creation.

Construction
Jenna Dumke
Jeff Sopinski

Lighting/Electrical
Abby Kun
Amanda Small

Structural
Patrick Zuza
Emily Wychock

Mechanical
Kristiana McMunn
Mike Hoffacker

Presentation 4: Proposal

AEI Student Competition:

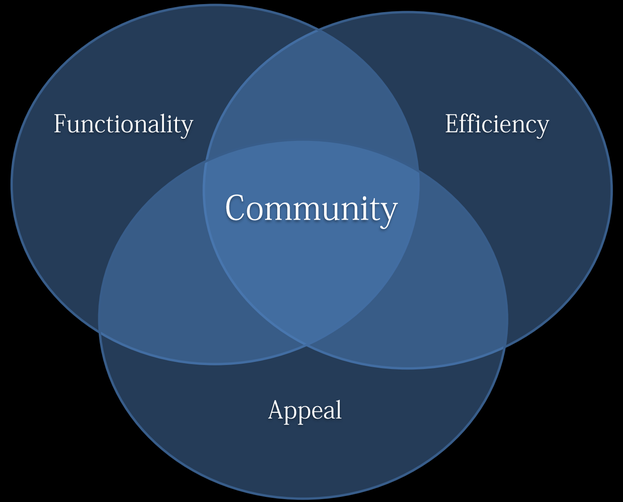
Reading School District Elementary School

creation.

Results

Team Goal: To create an innovative, high-performance environment in a way that stimulates involvement in both education & the community.

Purpose & Team Goals



Results

Higher Attendance

Higher Test Scores

Improved Teacher Satisfaction

LEED Certification

Safer Environment

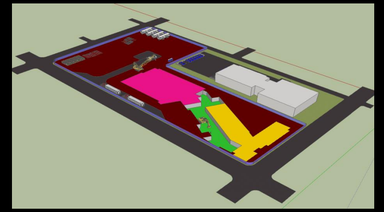
Lower Operational Costs

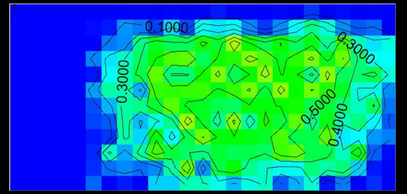
Median Construction Cost

creation.

BIM Execution Plan

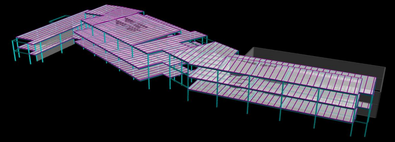
BIM Uses	Applicable Software
Scheduling	P6
Clash Detection	Navisworks
Estimating	RSMeans CostWorks
Virtual Mockups	SketchUp

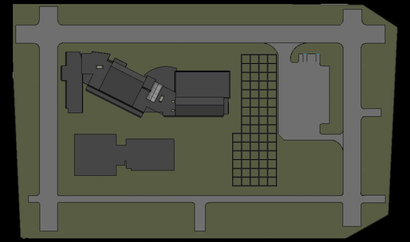




BIM Uses	Applicable Software
Lighting Calculations	AGi32
Daylighting & Electrical Integration	Daysim
Wiring, Circuiting, Systems Coordination	Revit
Rendering	3ds Max

BIM Uses	Applicable Software
Systems Coordination	Revit
Gravity System	RAM
Lateral System	ETABS
Modeling Space Frames	AutoCAD
Masonry Design	RAM Element





BIM Uses	Applicable Software
Scheduling	Trace
Clash Detection	Revit
4D Modeling	Excel

creation.

Production Schedule

Milestone:	Proposal Presentation								Progress Review 1 1/9/13		Progress Review 2 1/23/13		Progress Review 3 2/6/13		Electronic Submission Deadline 2/22/13
Week:	11/12/2012	11/19/2012	11/26/2012	12/3/2012	12/10/2012	12/17/2012	12/24/2012	12/31/2012	1/7/2013	1/14/2013	1/21/2013	1/28/2013	2/4/2013	2/11/2013	2/18/2013
School Systems Design Finalization	Green Roof Design														
	Systems Finalization														
				3D Review & Clash Detection											
Pool Design	Preliminary Load Calculations														
			System Design & Coordination												
							3D Review & Clash Detection								
Clinic Design								Preliminary Load Calculations							
									System Design & Coordination						
											3D Review & Clash Detection				
Report												Report Development & Finalization			

Proposal Presentation

Winter Break

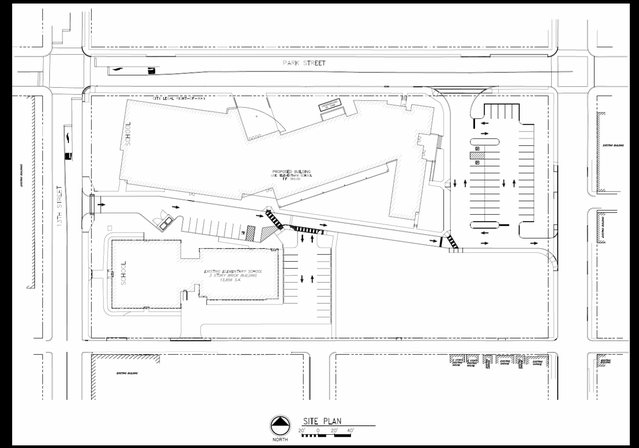
Progress Review 1

Progress Review 2

Progress Review 3

creation.

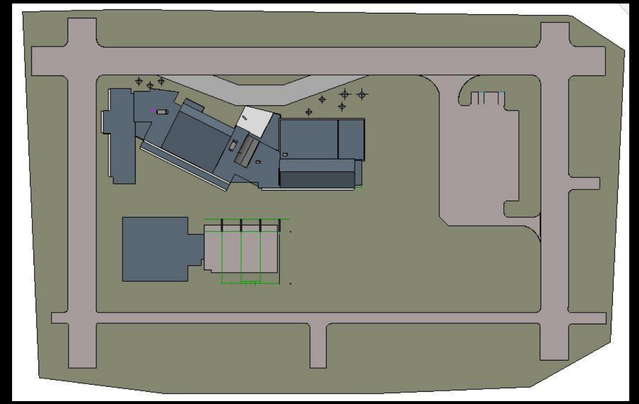
Proposed Plan



Master Plan
Design Considerations

- Restricted Site
- Renovation
- Traffic Flow
- Parking Accessibility
- Geothermal Boring Location
- Constructability
- Site Lighting and Light Trespass

Our Plan



creation.

