

Perkins Eastman



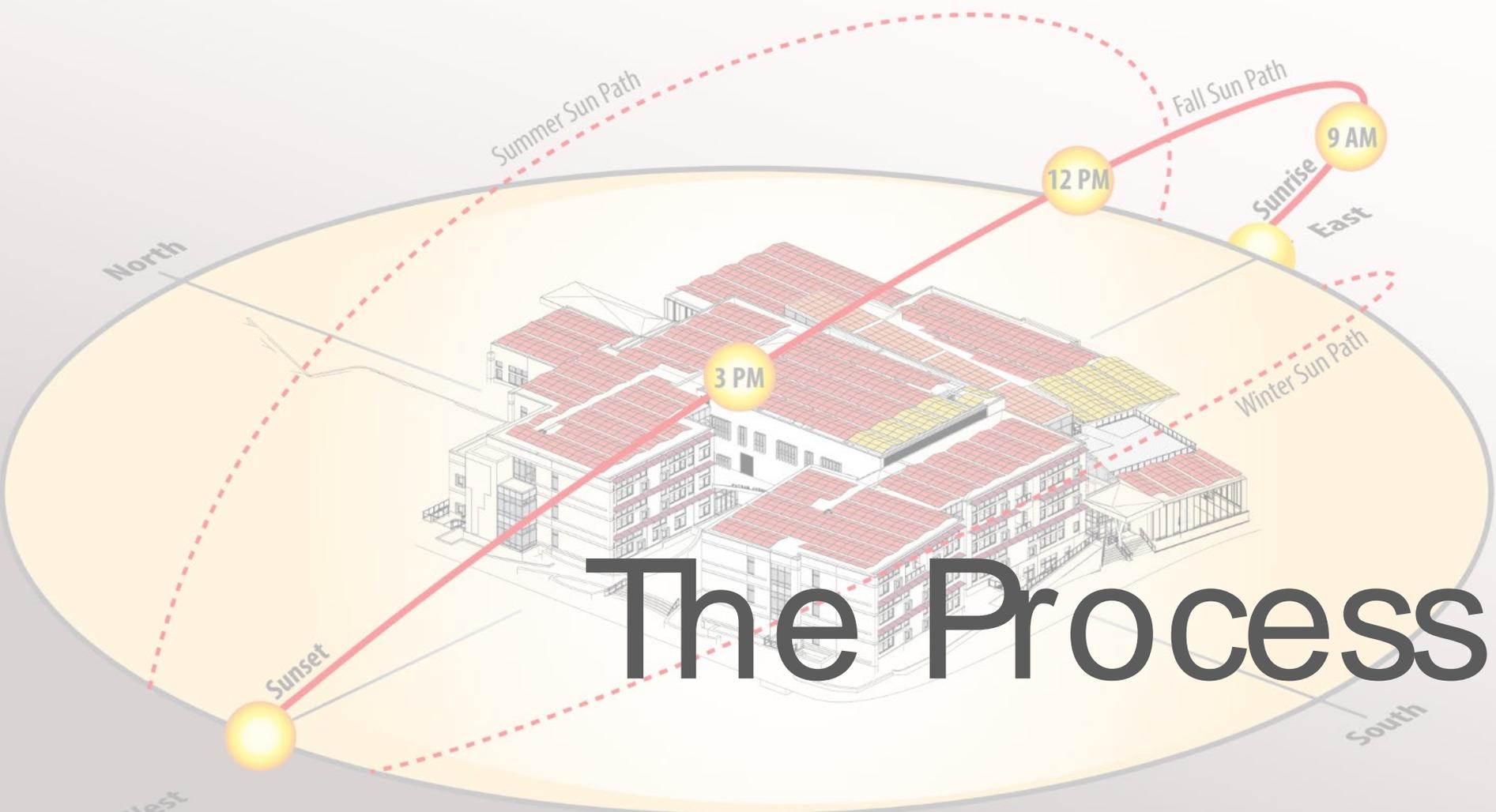
Perkins Eastman

Dr. Martin Luther King, Jr. School

MLK, Jr. School Council Meeting

26 February, 2014

- The Process
- The Details
- The Results
- The Construction



The Process

Perkins Eastman

1. Innovation Agenda

*The Innovation Agenda is an ambitious plan that will propel Cambridge Public Schools into the 21st century, and **prepare all our students for life in a world we cannot fully imagine** today. The Innovation Agenda is a design for excellent education rather than adequate education.*

Superintendent Young

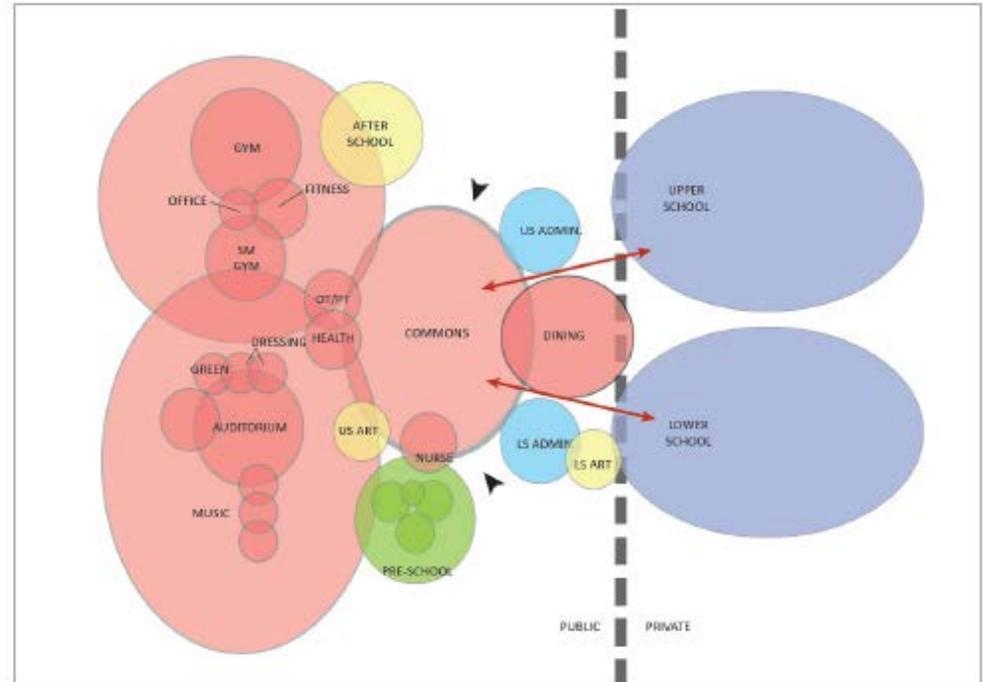
2. Net Zero Energy

*“For Cambridge the process of **planning and designing a net-zero school has changed the way we think about energy in all our buildings**. It has made us think about what energy we really need to use in our existing city buildings and will surely change some of what we do even in buildings not slated for full scale renovation or rebuilding.”*

Mayor Davis

Program: 740 Students

- **Lower School:**
400 JK-5th Graders
- **Upper School:**
300 6th – 8th Graders
- **Human Services:**
40 PreSchool Students,
Community School & After
School Programs
- **Hours of Operation:**
6:00 am to 11:00 pm

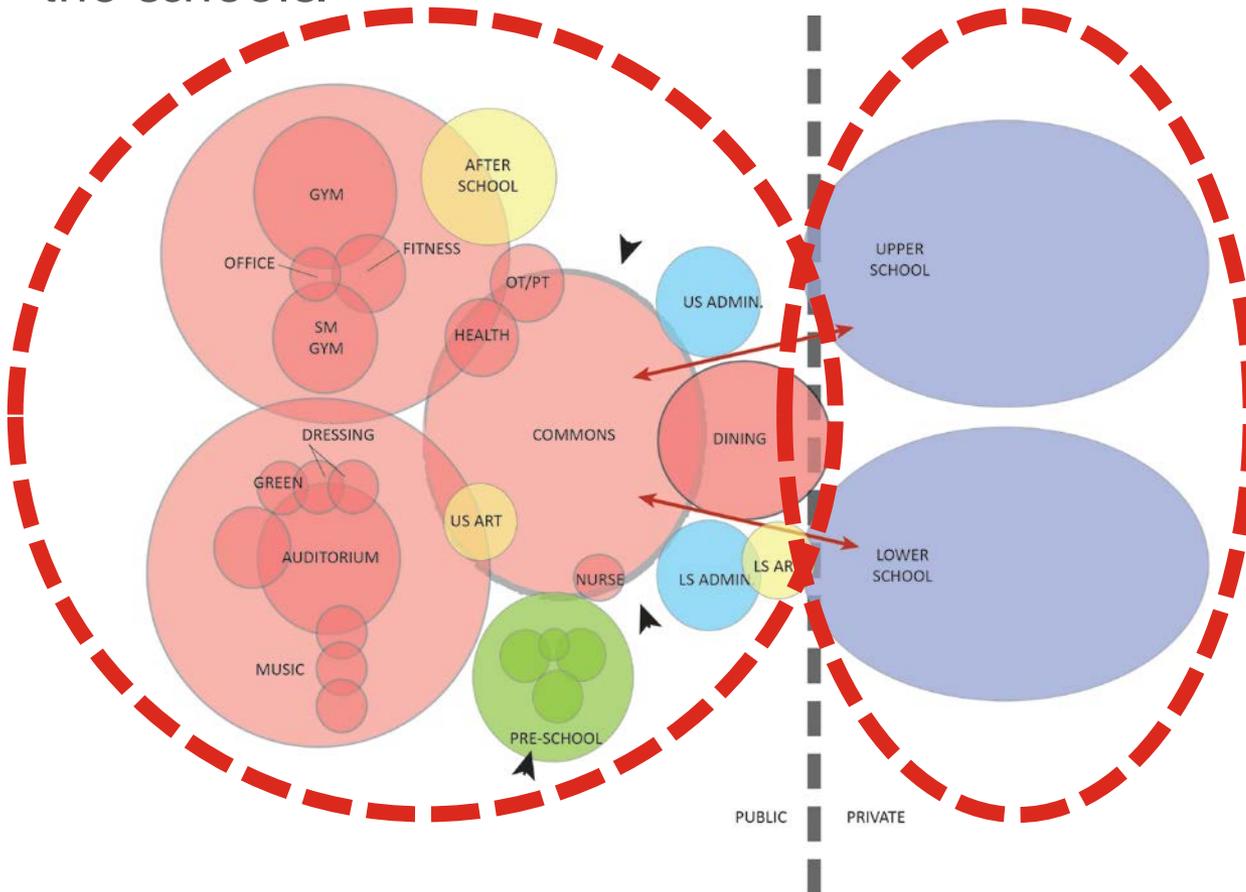


Other Criteria

- **Able to be Maintained:**
Defines “sustainability”
- **Site Water:**
High Water table; Poor Storm System;
Charles River Watershed
- **Responsive to Neighbors:**
Tight urban site

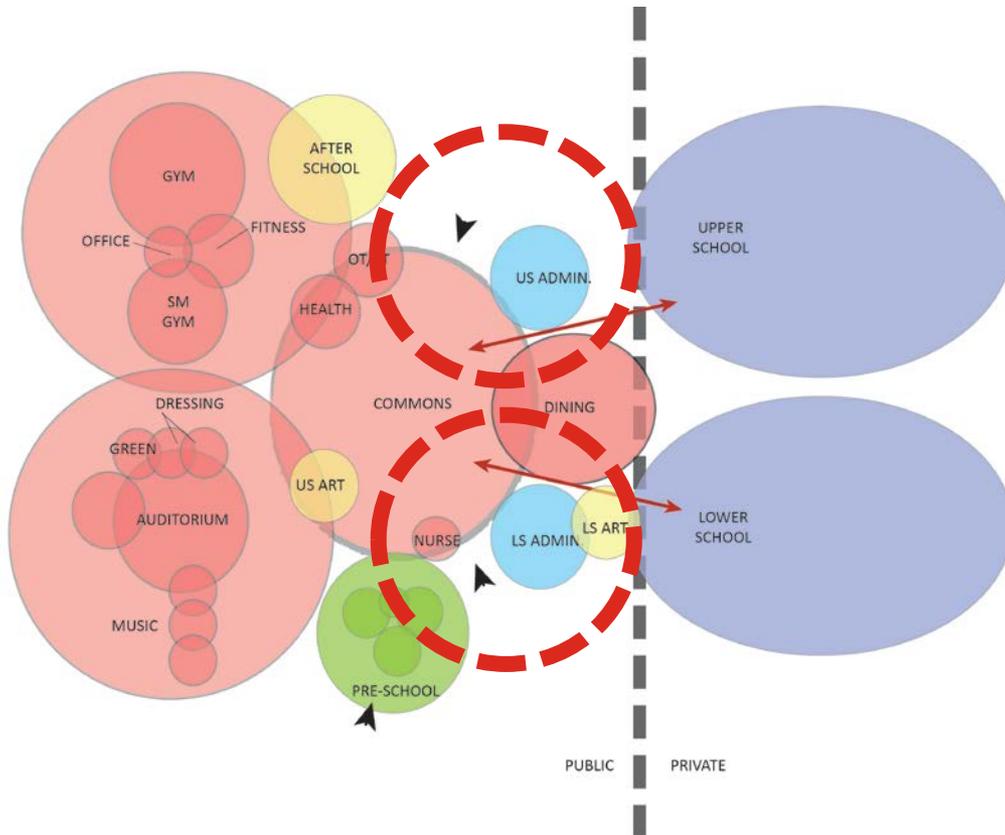
Principle:

- The campus is zoned into community/school and school-dedicated areas organized around a campus commons. This enables active community use without disruption to the schools.



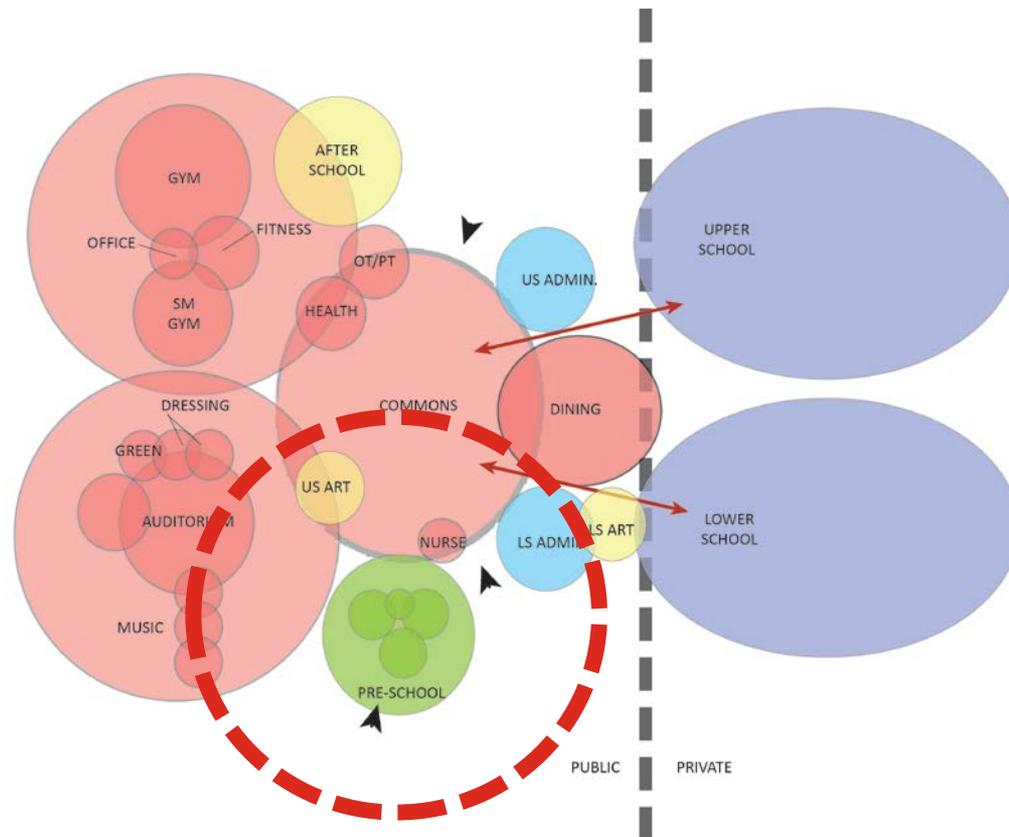
Principle:

- Each school administration controls the front door(s) and the campus commons.



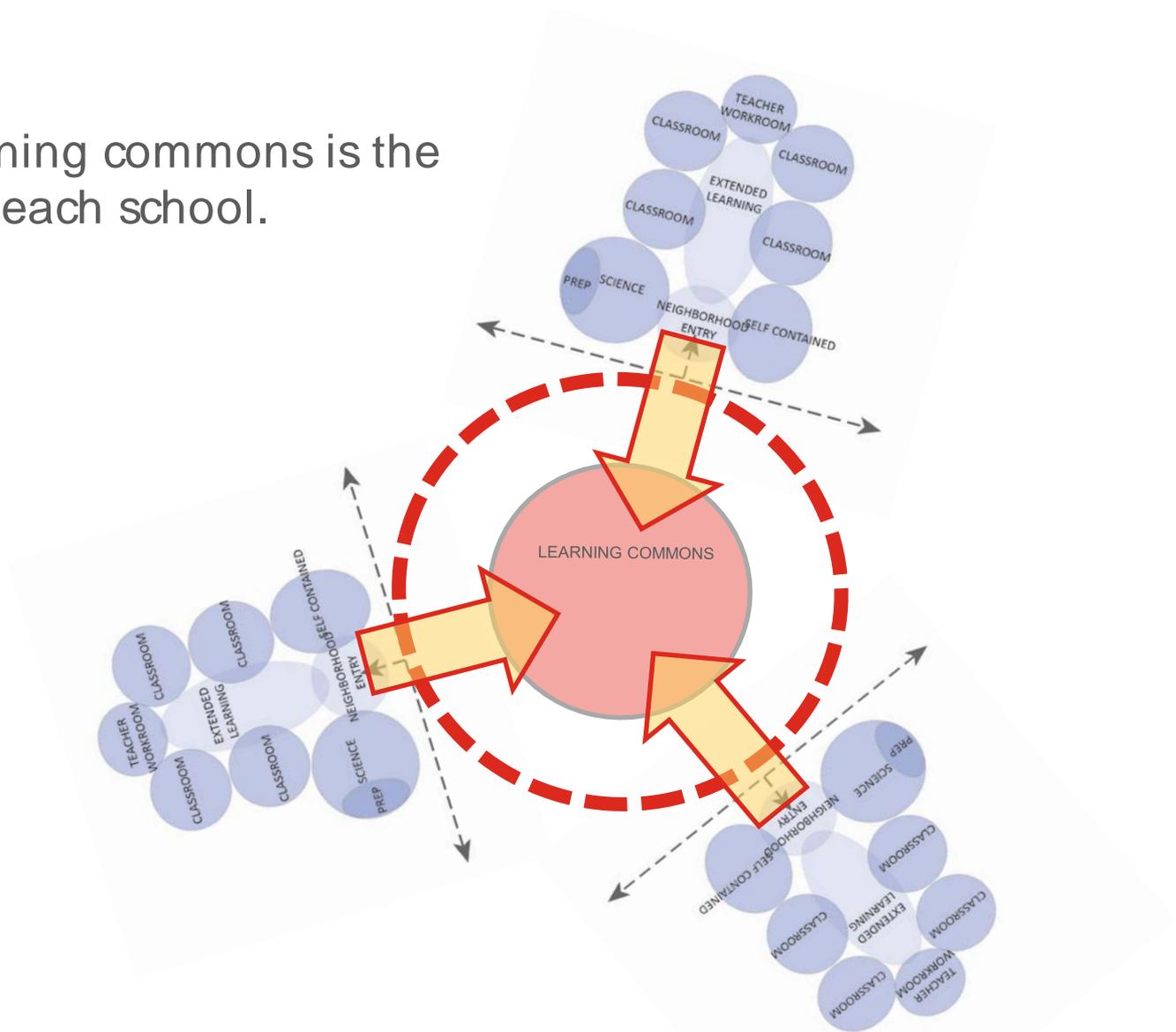
Principle:

- The Pre-School has its own entry but is also integrated into the campus-community commons.



