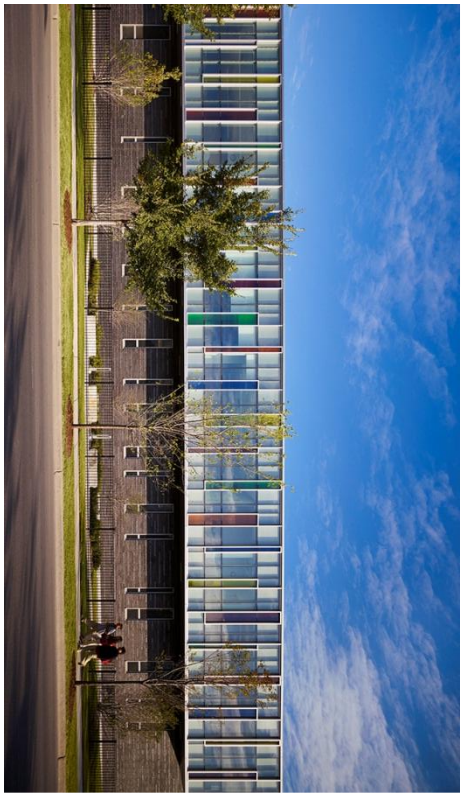

Creating Extraordinary Results through an Integrative Design Process

Integrative Design
18 April 2014

IL Healthy & High Performing Schools Symposium

US GBC IL / IL Green Governments Coordinating Council

Creating Extraordinary Results through an Integrative Design Process

2 case studies – The Wolcott School and the Sarah E. Goode STEM Academy

Introduction

- Deeta Bernstein, LEED AP BD+C, Sustainability Manager,
  Public Building Commission of Chicago
- Jennifer Costanzo, AIA, LEED AP BD+C, Principal,
  STR Partners, LLC
- Lawrence Kearns, AIA, Principal,
  Wheeler Kearns Architects
- Dr. Miriam Pike, Head of School,
  Wolcott School
- Sachin Anand, PE, LEED AP BD+C, Principal,
  dbHMS

Introduction

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Goode and Wolcott –

Similarities and Differences

Introduction

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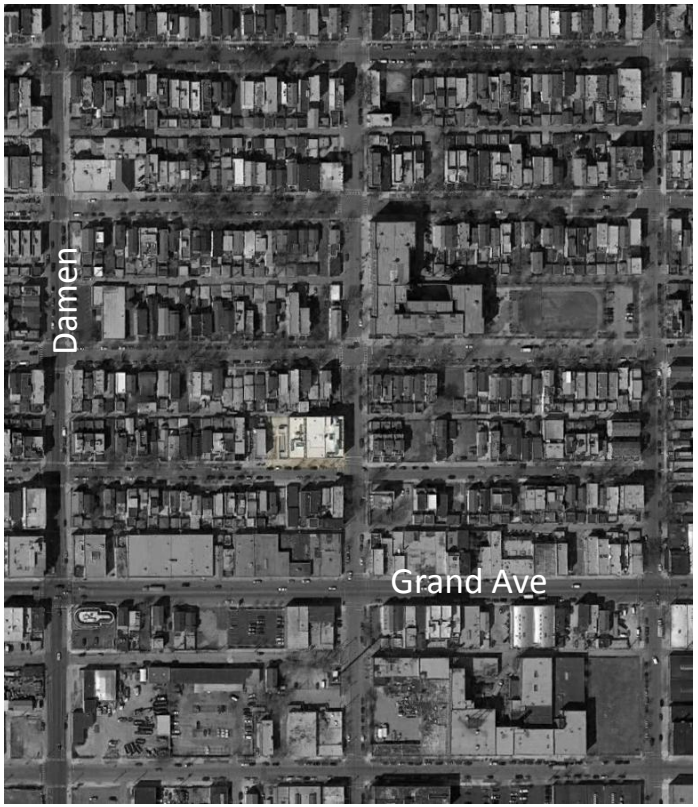

Sarah E Goode STEM Academy
207,000sf on 17.1 acres
1,200 students
New Construction