Enclosure

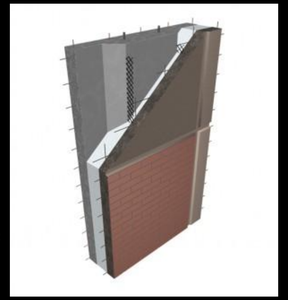
create a functional barrier from exterior elements while maintaining aesthetic appeal & interior comfort.

creation.

Enclosure

CONSTRUCTABILITY

- Two concrete wythes separated by insulation
- Lightweight = larger panel sizes, smaller structural frame
- Less crane picks, faster installation
- Local fabricator within 20 miles = fast deliveries, low delivery costs
- $27 per SF
- $1,102,300.00



create a functional barrier from exterior elements while maintaining aesthetic appeal & interior comfort.

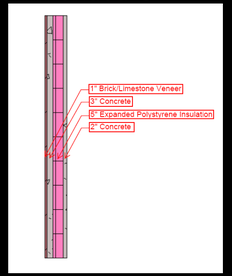
WALL DESIGN GOALS

To achieve our target U-value, while minimizing costs and optimizing energy efficiency and constructability.

WALL DESIGN CRITERIA

ASHRAE 90.1 Required U-value = 0.069
ASHRAE 50% energy savings recommended U-value = 0.037

OUR WALL: U-Value = 0.383



creation.

Enclosure

FENESTRATION DESIGN GOALS

To maximize the amount of natural daylight in the classroom spaces, while minimizing the cost of construction and optimizing energy savings.

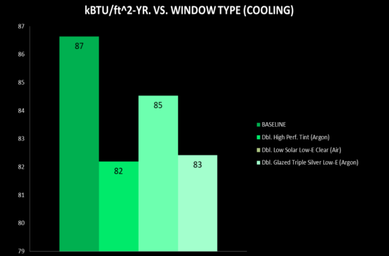
FENESTRATION DESIGN CRITERIA

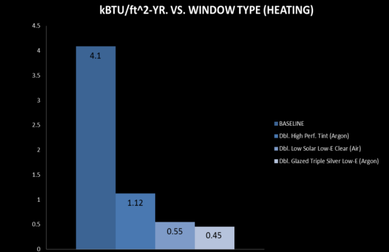
ASHRAE 90.1 Requirements: U-Value = 0.55, SHGC = 0.4,
ASHRAE 50% Energy savings recommendation: U-value = 0.45, SHGC = 0.5, VT = 0.63
Window to Wall Ratio < 40%

create a functional barrier from exterior elements while maintaining aesthetic appeal & interior comfort.

RESULTS

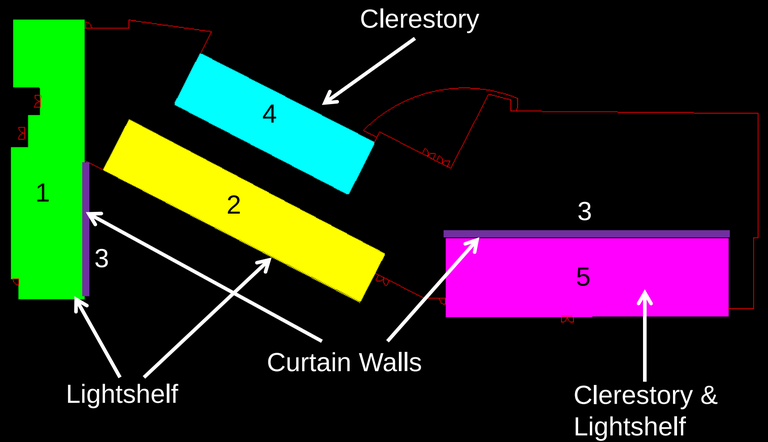
Our Window: U-Value = 0.54, SHGC = 0.4, VT = 0.6
Window to Wall Ratio = 29.5%



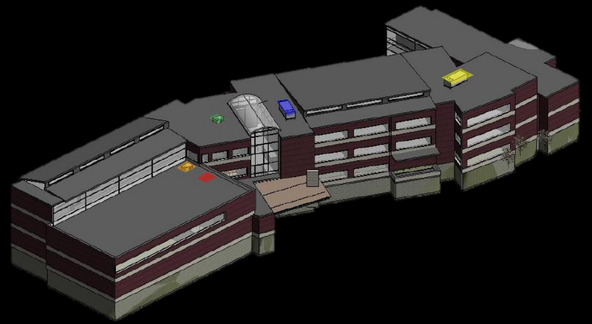


creation.

Enclosure

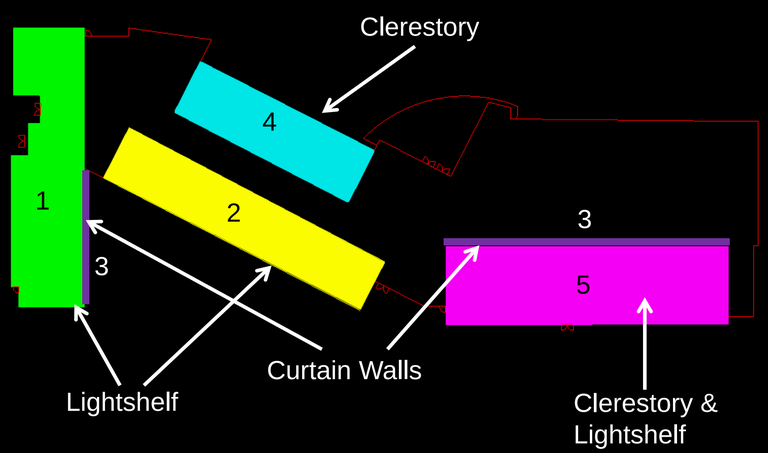


create a functional barrier from exterior elements while maintaining aesthetic appeal & interior comfort.

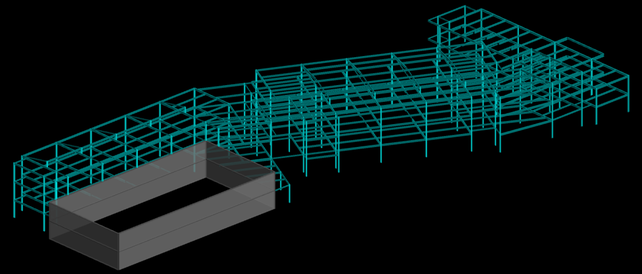


creation.