Principle:

- The learning commons is the heart of each school.

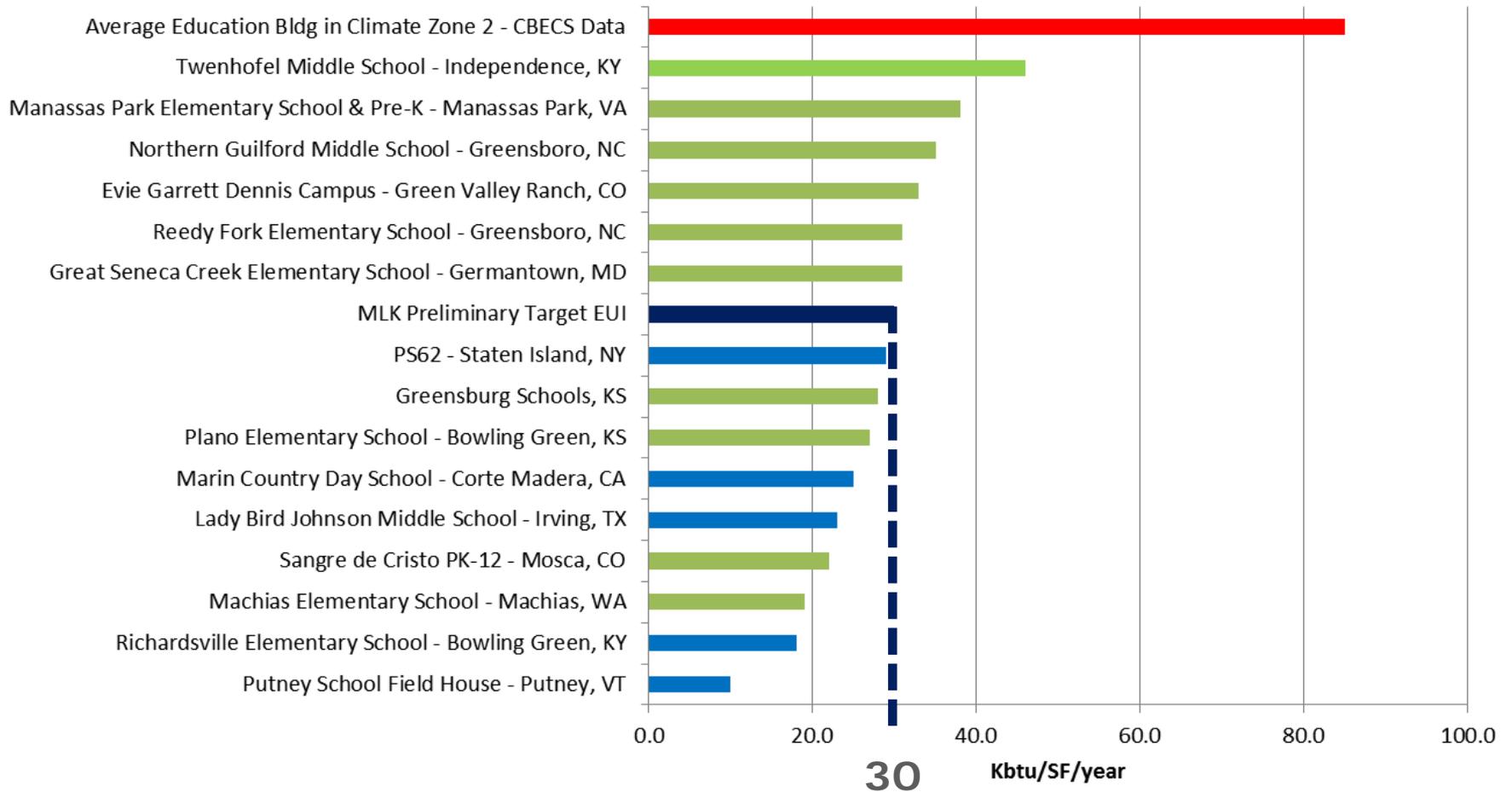


NREL Net Zero Energy Classifications – How is Energy Harvested?

| | |
|--------|---|
| NZEB:A | Renewable energy harvested within the building |
| NZEB:B | Renewable energy harvested within the building and on the site |
| NZEB:C | Renewable energy harvested within the building on site or by renewable sources imported to the site |
| NZEB:D | Renewable energy harvested within building footprint and/or on site and supplemented by purchased renewable energy certificates |

- Benchmark performance targets
- Establish the “Energy Budget”
- Optimize the building design
- Research and investigation of expected & anticipated energy use
- Education of owner about their role
- Engagement of the occupants in reducing building energy needs

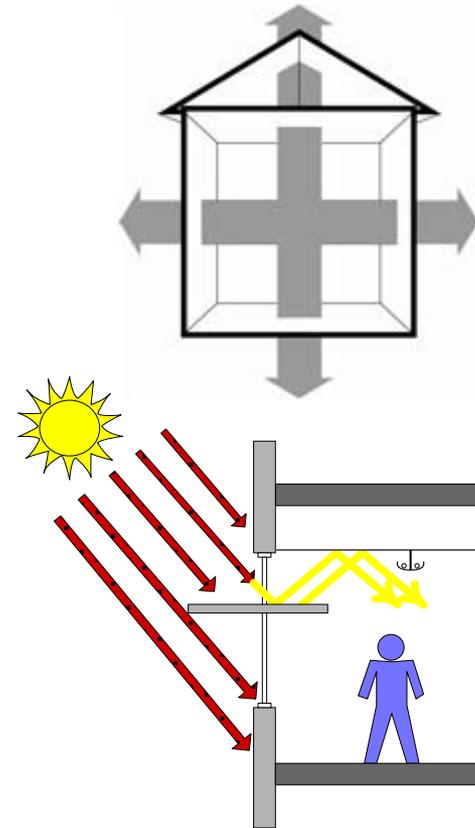
Steps to NZEB - Energy Benchmarking (EUI)



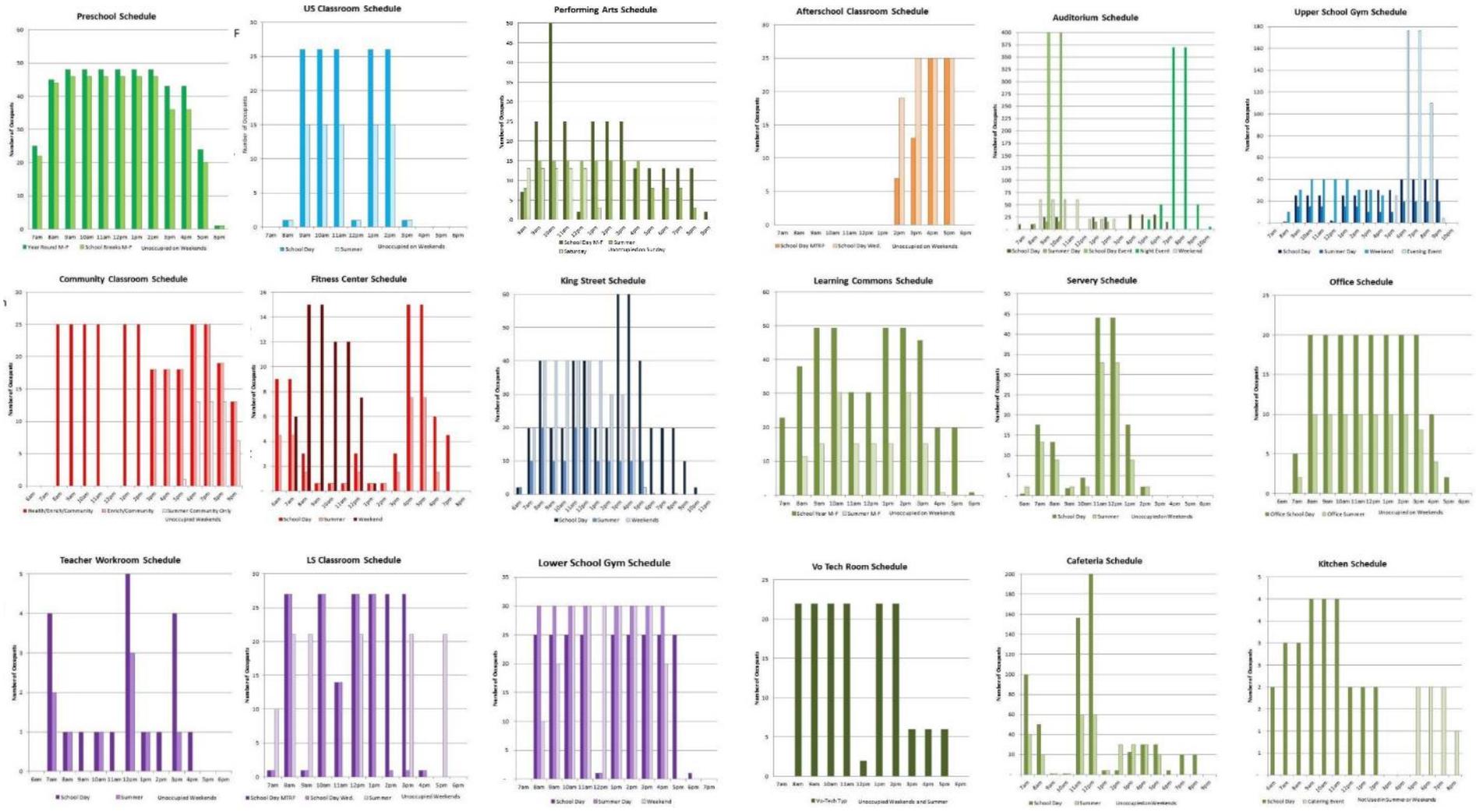
- **Maximum possible:**
 - 2,700,000 kWh/year with site fully covered (140,000 sf)
 - 57.6 kbtu/sf/year
- **Likely required:**
 - 1,410,000 kWh/year with approximately 73,500 sf of PV
 - 30 kbtu/sf/year
- **Site impact:**
 - Greater than 50% site coverage with PV



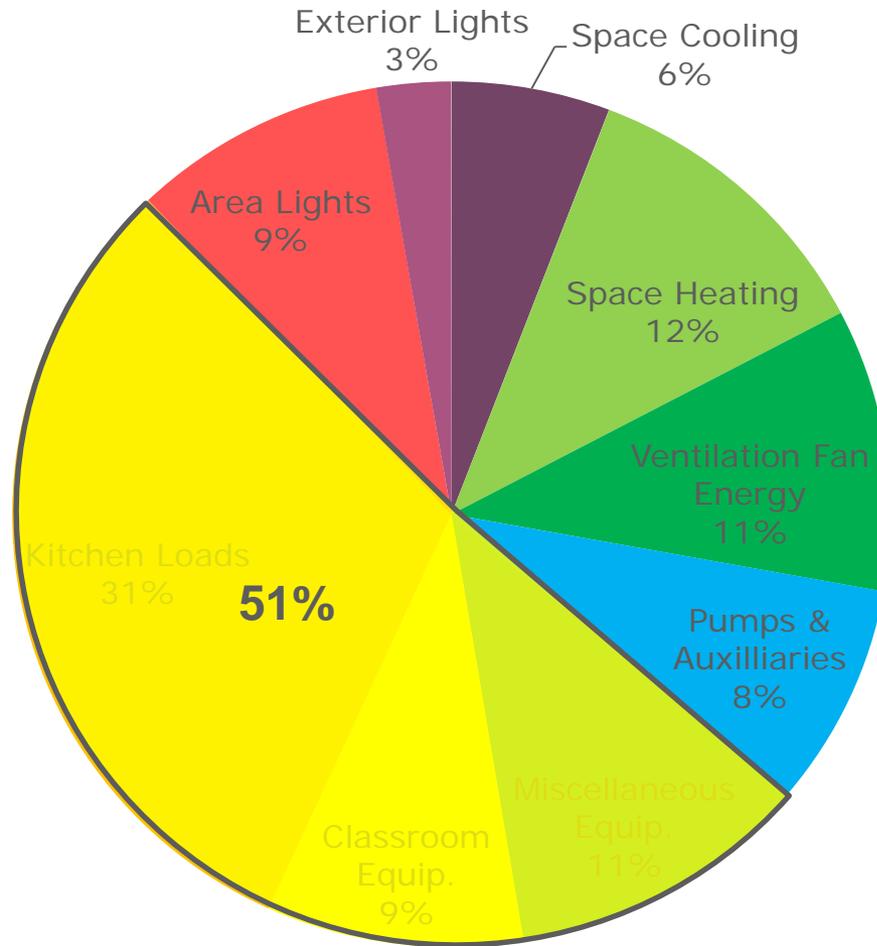
- Optimize the building
 - *Reduce loads & demands on systems*
- Optimize passive systems
 - *Reduce energy use*
- Optimize active systems
 - *Use energy efficiently*



Steps to NZEB – Understanding Expected Energy Use



Steps to NZEB – Educating Owners on Their Role



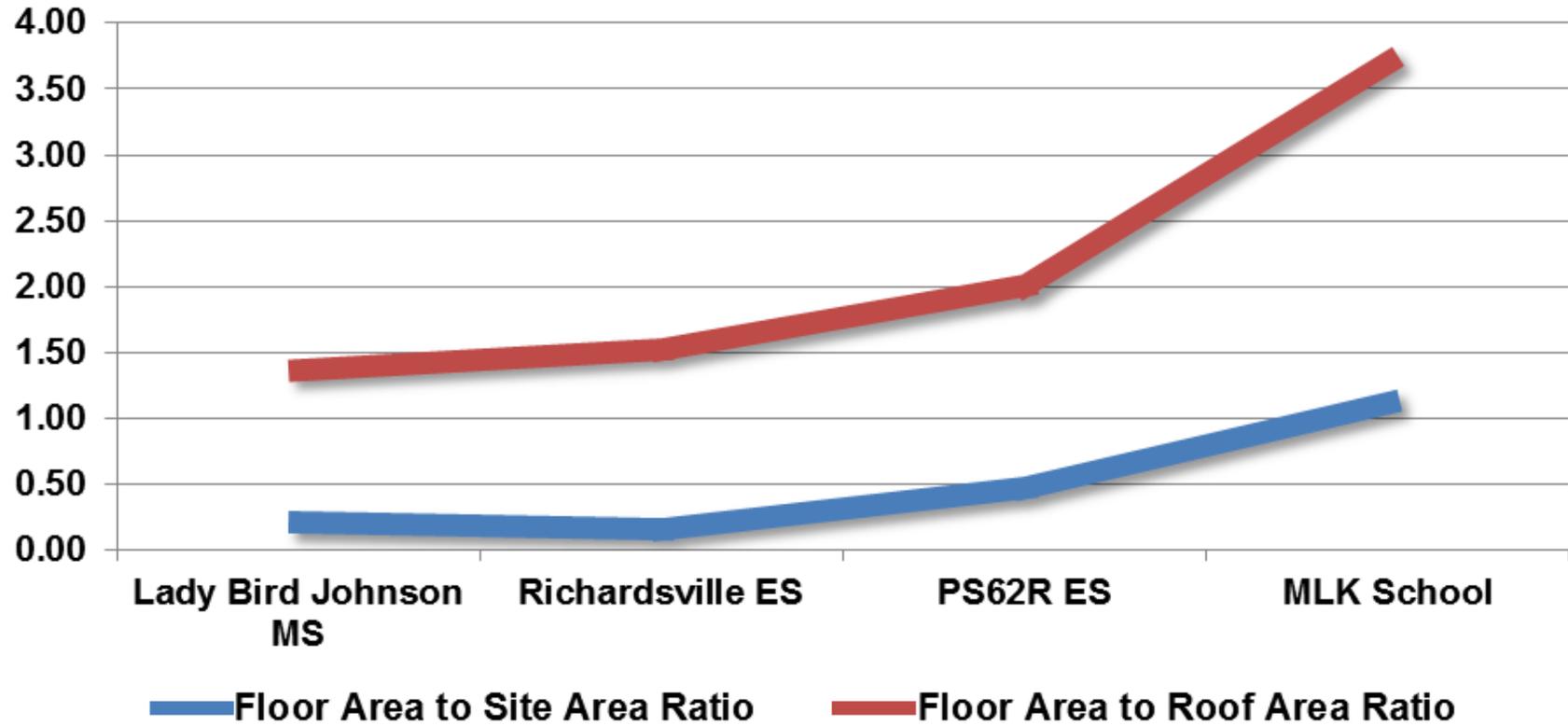
PS62R Owner (plug loads) Impact
at Schematic Design Phase

- Granular information about real time energy use
- Information relevant to the occupants

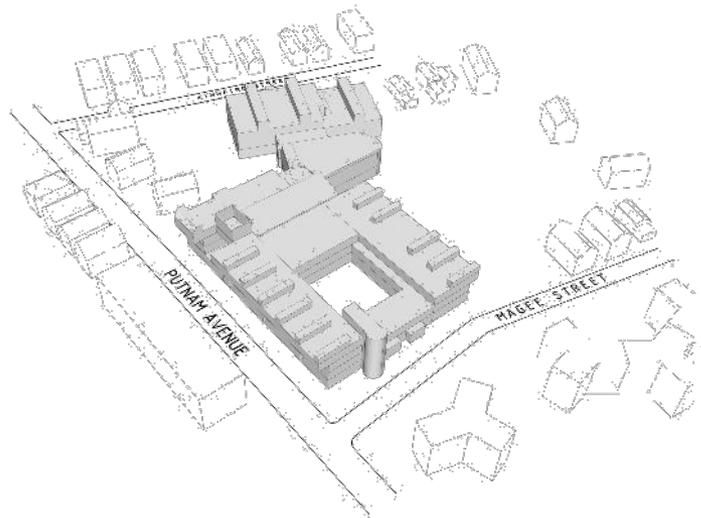


Example of a proposed
“Age Appropriate”
Building Dashboard

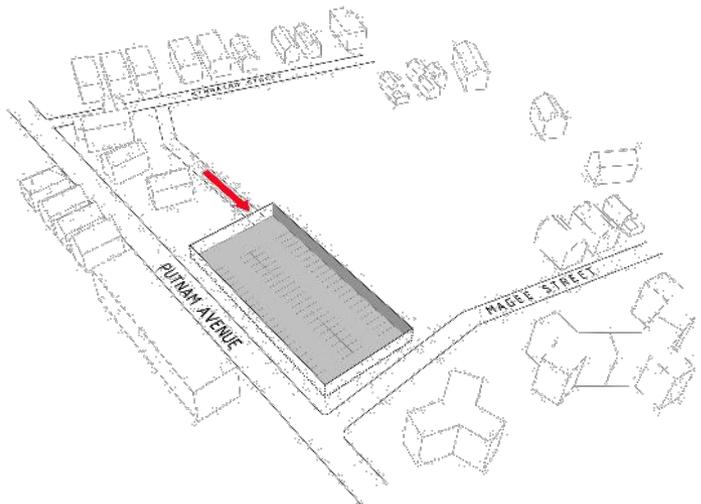
Stoddert Elementary School
& Community Center
Energy Patrol Members



