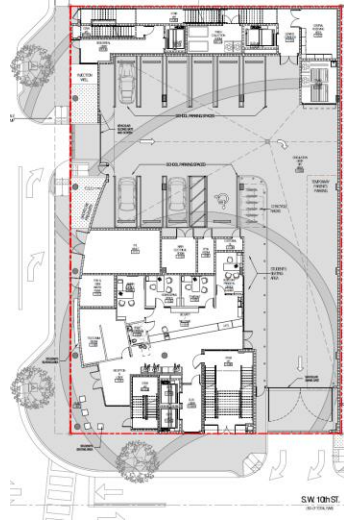
3rd Floor

4th Floor

5th Floor

6th Floor

7th Floor



**Entry**  
**Parking**  
**Drop-off**  
**Admin.**

**Admin.**  
**Food Service**  
**Apartments**

**Media**  
**Faculty Club**  
**Apartments**

**Computer**  
**Foreign Lang.**  
**ESE**  
**Supplemental**  
**Classrooms**

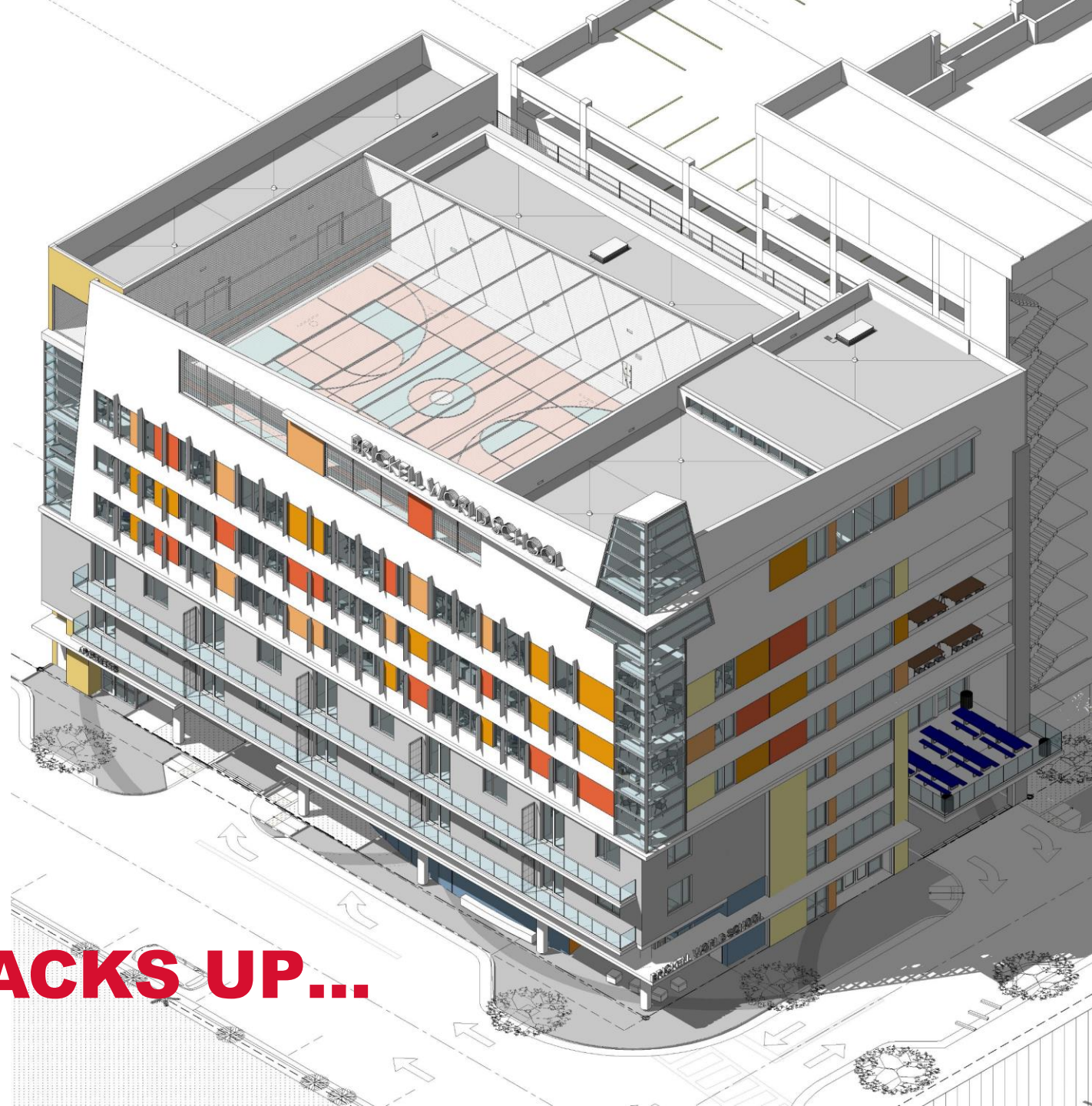
**Science**  
**Classrooms**  
**Resource**

**Art Lab**  
**Music Lab**  
**Resource**  
**Classroom**

**Lockers**  
**Health**  
**Multipurpose**  
**Roof Play**





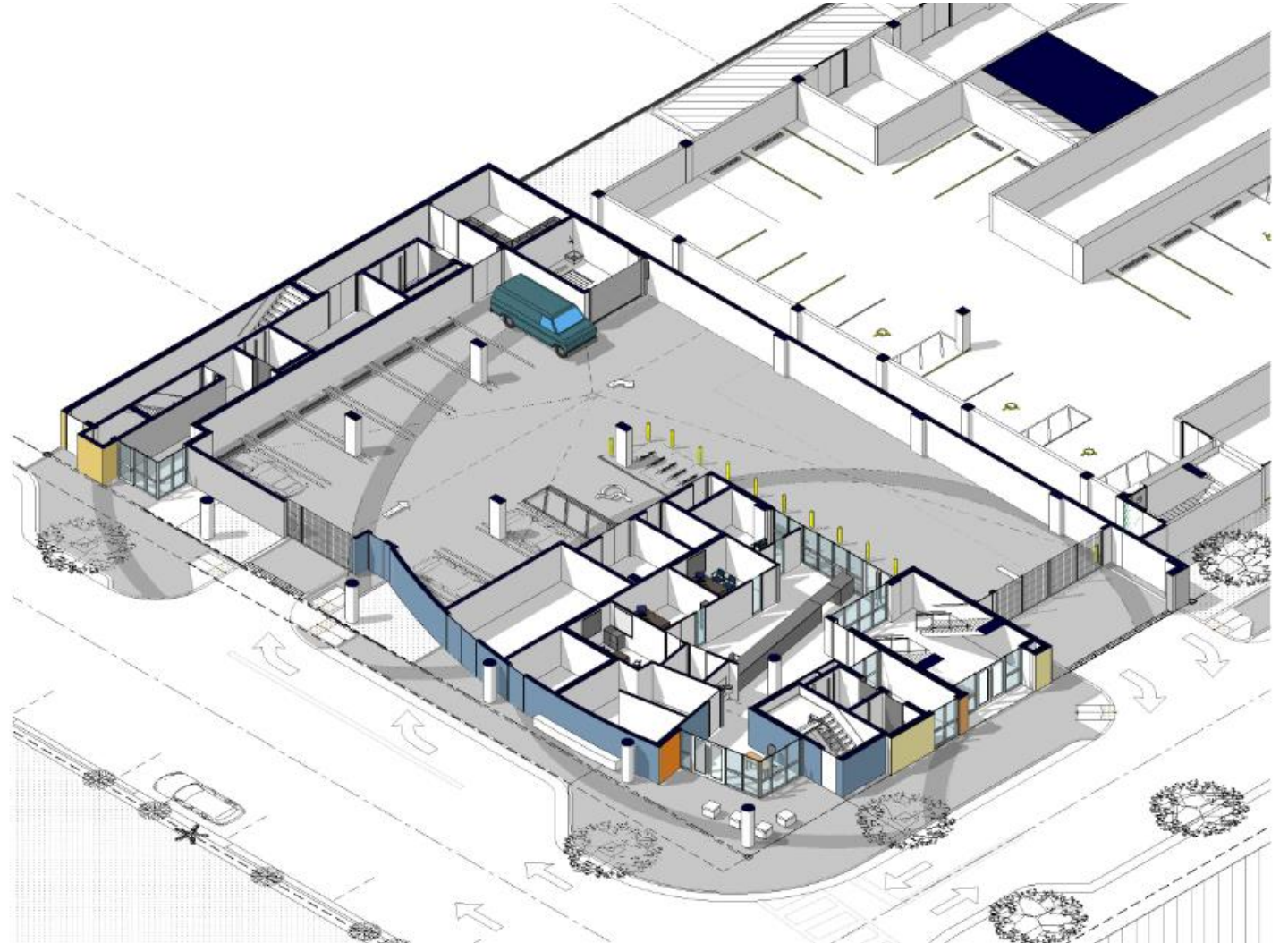
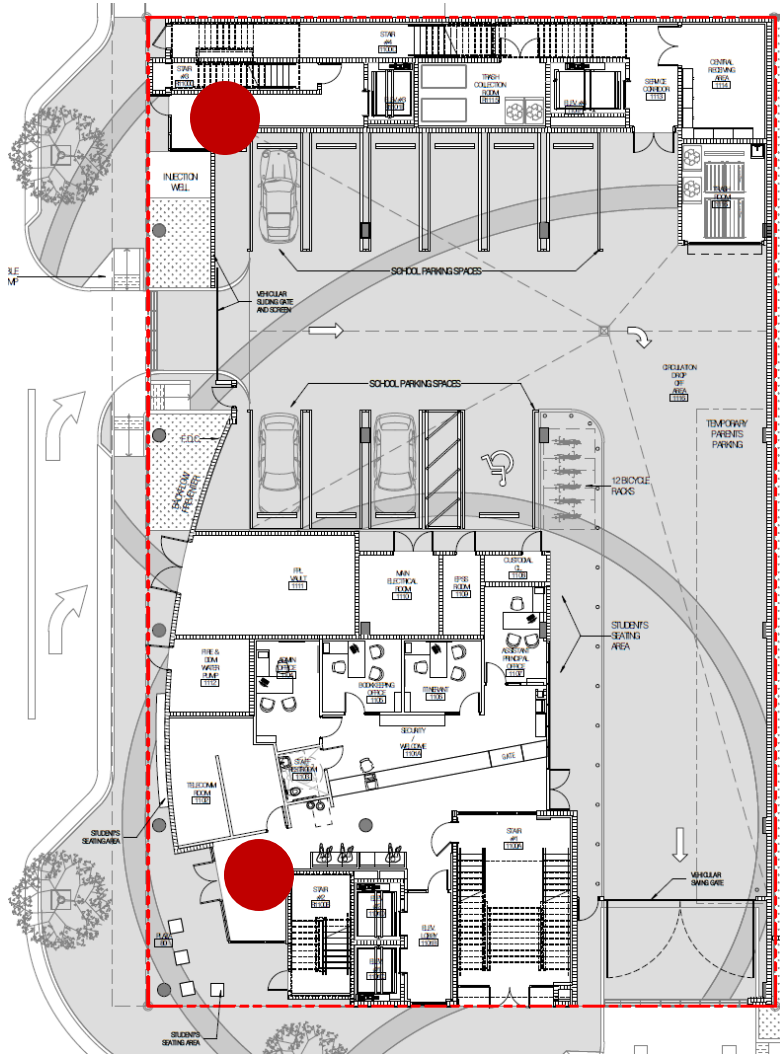