Enclosure



create a functional barrier from exterior elements while maintaining aesthetic appeal & interior comfort.



- Panels attached to steel frame
- Bay spacing to accommodate desired window area

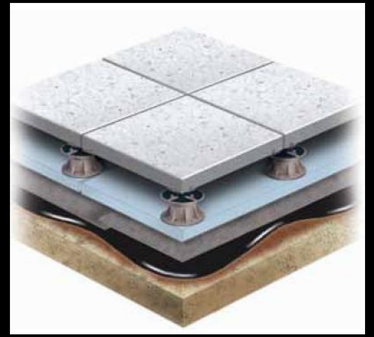
creation.

Enclosure

Green Roof Analysis

CONSTRUCTABILITY

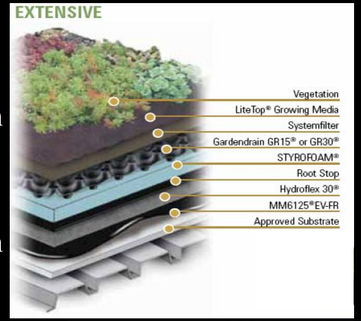
- Lightweight system
- Minimal maintenance
- Retains rainwater during droughts
- Open joint assembly
- Access to substrate



Green Roof Depth: 4”

Compared to a dark roof :
Electrical: 3179.2 kWh
Total Energy Cost Savings: $407.40

Compared to a white roof :
Electrical: 1707.7 kWh
Total Energy Cost Savings: $288.79



ROOF DESIGN GOALS

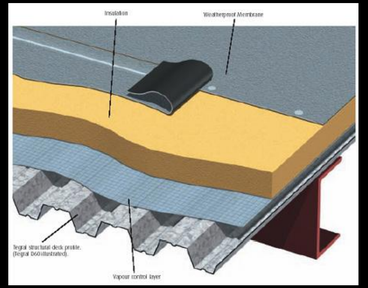
To achieve our target U-value, while minimizing additional structure costs and optimizing energy efficiency and constructability.

ROOF DESIGN CRITERIA

ASHRAE 90.1 U-value = 0.048 with insulation entirely above deck, c.i.
ASHRAE 50% energy savings recommended U-value = 0.0333 with c.i

RESULTS

Our Roof: U-value = 0.0333

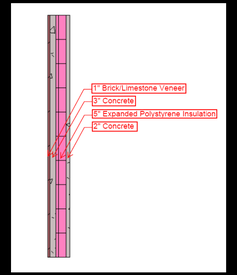


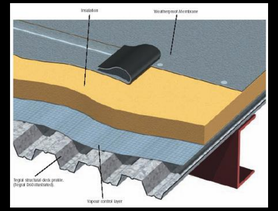
creation.

Enclosure

Results

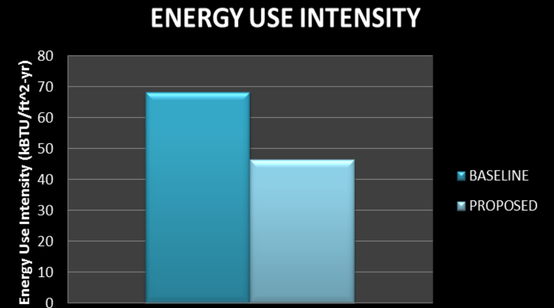
WALL: U-Value = 0.383
ROOF: U-value = 0.033
WINDOW: U-Value = 0.540, SHGC = 0.4, VT = 0.6





create a functional barrier from exterior elements while maintaining aesthetic appeal & interior comfort.

ENTIRE ENCLOSURE ENERGY SAVINGS



Reduced energy use intensity by 22 kBTU/ft^2-yr
(represents all selected enclosure materials with a ground source heat pump system)

creation.

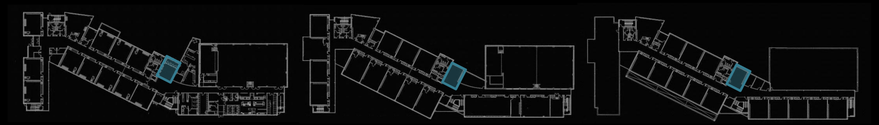
Atrium

create an attractive & secure entrance to
welcome students, faculty, and guests.

creation.

Atrium

create an attractive & secure entrance to welcome students, faculty, and guests.



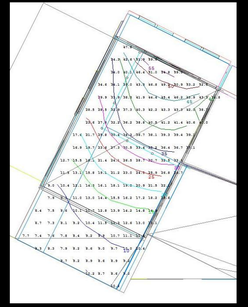
DESIGN CONSIDERATIONS

- Mechanical loads
  - Glass – high solar loads
  - Air must be supplied for all three floors
- Glare
- Diffuse Daylighting
- Light Levels
- Safety

creation.

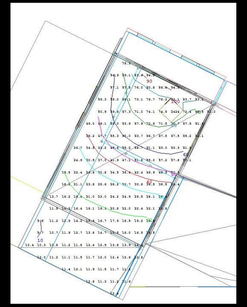
Atrium

December 21st @ Noon



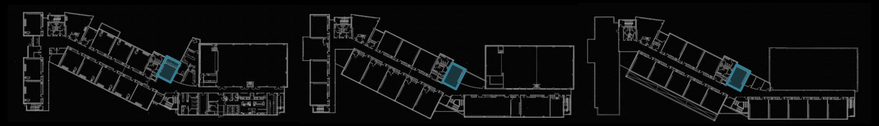
Average Illuminance: 25 fc

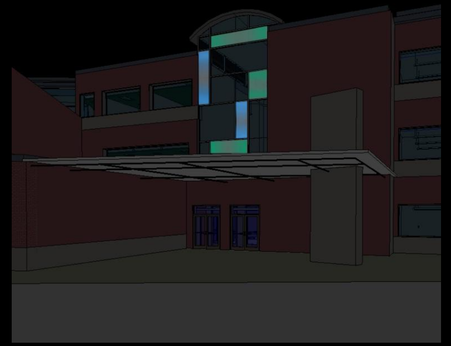
June 21st @ Noon



Average Illuminance: 53 fc

create an attractive & secure entrance to welcome students, faculty, and guests.