172sf

The Wolcott School
33,000sf on .35 acres
160 students
Adaptive Reuse

206sf

Introduction

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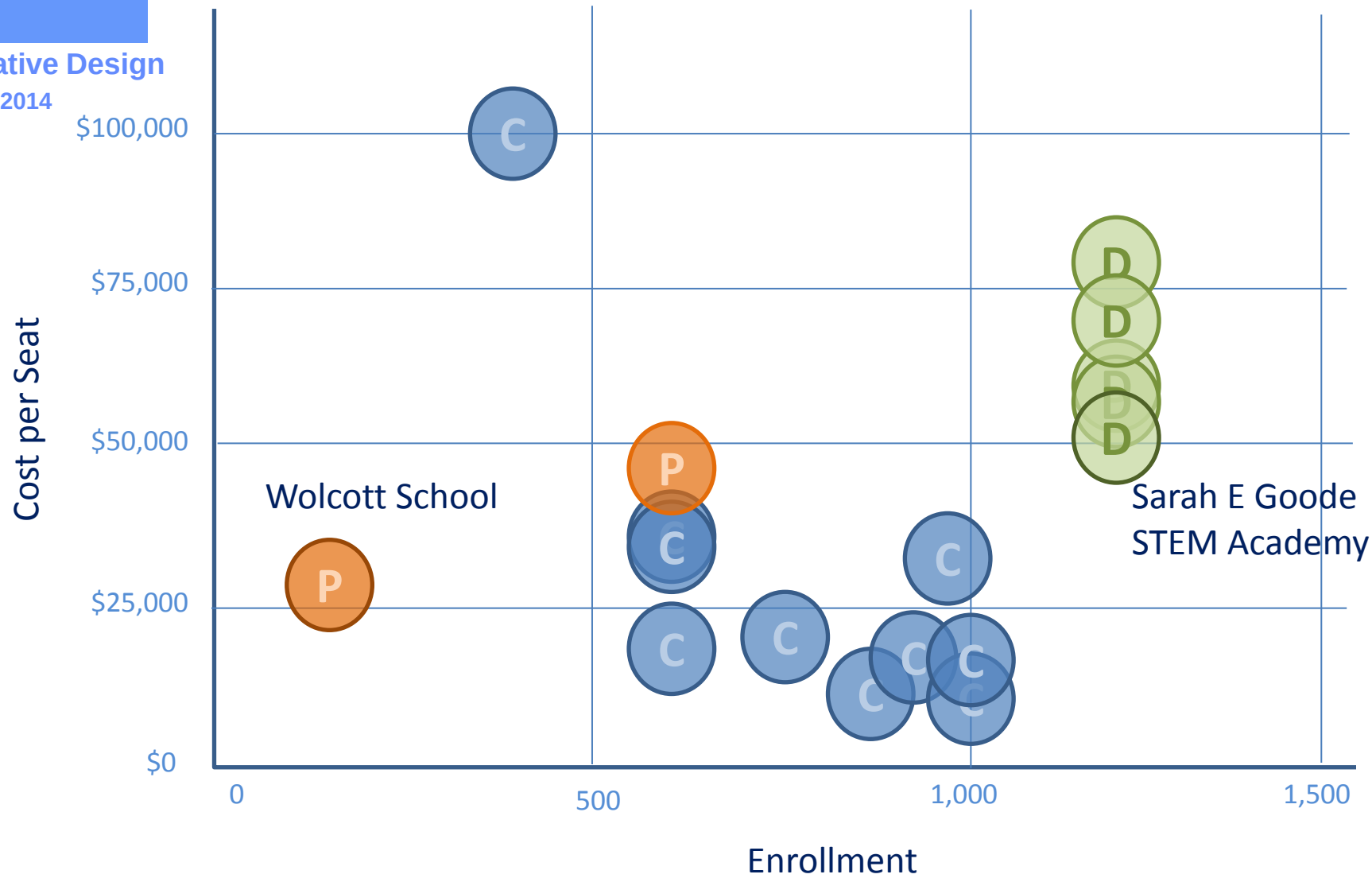