**HOW IT STACKS UP...**

---



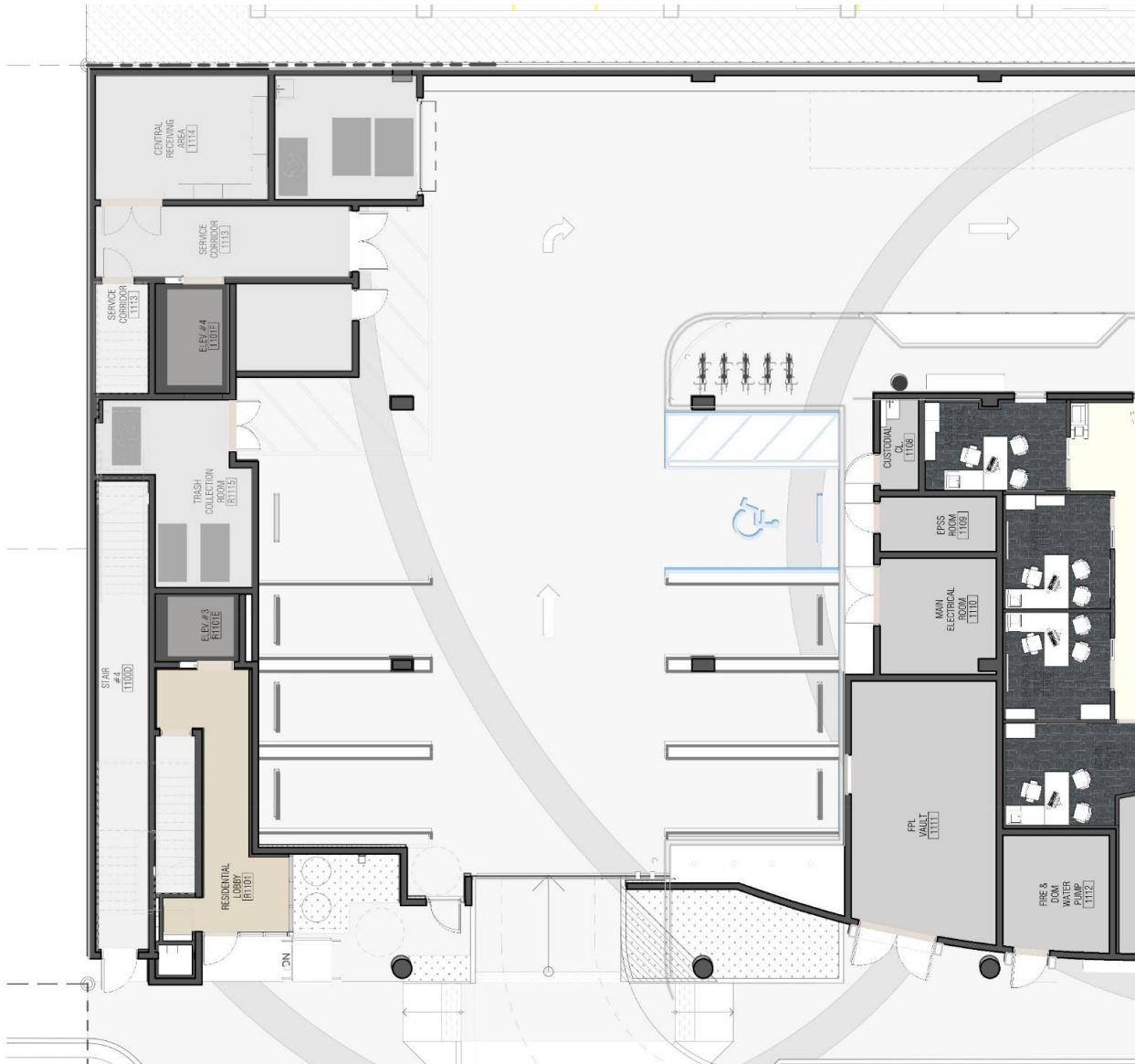
# FIRST FLOOR





**WELCOME LOBBY ENTRANCE**

---



**WELCOME LOBBY**

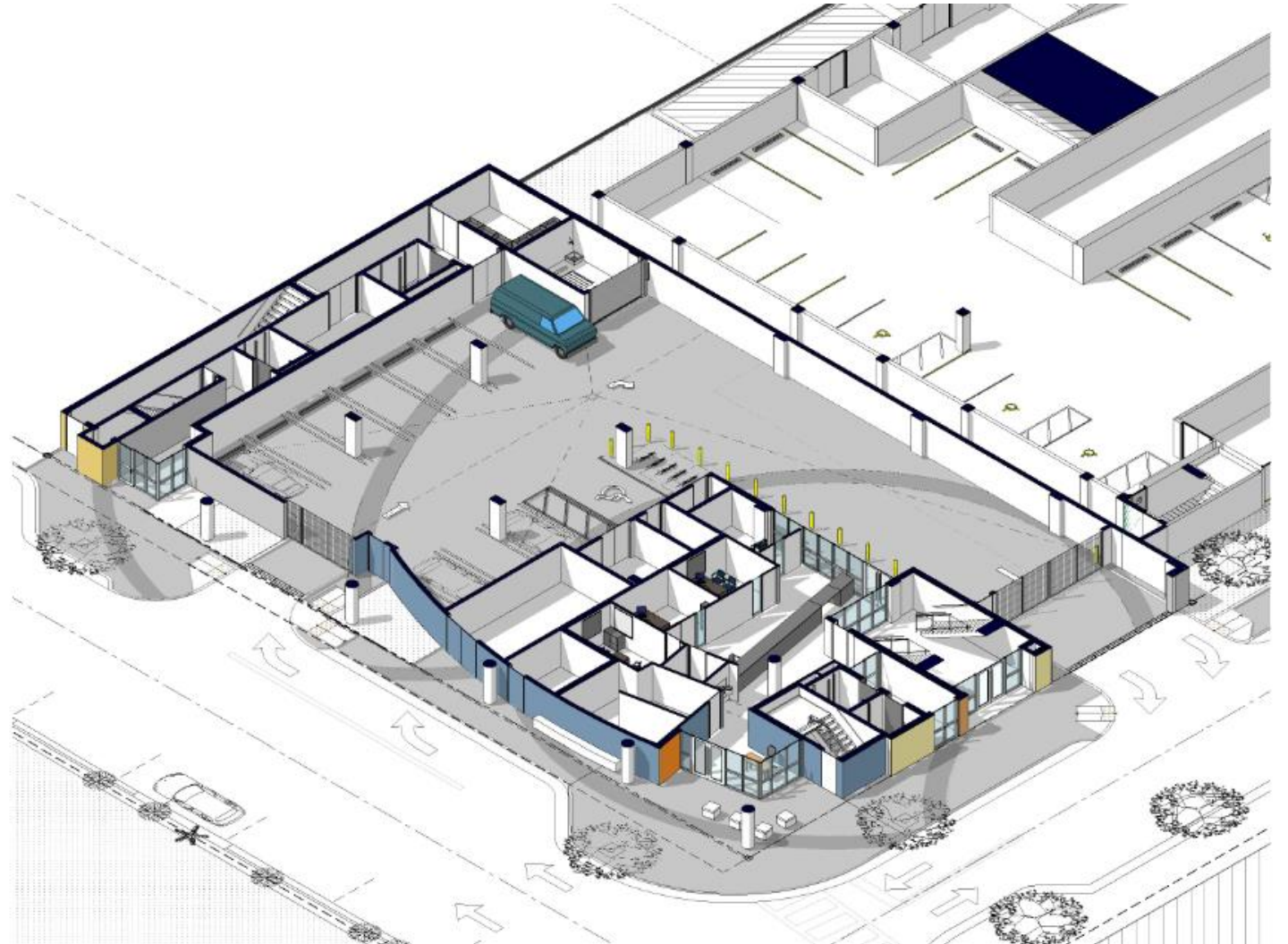
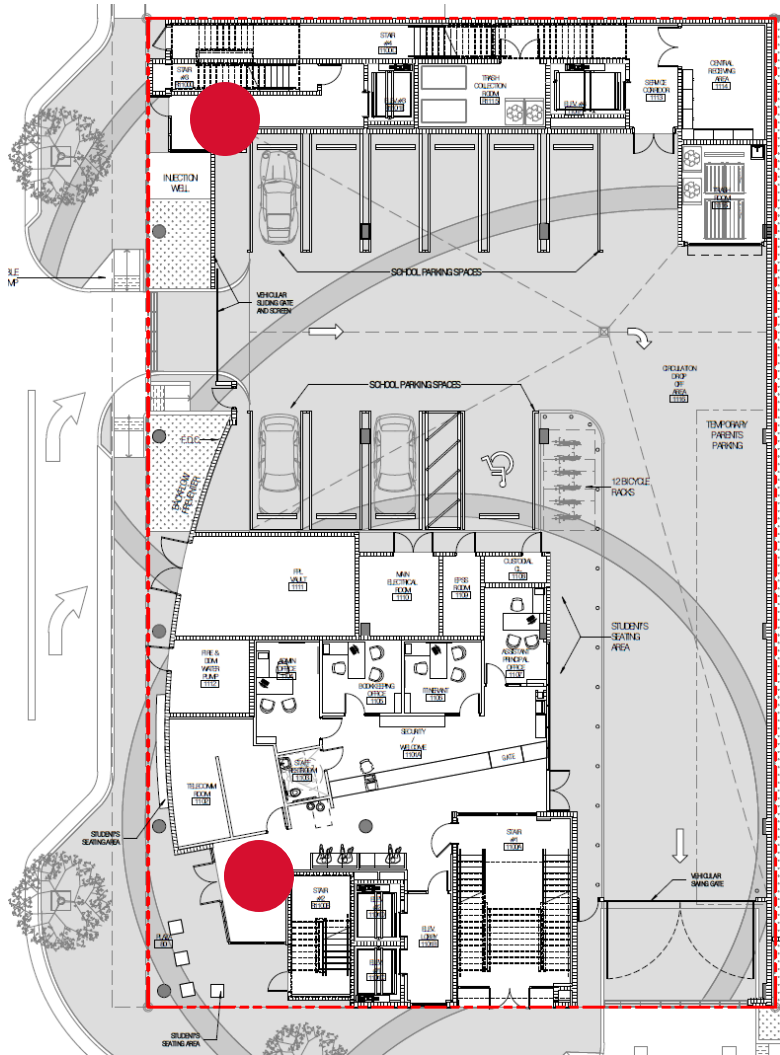