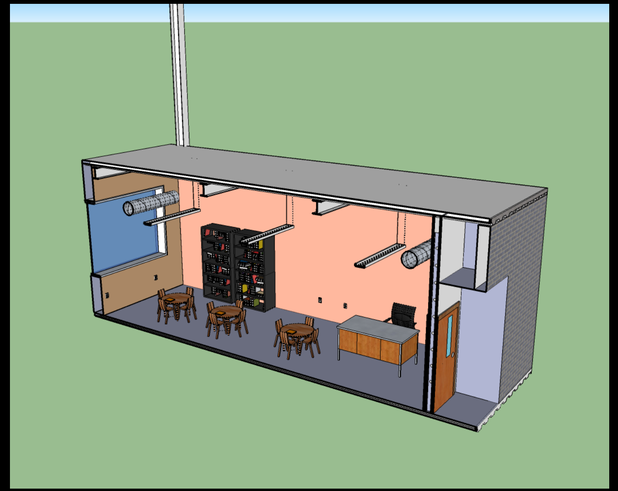
creation.

Classrooms

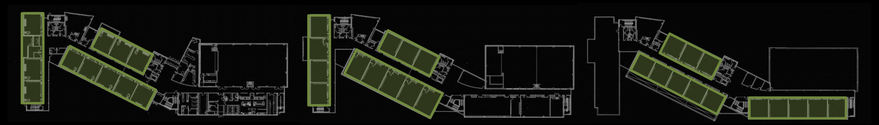
create a stimulating & comfortable learning environment.

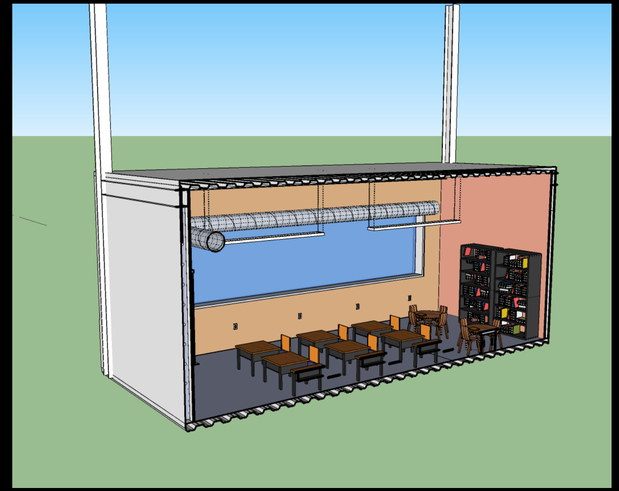
creation.

Classrooms



create a stimulating & comfortable learning environment.



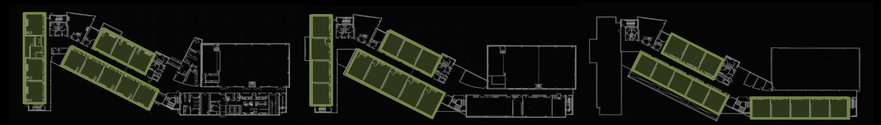


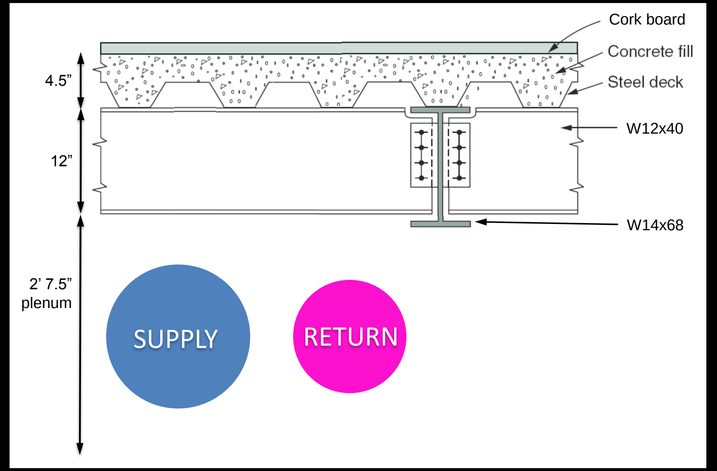
creation.

Classrooms

- Typical bay 28 x 30
- Limited beam depths
- Composite metal deck

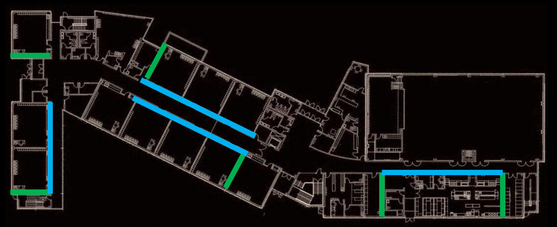
create a stimulating & comfortable learning environment.





creation.

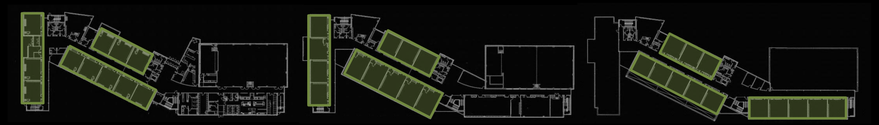
Classrooms

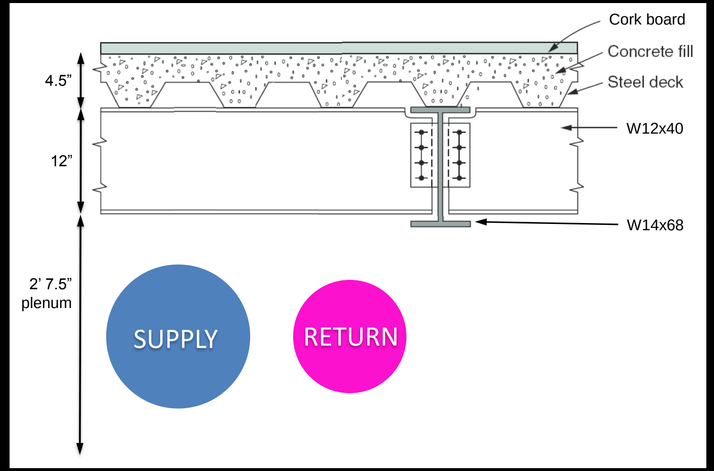


Masonry Shear Wall

Braced Frame

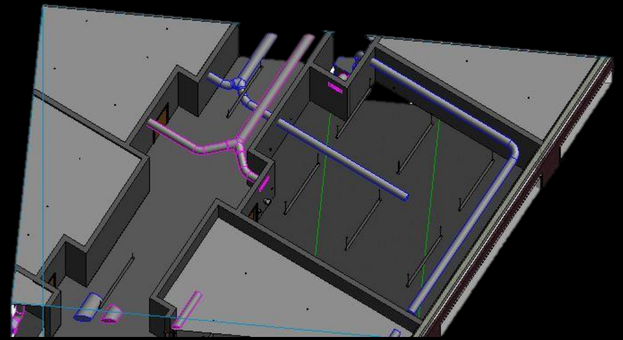
create a stimulating & comfortable learning environment.