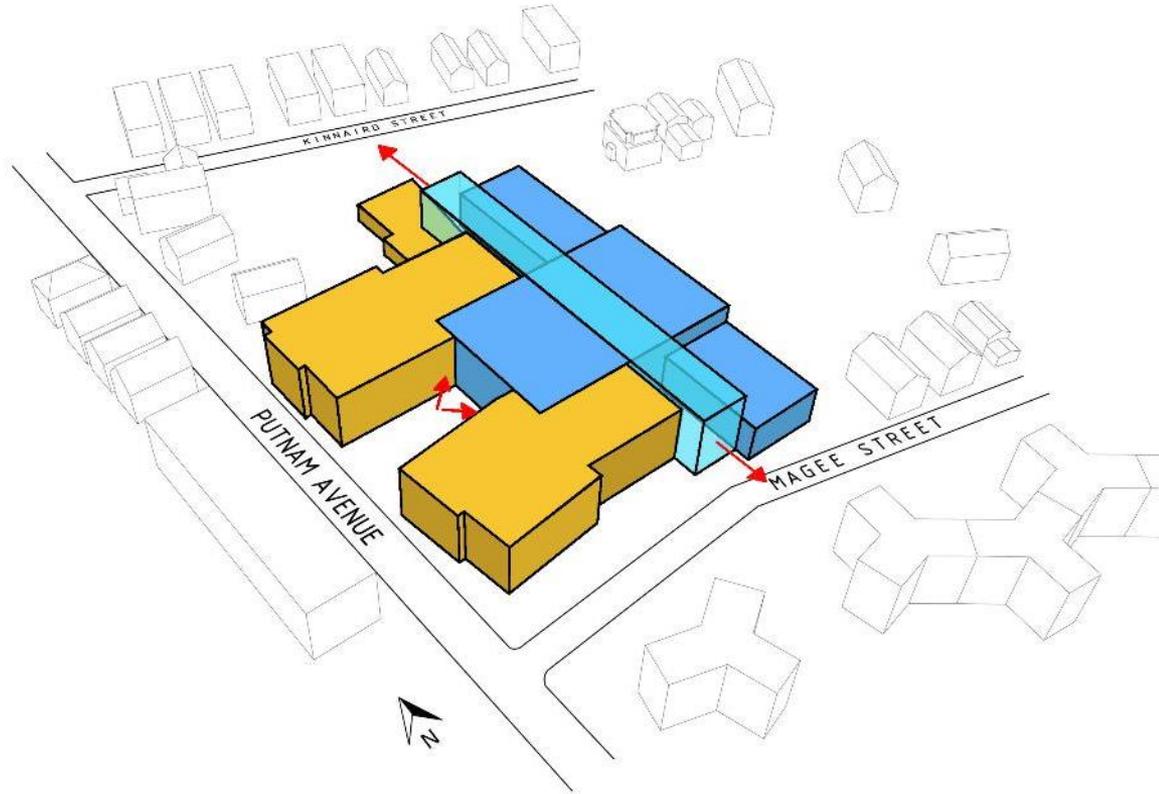
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| NZEB:B | Renewable energy harvested within the building and on the site |
| NZEB:C | Renewable energy harvested within the building on site or by renewable sources imported to the site |
| NZEB:D | Renewable energy harvested within building footprint and/or on site and supplemented by purchased renewable energy certificates |



EXISTING BUILDING



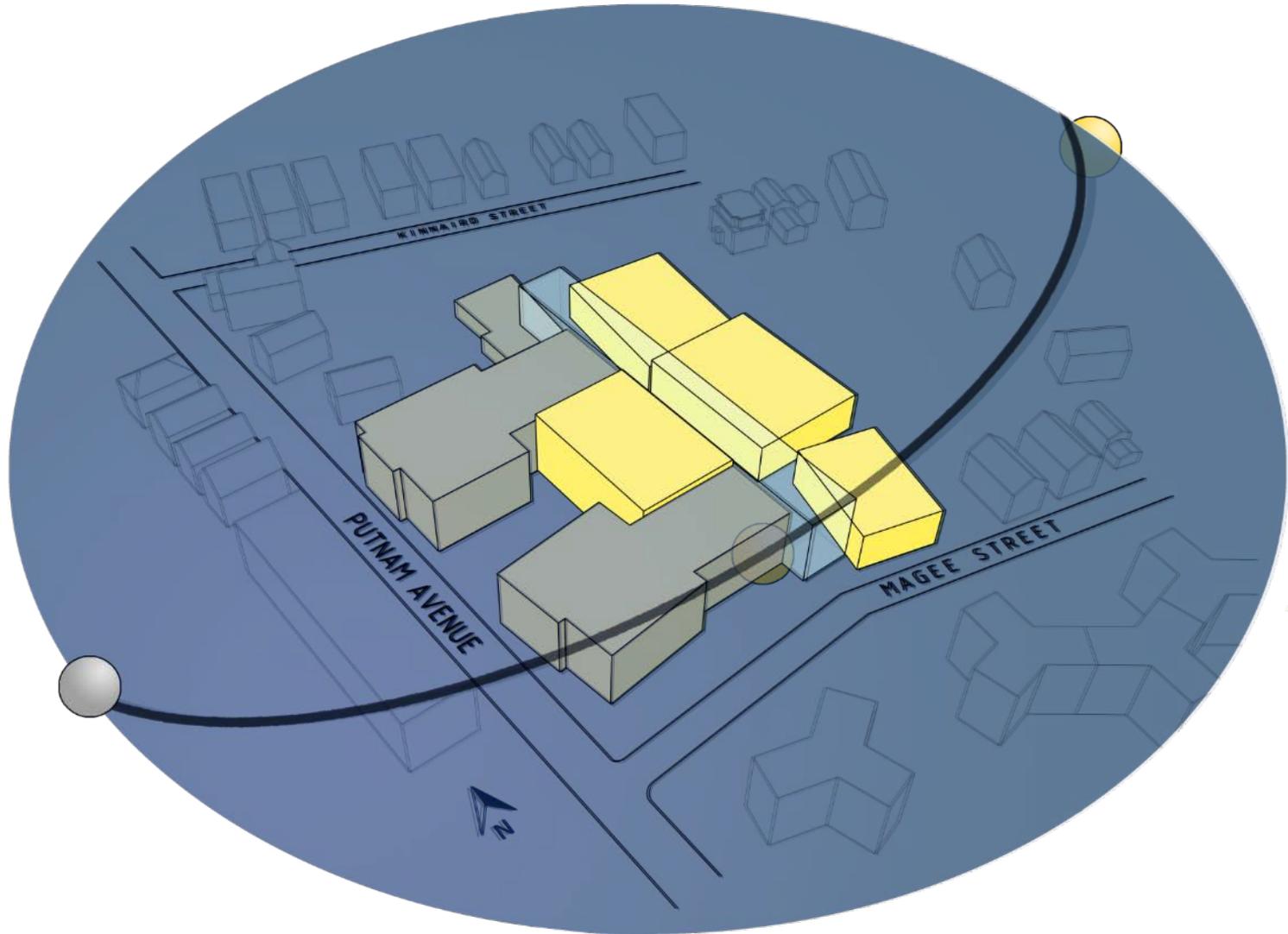
BUILDING REUSE
UNDERGROUND PARKING



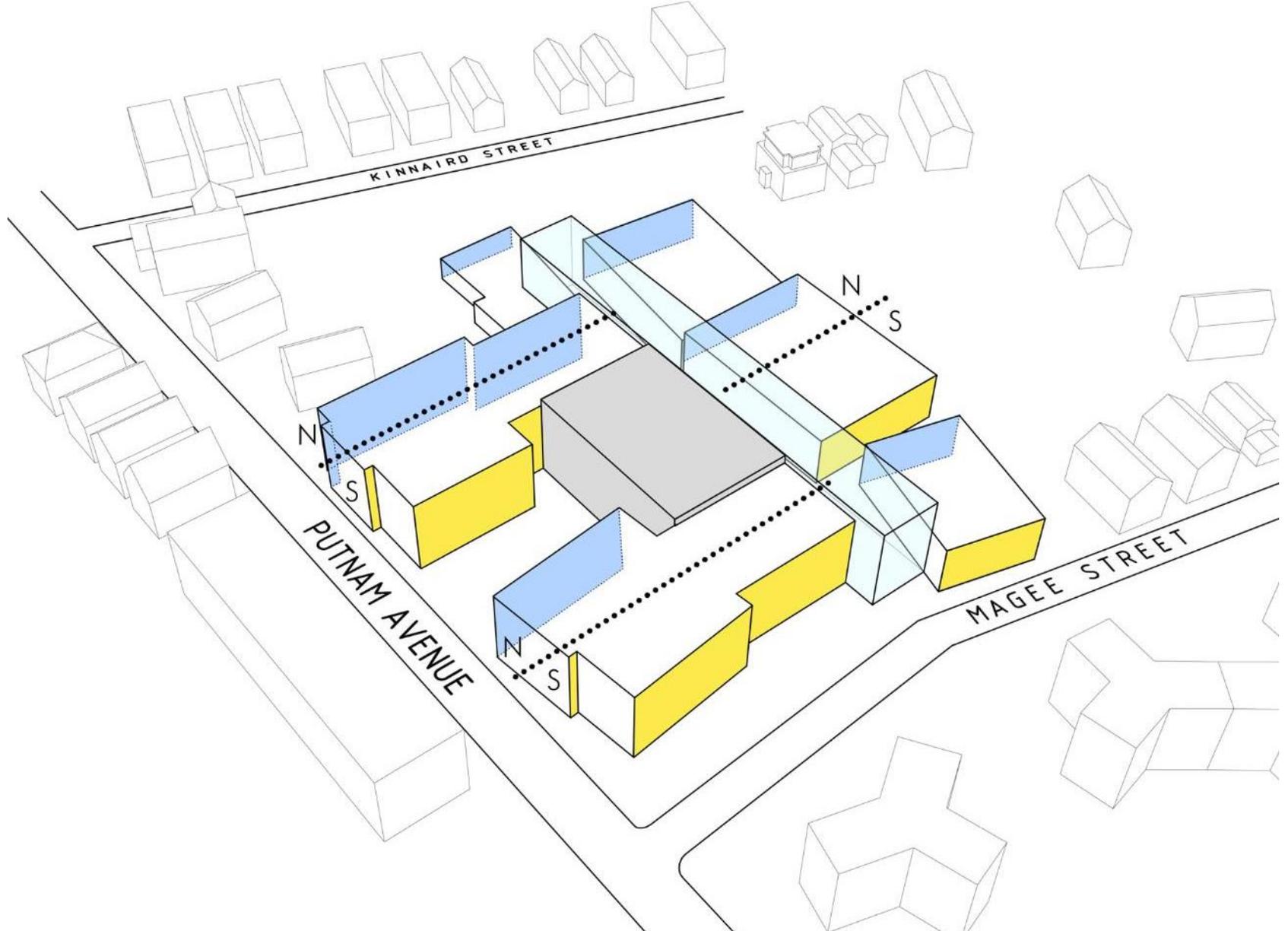
PARTI

PRIVATE / PUBLIC / KING STREET

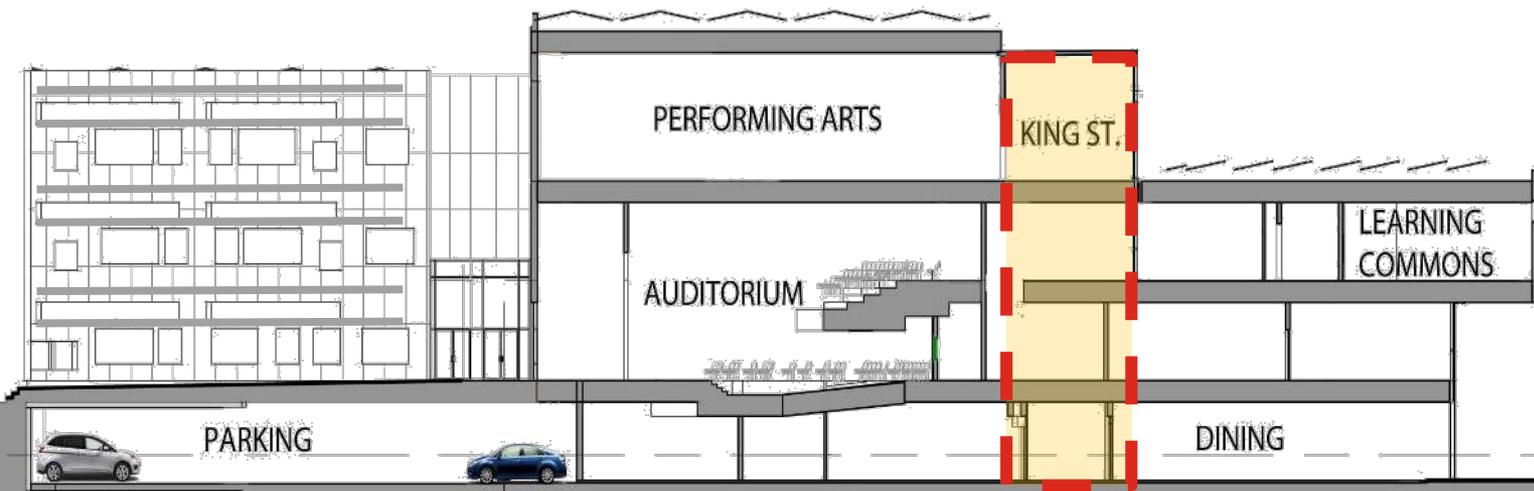
Feasibility Study: Zoned for Security & Hours of Use

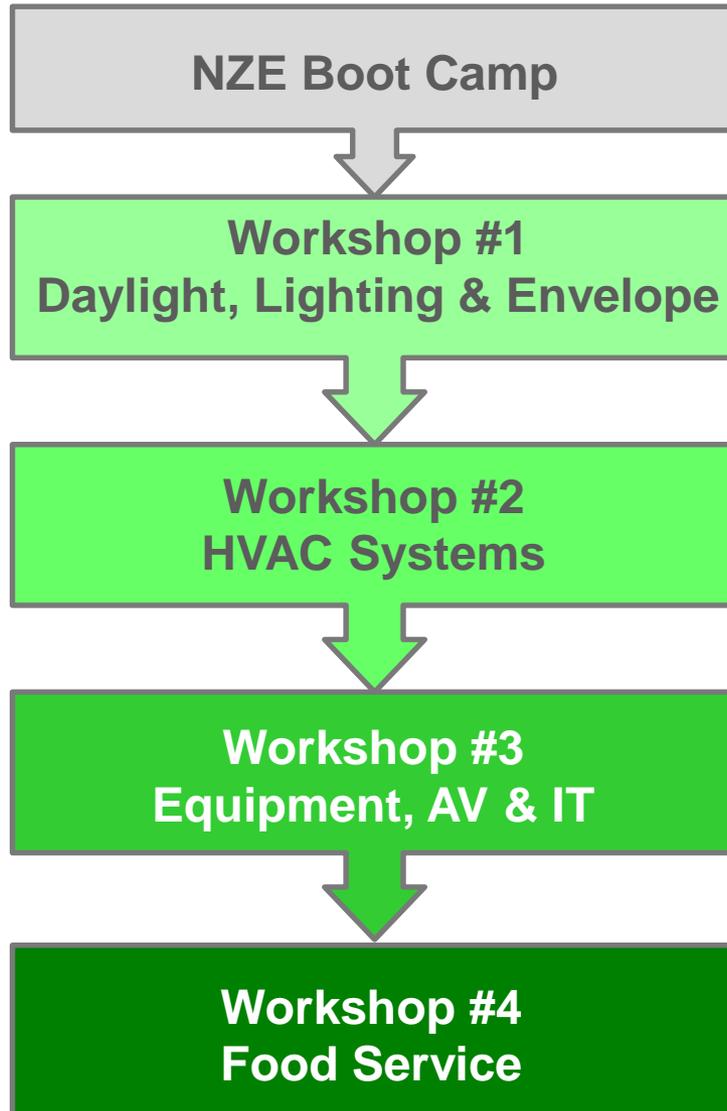


Feasibility Study: Solar Orientation



- 170,000 GSF + 18,000 Garage
- 4 Stories
- 75 parking spaces (6 on site + 69 in garage)
- Compact footprint – surround auditorium
- Vertically stacked – take advantage of grades
- Maximize open space – minimize onsite Parking





Project team starts to focus on energy

Project team focuses on large energy impacts such as building orientation and envelope

Project team focuses on additional large building wide energy systems

Project team focuses on smaller building wide loads and occupant energy usage

Project team focuses on single, focused building space with intense energy usage

Orientation, Daylighting & Urban Design

- 1. Parking
- 2. Courtyard
- 3. Basketball Court
- 4. Turf Field
- 5. Play Area
- 6. Preschool Play Area



- Massing steps-up to center; lower next to houses
- Matches street line; smaller “blocks” in scale
- Pulls away from north property line to avoid shadows on neighbors





SOUTH ELEVATION (MAGEE STREET): 30-35%



WEST ELEVATION (PUTNAM AVENUE): 25%

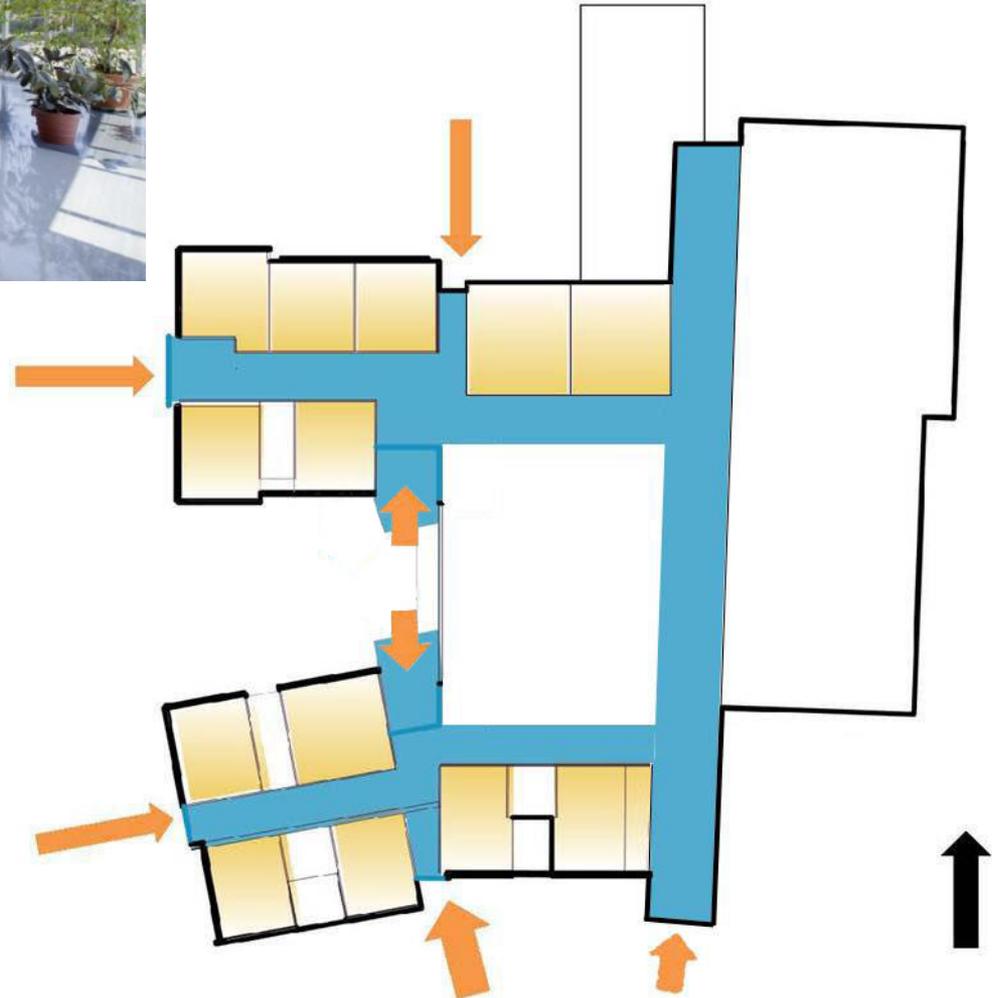
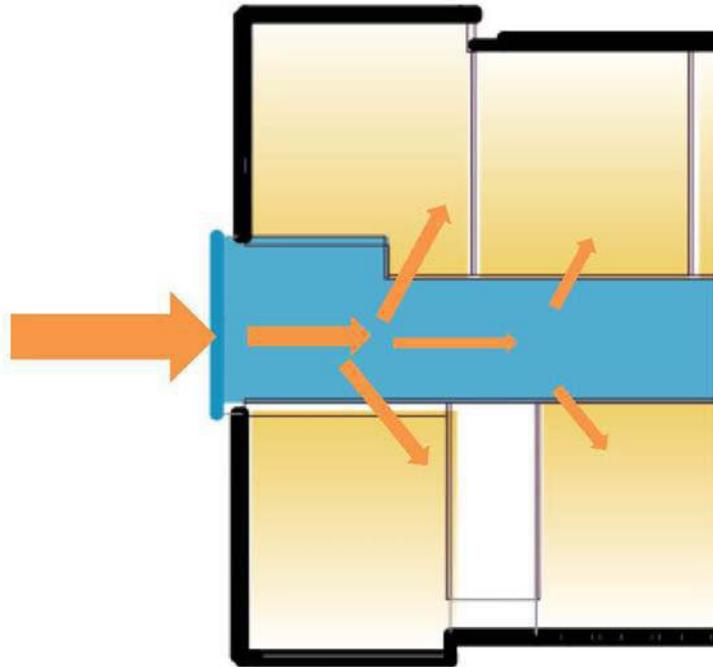