# SECOND & THIRD FLOOR PLAN

---

# FIRST FLOOR



# EXTERIOR RENDERINGS

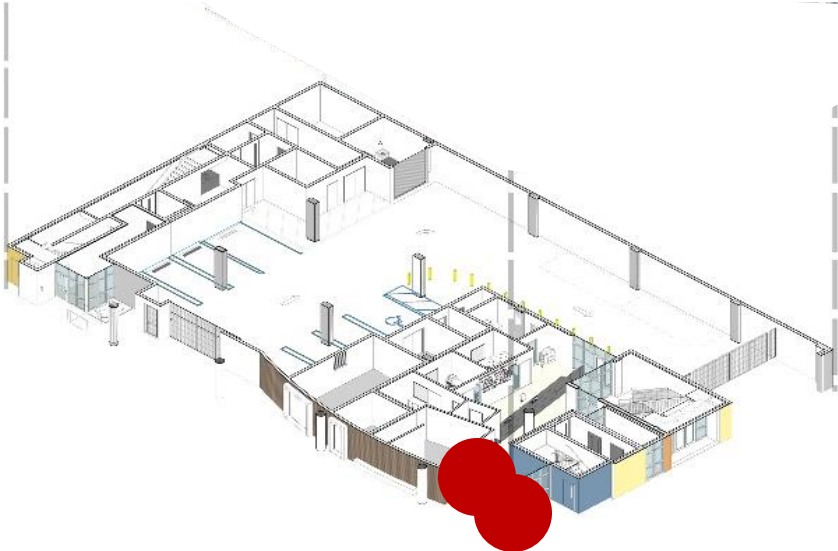


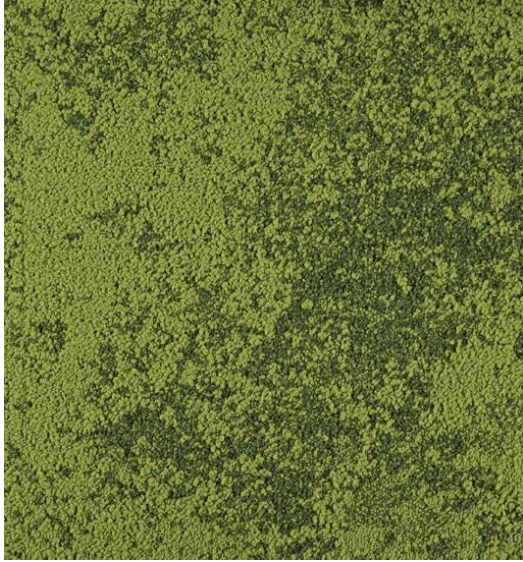


# WELCOME CENTER



Ground Floor





# **FIT STAIR**

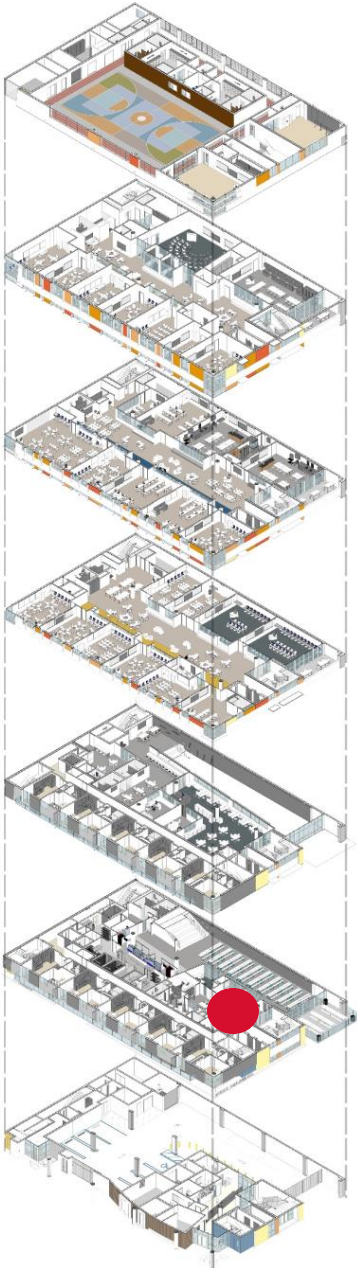
Biophilic Experience



# SECOND FLOOR



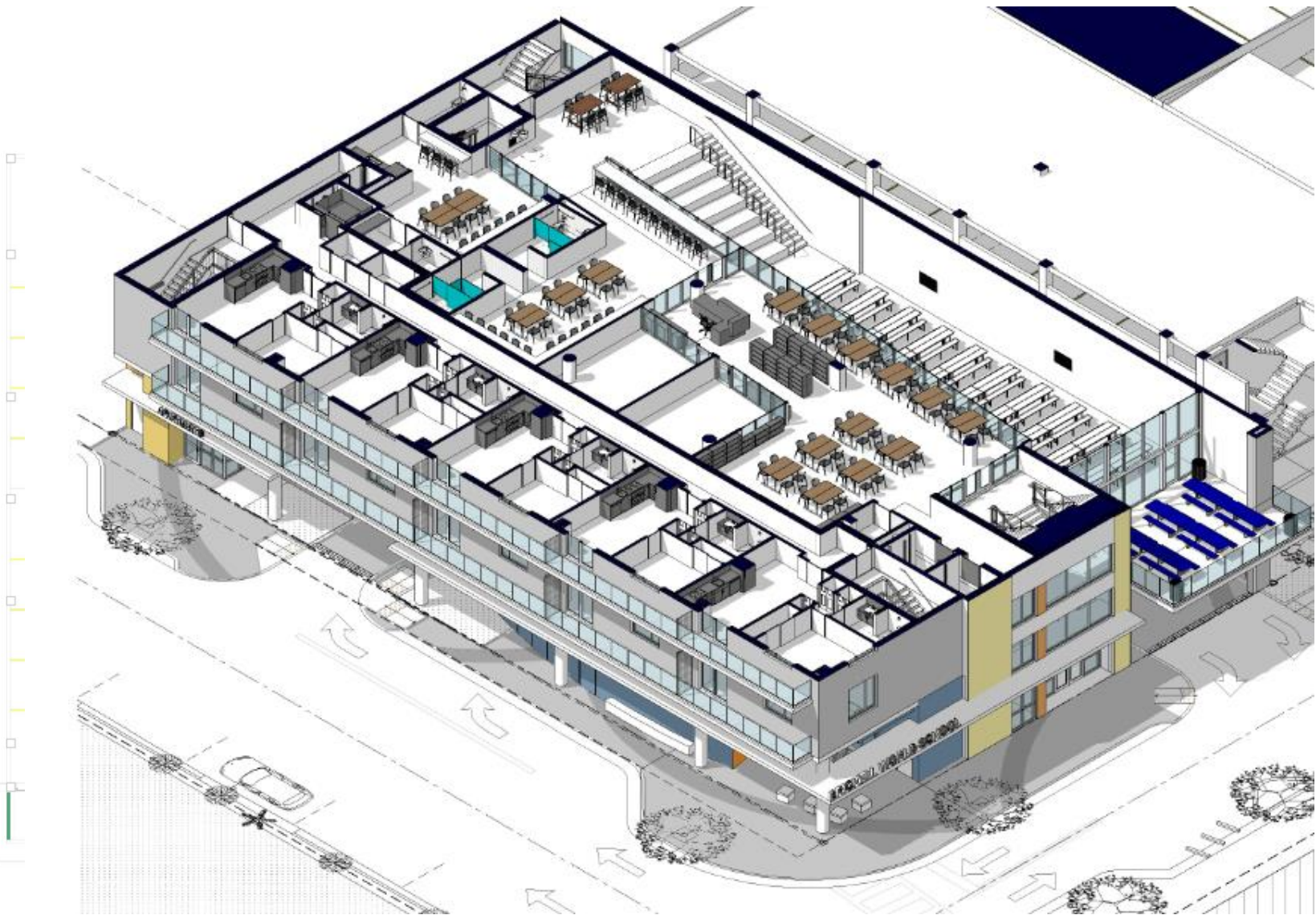
# ADMINISTRATION RECEPTION

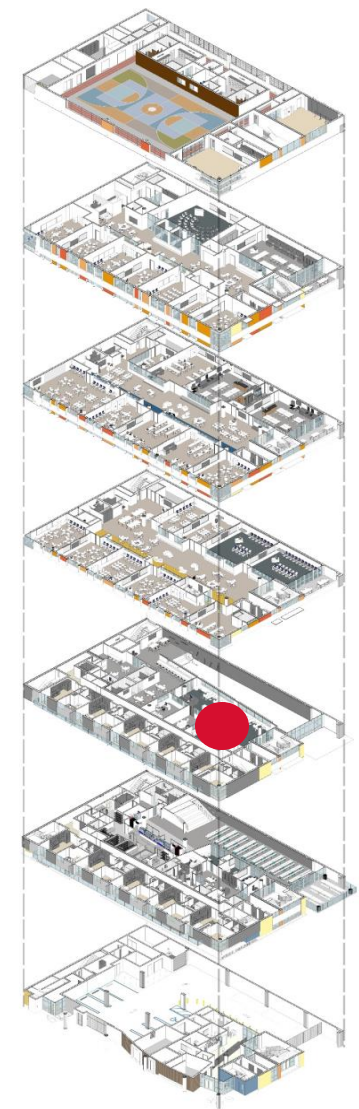


# WORLD DINING ROOM

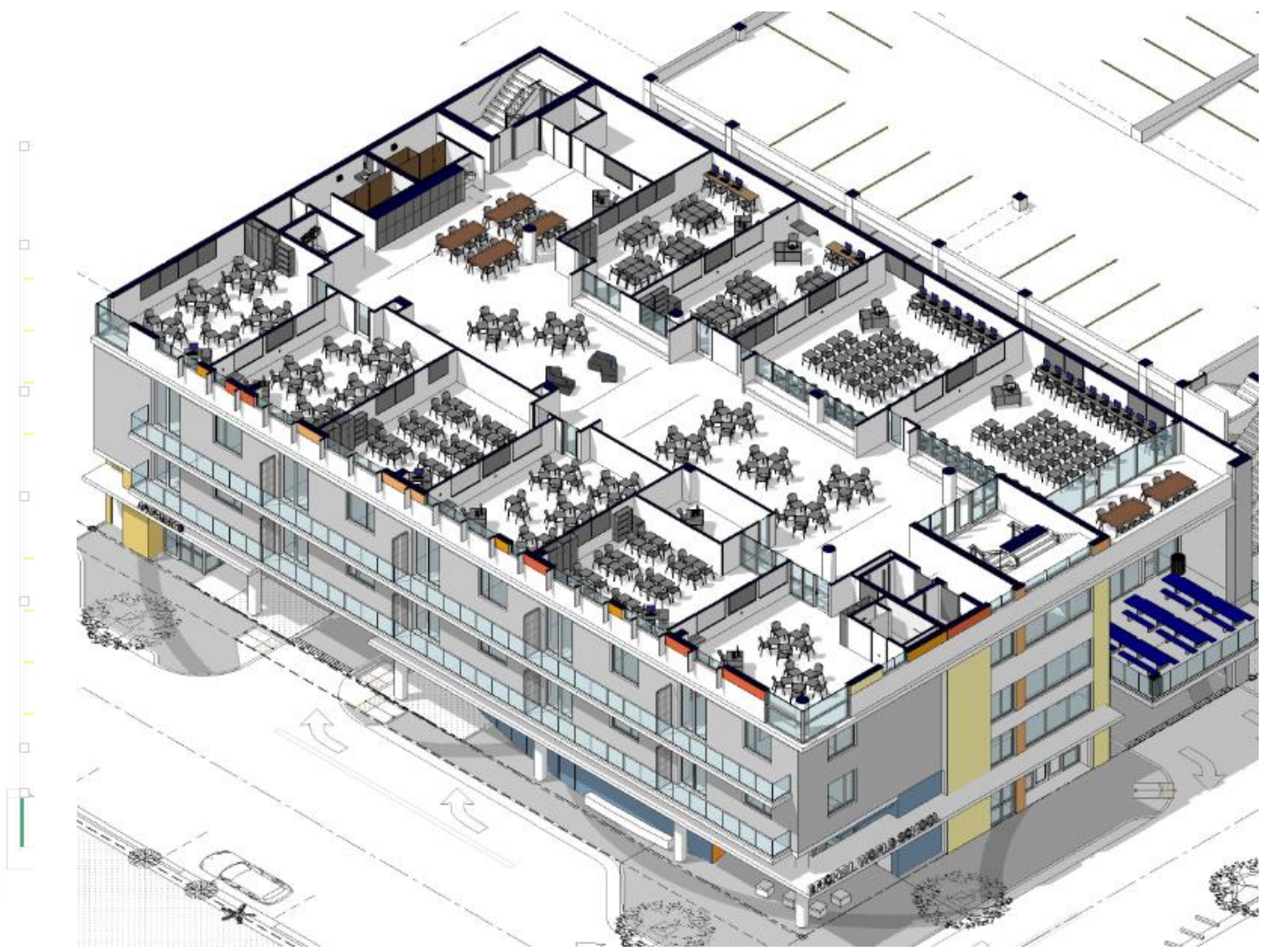
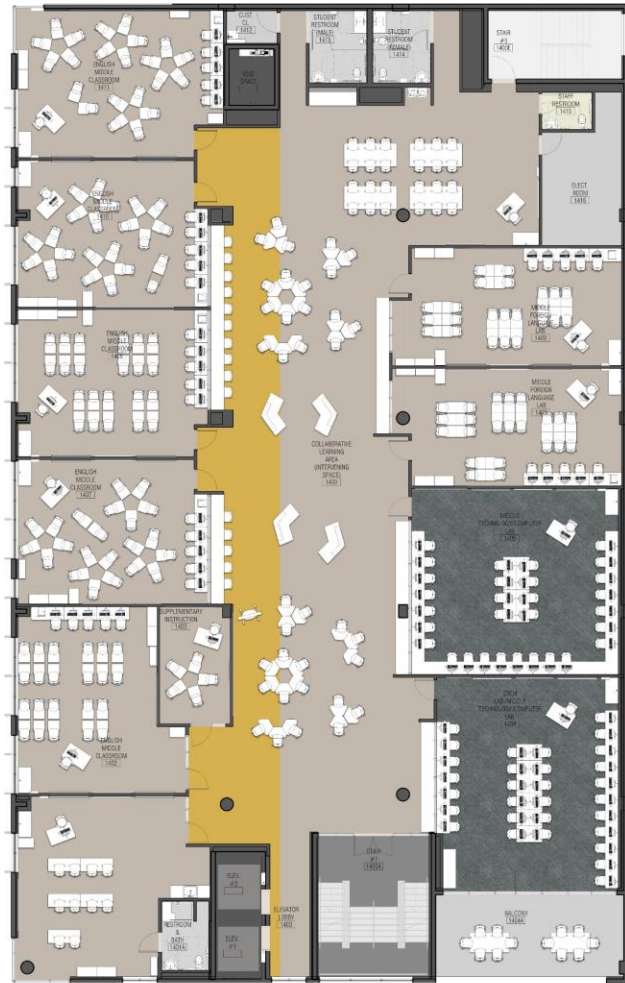


# THIRD FLOOR



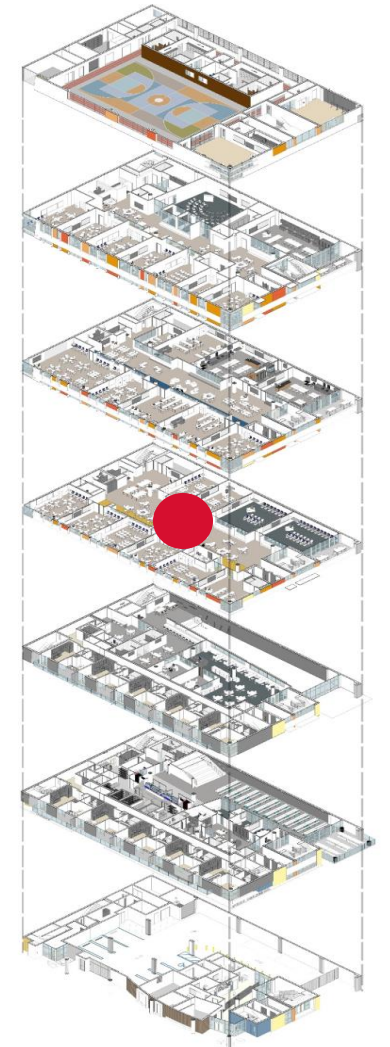
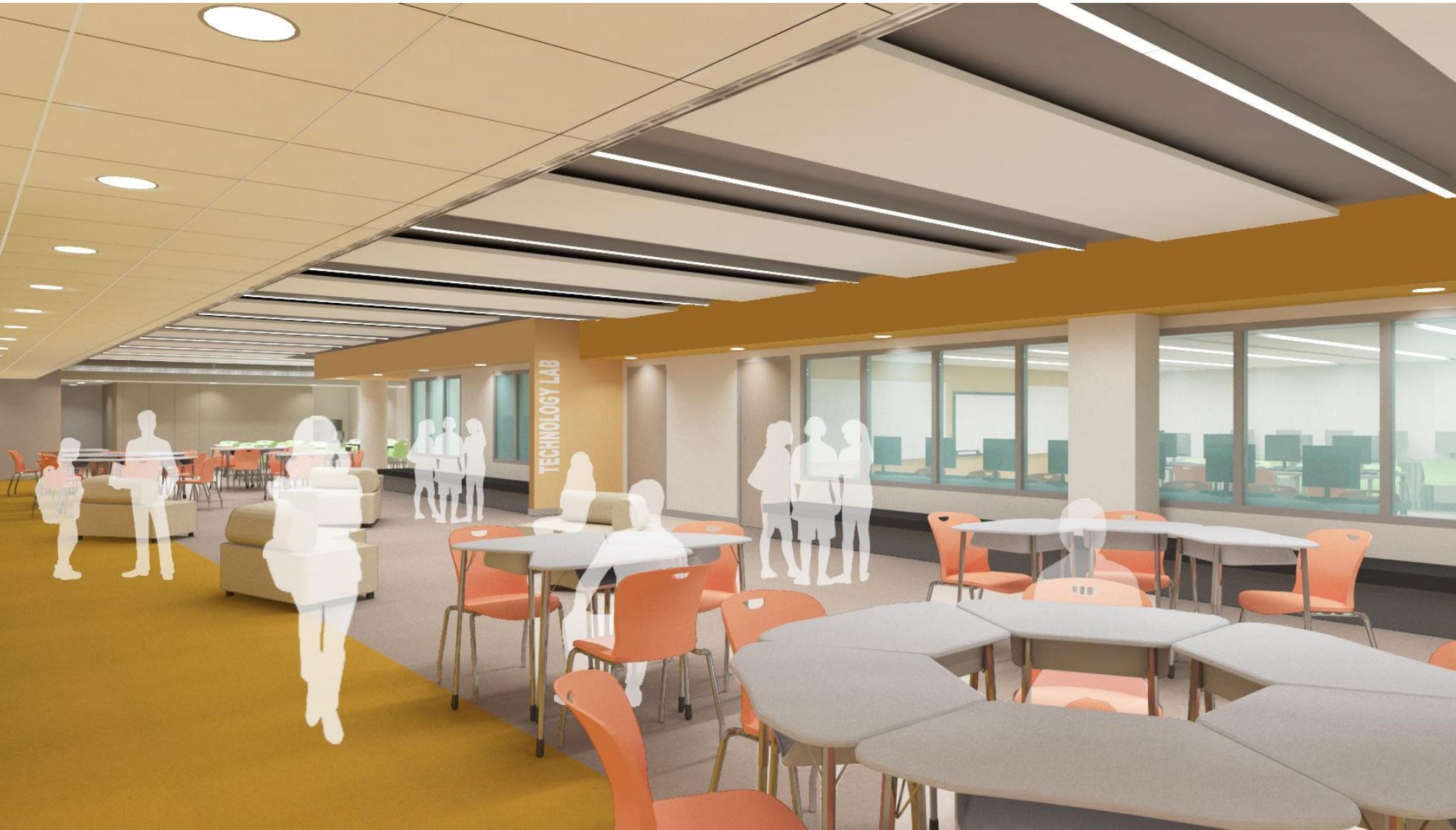