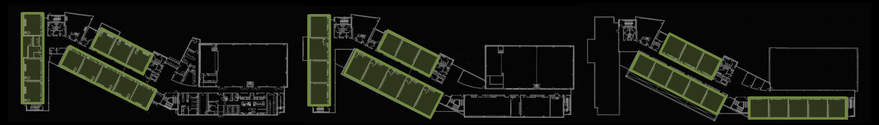
creation.

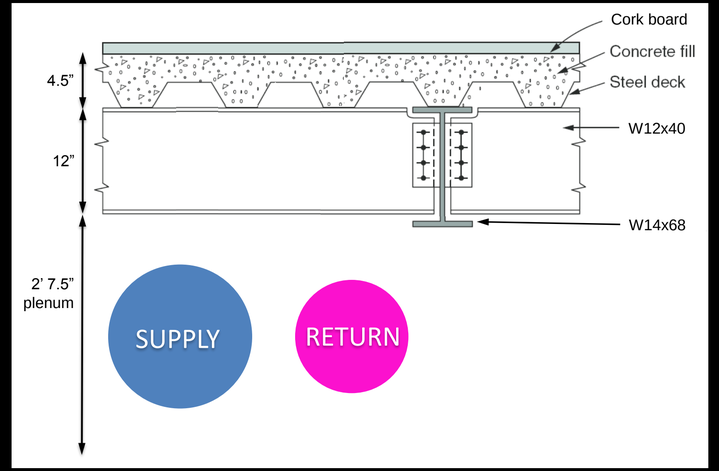
Classrooms



Supply Return

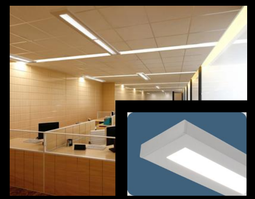
create a stimulating & comfortable learning environment.





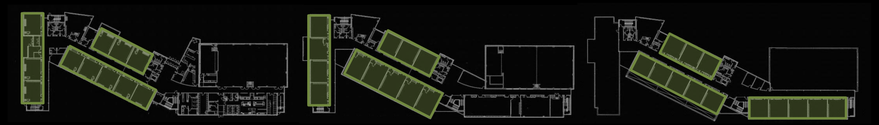
creation.

Classrooms

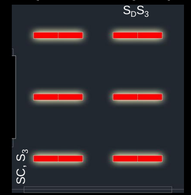


Company	Fixture Series	Mounting	Lamp
Pinnacle	Linero 8 – 4′ & 8′	Suspended	T8
Ledalite	Jump – 8′	Wall	8′ LED
Ligholier	LED Micro Undercabinet	Surface	10W/LF LED

create a stimulating & comfortable learning environment.



Test Mode
(Full Output)



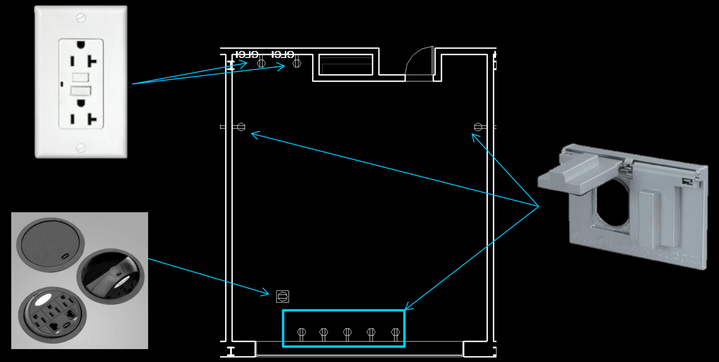
50% Light Output
with Board Light

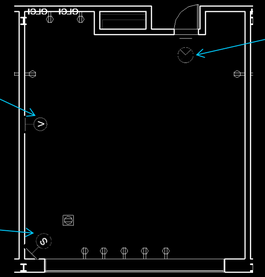
A/V Mode

Total Classroom Energy Savings per Year:
21,000 kWh

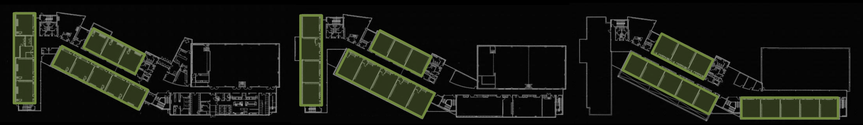
creation.

Classrooms





LIGHTOLIER
EX 2 Edge-Lit Exit Series
Double Face, Self-Powered



Equipment Type	Manufacturer	Specific Details
Television	Sony	Wall mounted, data supply for basic television and morning news
Projector	InFocus	Classroom grade projector, ceiling mounted, interactive screen functions
Computers	Dell	High performance and functionality, touchscreen interaction

** Alternate products are also acceptable if required specifications can be met **

All images from google.com

creation.

Administration

create a productive & inviting work environment

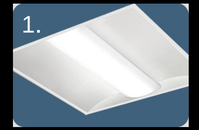
creation.