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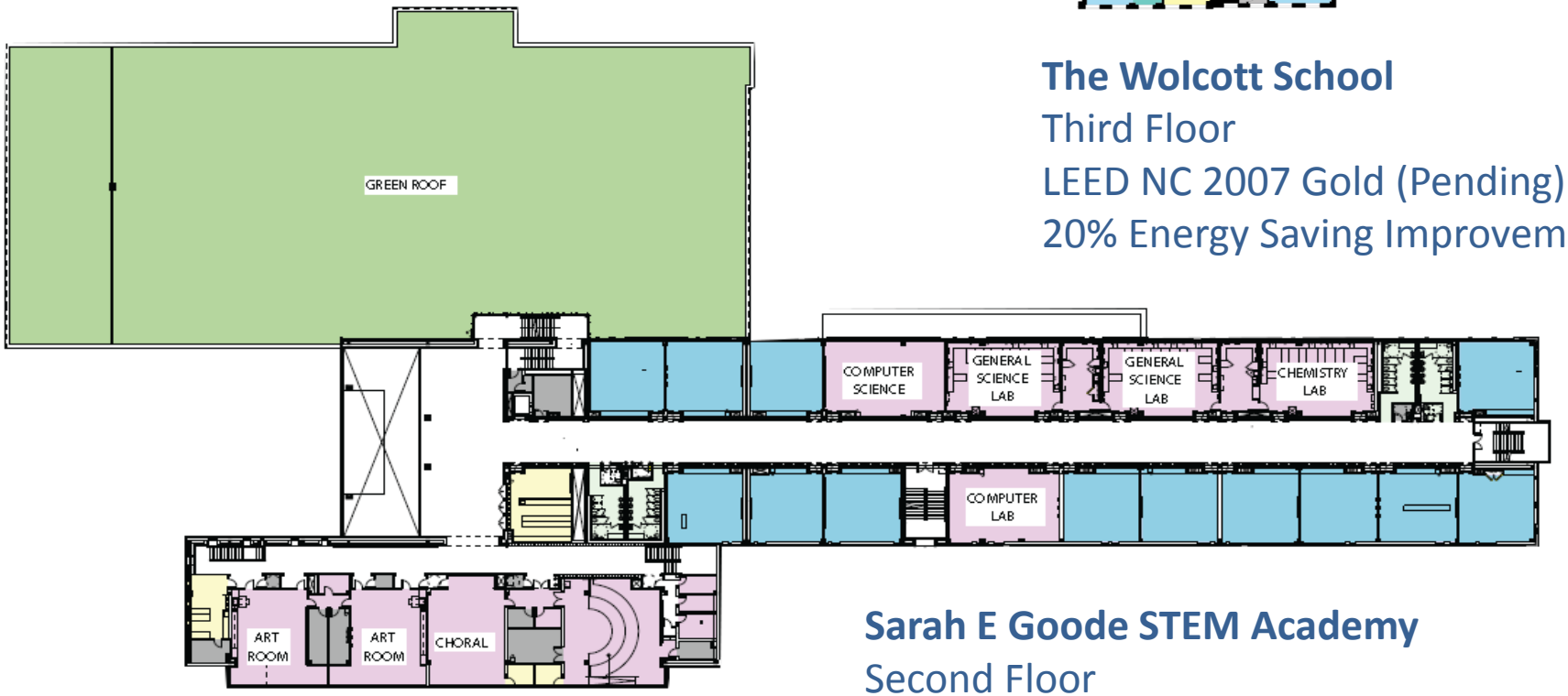
The Wolcott School

Third Floor

LEED NC 2007 Gold (Pending)

20% Energy Saving Improvement



Sarah E Goode STEM Academy

Second Floor

LEED for Schools 2007 Platinum

38.5% Energy Saving Improvement

Introduction

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Who Are You?

Objectives

- Understand how the integrative design process works.
- Learn how such collaboration can be leveraged to create extraordinary results – *whether to reduce first cost while improving ongoing efficiency or to create an "antithesis" school*.
- Learn how excellent learning environments can be created in and beyond the classroom through this process.
- See how practical off-the-shelf parts can be put together for a whole that is truly greater than the sum of its parts

A Word About Integrative Design…

Extraordinary projects can result from leveraging the cognitive diversity inherent in a project team. Each member can bring a different perspective and can possess different tools to solve difficult problems

Involve Team Members **EARLY** , working **INTENSIVELY** in pursuit of **JOINTLY** developed criteria, making decisions **COLLABORATIVELY**

- Partnerships - Will you be pursuing partnerships with organic growers or farms? If so, will they be recognized?
- Partnerships - Will the dining room host gallery space for local artists? Could the dining room host live music? Live dance? Is an impromptu dance floor desirable? Is there a story time for kids?