# FOURTH FLOOR - PATHWAYS



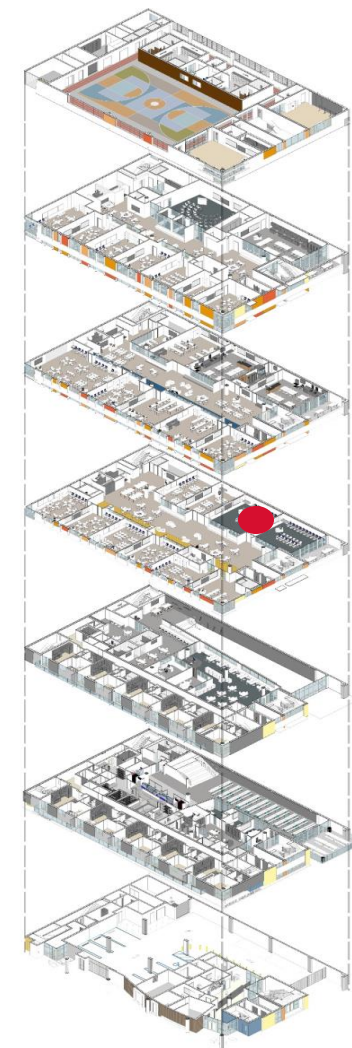


# FOURTH FLOOR – PATHWAYS COLLABORATORIUM

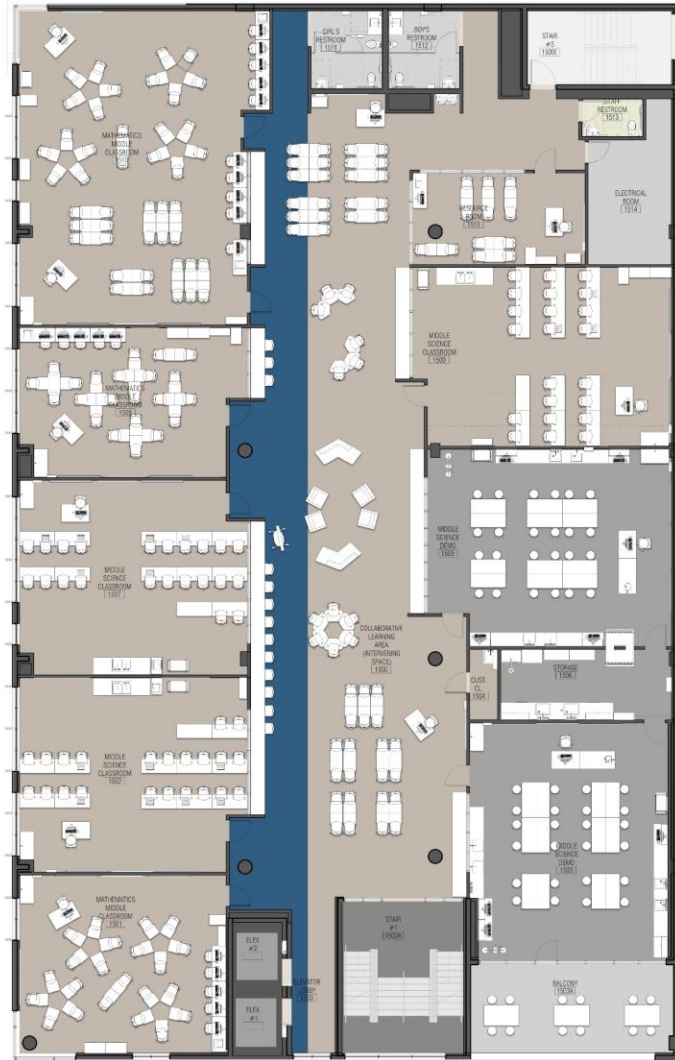


# FOURTH FLOOR – PATHWAYS STUDIOS

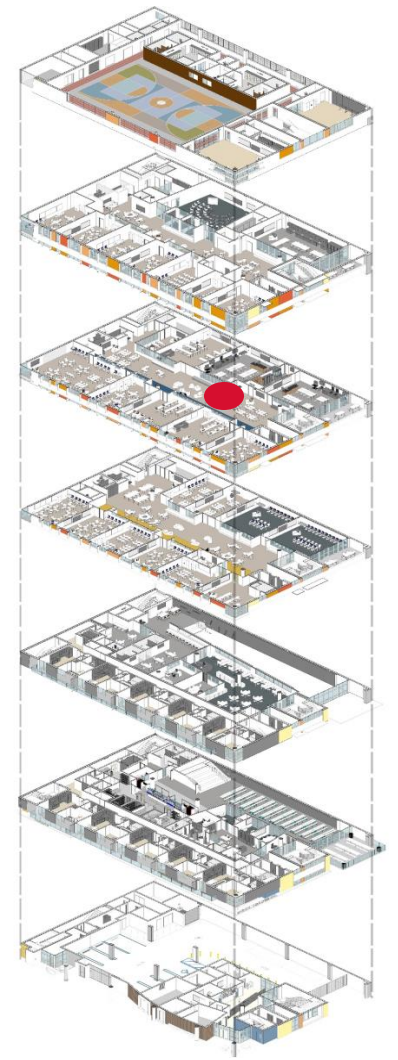


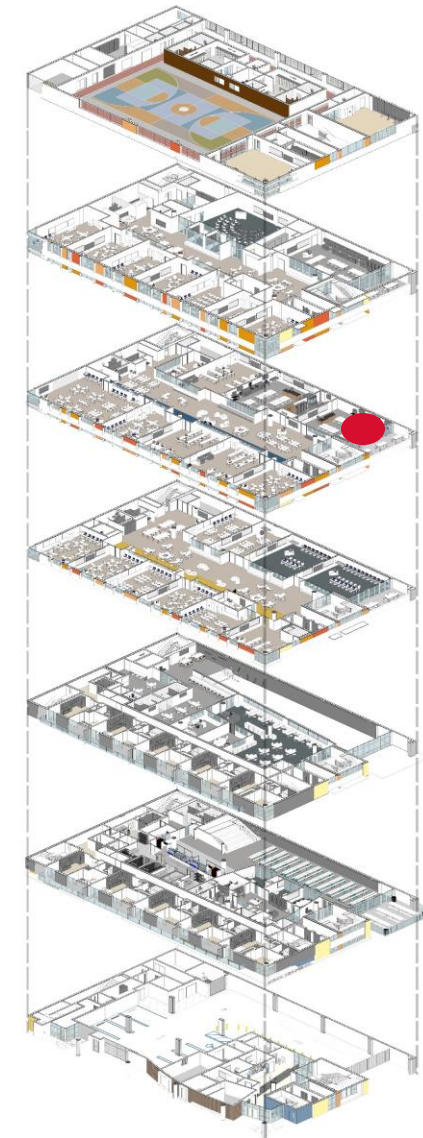


# FIFTH FLOOR - DISCOVERY

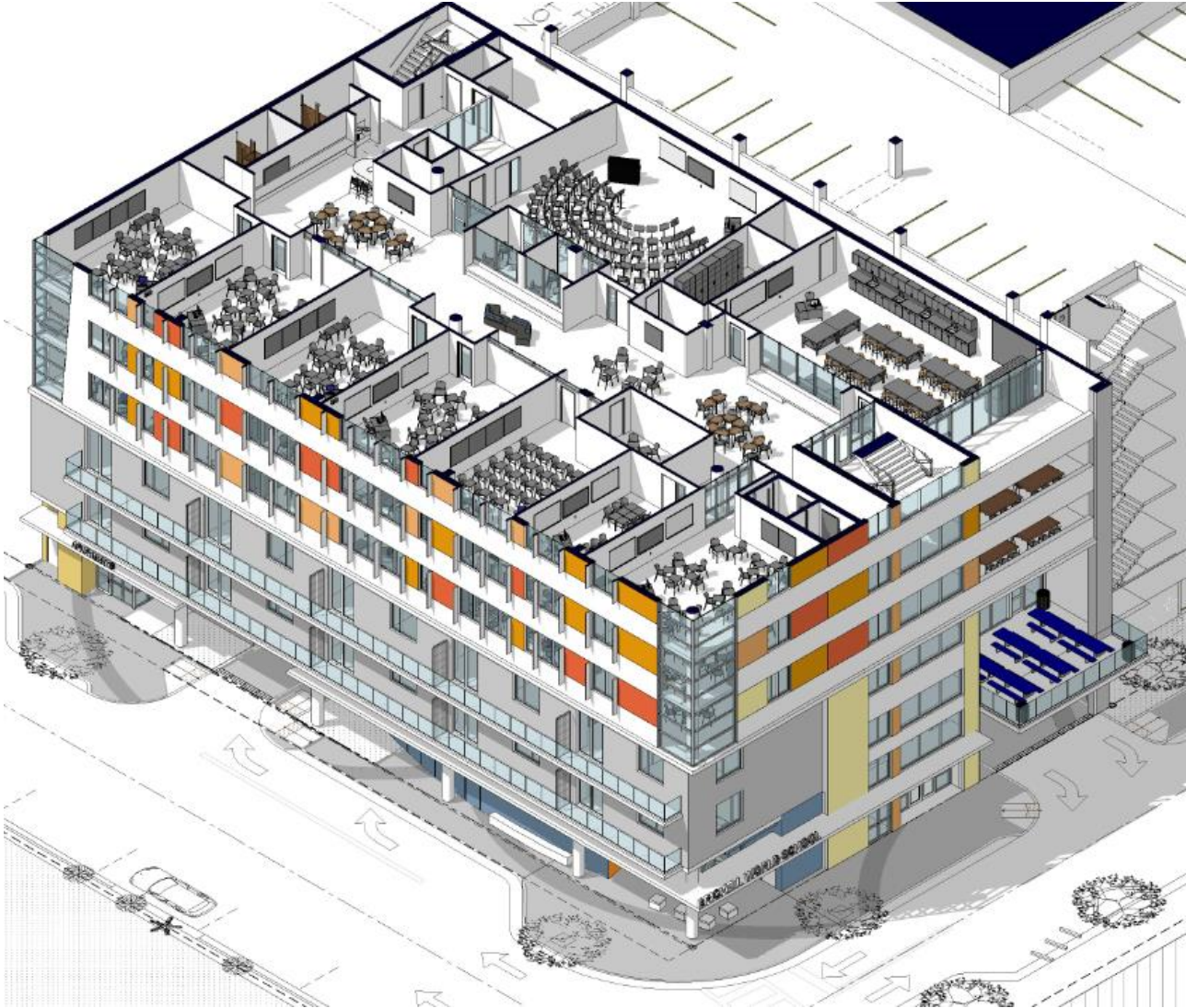


# FIFTH FLOOR – DISCOVERY COLLABORATORIUM





# SIXTH FLOOR - WONDERMENT



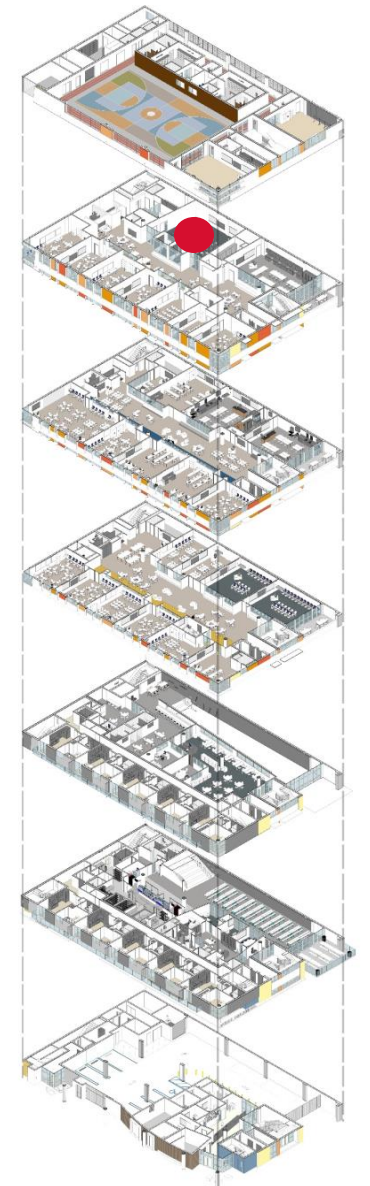
# SIXTH FLOOR – WONDERMENT COLLABORATORIUM