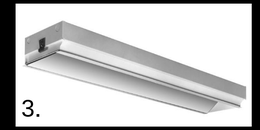
Administration

create a productive & inviting work environment

DESIGN CONSIDERATIONS

- Mechanical equipment noise
- Security system
- Structural grid irregularity





Company	Fixture Series	Mounting	Lamp
1. Pinnacle	Adeo 2'x2', 2'x4'	Recessed	T8
2. Lightolier	Calculite 6"x6" Square DL	Recessed	27W LED
3. Lightolier	Wal-Master Wall Washer	Recessed	T8
4. AXIS	Beam 4 – Perimeter System	Recessed	T8

2'x2' Tile Ceiling – Dropped at 8'

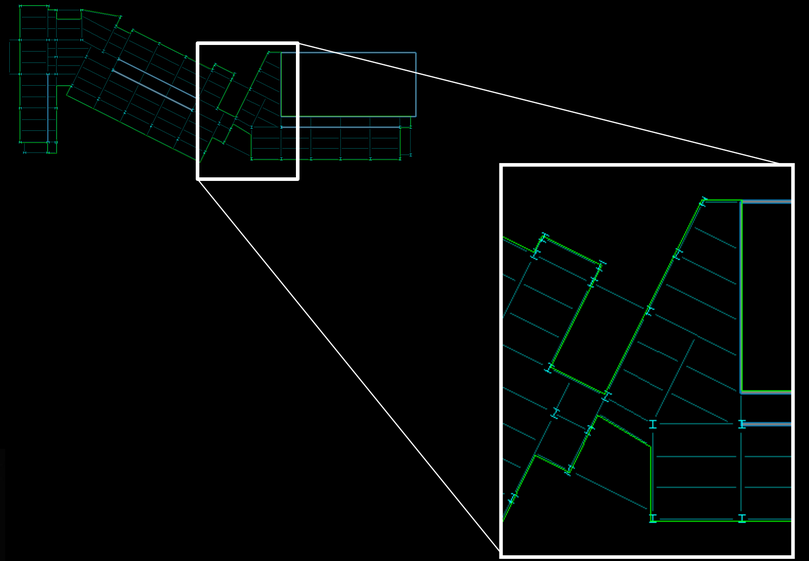
creation.

Administration

create a productive & inviting work environment

DESIGN CONSIDERATIONS

- Mechanical equipment noise
- Security system
- Structural grid irregularity



creation.

DESIGN CONSIDERATIONS

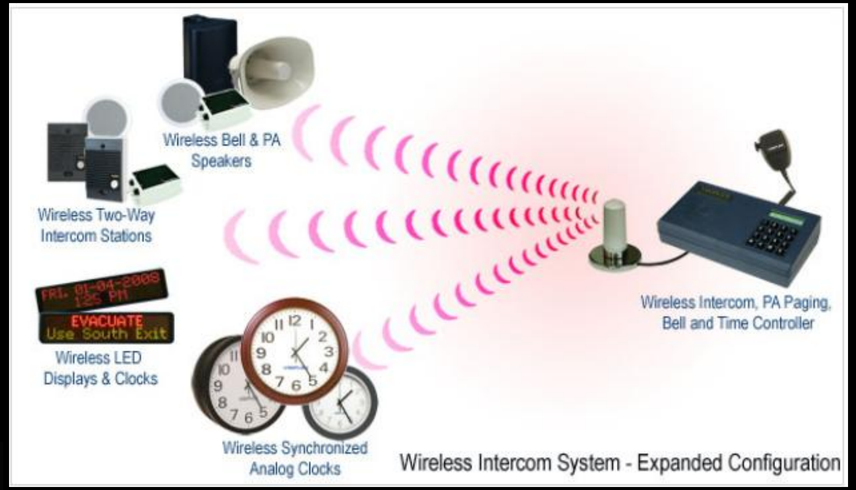
- Mechanical equipment noise
- Security system
- Structural grid irregularity

Administration

Visiplex System Functions

- Classroom and Building Speakers
- Intercom system at entry
- Synchronized Clocks
- Fire Alarm Announcement Integrated

- All Controlled from main admin office, as well as from an intranet log in from home computers



Visiplex.com

creation.

Corridor

create a space which accommodates traffic flow
and major building system components

creation.

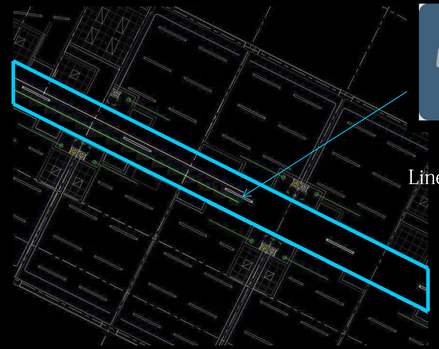
Corridor

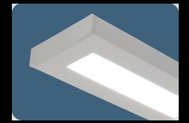
DESIGN CONSIDERATIONS
- Plenum space
- Acoustics

create a space which accommodates traffic flow
and major building system components

creation.

Corridor





Pinnacle
Linero 8 – 8ft length

create a space which accommodates traffic flow and major building system components

Design Criteria from IES Lighting Handbook	
Age Range	25-65
Average Illuminance	5 fc
Avg:Min Ratio	2:1

Lighting Power Density (Based on Standard 90.1)	
ASHRAE 90.1	0.66 W/SF
Actual LPD	0.25 W/SF

- Exposed ceiling
- Fixtures
  - 8ft AFF
  - Spaced 30ft on center
- Acoustic paneling
  - Hung from ceiling and mounted high on walls

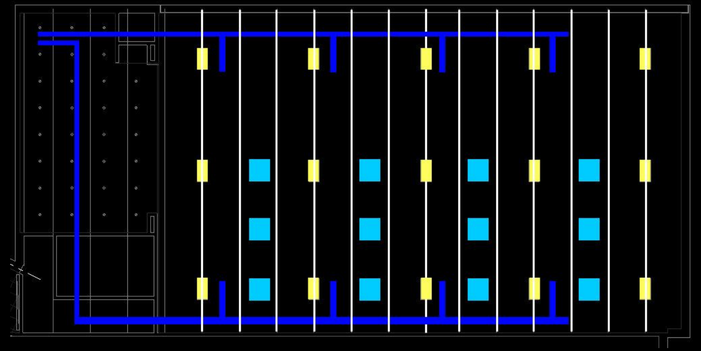
creation.

Multipurpose Room

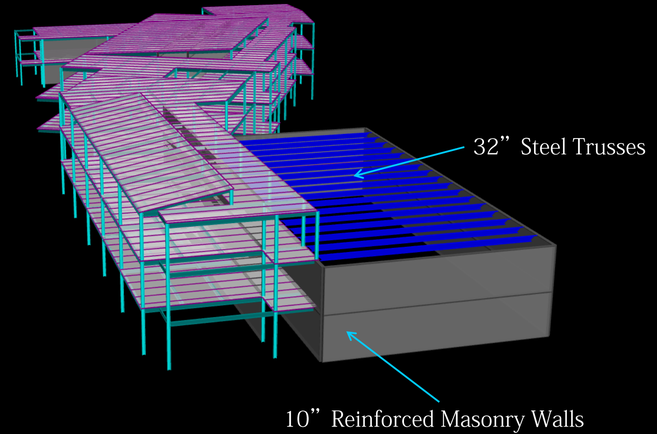
create a flexible space for the school and community.

creation.