Posted at 10:52 AM in Conceptual | Permalink | Comments (2)

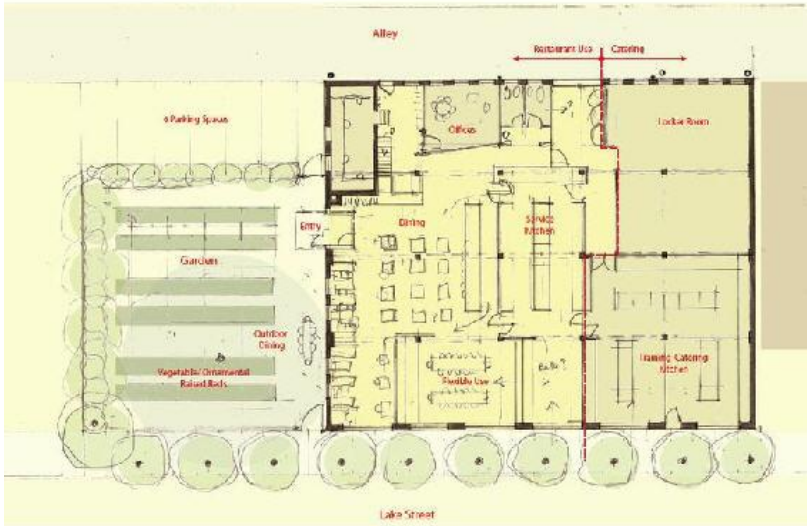
Materials

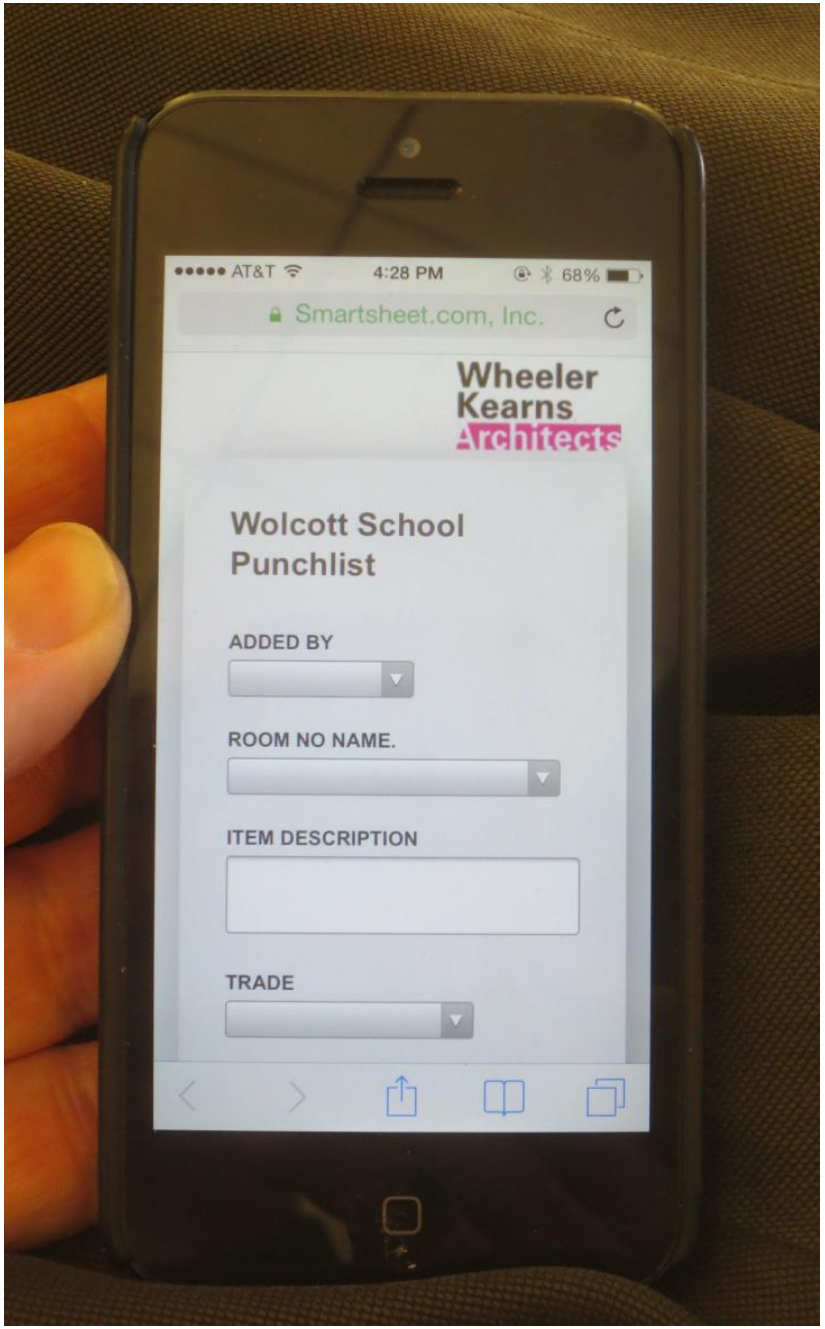
- Materials - Should the materials here be finished (polished metal, stone and wood) or more unfinished "raw" appearance seem better (exposed brick, concrete, timber)?