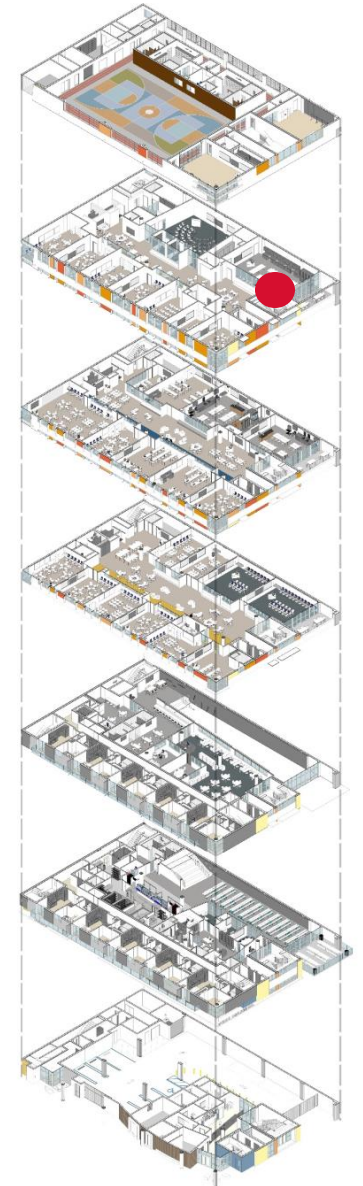
# SIXTH FLOOR - MUSIC

---

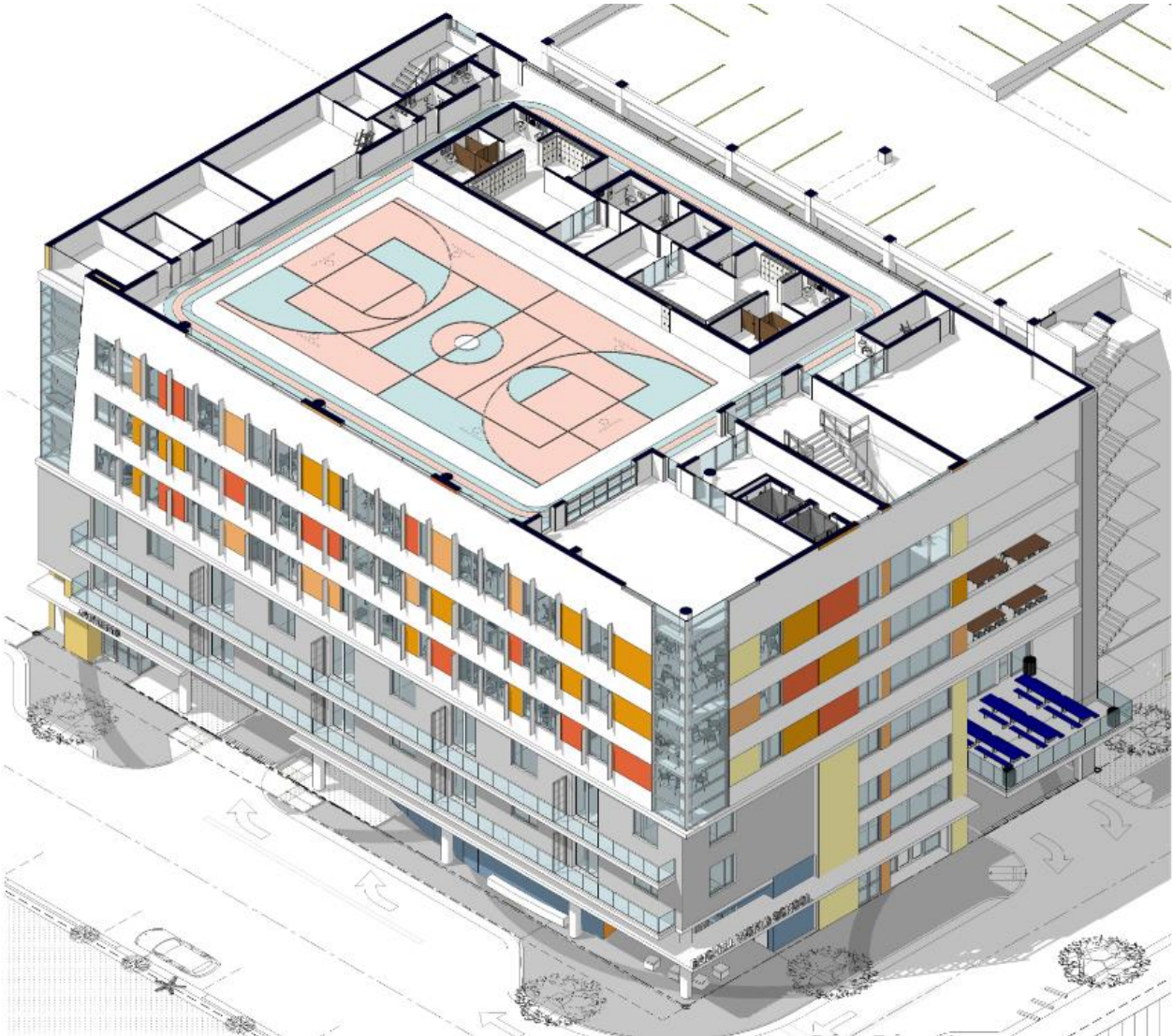
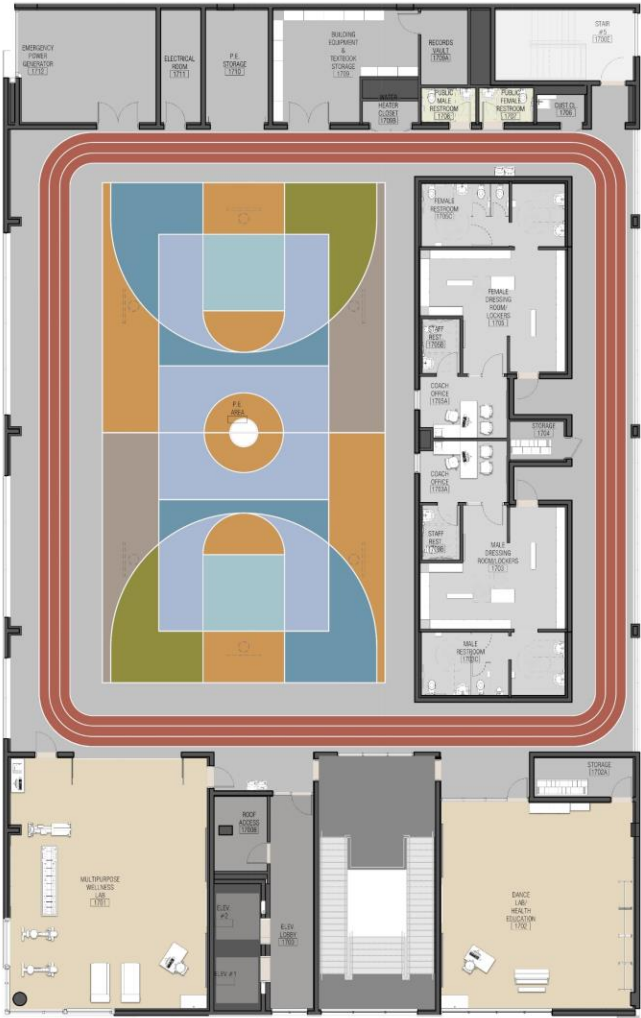


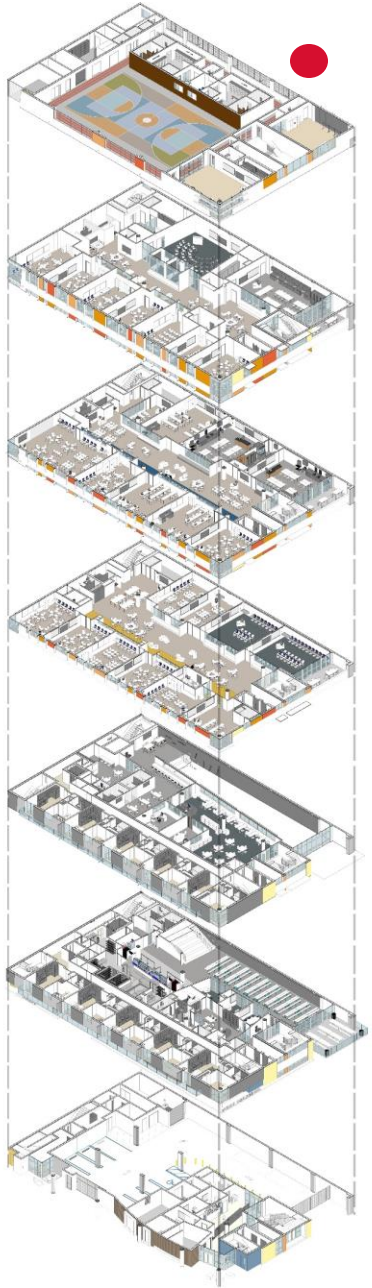
# SIXTH FLOOR - ART

---



# SIXTH FLOOR - WELLNESS





# 2 ARCHITECTURAL HIGH PERFORMANCE STRATEGIES:

---

1 Reduce Demand

2 Almost Airtight  
Envelope



# REDUCE DEMAND

---

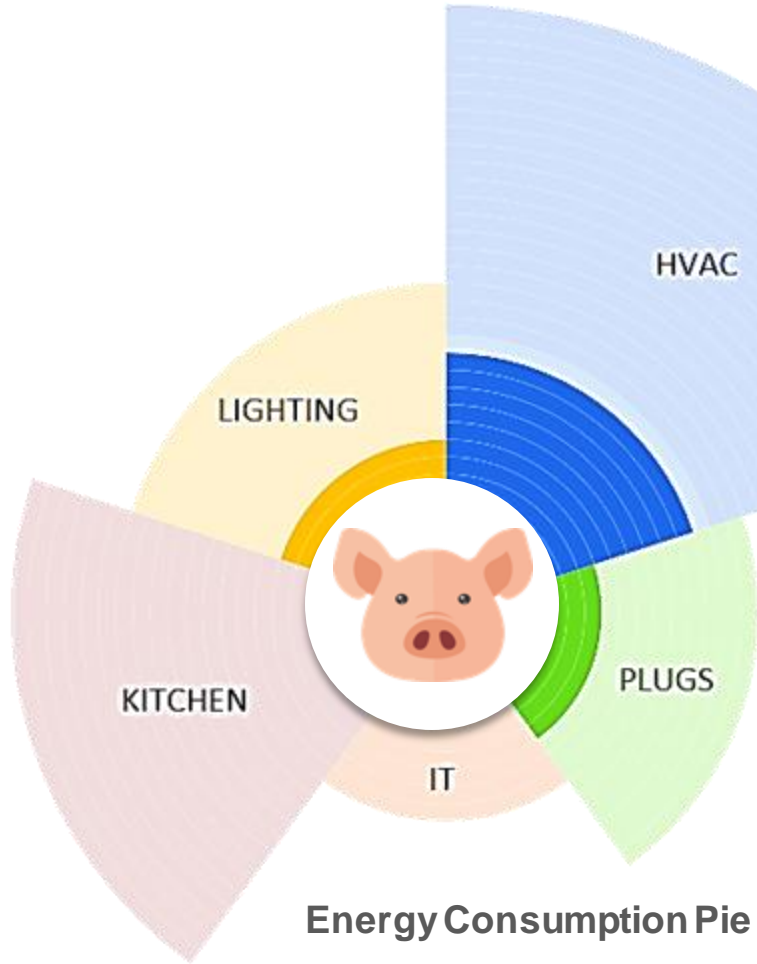
## ENERGY INTENSIVE PROGRAMS

*Advanced strategies to reduce/eliminate exfiltration energy losses from*

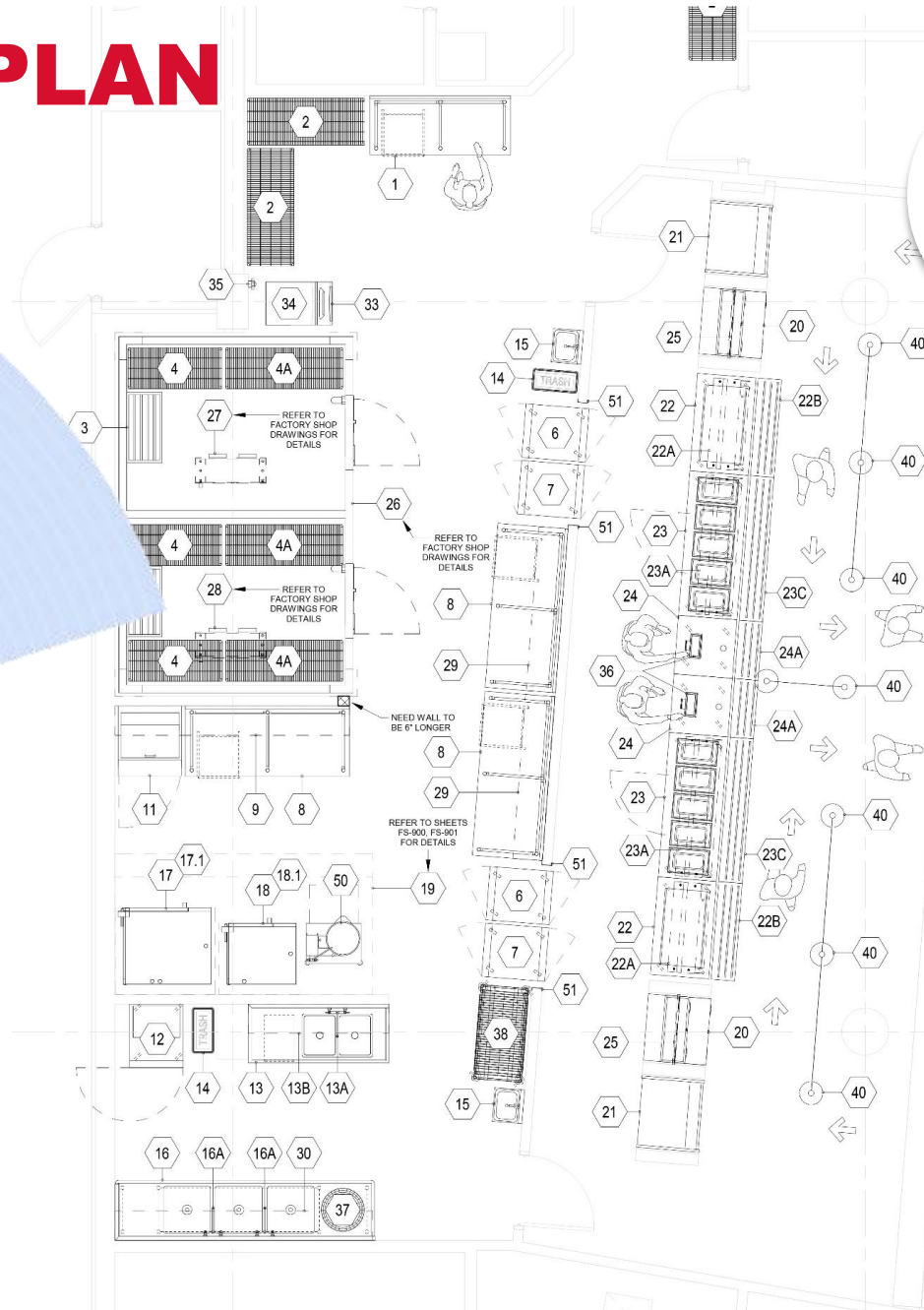
- Oversized Admin
- Media Center
- Kitchen
- Gymnasium
- Science labs
- Art Labs