Multipurpose Room

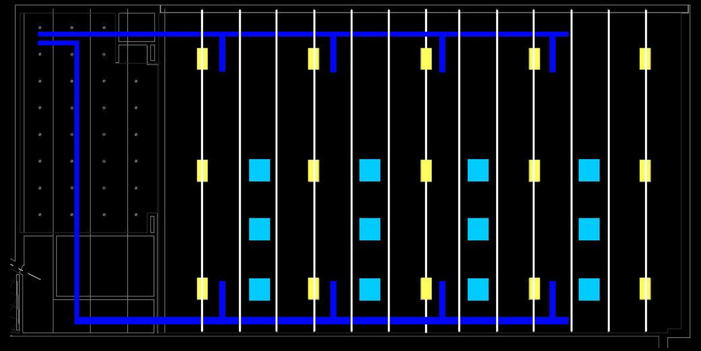


create a flexible space for the school and community.



creation.

Multipurpose Room



create a flexible space for the school and community.

Fixtures

- 15 (6) 54W T5HO
- Philips Day-Brite Fluorescent Gym Luminaire

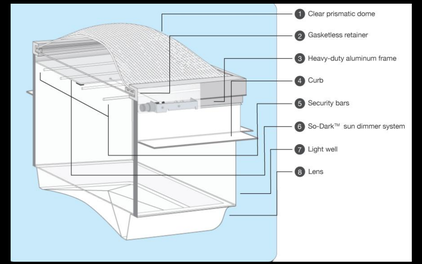
Design Criteria from IES Lighting Handbook (for Class 3 Sports Lighting)	
Age Range	25-65
Average Illuminance	50 fc
Avg:Min Ratio	3:1

Lighting Power Density (Based on Standard 90.1)	
ASHRAE 90.1	1.20 W/SF
Actual LPD	0.89 W/SF

creation.

Multipurpose Room

create a flexible space for the school and community.

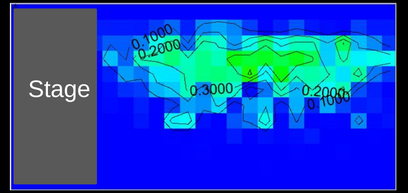


4’x4’ with 2.5’ light well

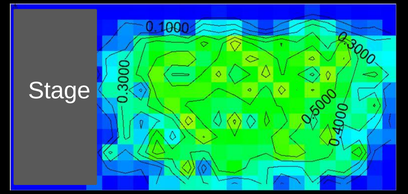
Passive Daylighting System
paired with
So-Dark Motorized Shade Screen

By Daylighting Systems, Inc.

Useful Daylight Illuminance
(500 lux and greater)



Without Skylights



With Skylights

Energy Savings per Year =
1,791 kWh

creation.

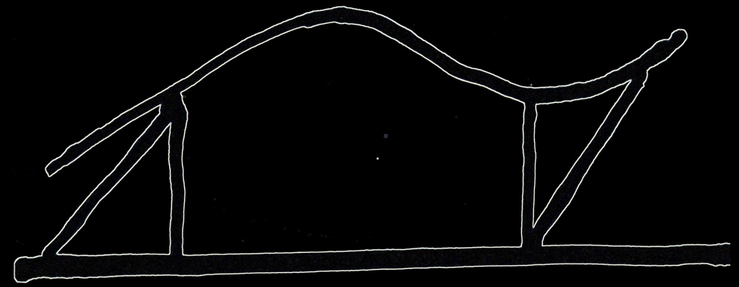
Pool & Clinic Renovation

create a recreational building to encourage
healthy living and community involvement

creation.

Pool & Clinic Renovation

create a recreational building to encourage healthy living and community involvement



CONSTRUCTABILITY

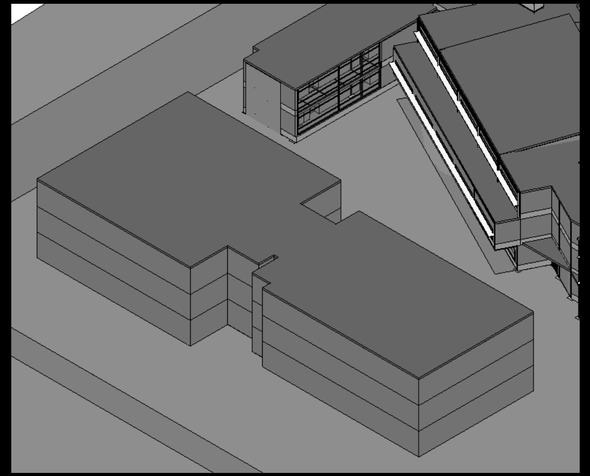
- Scheduling & Phasing
- Site Logistics
- Budget

DESIGN CONSIDERATIONS

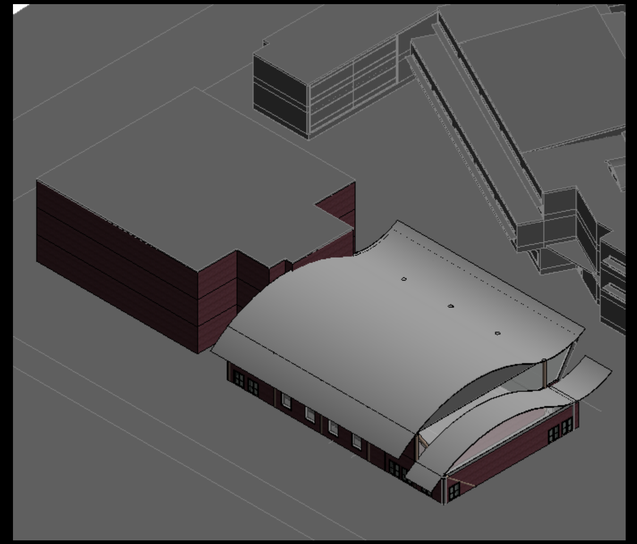
- Humidity
- Energy Savings
- Large roof span
- Lighting fixtures

creation.