Posted at 10:52 AM in Conceptual | Permalink | Comments (2)

Schemes

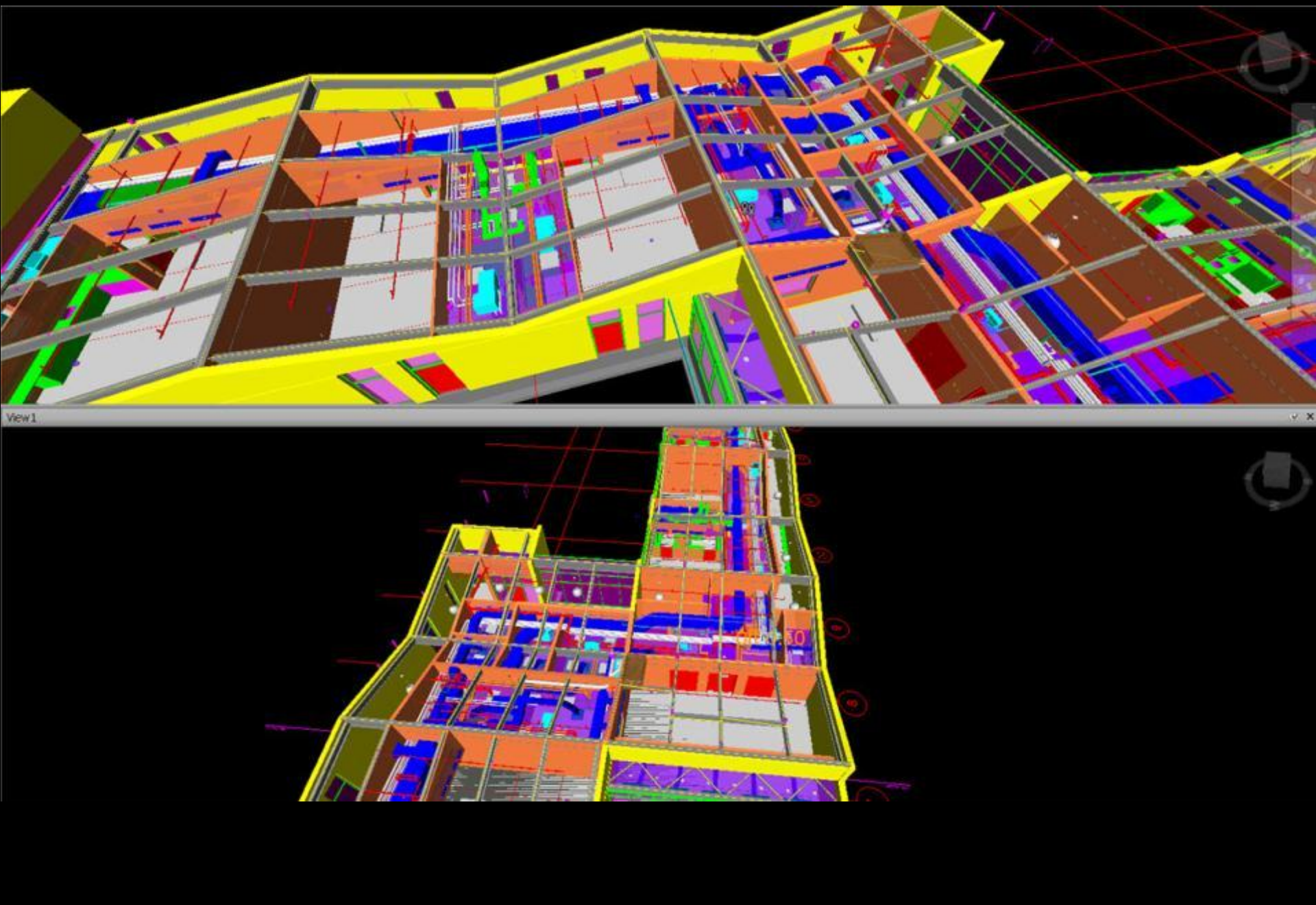
- Schemes - Do you gravitate toward any of the three Predesign schemes? If so, why?