# KITCHEN FLOOR PLAN



Energy Consumption Pie



ITEM #	QTY	CATEGORY	MANUFACTURER	EQUIPMENT SPECIFICATIONS	REMARKS
1	1	Wall Panel	WALL PANEL		
2	1	Wall Panel	WALL PANEL		
3	1	Wall Panel	WALL PANEL		
4	1	Wall Panel	WALL PANEL		
4A	1	Wall Panel	WALL PANEL		
6	1	Wall Panel	WALL PANEL		
7	1	Wall Panel	WALL PANEL		
8	1	Wall Panel	WALL PANEL		
9	1	Wall Panel	WALL PANEL		
11	1	Wall Panel	WALL PANEL		
12	1	Wall Panel	WALL PANEL		
13	1	Wall Panel	WALL PANEL		
13A	1	Wall Panel	WALL PANEL		
13B	1	Wall Panel	WALL PANEL		
14	1	Wall Panel	WALL PANEL		
15	1	Wall Panel	WALL PANEL		
16	1	Wall Panel	WALL PANEL		
16A	1	Wall Panel	WALL PANEL		
17	1	Wall Panel	WALL PANEL		
17.1	1	Wall Panel	WALL PANEL		
18	1	Wall Panel	WALL PANEL		
18.1	1	Wall Panel	WALL PANEL		
19	1	Wall Panel	WALL PANEL		
20	1	Wall Panel	WALL PANEL		
21	1	Wall Panel	WALL PANEL		
22	1	Wall Panel	WALL PANEL		
22A	1	Wall Panel	WALL PANEL		
22B	1	Wall Panel	WALL PANEL		
23	1	Wall Panel	WALL PANEL		
23A	1	Wall Panel	WALL PANEL		
23C	1	Wall Panel	WALL PANEL		
24	1	Wall Panel	WALL PANEL		
24A	1	Wall Panel	WALL PANEL		
25	1	Wall Panel	WALL PANEL		
26	1	Wall Panel	WALL PANEL		
27	1	Wall Panel	WALL PANEL		
28	1	Wall Panel	WALL PANEL		
29	1	Wall Panel	WALL PANEL		
30	1	Wall Panel	WALL PANEL		
33	1	Wall Panel	WALL PANEL		
34	1	Wall Panel	WALL PANEL		
35	1	Wall Panel	WALL PANEL		
36	1	Wall Panel	WALL PANEL		
37	1	Wall Panel	WALL PANEL		
38	1	Wall Panel	WALL PANEL		
40	1	Wall Panel	WALL PANEL		
51	1	Wall Panel	WALL PANEL		

# ALMOST AIRTIGHT ENVELOPE

---

## HIGH PERFORMANCE ENVELOPE

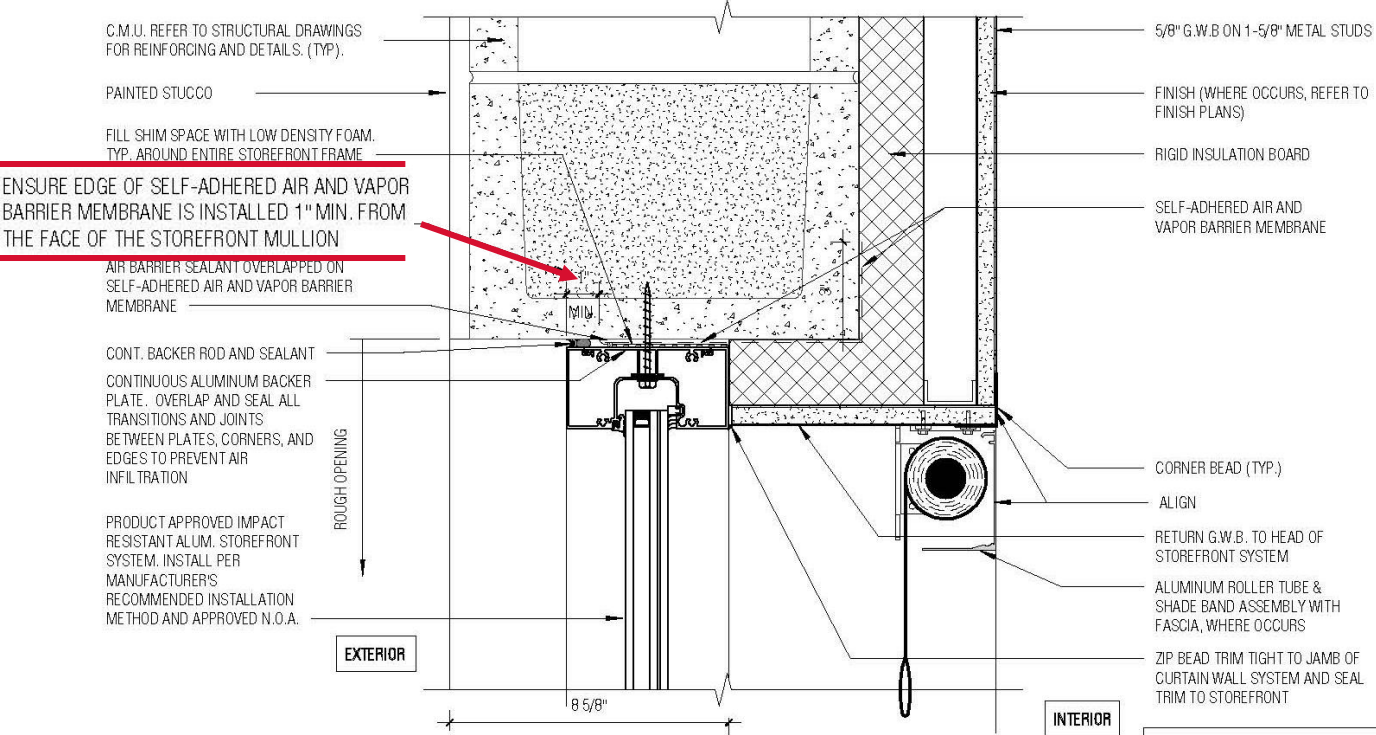
*Moisture seals wrapped into all door and window openings*

- Walls
- Roof
- Windows
- Doors





# WINDOWS

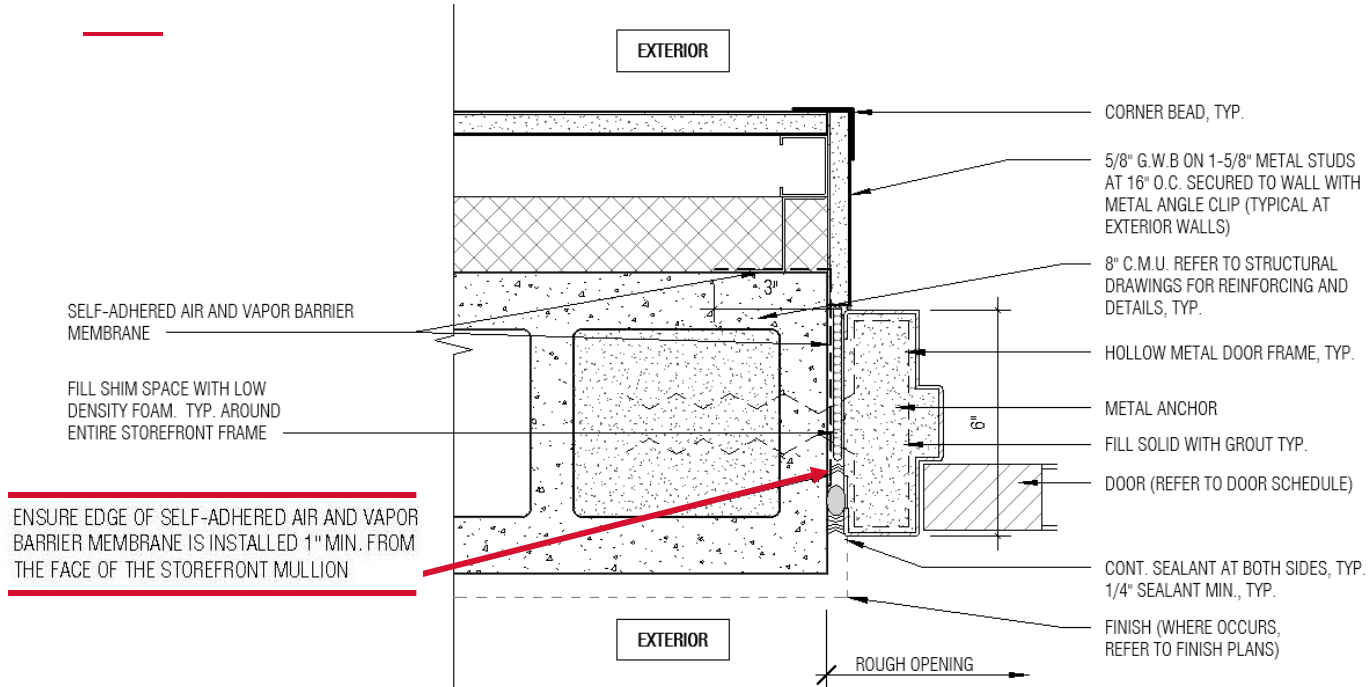


NOTE: CAP ALL VERTICAL MULLIONS TO PREVENT AIRFLOW INTO ASSEMBLY. OVERLAP AND SEAL ALL JOINTS WITH SELF-ADHERED AIR AND VAPOR BARRIER MEMBRANE AND BUTYL SEALANT PRIOR TO INSTALLATION.

**3 STOREFRONT HEAD DETAIL**  
**A-854 Scale: 3" = 1'-0"**



# DOORS



NOTE: CAP ALL VERTICAL MULLIONS TO PREVENT AIRFLOW INTO ASSEMBLY. OVERLAP AND SEAL ALL JOINTS WITH SELF-ADHERED AIR AND VAPOR BARRIER MEMBRANE AND BUTYL SEALANT PRIOR TO INSTALLATION.



12

## DOOR JAMB DETAIL - HEAD SIMILAR

A-850

Scale: 3" = 1'-0"





BRICKELL WORLD SCHOOL



# PROJECT OVERVIEW

## ○ Challenges

- Target EUI of 27 or lower
- No mechanical rooms
- Floor to floor height reduced
- Rapid schedule
- Residential component and serviceability separate from MDCPS
- Small footprint

### DIVISION 15 – MECHANICAL

This division contains the following elements:

- 1.1 General.
- 1.2 General Mechanical Requirements.
- 1.3 Mechanical Submittal Phasing Requirements.
- 1.4 General Plumbing Requirements.
  - A. Plumbing Systems.
  - B. Plumbing Drawings.
  - C. Specific Room Plumbing Requirements.
    - 1. Toilet Rooms and Group Showers.
    - 2. Kitchens.
      - a. General Requirements.
      - b. Grease Interceptors.
      - c. Floor Drainage.
      - d. Dumpster Pad Area.
    - 3. Laboratories (Science, Art, Printing, Photography, etc.)
    - 4. Equipment Rooms.
  - D. Domestic Water.
  - E. Drainage, Waste, and Vent Systems.
  - F. Plumbing Fixtures.
  - G. Fire Protection.
  - H. Fuels and Energy Sources
  - I. Compressed Air
- 1.5 Heating, Ventilating, and Air-conditioning.
  - A. General.
  - B. Life Cycle Cost Analysis (LCCA).
  - C. HVAC System Selection.
    - 1. General Requirements.
    - 2. Specific Requirements.
  - D. Heating Sources.
  - E. Cooling Sources.
  - F. Design Considerations.
  - G. Indoor Air Quality and Outside Air Requirements.
  - H. Acoustical Considerations.
  - I. Pumping and Piping Systems.
  - J. Pipe Insulation.
  - K. Equipment Selection.
    - 1. Outdoor Air Intake.
    - 2. Air Filters.
    - 3. Air-handling Units and Outside Air Supply Fans.
    - 4. Coils.
    - 5. Air Duct Design.
    - 6. Air Distribution Devices.
    - 7. Return and Exhaust Air.
    - 8. Cooling System.
    - 9. Heating System.