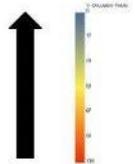
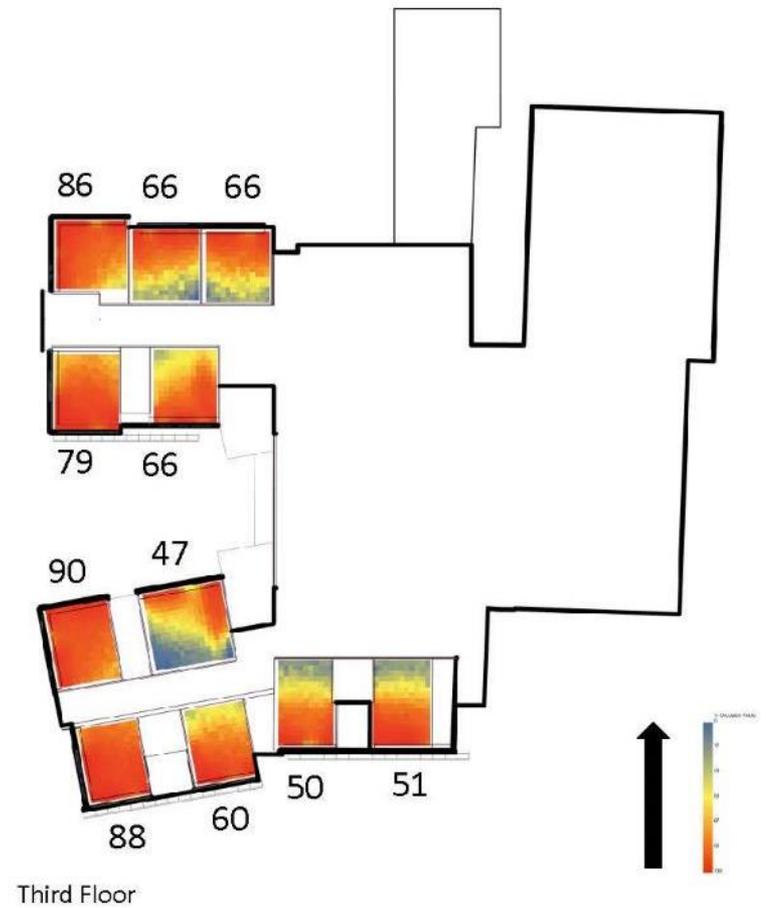
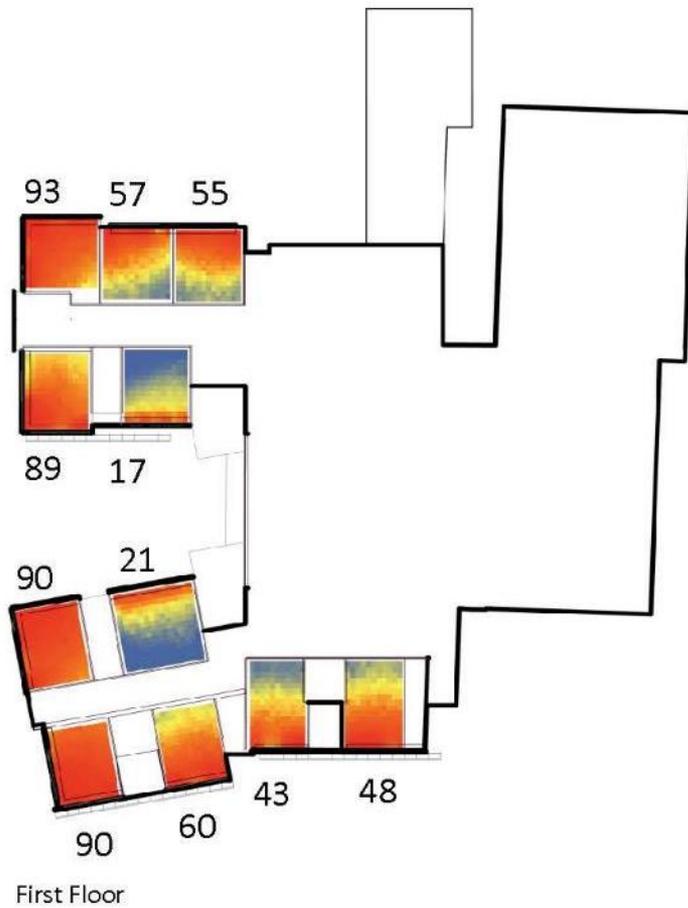
NORTH ELEVATION (KINNAIRD STREET): 35%



EAST ELEVATION (HAYES STREET): 25%

Extended Learning Environments, Circulations & Borrowed Light



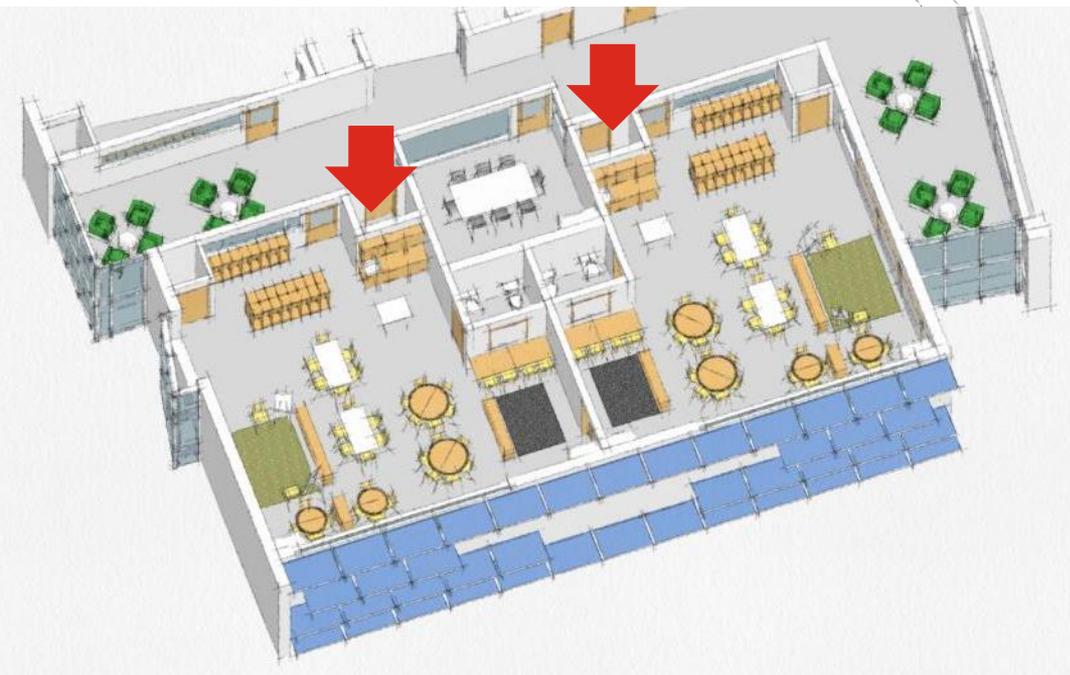
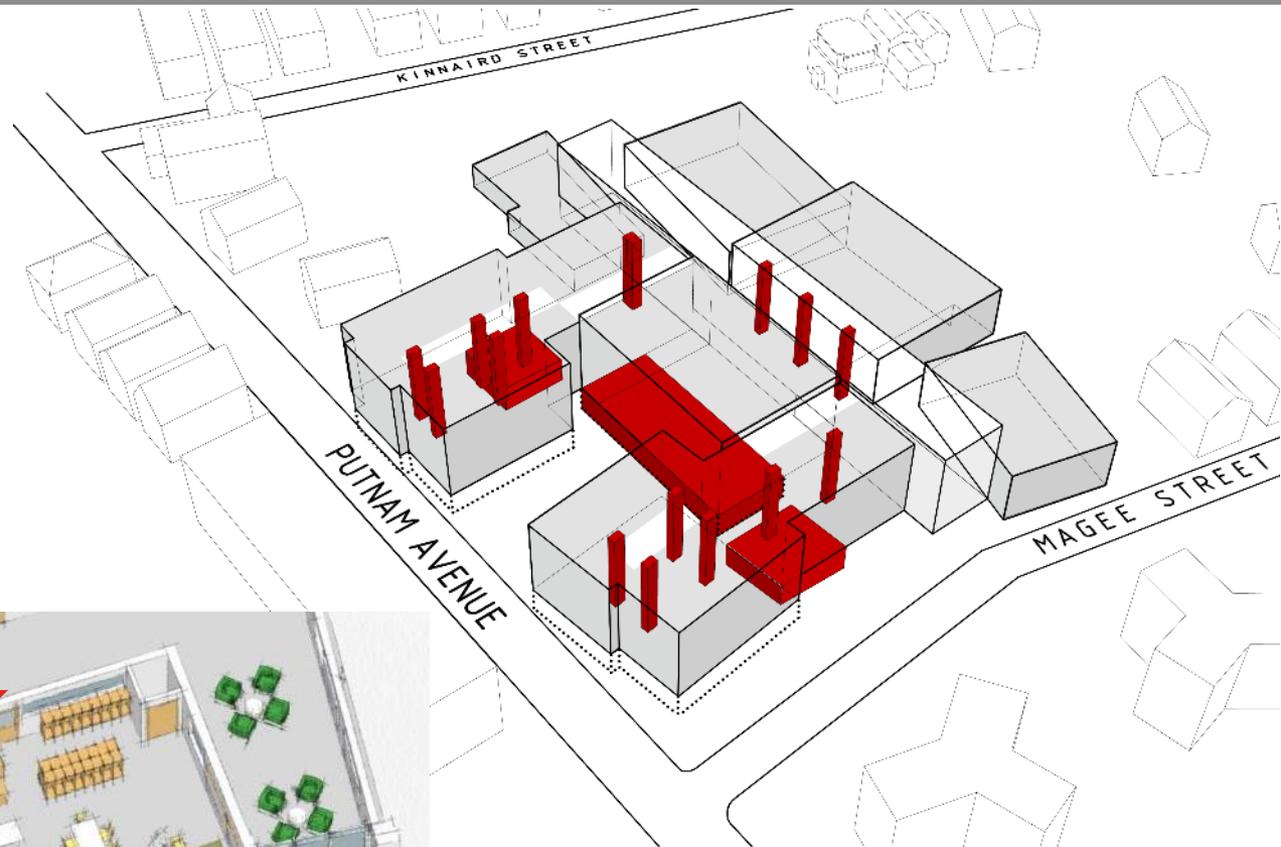


L-Shaped Classroom: Zoned for Natural Light



Mechanical Systems: Impact on Programming

- Main mechanical rooms below areas they serve
- Accessible HP closets for every classroom
- Keep roof areas clear for PV's

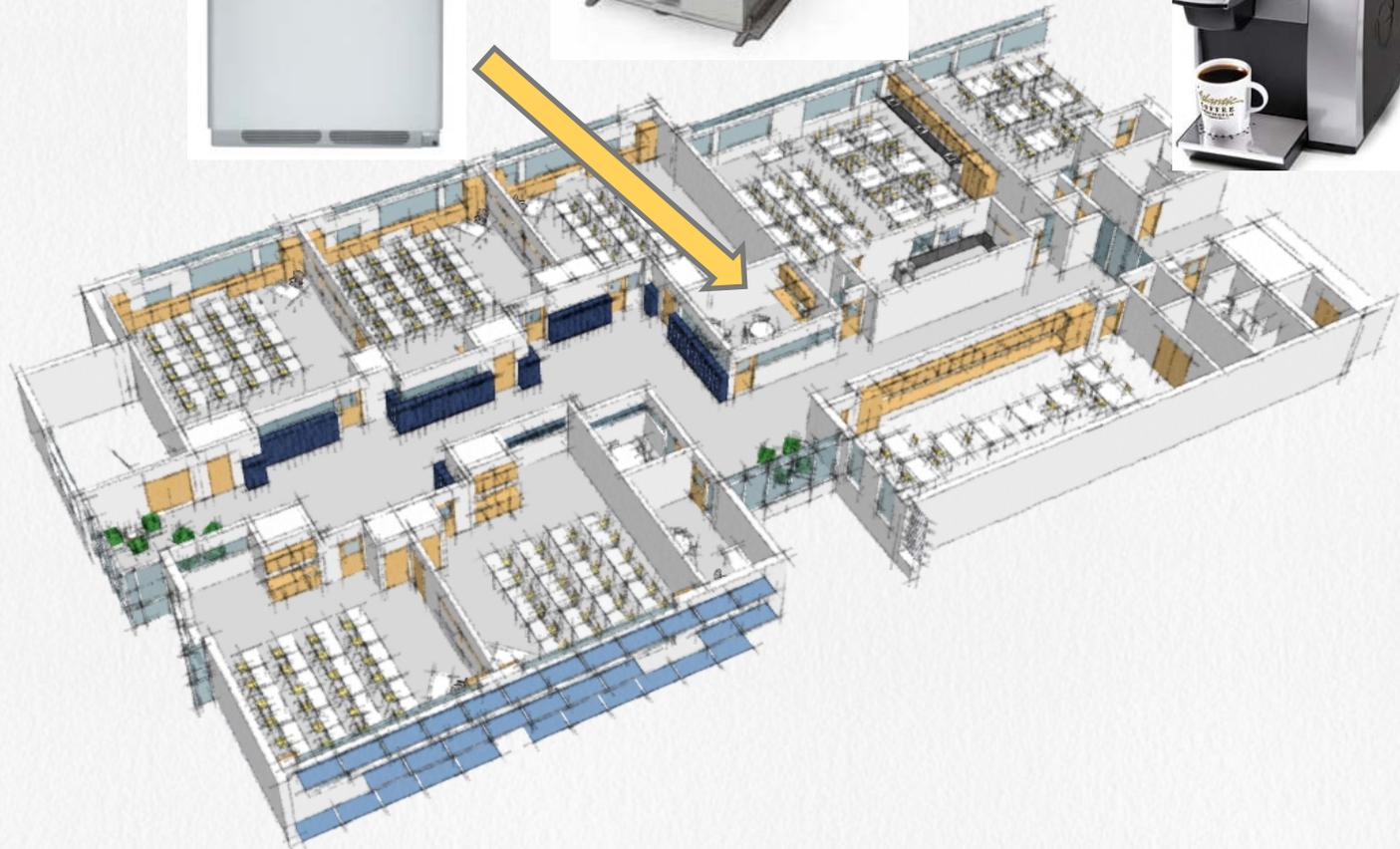


Equipment Workshop – Plug Loads in the Classroom



Features:

- Espresso Machine
- Large Refrigerator
- Microwave
- Printer
- Copier
- Scanner
- Fax (if needed)
- Speed
- Expanded Paper Storage
- Open or secure access
- Energy Star Compliant



Automatic Equipment Control

- Circuit breaker controls or timer switches can be installed to turn on selected service line equipment with enough time to make temperature for food service, but not any earlier.
- New equipment can make temperature quickly
- These controls can save energy by limiting equipment run time.



3.5% less Kitchen energy load

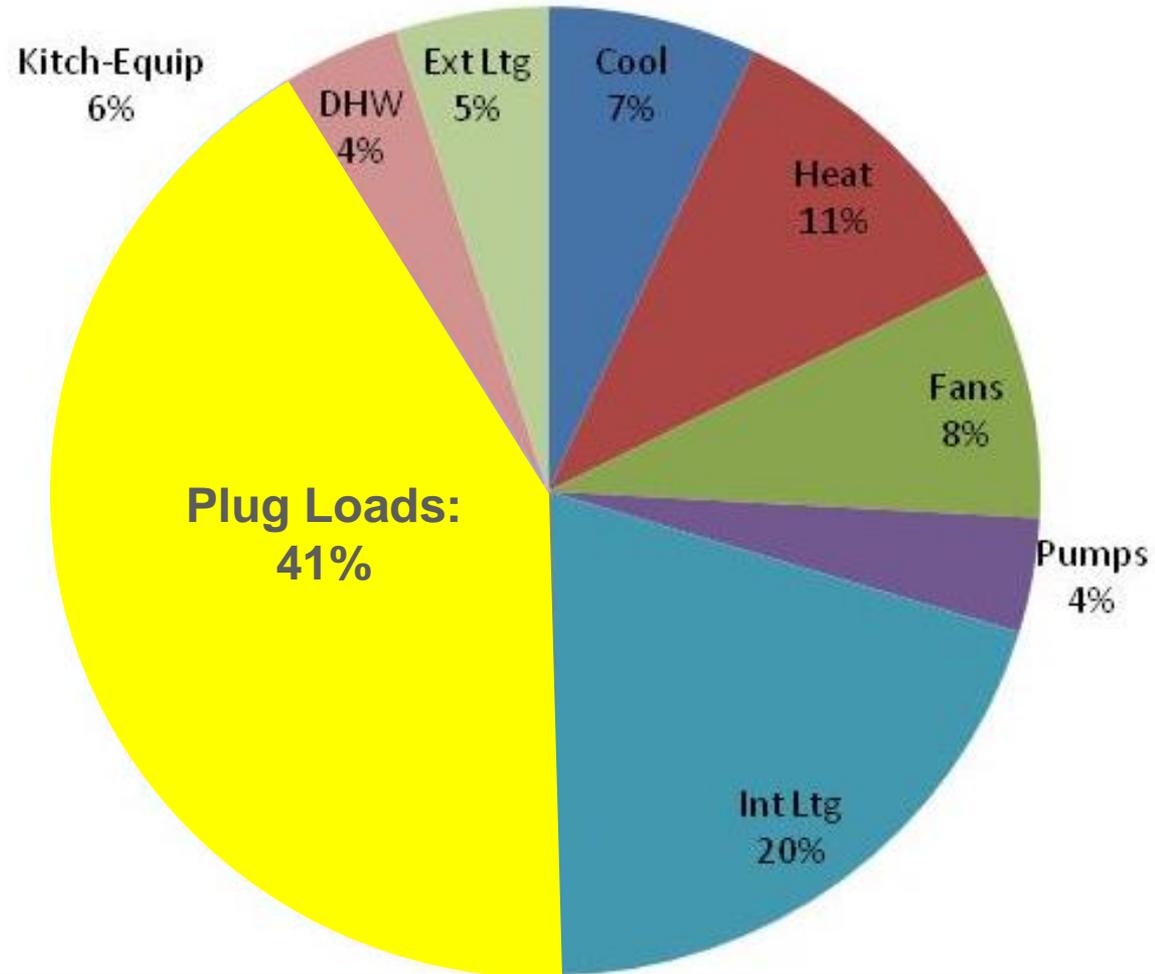
| CPS Chicago Public Schools | | | | | October Lunch Menu 2012 | | | | | |
|---|--|--|--|---|--|---|---|--|---|---|
| * Please notify the kitchen manager and Food Service office of any student allergies. Menu is subject to change * | | | | | | | | | | |
| Monday | Tuesday | Wednesday | Thursday | Friday |  FOOD DAY OCTOBER 24, 2012 FOOD DAY is a nationwide celebration and movement toward more healthy, affordable, and sustainable food. This year, the Food and Nutrition Services Department is celebrating FOOD DAY by launching several salad bars throughout the district to increase the variety of healthy options available to students. Communities and organizations across the country will recognize FOOD DAY through exciting events that honor food, spread knowledge, and encourage activism to address the food issues we face. To find events near you, or to learn about hosting your own event go to: www.FoodDay.org <small>Non-Discrimination Statement: This explains what to do if you've been treated unfairly. In accordance with federal law and US Department of Agriculture policy, this institution is prohibited from discriminating on the basis of race or color, national origin, sex, age, or disability. To file a complaint of discrimination, write to: USDA Director, Office of Civil Rights, 1400 Independence Ave SW, Washington D.C. 20250-9410 or call 800.795.3472 or 202.720.6902 (TTY). USDA is an equal opportunity provider and employer.</small> | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| Tomato Garden Vegetable Soup Garlic Bread Hummus + Veggie Sticks | Baked Fish Sandwich on a whole wheat roll Sweet Peas Steamed Carrots | Garlic Chicken and Pasta Steamed Broccoli Vegetable Cup | Beef Meatball Sub Greenbeans Roasted Cauliflower Applesauce | Featured Salad Option: Chicken Caesar Pizza Selection Includes: Veggie Pizza or Cheese Pizza with Side Salad or fruit | Columbus Day No School | Bold Turkey Burgers Sweet Potato Wedges Apple-Cabbage Slaw Sliced Peaches | Mexican Chicken and Rice Bowl Corn on the Cob Three bean Salad | Healthy Harvest Beef Stew Whole Grain Biscuit Cinnamon Apple Slices | Featured Salad Option: Chef Salad Pizza Selection Includes: Personal Cheese or Pepperoni with Side Salad or fruit | Featured Salad Option: Greek Salad Pizza Selection Includes: Parlor Slice Pizza or Pepperoni with Side Salad or fruit |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| Three Cheese Pasta Bake Chickpea Salad Steamed Greenbeans Applesauce | BBQ Chicken Sandwich Lettuce and Tomato Sweet Corn | Sweet and Sour Chicken with Rice Steamed Carrots Broccoli Pineapple | Tomato Beef and Macaroni Mixed Vegetables Sliced Peaches | Eid Al-Adha No School | Chili and Cheese Nacho Bowl Lettuce and Tomato Red Pepper Corn | All Turkey Hotdog with the works! Sweet Potato Fries Mixed Vegetables Diced Peas | Chicken Salad in a whole wheat pita Crunchy Broccoli Carrot sticks | Spaghetti with Beef Bolognese Bread Stick Mozzarella Salad Greenbeans | Grilled Cheese Sandwich Tomato & Basil Soup Cucumber Salad | Cheddar Mac and Cheese Broccoli Garden Salad Fresh Fruit |
| 29 | 30 | 31 | No Dairy or Dairy Free Optional | | | | | | | |
| Sandwich Tomato & Basil Soup Cucumber Salad | Cheddar Mac and Cheese Broccoli Garden Salad Fresh Fruit | Chicken Burrito Corn on the Cob Mixed Vegetables | Contains Pork | Vegetarian Item | No Dairy or Dairy Free Optional Contains Pork Vegetarian Item | | | | | |