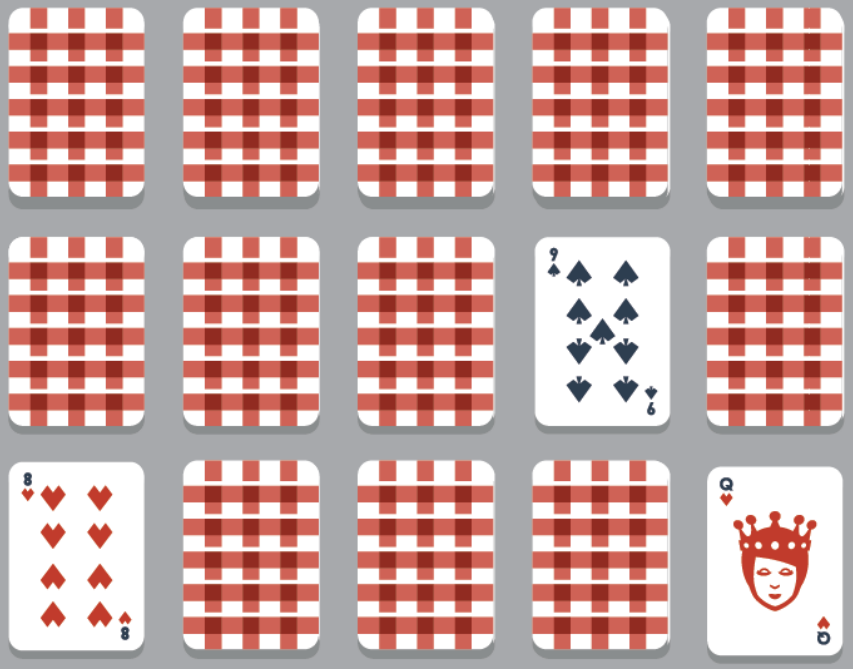




Save | File | Print | Undo/Redo | View: Grid | Indent | Text Style | Font: Arial | 10pt | Align | Color | Number | Highlight Changes

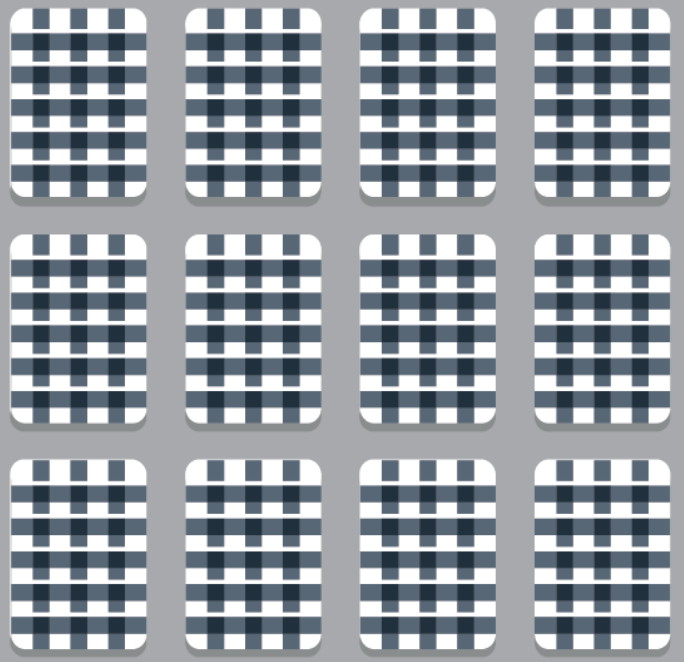
	Colu 2	Colu 3	Colu 4	Column 5	Credit Description	Column 7	Column 8	Credits	Comments
1				Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 69 points Platinum 80+ points					
2	62	7	30	**Points Achieved**			Possible	110	Review Comments
3									**Menu Item City Green Permit: 50% Green Roof or Achieve one higher level**
4	20	0	6	**Sustainable Sites**			Possible	26	Review Comments
5	Y	?	N						
6	Y			Prereq 1	**Construction Activity Pollution Prevention**			0	Assumed that CM will develop and implement an erosion and sedimentation control plan for all activities associated with the project.
7	1			Credit 1	**Site Selection**			1	Site is not prime farmland or parkland, is developed, is not specifically identified as habitat for endangered species, and is not within 100 feet of any wetlands.
8	5			Credit 2	**Development Density & Community Connectivity**			5	Density is likely but needs to be verified
9			1	Credit 3	**Brownfield Redevelopment**			1	
10	6			Credit 4.1	**Alternative Transportation - Public Transportation Access**			6	2 bus lines likely within .25 miles. Can be University lines
11	1			Credit 4.2	**Alternative Transportation - Bicycle Storage & Changing Rooms**			1	Credit template for SSc4.2 is complete.
12			3	Credit 4.3	**Alternative Transportation - Low Emitting & Fuel Efficient Vehicles**			3	Credit template for SSc4.3 is complete.
13	2			Credit 4.4	**Alternative Transportation - Parking Capacity**			2	All 37 parking spaces provided on site plan are to upgrade parking for adjacent buildings that where not in compliance with Chicago Zoning Ordinance. Although 2 preferred parking spaces are provided, no parking spaces are designated for use by the building occupants (inner-city high school students).
14	1			Credit 5.1	**Site Development - Protect or Restore Habitat**			1	Likely with open space and green roof
15	1			Credit 5.2	**Site Development - Maximize Open Space**			1	Likely with open space and green roof
16			1	Credit 6.1	**Stormwater Design - Quantity Control**			1	
17			1	Credit 6.2	**Stormwater Design - Quality Control**			1	
18	1			Credit 7.1	**Heat Island Effect - Non-Roof**			1	All high albedo paving at alley or parking walking surfaces
19	1			Credit 7.2	**Heat Island Effect - Roof**			1	Non green roof will be highly reflective white TPO or PVC