Pool & Clinic Renovation

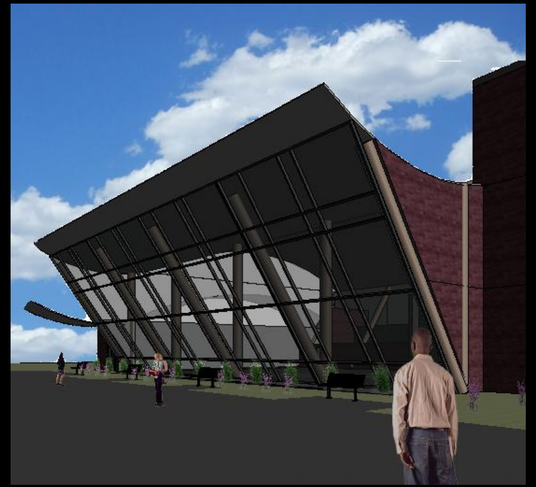


create a recreational building to encourage
healthy living and community involvement



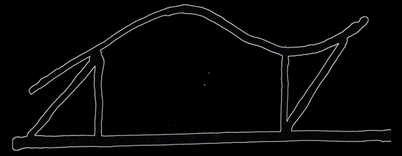
creation.

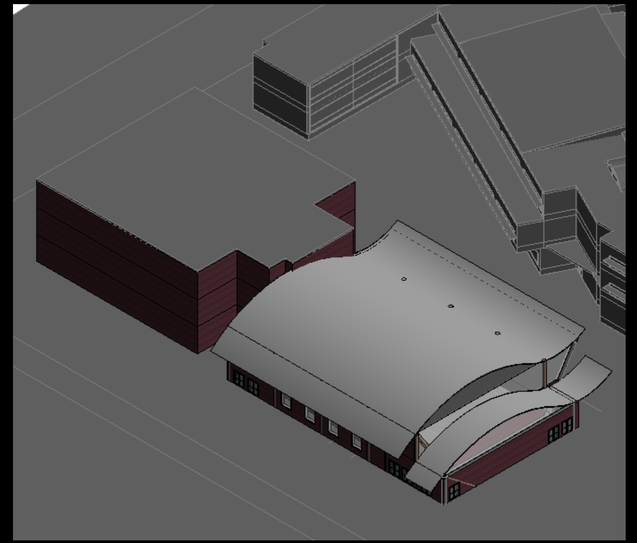
Pool & Clinic Renovation



Northwest corner

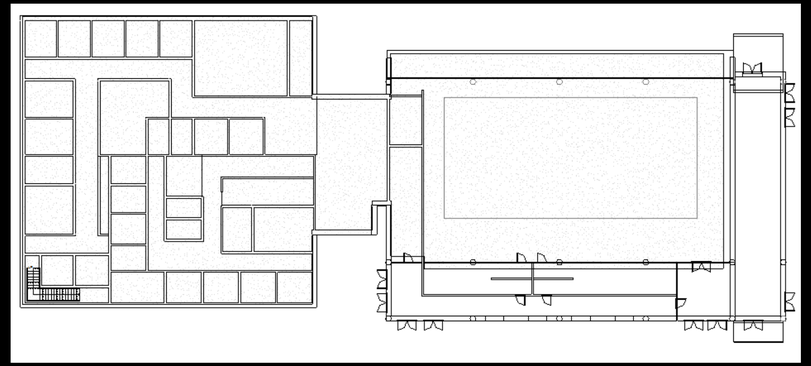
create a recreational building to encourage healthy living and community involvement





creation.

Pool & Clinic Renovation



create a recreational building to encourage healthy living and community involvement

Fixture Considerations

- High Bay Fixtures
- Water tight fixtures
- Complete lifecycle cost analysis

Design Criteria from IES Lighting Handbook (for Class 3 Sports Lighting)	
Age Range	25-65
Average Deck Illuminance	100 fc
Average Water Illuminance	300 fc
Avg:Min Ratio	3:1

Lighting Power Density (Based on Standard 90.1)	
ASHRAE 90.1	1.20 W/SF

creation.

Team Goal: To create an innovative, high-performance environment in a way that stimulates involvement in both education & the community.

Lighting Power Density
Interior: about 46,000 W/SF
44.8% below ASHRAE Standard 90.1 Requirements
*Does not include specialty lighting spaces (Library & Atrium)

Floor to Floor Height Reduction Savings
Façade: 6775 square feet, $182,000
Structural Steel: 762 LF, 38100 lbs, $50,000
Air Volume: 660,000 CF

LEED Certification
Currently 51 points for LEED Silver

Operability
Decreased maintenance of green roof
Less maintenance of geothermal mechanical system

Energy Use Intensity savings
Reduced the building energy use intensity by 22 kBTU/ft^2-yr through enclosure design and system selection

creation.

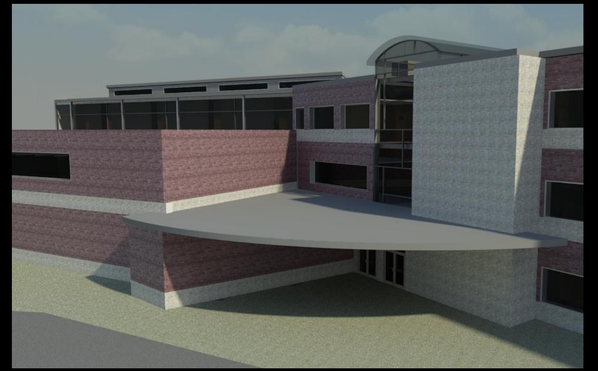
Building Systems

Lighting/Electrical Systems

- Public Spaces all on Building Management System
- Emergency fixtures will also serve as normal power and default to emergency when necessary.
- 277/480V Lighting Panels, 120/208V Electrical Panels
- Interior building transformer and generator
- On site High Voltage transformer; secondary
- Overhead power lines supply building

Construction

- Multiple Prime with Construction Management Agency
- Proposed CM @ Risk w/ Design Assist Subs
- Construction Budget: $18,00,000
- 15 Month Schedule
- Rammed Aggregate Piers



Structural Systems

- Structural steel frame, typical classroom 28x30
- W10 and W12 columns spliced at 3rd floor
- W14 girders and W12 beams, W8 girders in corridors
- Braced frames and reinforced masonry shear walls
- Composite metal deck

Mechanical Systems

- Ground Source Heat Pump System
- 5 Dedicated Outdoor Air Units serving 5 zones
- Outdoor air units take the majority of the sensible and latent loads
- Ventilation and Terminal Unit split system
- Heat Pumps range in size from 3/4 – 3 tons

creation.

Images taken from:
axislighting.com
daylighting.com
lightolier.com
ledalite.com
pinnacle-ltg.com
Lithonia.com
acoustimac.com