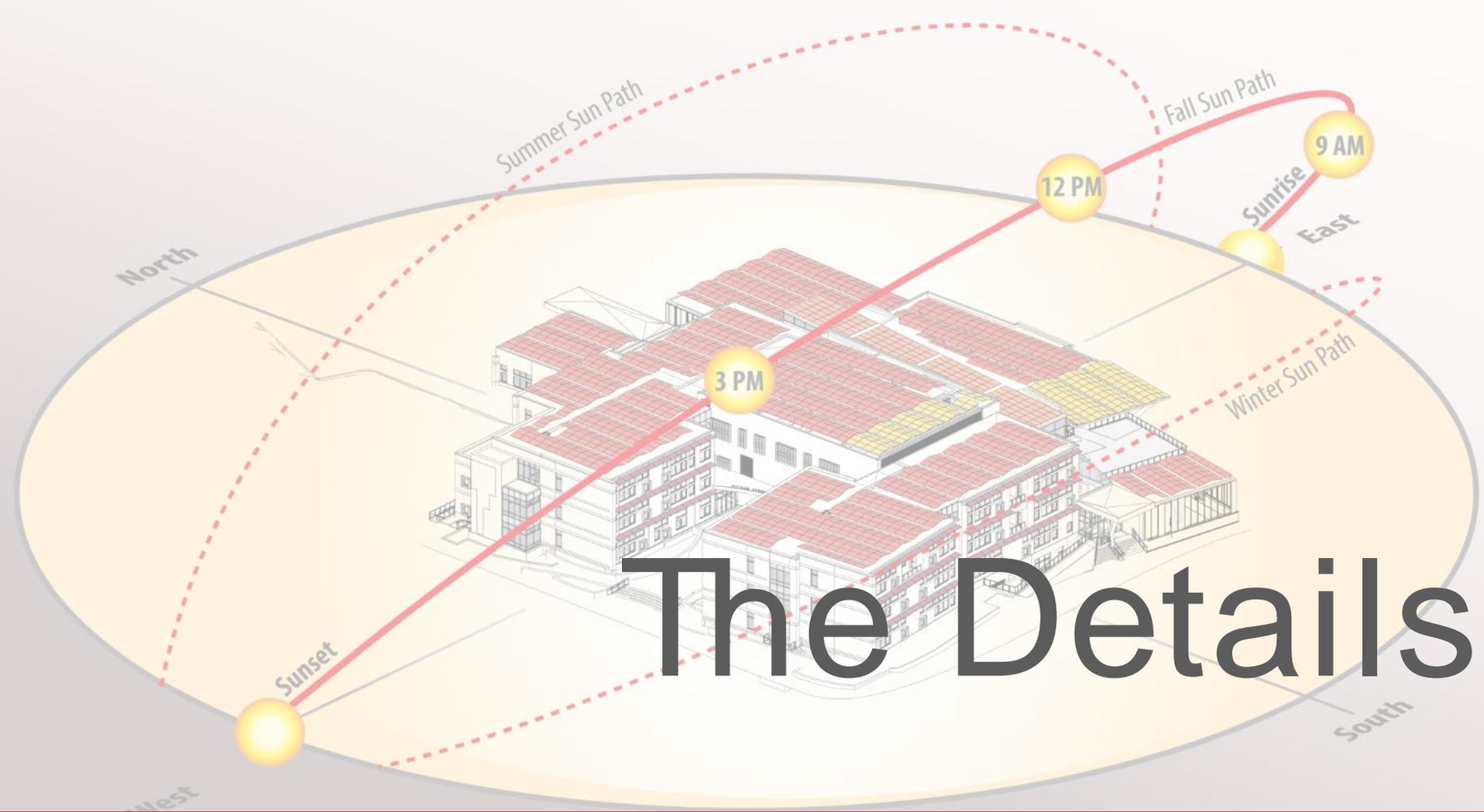
Cold Food Day

- Current 1 almost completely cold food day per 6 week cycle
- Cold food days mean no cooking equipment, hot food wells or exhaust hood need to be used.
- For full benefit would need to be paired with a cold breakfast.

2.6% less Kitchen energy load

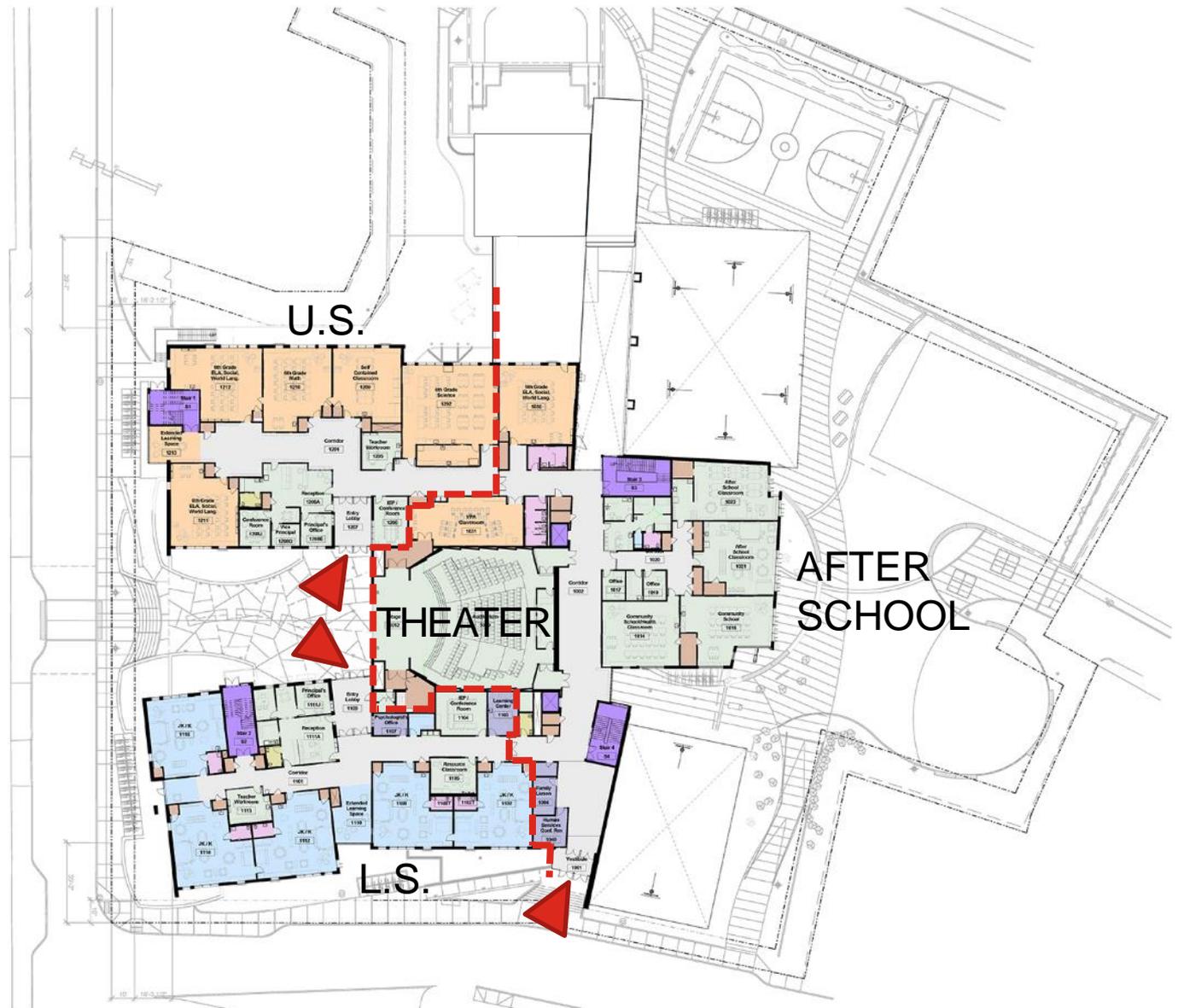
Schematic Phase: Energy End Use Breakdown

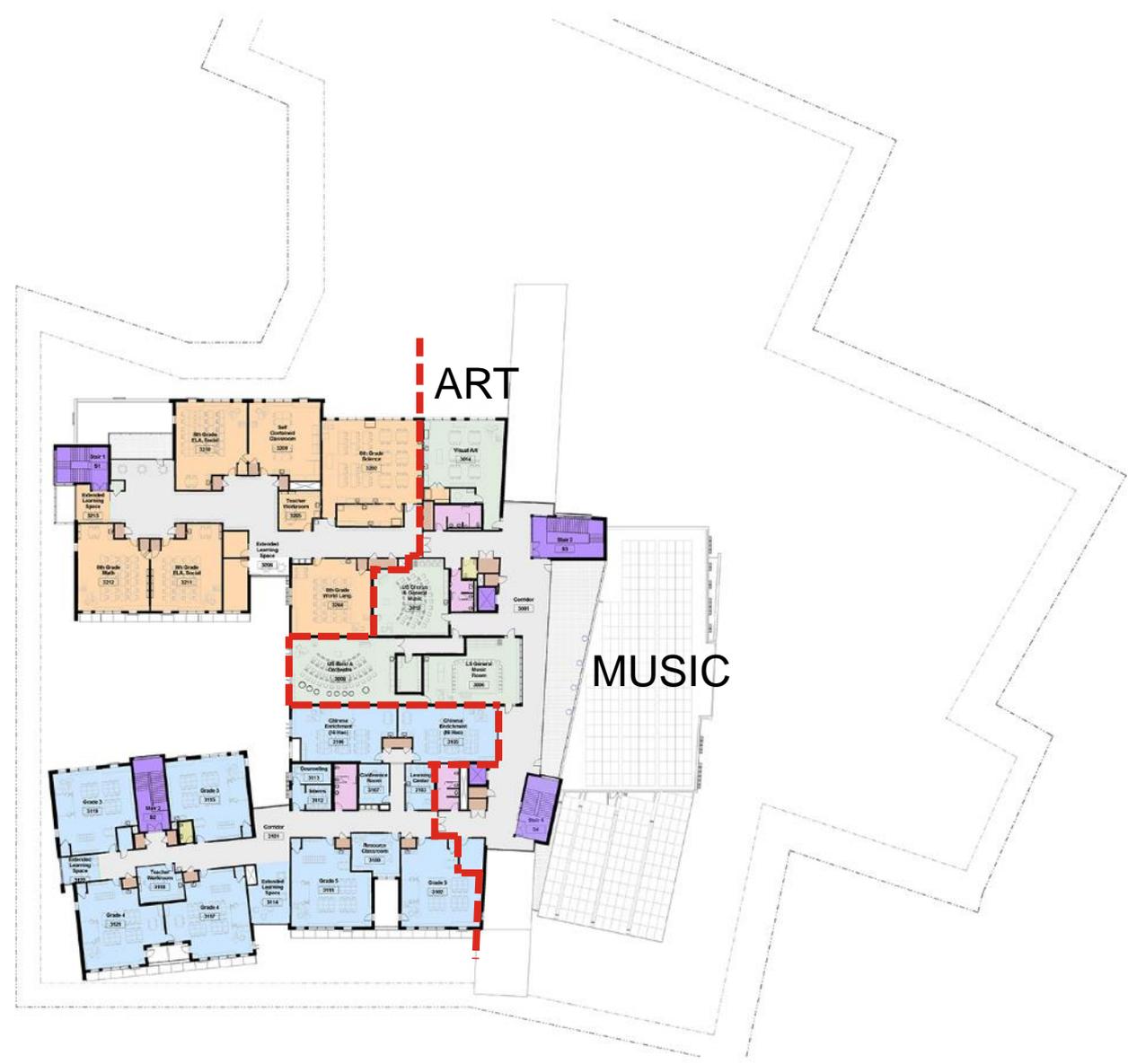




The Details

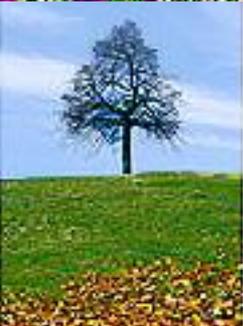
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BUILDING AS A TEACHING TOOL:

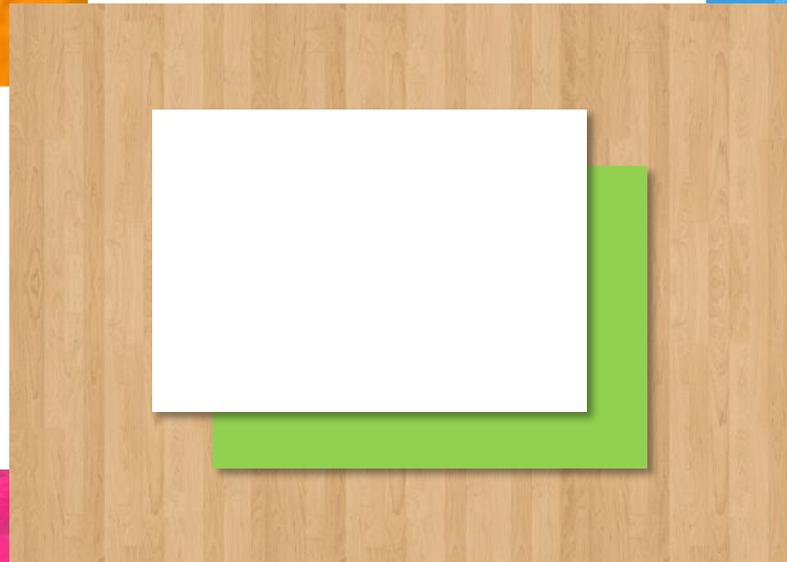
LEARNING THROUGH THE SEASONS



AUTUMN



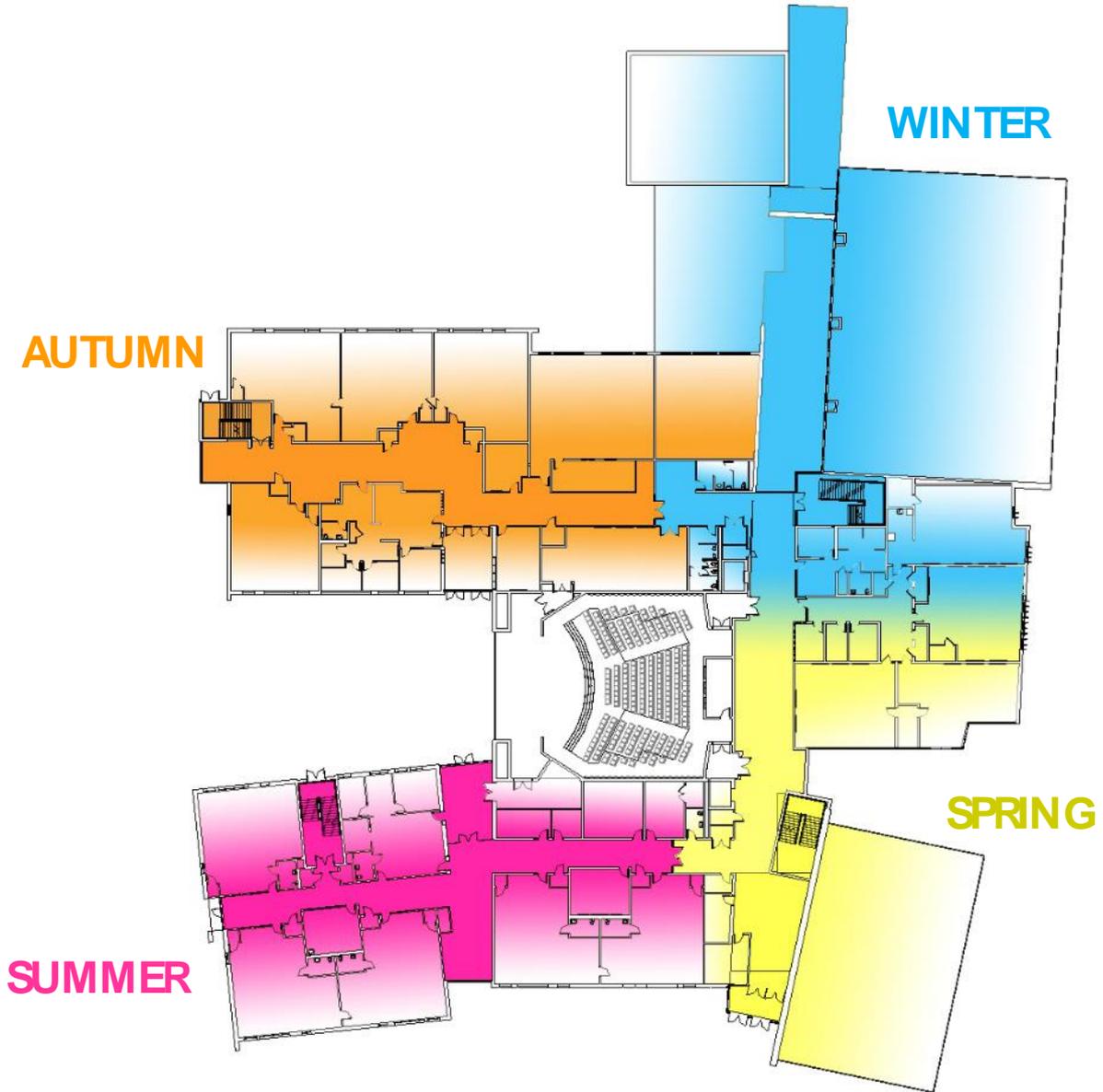
WINTER



SUMMER



SPRING





Learning Commons: Winter To Spring



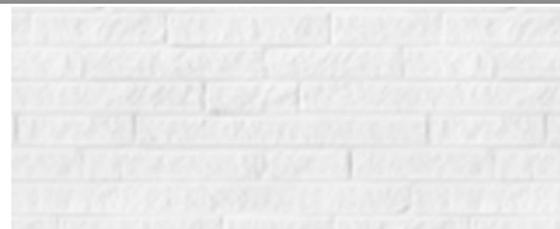






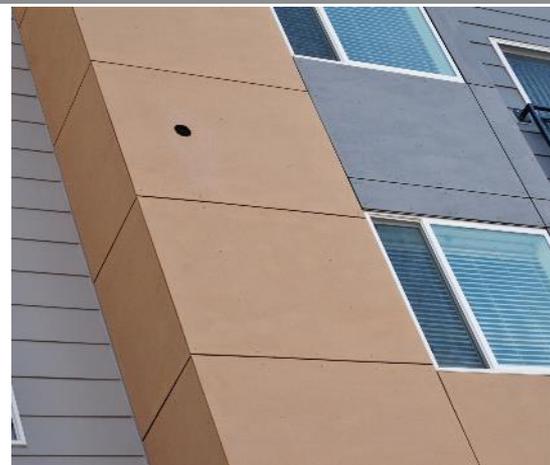
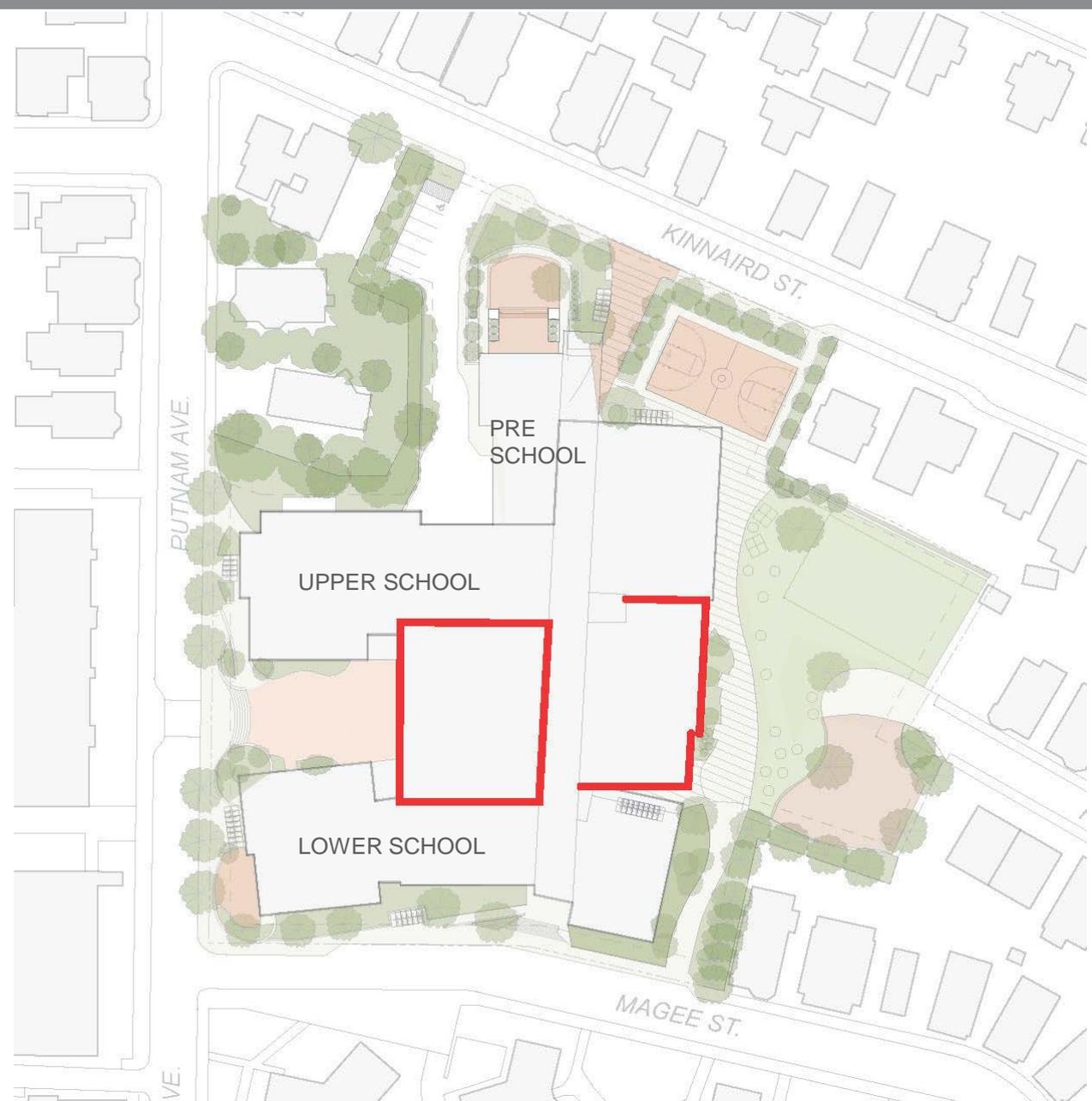
West Elevations: 6.9% Glazing





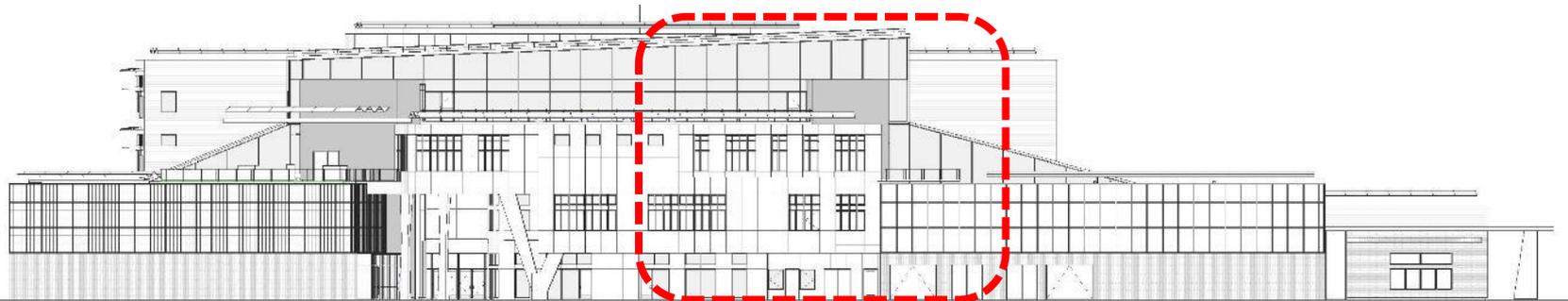
South Elevations: 32.7% Glazing

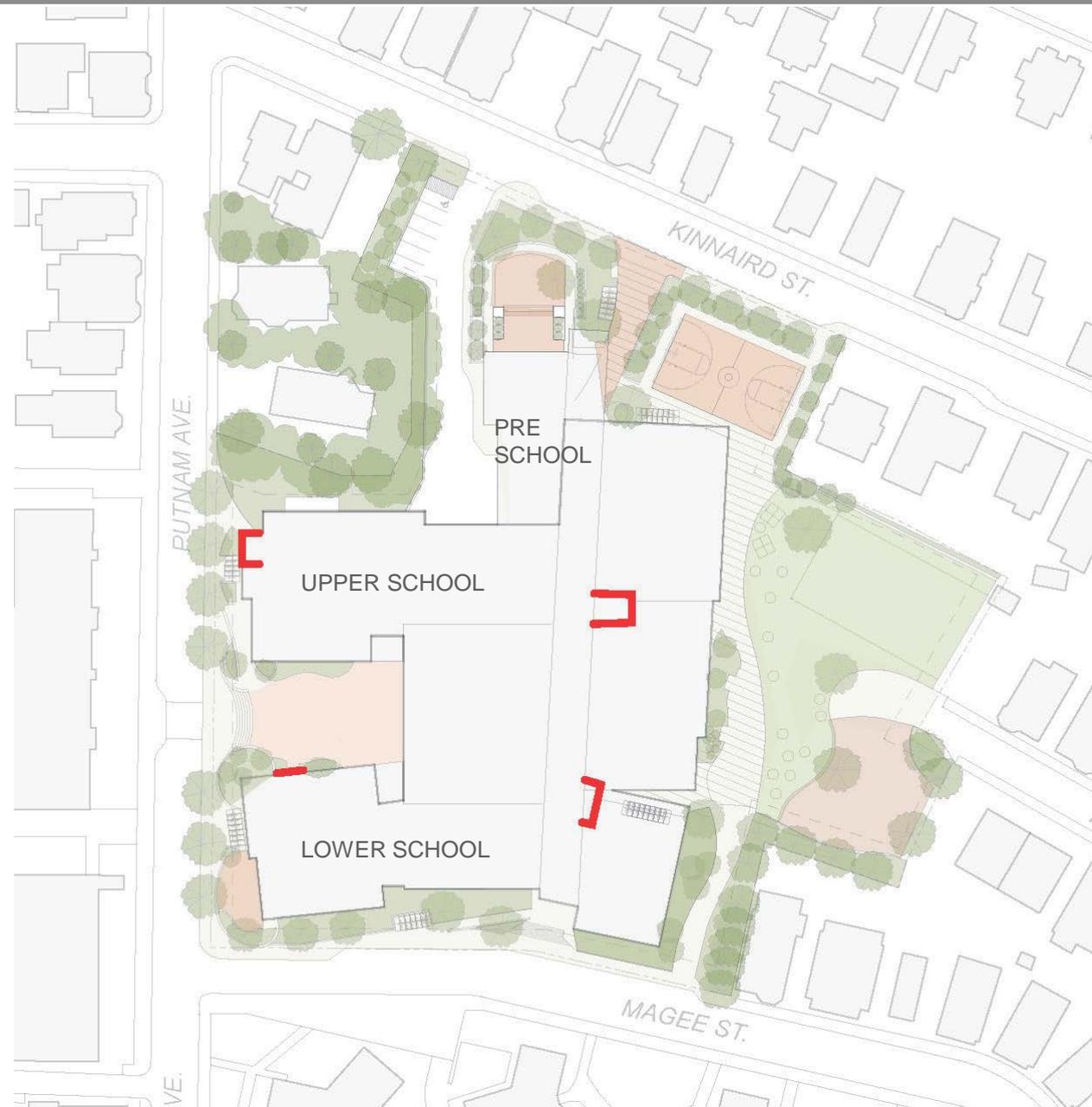






East Elevations: 28.3% Glazing



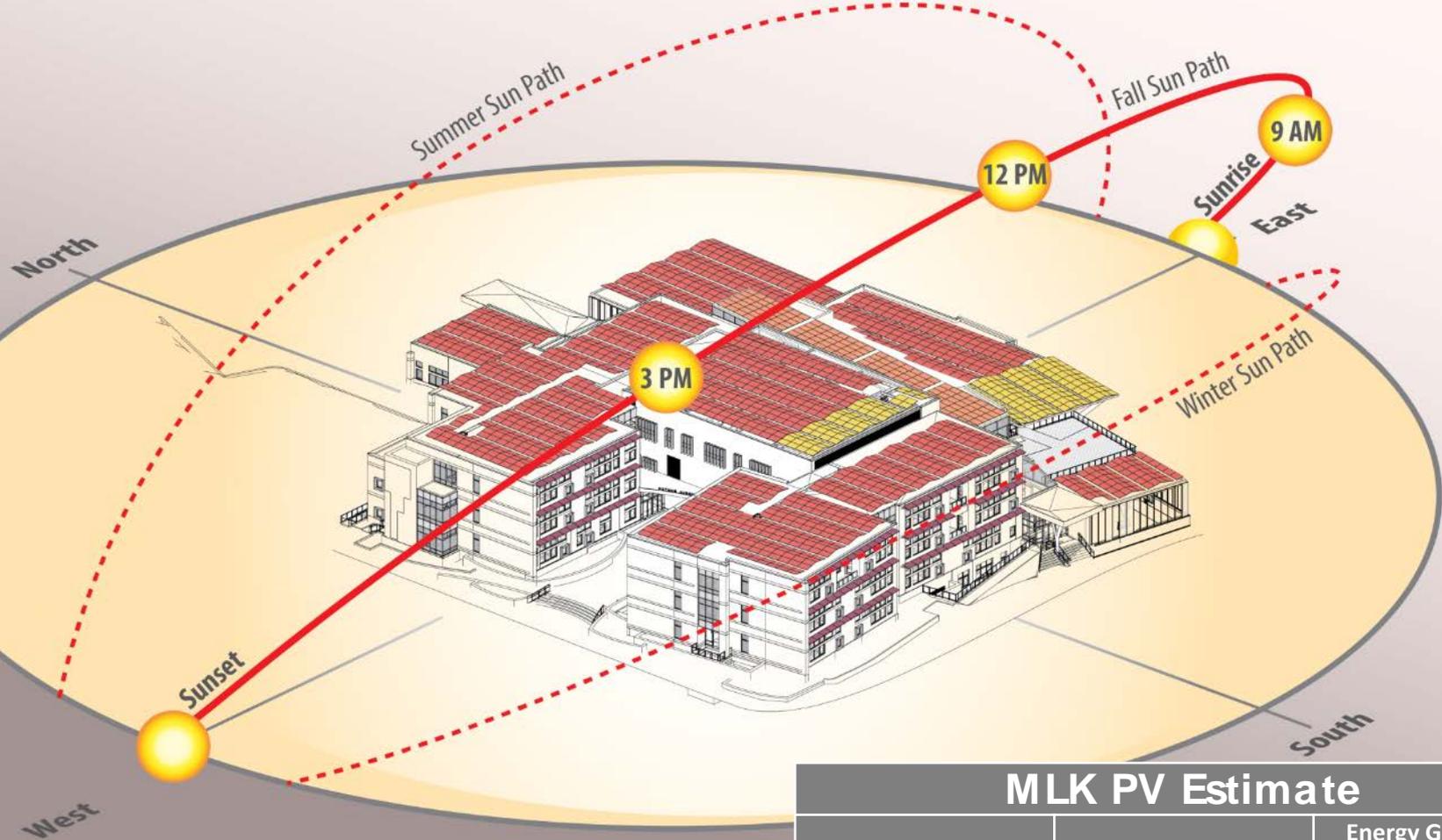


ALUMINUM WALL PANEL

Entry Court (North Elevations: 32.1% Glazing)



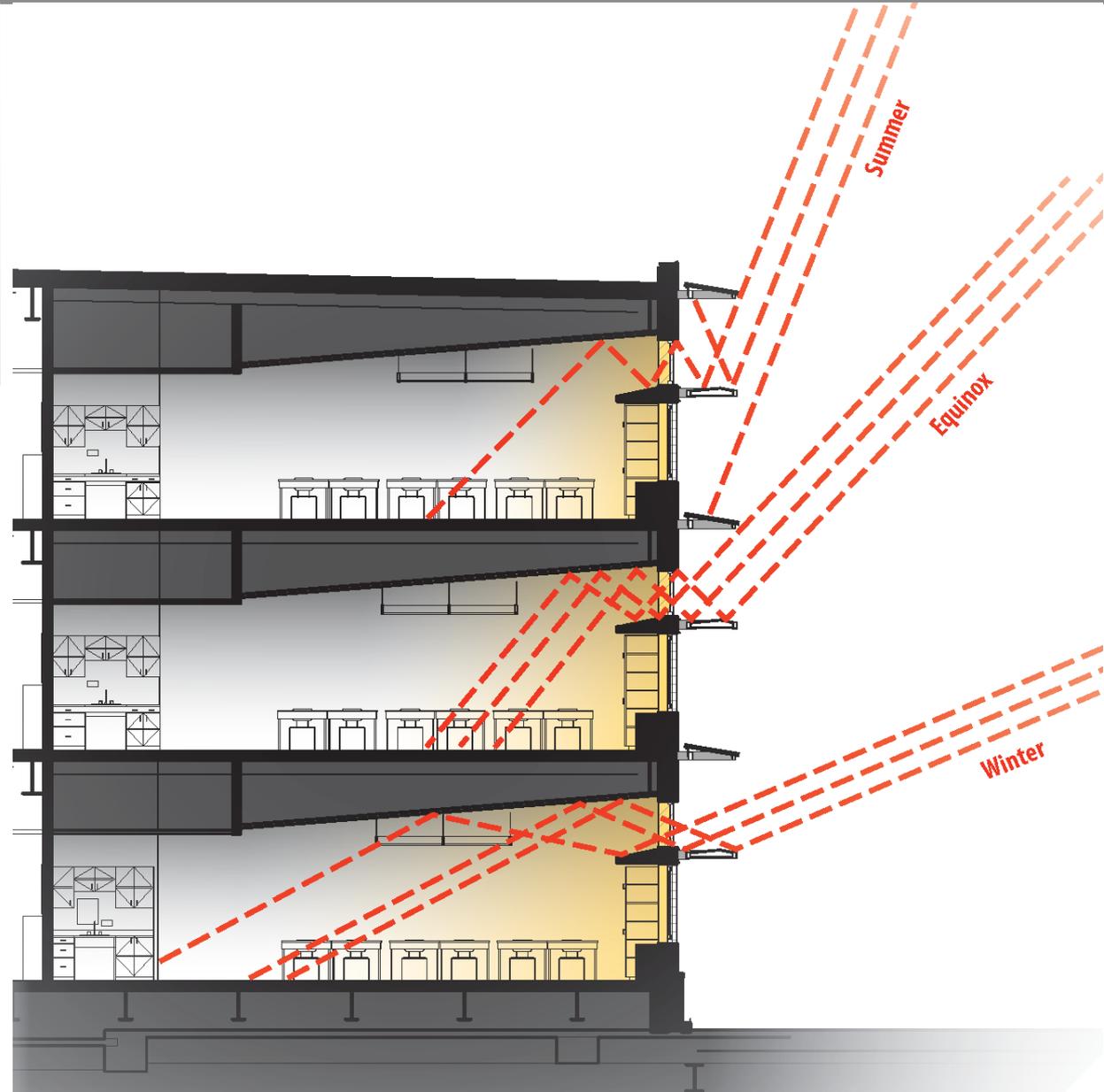
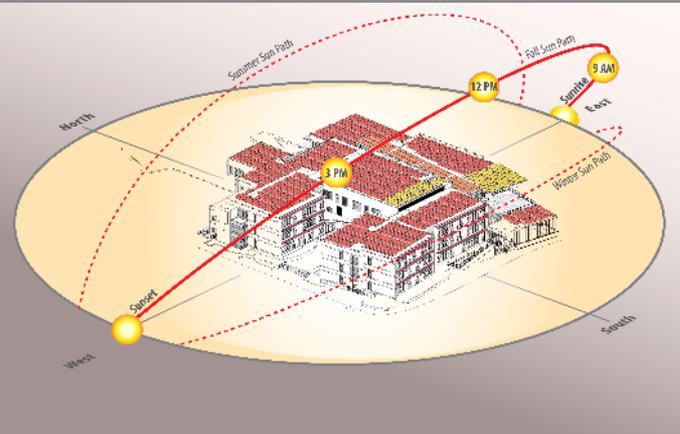
Photovoltaic System