View1



15 Cards (Tools) out of 52
14.5 Trillion Possible Combinations

12 Cards (Tools) out of 52



1:450,000,000 chance
that SHE has all HIS tools

Stepping Stones to Integrative Design – Shifting the Way We Think

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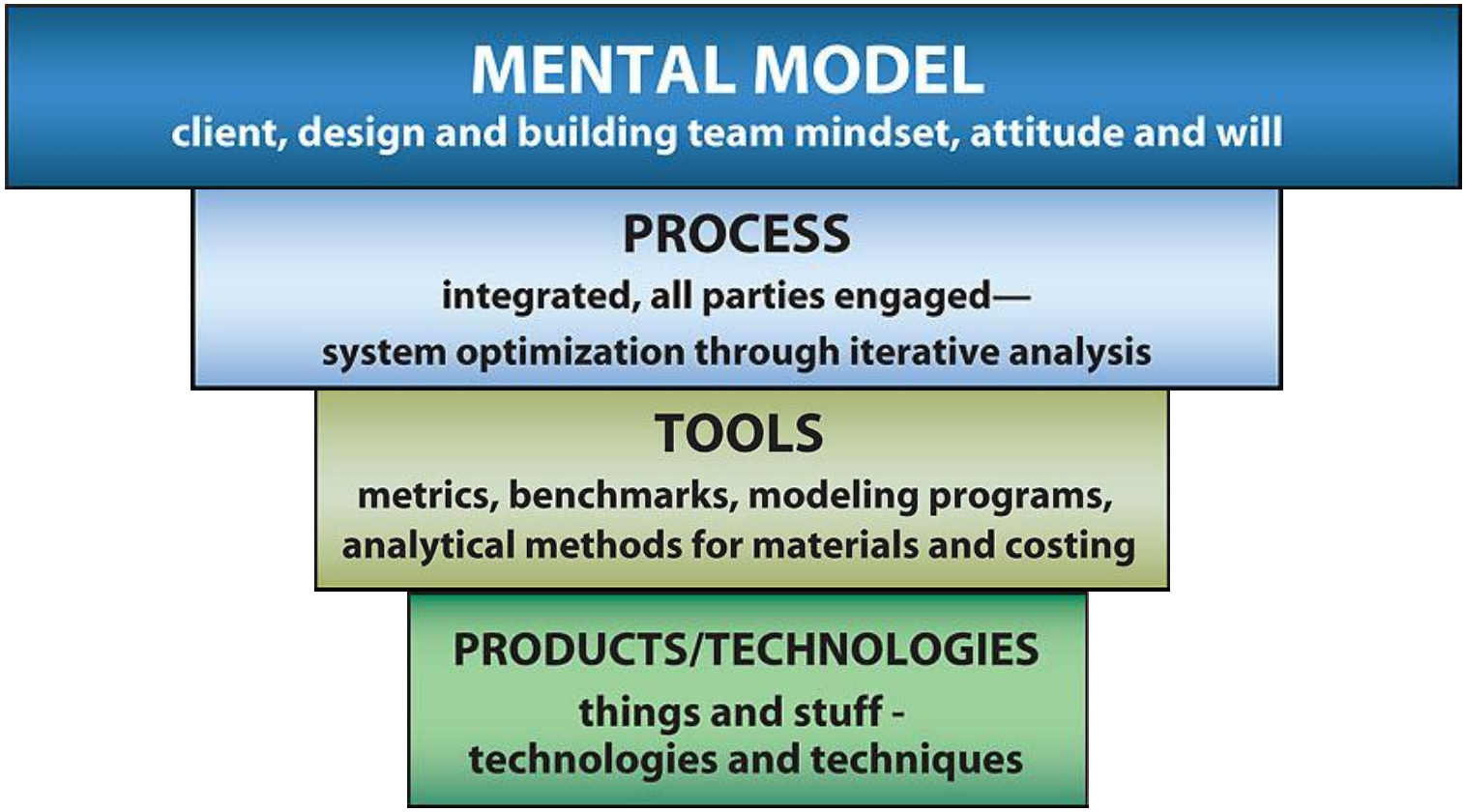