# WHAT EXACTLY IS EUI?

---

## EUI STANDS FOR ENERGY USE INTENSITY

Which in short terms represents the total building energy usage divided per total square feet are in a year period **West Brickell Middle School Design has a proposed EUI of 25!**



= 25

# HOW DOES THAT COMPARE TO OTHER BUILDINGS?

The average k-12 building has an average EUI of 48.5 in which west Brickell middle school scores at 25

Market Sector	Property type	Source EUI (kBtu/ft <sup>2</sup> )	Site EUI (kBtu/ft <sup>2</sup> )
Banking/Financial Services	Bank Branch	209.9	88.3
Banking/Financial Services	Financial Office	116.4	52.9
Education	College/University	180.6	84.3
Education	K-12 School	104.4	48.5
Education	Pre-school/Daycare	131.5	64.8
Education	Vocational School/Adult Education	110.4	52.4

Source: Energy Star



# MECHANICAL EXECUTIVE SUMMARY

## ○ Mechanical Systems

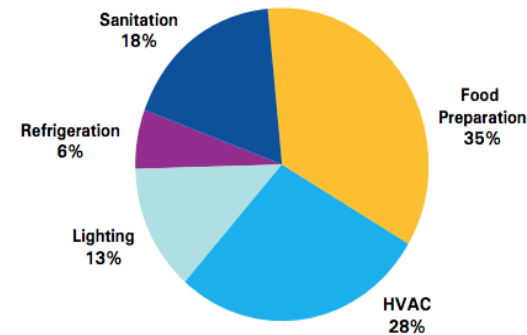
- EUI calculation based on total building energy
- Energy star and Water star certification

## ○ HVAC Air Systems

- Garage Exhaust:
- Dining Area;
- Destratification fans
  - Circulate the air and create a more even temperature throughout the space.

## Energy Consumption in Restaurants (Source: Energy Star)

Example of the Average Energy Consumption in a Full-service Restaurant  
(British Thermal Units (Btu))





# MECHANICAL EXECUTIVE SUMMARY

## ○ Kitchen Exhaust

- Exhaust systems have been carefully selected based on its primary use.
  - Kitchen Exhaust: The second to highest energy consumption
  - This is due to continue power consumption from exhaust cooking fumes and dedicated outside air system which is 100% outside air. The outside air unit will have to temper outside air without recirculation ( BIG WASTE OF ENERGY).
  - Meet Florida Mechanical Code and NFPA and reduce kitchen exhaust system from Type I hood ( grease ) to Type II (heat and Vapor) by selecting UL listed equipment with proper UL certification for Heat and Vapor equipment Only.
  - Selected new kitchen equipment that would offset the energy consumption of providing robust makeup/exhaust for traditional hood



# SUPPORTING DOCUMENTATION

## CERTIFICATE OF COMPLIANCE

Certificate Number 20161026-E360598  
Report Reference E360598-20140529  
Issue Date 2016-OCTOBER-26

Issued to: CONVOTHERM ELEKTROGERATE GMBH  
TALSTRASSE 35,  
82436 EGLFING GERMANY.

This is to certify that representative samples of

COMMERCIAL COOKING APPLIANCES  
USL, CNL – Convection / Steam Ovens Model "C4e" followed by "T" or "D"; followed by "6.10", "6.20", "10.10", "10.20", "12.20", "20.10" or "20.20" followed by "ES" or "EB", may be followed by suffix "-N".

Following models are Complimentary Listed under KNLZ:

USL, CNL – Convection / Steam Ovens Model "C4e" followed by "T" or "D"; followed by "6.10", "6.20", "10.10", "10.20" followed by "ES" or "EB", may be followed by suffix "-N" With Integral System for Limiting the Emissions of Grease-Laden Vapors.

Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety: UL 197, Standard for Commercial Electric Cooking Appliance .  
CAN/CSA-C22.2 No. 109-M1981 (Reaffirmed 2009), Standard for Commercial Cooking Appliance.

Additional Information: See the UL Online Certifications Directory at [www.ul.com/database](http://www.ul.com/database) for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.

Look for the UL Certification Mark on the product.

*Barnalis*  
Bruno Michelbach, Director North American Certification Program  
UL LLC



Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at [www.ul.com/contact](http://www.ul.com/contact)

## CERTIFICATE OF COMPLIANCE

Certificate Number 20160616-E35238  
Report Reference E35238-20071018  
Issue Date 2016-JUNE-16

Issued to: CLEVELAND RANGE L L C  
18301 St. Clair Ave  
CLEVELAND OH 44110

This is to certify that representative samples of

COMMERCIAL COOKING APPLIANCES; COMMERCIAL COOKING APPLIANCES WITH INTEGRAL SYSTEMS FOR LIMITING THE EMISSION OF GREASE-LADEN AIR.

Model OES-3.10, OES-3.10 mini, OES-6.06, OES-6.08, OES-6.08 mini, OES-6.10 mini 2in1, OES-6.10 mini, and OES-10.10 mini, Combination Ovens with Integral System for Limiting the Emissions of Grease Laden Vapors. "-" in model number is optional.


Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety: UL 197 and CSA C22.2 No. 109-M1981, Standards for Commercial Cooking Appliances

Additional Information: See the UL Online Certifications Directory at [www.ul.com/database](http://www.ul.com/database) for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.

Look for the UL Certification Mark on the product.



### Combi steamer



**Model**  
Convotherm 4 easyTouch

Project \_\_\_\_\_  
Item \_\_\_\_\_  
Quantity \_\_\_\_\_  
FCSI section \_\_\_\_\_  
Approval \_\_\_\_\_  
Date \_\_\_\_\_

- easyTouch
- 7 slide rails
- Electrical
- Injection/Spritzer
- Right-hinged door

**Key features**

- ACS+ operating modes: Steam, combi-steam, hot air
- ACS+ extra functions:
  - Crisp&Tasty - 5 moisture-removal settings
  - BakePro - 5 levels of traditional baking
  - HumidityPro - 5 humidity settings
  - Controllable fan - 5 speed settings
- easyTouch 9" full-touch screen
- ConvoClean+ fully automatic cleaning system with eco, regular and express modes - with optional single-dose dispensing
- Ethernet interface (LAN)
- HygienicCare
- USB port integrated in the control panel
- TriColor indicator ring - indicates the current operating status
- Steam generated by injecting water into the cooking chamber
- Right-hinged door
- KNLZ listed for ventless operation, local codes prevail as in NFPA 96-1994

**Standard features**

- ACS+ (Advanced Closed System +) operating modes:
  - Steam (86-266°F) with guaranteed steam saturation
  - Combi-steam (86-482°F) with automatic humidity adjustment
  - Hot air (86-482°F) with optimized heat transfer
- HygienicCare - food safety provided by antibacterial surfaces:
  - easyTouch control panel
  - Door handle and recoil hand shower
- easyTouch user interface:
  - 9" full-touch screen
  - Press&Go - automatic cooking with quick-select buttons the same time
  - TrayTimer - oven-load management for different products at the same time
  - Regenerate+ - flexible multi-mode retherm function
  - ecoCooking - energy-save function
  - Low-temperature cooking / Delta-T cooking
  - Cook&Hold - cook and hold in one process
  - 399 cooking profiles each containing up to 20 steps
  - On-screen help with topic-based video function
  - Start-time preset
- Multi-point core temperature probe
- Door handle with safety latch and slam function
- Data storage for HACCP and pasteurization figures
- Preheat and Cool down function

**Options**

- Steam and vapor removal - built-in condenser (upon request)
- Disappearing door - more space and added safety (see page 2)
- ConvoGrill with grease management function (upon request)
- ConvoSmoke - built-in food-smoking
- Marine version (see separate data sheet)
- Available in various voltages
- Sous-vide probe, external connection
- Core temperature probe, external connection

**Accessories**



- ConvoLink HACCP and cooking-profile management PC software
- Signal tower - Indicates the operating status from a distance
- Banquet system (optionally as a package or individually): Plate rack, mobile shelf rack, transport trolley, thermal cover
- Equipment stands in various sizes and designs
- Racks for cooking and baking
- Stacking kits
- Cleaning products for the fully automatic ConvoClean+ cleaning system and the semi-automatic cleaning system


Commercial combination oven with integral system for limiting the emissions of grease laden air. The product conforms to the ventless operation recommendations set forth by NFPA36 using EPA302 test method.

Manitowoc Foodservice  
18301 St. Clair Ave.  
Cleveland, Ohio 44110

Phone 1-800-338-3204

www.convotherm.com



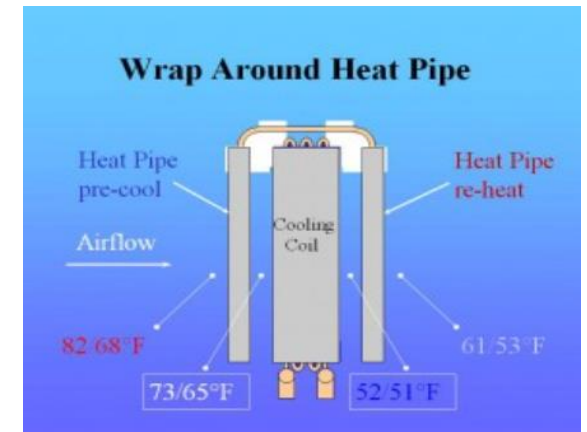
1

C4eT 6.10 ES

# PROJECT OVERVIEW (CONT.)

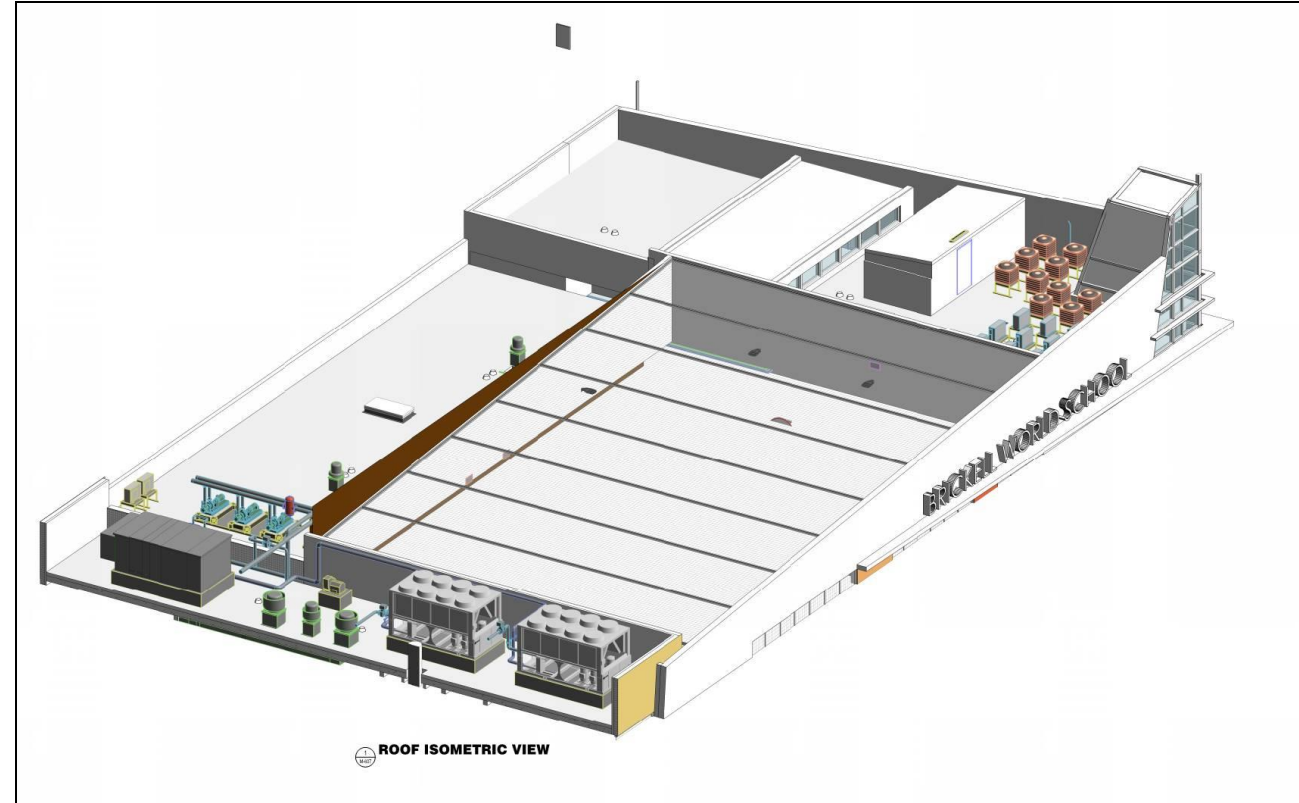
## ○ HVAC Air Systems (cont.)