MLK PV Estimate

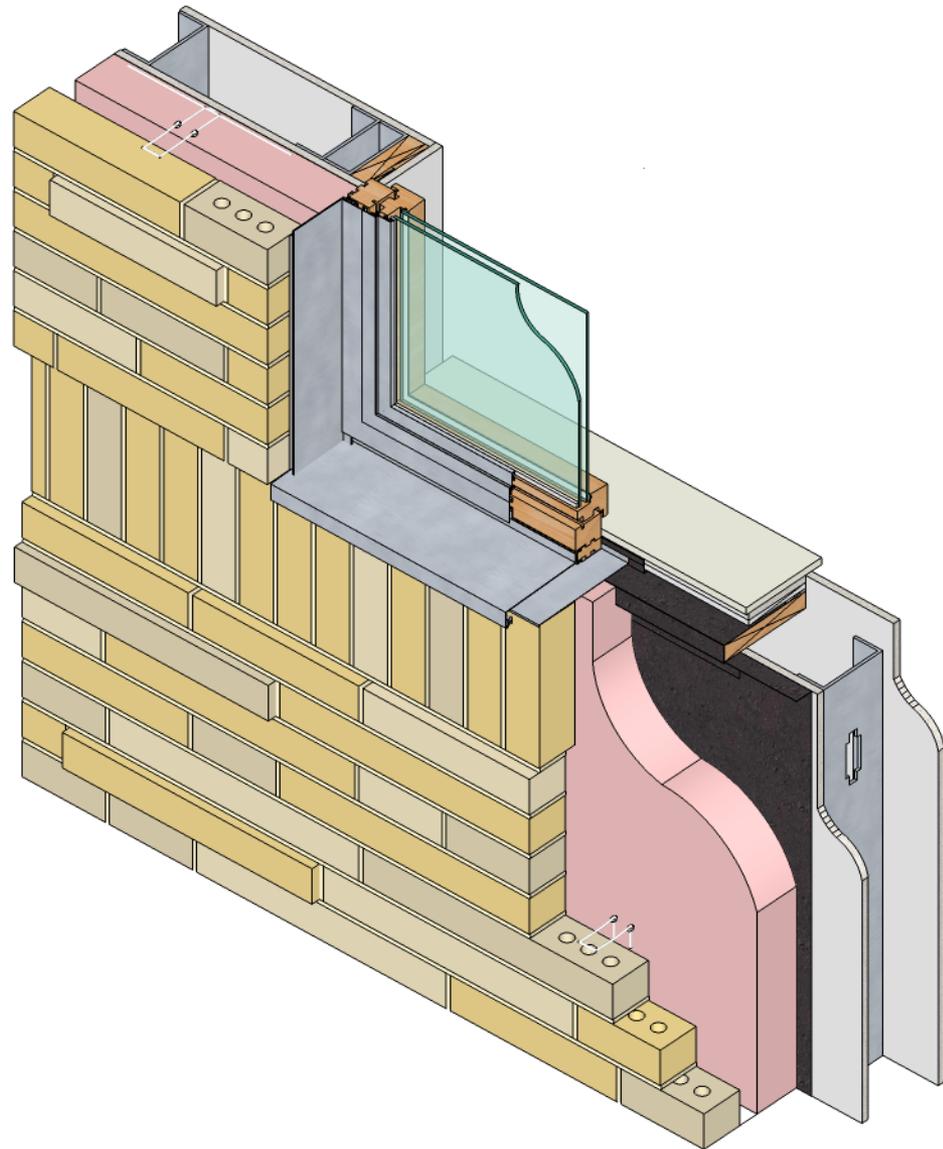
| Location | Panel Quantity | Energy Generated (kWh) |
|--------------------------|----------------|------------------------|
| Flat Roof | 1830 | 58267 |
| Canopy | 184 | 56669.5 |
| King Street | 168 | 56569.1 |
| Roof Total | 2182 | 698505.6504 |
| Façade Total | 126 | 43676.9 |
| Total for Project | 2308 | 742182.5 |

Section Through South Facing Classrooms

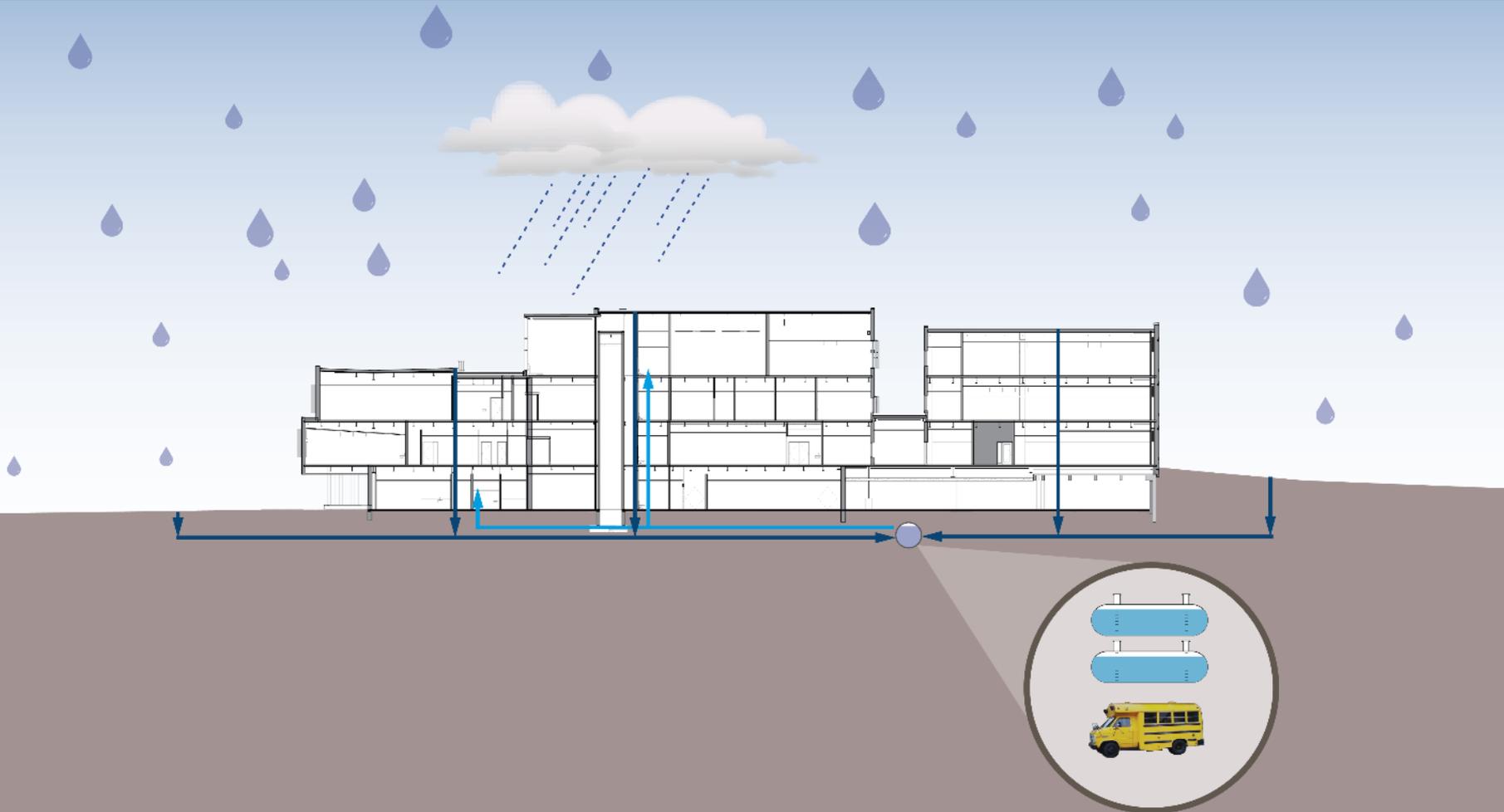


- High performance envelope
- Envelope air tightness
- Sun Shades & Light Shelf
- Minimize direct solar heat gain

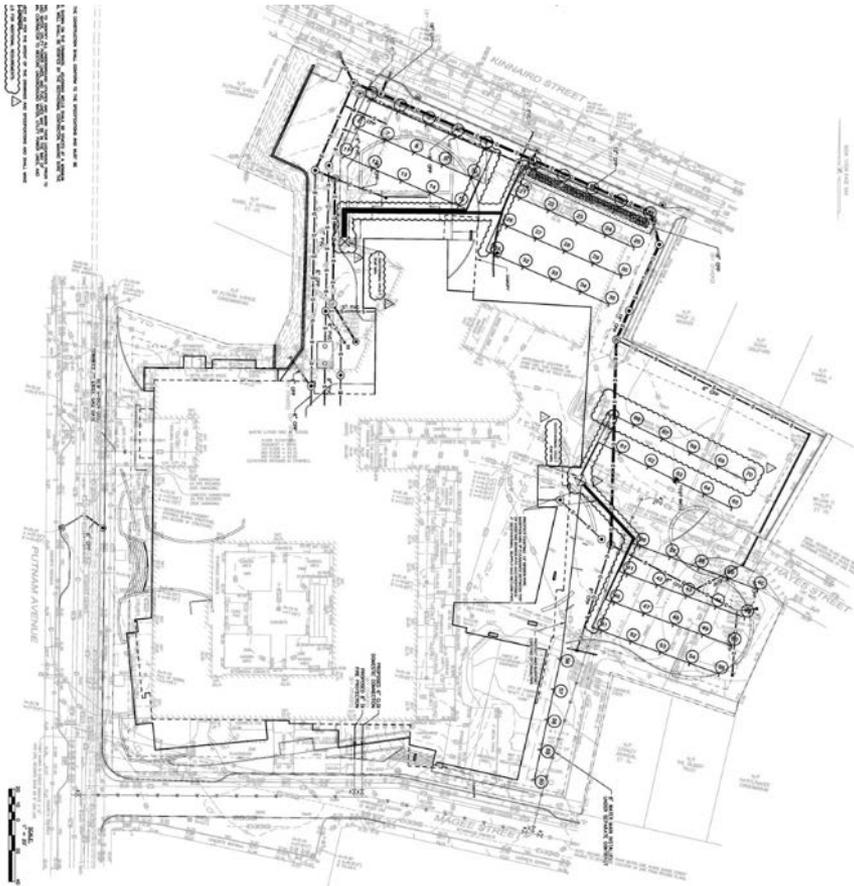
- Wall R-values: R-26
 - Effective value vs. Insulation value
 - Rain screen support systems – minimize thermal bridging
- Window U-values:
 - Wood windows: .23
 - Curtainwall: .32
- Translucent Panels:
 - U-values: .14



- Two 10,000 gal. tanks
- Toilet Flushing
- Phosphorous Removal

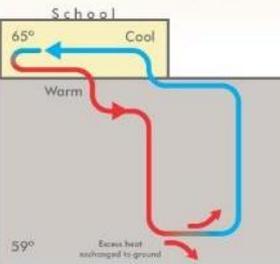


- 65 Wells (Hybrid System)

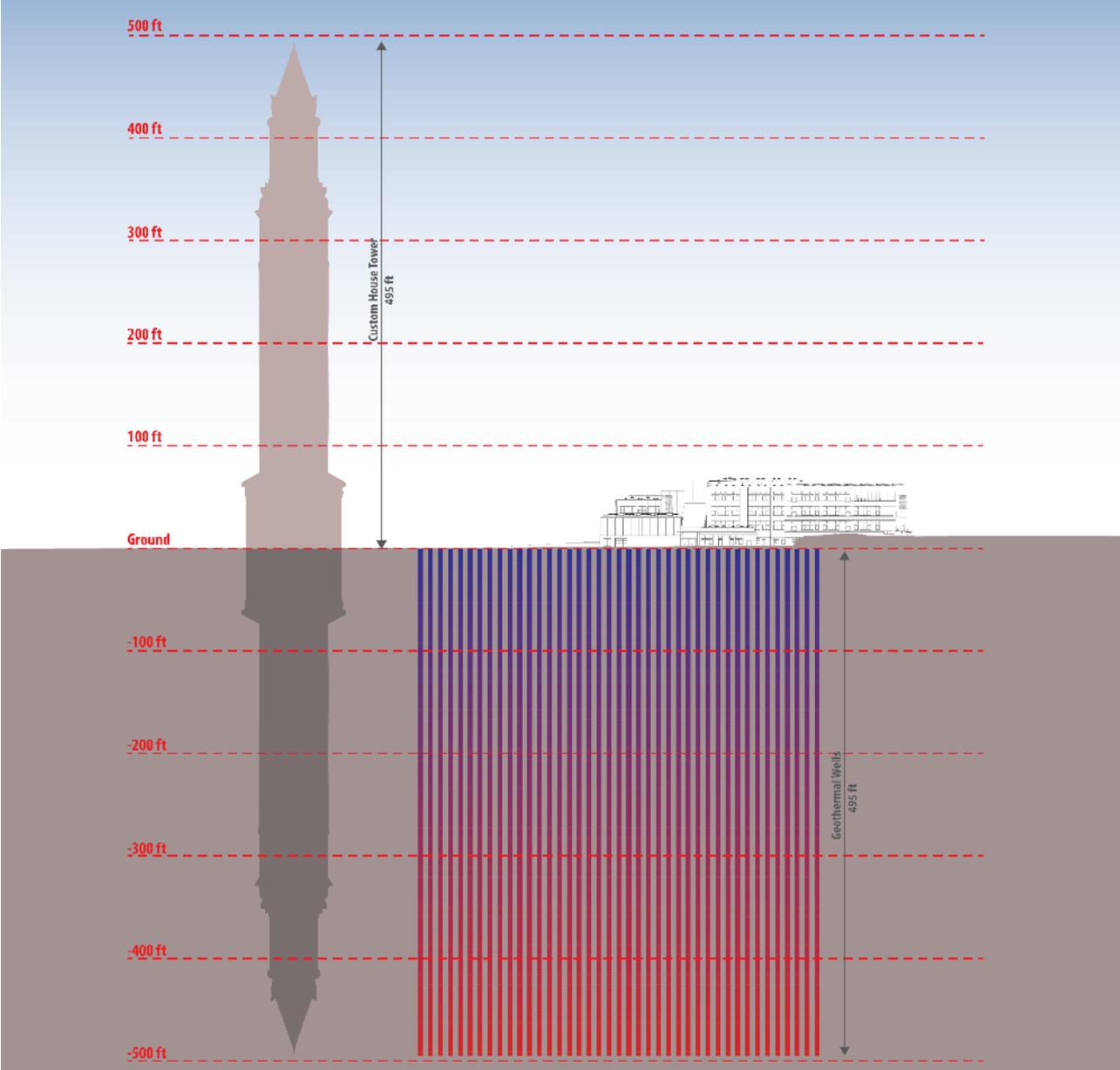
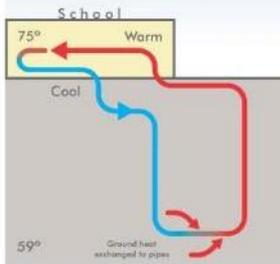


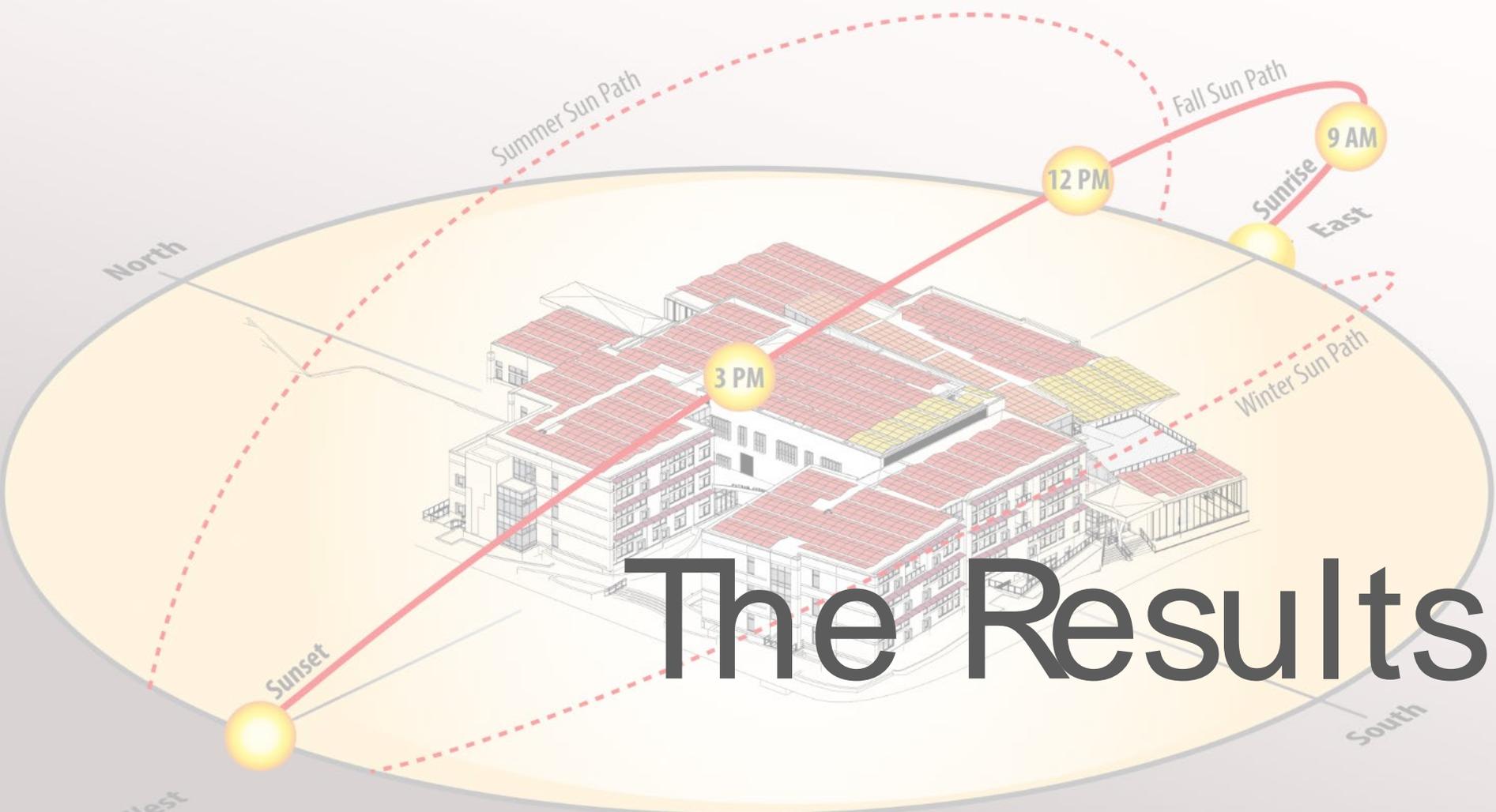
- Student Engagement
 - Feature in Landscape
 - Learning Moments

SUMMER
85° F



WINTER
45° F





The Results

Perkins Eastman

Sustainable Sites

20pts / 1pt

- Site Development: Maximize Open Space
- Storm Water Design: Quality Control
- Light Pollution Reduction

Water Efficiency

8pts / 0 pts

- Innovative Wastewater Technologies
- Water Use Reduction: 30%, 35%, 40% Reduction

Energy & Atmosphere

32pts / 1pt

- Optimize Energy Performance (1 pt for every 2% above 10% min)
- Enhanced Commissioning
- Measurement and Verification

Materials & Resources

5pts / 2pts

- Construction Waste Management: Divert 75% from Disposal
- Recycled Content: 20% (post-consumer + ½ pre-consumer)
- Regional Materials: 10% Extracted, Processed & Manufactured Regionally

Indoor Environmental Quality

32pts / 2pts

- Low-Emitting Materials: Adhesives & Sealants
- Controllability of Systems: Thermal Comfort
- Daylight & Views: Daylight 90% of Spaces
- Enhanced Acoustical Performance

Innovation & Design Process

5pts / 1pt

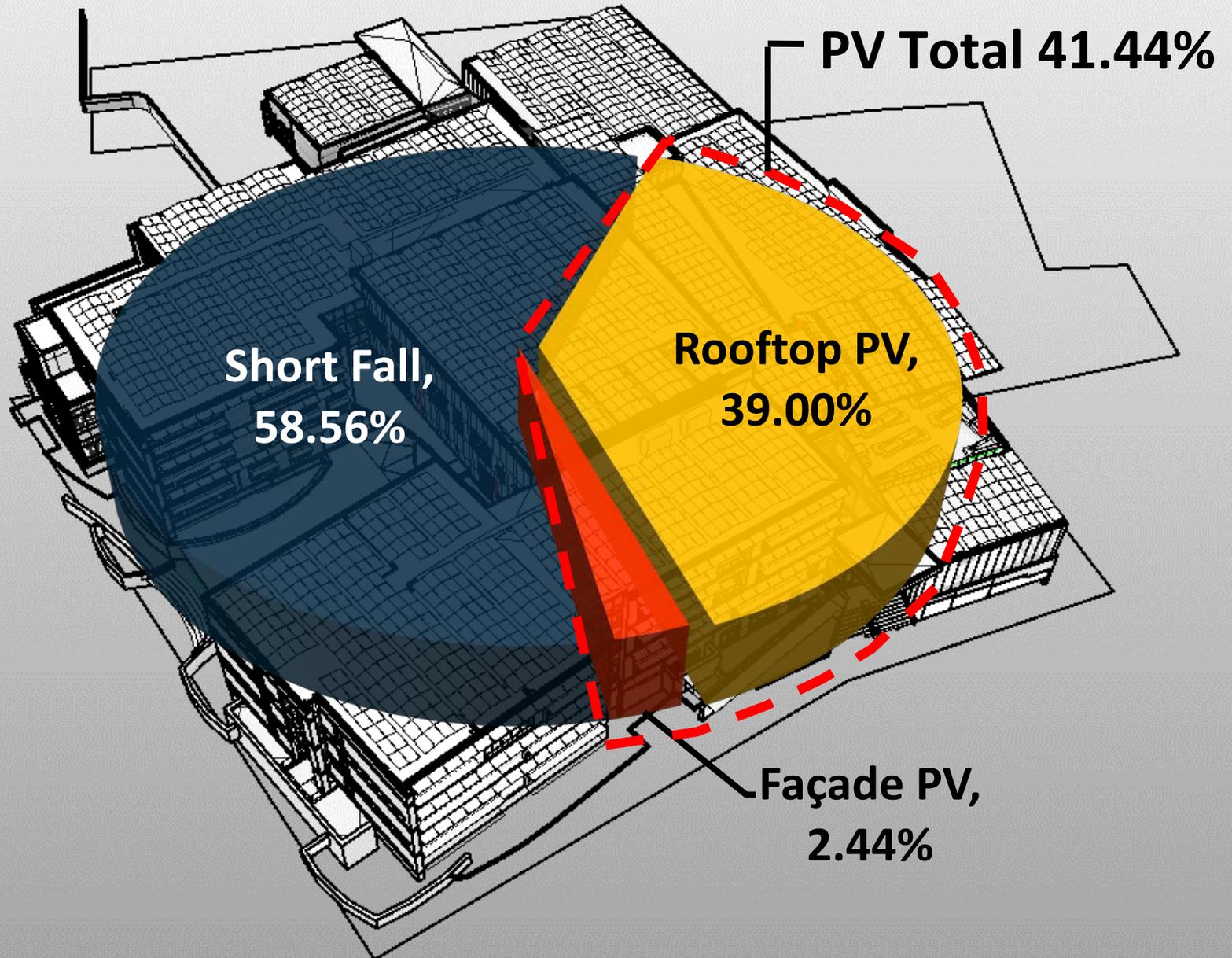
- Exemplary Energy Performance
- Exemplary Renewable Energy Performance
- Education Outreach

Regional Priority Credits

3pts / 1pt

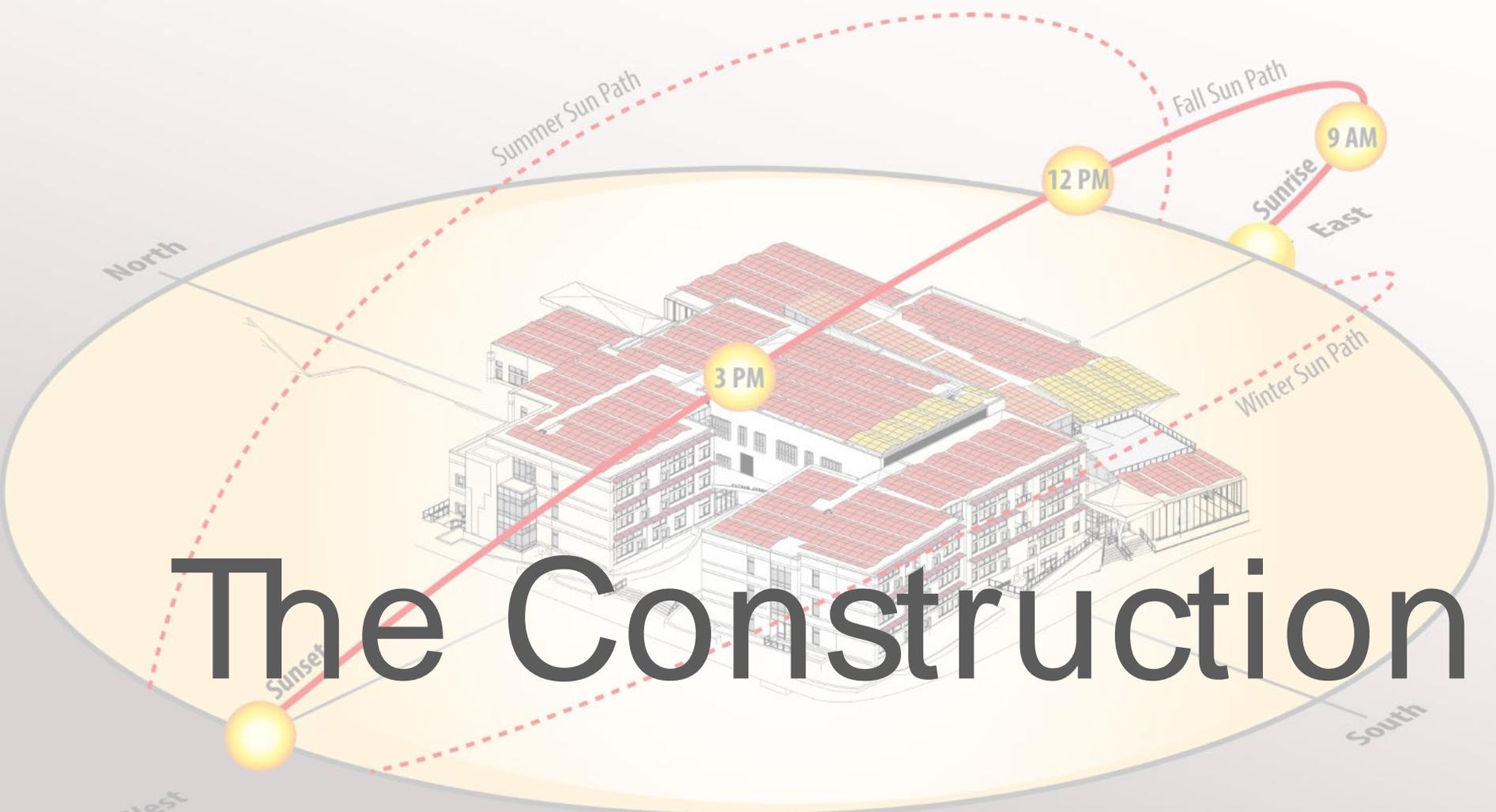
- Brownfield Redevelopment
- Heat Island Effect, Roof

Achieving NZE on a Dense Urban Site: How Close are we to our Goal?



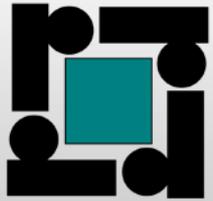
Achieving NZE on a Dense Urban Site: How Close are we to our Goal?

- Energy performance target (site): 30 kbtu/sf/year
- Current projected energy performance (site): 31.7 kbtu/sf/year
- Current projected annual energy use (w/contingency): 1,790,902 kwh/year
- Current projected annual energy production: 742,182 kwh/year
- Percentage of projected annual energy use offset by on-site renewable energy: 41.4% w/contingency, 49.7% w/o contingency

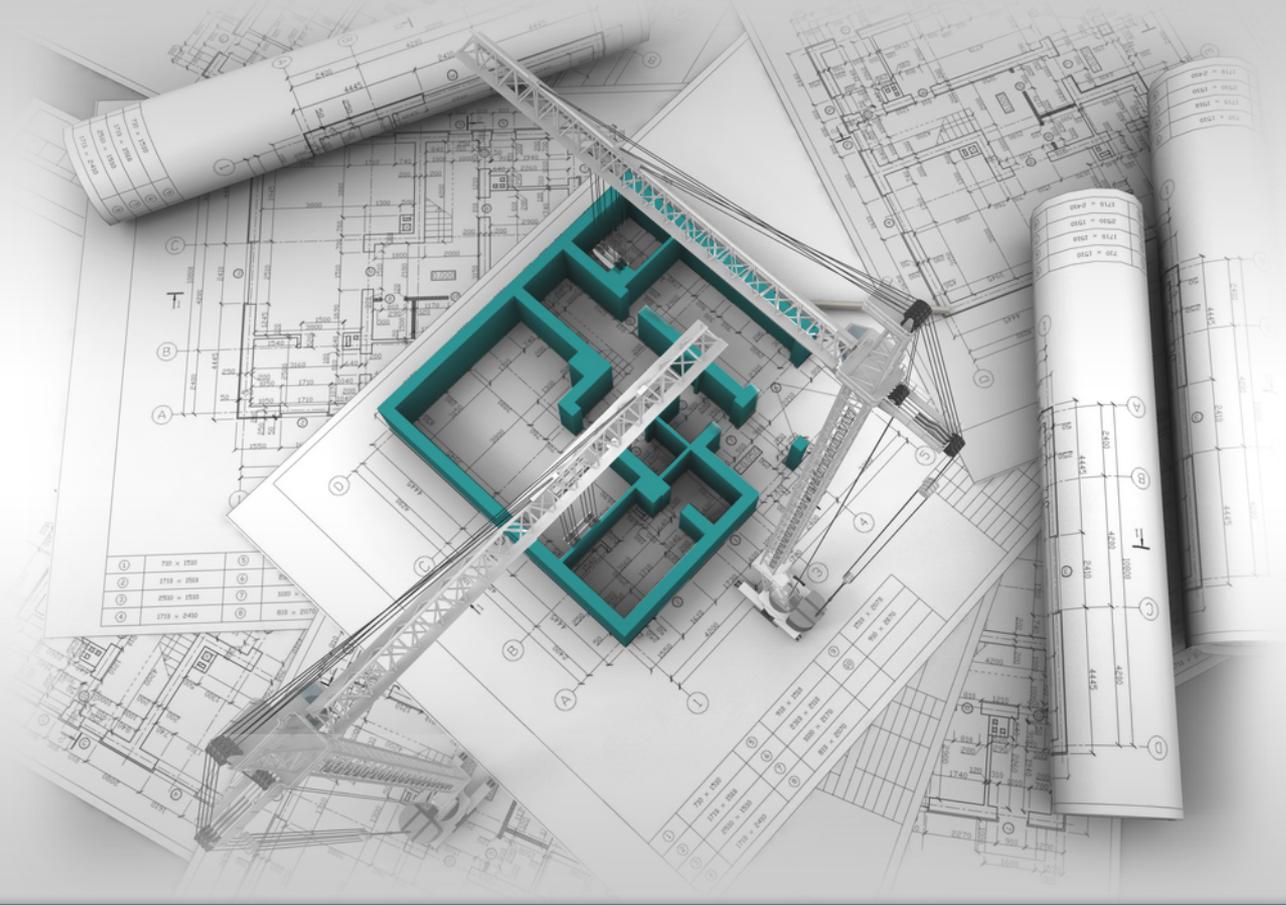


The Construction

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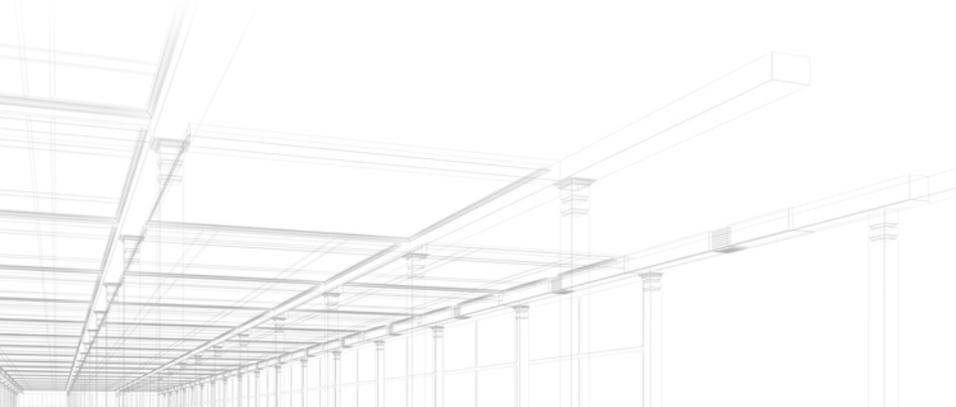
W. T. RICH COMPANY, INC.



Rich-Caulfield MLK Venture Community Update

Dr. Martin Luther King Jr. School Construction Project
City of Cambridge, Cambridge, Massachusetts

February 26, 2014



Schedule / Presentation Overview

- Demo / Abatement
- Geothermal
- Contract Documents
 - Bidding and Award
- Concrete Foundations
- Structural Steel
- Building Envelope / Overall Construction



3D Line Art - Courtyard View

Demo / Abatement

- Abatement
 - Work Complete
- Mass Building demolition and disposal
 - 99% Complete – Only Foundation Wall at Magee and SOG Remaining



Geothermal Wells

- Geothermal Drilling adjacent to Hayes Street (Phase 1)
 - Will Complete Drilling by Late March
- Target to start Geothermal Drilling adjacent to Kinnaird Street (Phase 2)
 - Late March 2014 Commencement
- Target to Complete Geothermal Activities
 - Mid May 2014

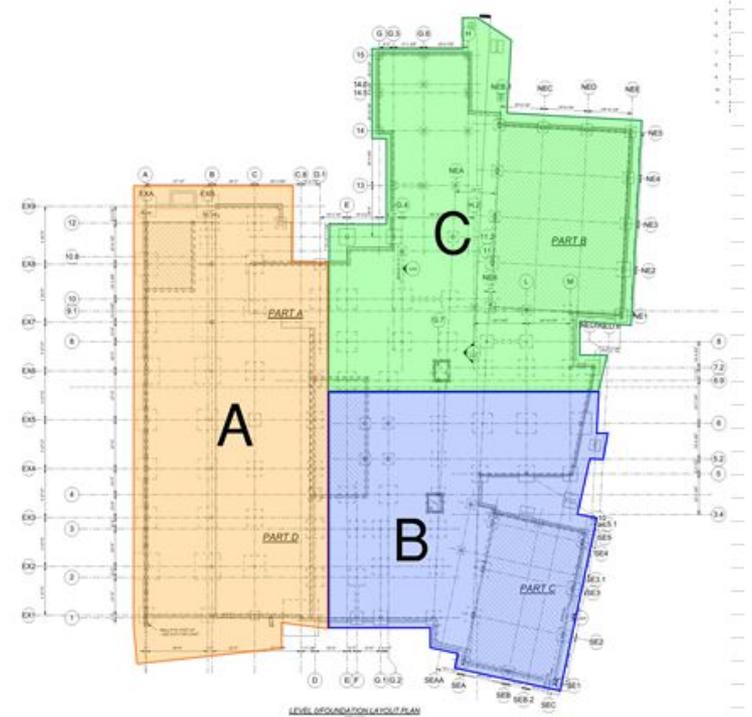
Bidding and Award Phase

- Release full 100% Construction Document Set to public
 - Complete
- Bids for Full Scope of Work
 - Received and Under Evaluation



Concrete Foundations

- Target to commence with concrete foundations
 - Mid March (Area A)
- Will start foundations along Putnam Ave and work our way towards Kinnaird Street
- Target to finish concrete foundations
 - Early May

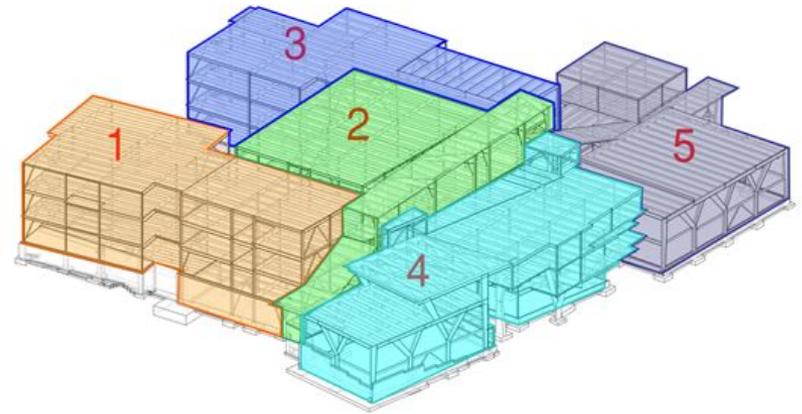


Foundation Phases



Structural Steel

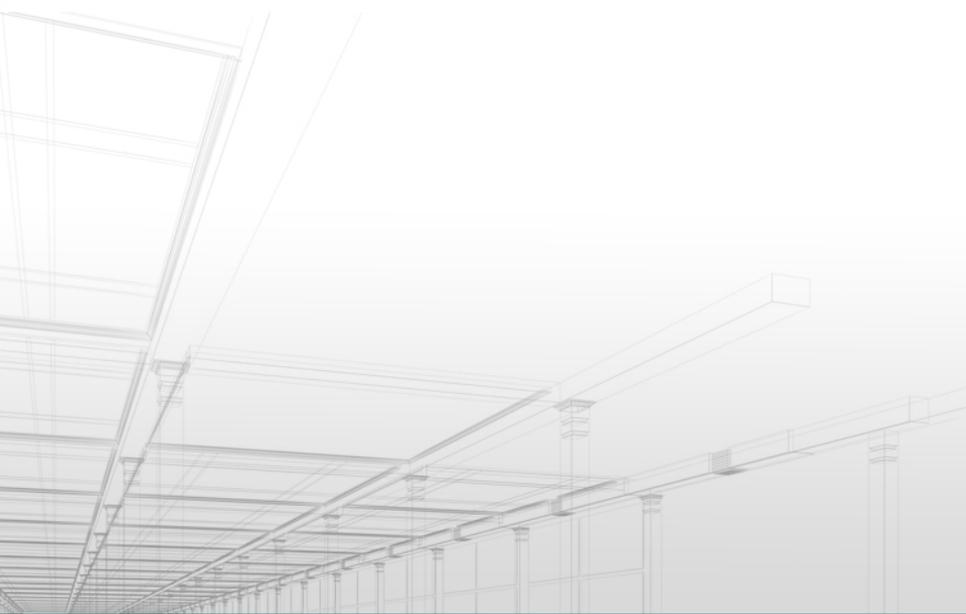
- Target to commence with structural steel
 - Early May (Area 1)
- Will start erection along Putnam Ave and work our way towards Kinnaird Street
- Target to finish structural steel
 - Late September



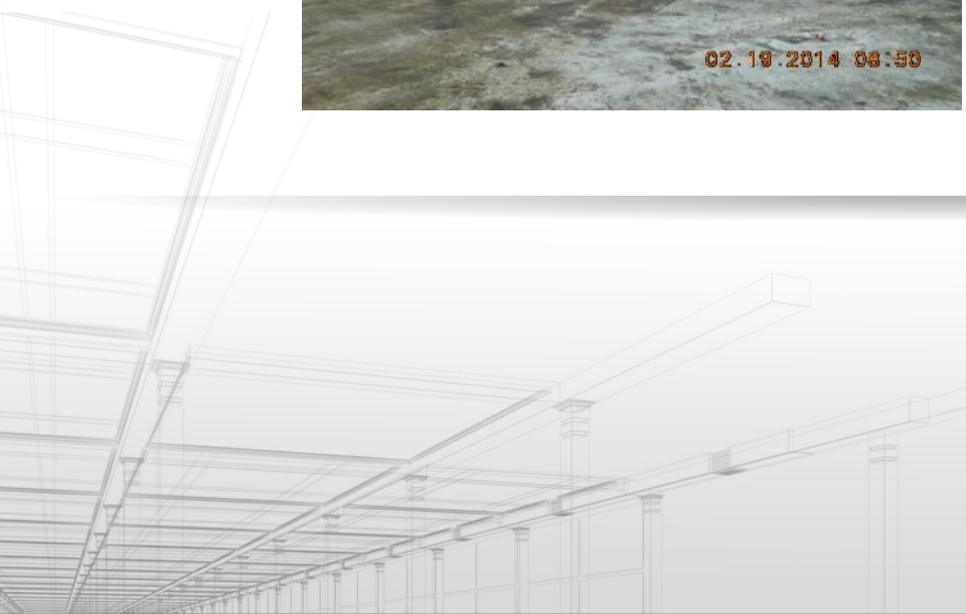
Structural Steel Phases

Building Envelope / Overall Construction

- Target to commence with Envelope and Enclosure
 - June 2014
- Target for enclosed structure
 - December 2014
- Target to finish
 - September 1, 2015



Progress Photos



Questions