- Dedicated Chilled Water Units
- ECM motors that coil potentially reduce operating cost up to 50%.
- Soft start and even air flow in space to be conditioned .
- Dedicated Outside Air System (DOAS)
- **Maintain accurately humidity levels, provide proper Indoor Air Quality**, comply with MDCPS criteria and maintain building at positive pressure.
- The DOAS feature MI technology providing redundancy in case fan failure occurs.
- Heat pipe technology was also incorporated into DOAS system in order to reduce heating energy and maintain proper humidity levels



# PROJECT OVERVIEW (CONT.)

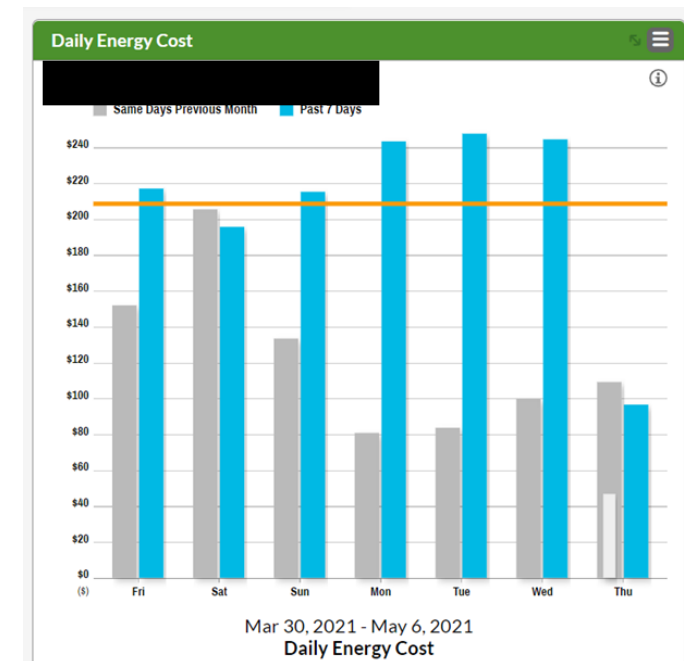
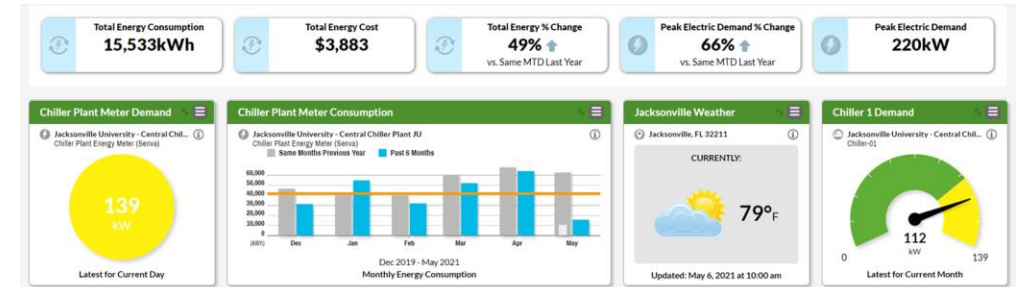
- HVAC Air Systems (cont.)
  - Air Cooled Chillers. The proposed Chillers were selected to maximize efficiency based on required demand.
  - Low noise chiller
  - Considerations with nearby multistory residential building
  - DX units for electrical, IT, residential



# PROJECT OVERVIEW (CONT.)

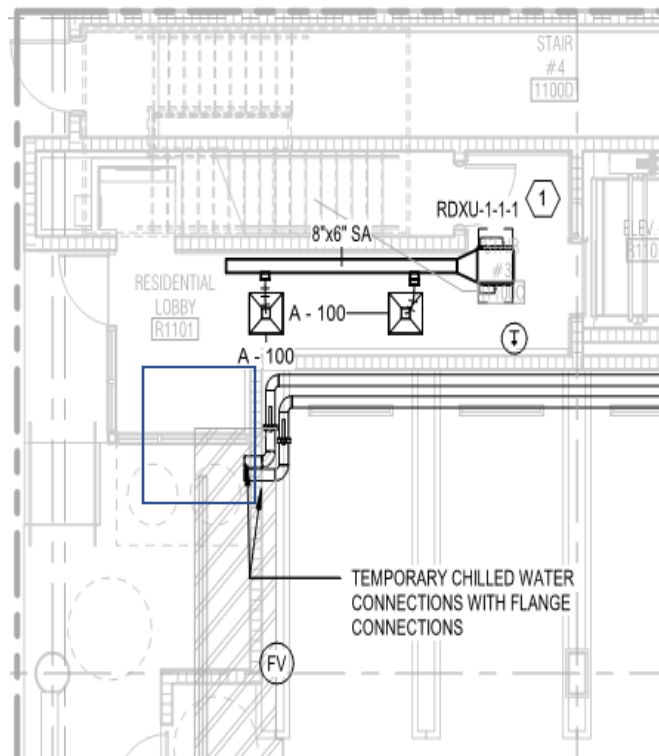
## ○ Building Automation System

- Smartboard at entrance of facility
- Detailing building performance
- Alerting MDCPS staff when building performance criteria is underperforming
- Sub metering on all utilities to track energy usage
- Dashboard for ease of view for MDCPS staff to determine current building performance

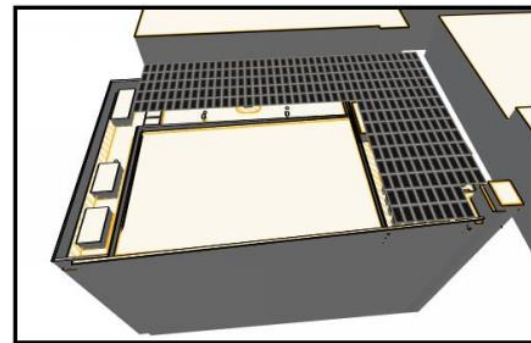


# THINKING ABOUT THE FUTURE

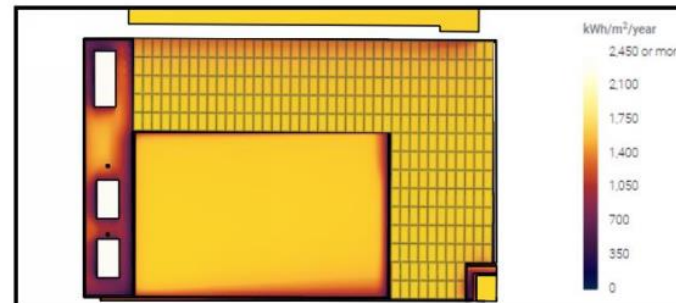
- Solar ready
- Equipment replacement – easy access



## POWER PRODUCTION AND SAVINGS



Annual Irradiance



## 'For our children's sake': Miami Dade schools commit to 100% clean energy by 2030

BY ALEX HARRIS AND COLLEEN WRIGHT  
APRIL 21, 2021 06:00 PM, UPDATED APRIL 21, 2021 07:15 PM



Solar array floats out as FPL and Miami-Dade County launched a half-acre 402-panel floating solar array generating 160 kilowatts of power into the Blue Lagoon adjacent to Miami International Airport on Tuesday, January 28, 2020. CARL JUSTE [CJUSTE@MIAMIHERALD.COM](mailto:CJUSTE@MIAMIHERALD.COM)

Listen to this article now  
07:13 Powered by Trinity Audio

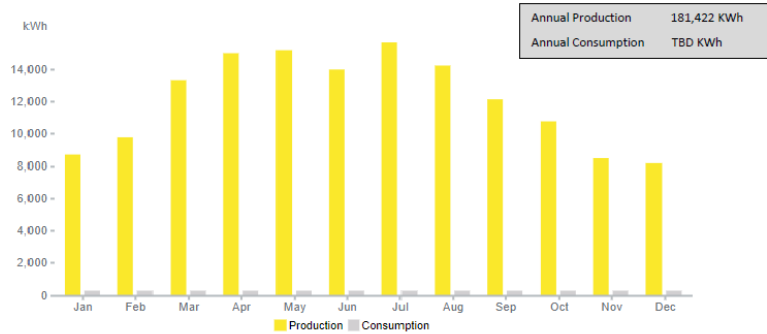
Miami-Dade County, the fourth-largest school district in the nation, became the first Southern school district to commit to an ambitious goal: switching to "clean energy" entirely by 2030.

The resolution didn't define clean energy, but traditionally that means switching away from fossil fuels in favor of renewable energy, like switching to electric buses and more schools powered by solar energy.

Still, the resolution represents a victory for parents and students who developed and pushed for the proposal, passed unanimously with no debate in a Wednesday school board meeting.

# THINKING ABOUT THE FUTURE

Estimated Monthly Production



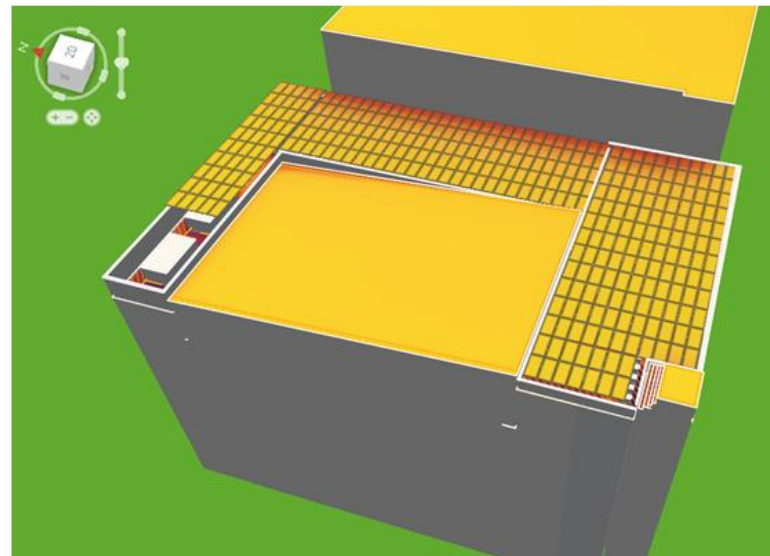
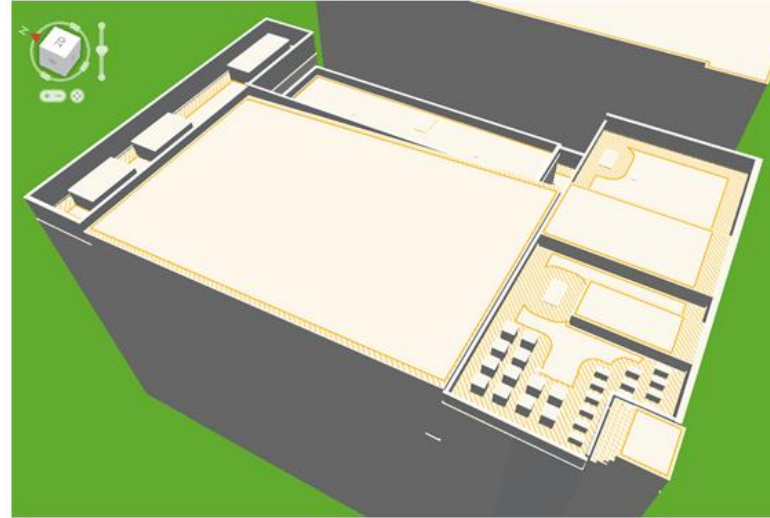
Estimated Yearly Production

(kWh)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Utility Consumption Pre-Solar	0	0	0	0	0	0	0	0	0	0	0	0	0
Utility Consumption Post-Solar	(8,699)	(9,774)	(13.3k)	(15k)	(15.2k)	(14k)	(15.7k)	(14.3k)	(12.1k)	(10.8k)	(8,476)	(8,167)	(145.6k)
Solar Production	8,699	9,774	13.3k	15k	15.2k	14k	15.7k	14.3k	12.1k	10.8k	8,476	8,167	145.6k
(\$)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Utility Bill Pre-Solar	27	27	27	27	27	27	27	27	27	27	27	27	318
Utility Bill Post-Solar	27	27	27	27	27	27	27	27	27	27	27	27	318
Utility Bill Savings	0	0	0	0	0	0	0	0	0	0	0	0	0

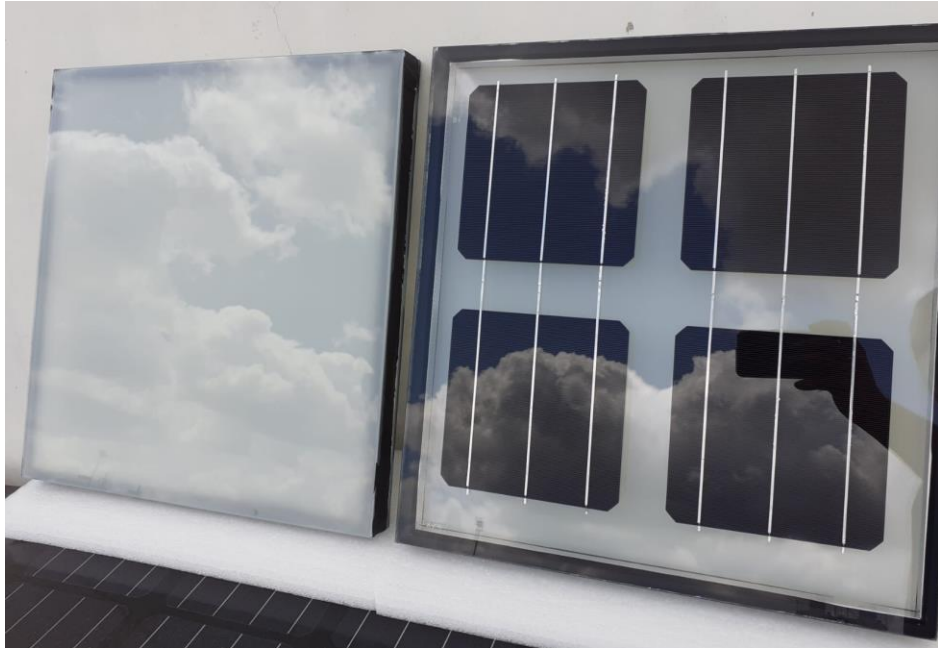
\*Note: This table and graph will be updated once the utility company is determined, buildings rate structure and a full energy model of the energy usage of the building analysis is done to determine what loads are to be offset by the building.



\*Estimated savings after purchase, financing, and operational costs. Assuming rate increase 3.0% per year and cashflow discounted at 5.0%



# THINKING ABOUT THE FUTURE



- Ventilated façade, 4,700 sq ft of PV integration, 52,000 kWh/year
  - Original roof
- Provided multiple LCCAs
- Evaluated multiple system types
- Total usage 2,084,000 KBTU in a year



# CONCLUSION

---

## Critical Factors for a Successful Project

1. Exceptional Project Team
2. Define goals and objectives
3. Communication
4. Weekly updates and managing milestones
5. Safe & sustainable.