Concept by Bill Reed and Barbra Batshalom

Building as an Organism

- Systems are related, integrated
- Parts not independent
- Holistic, non-linear
- Analyze to streamline

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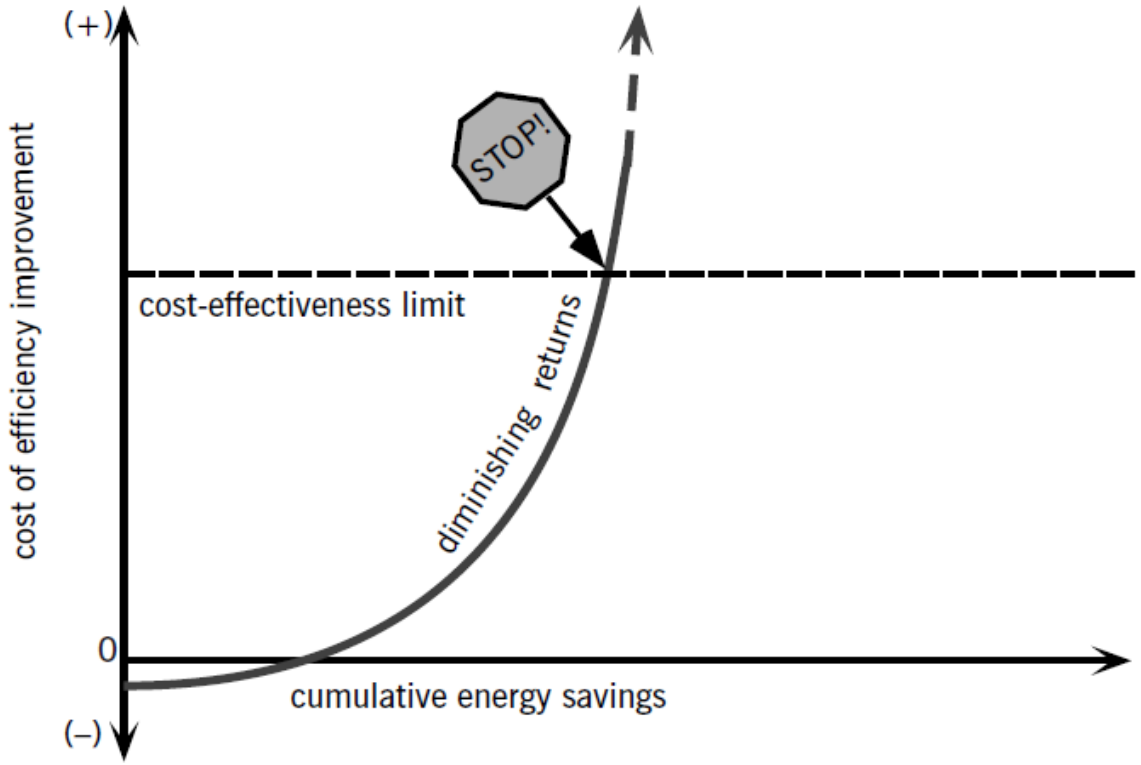
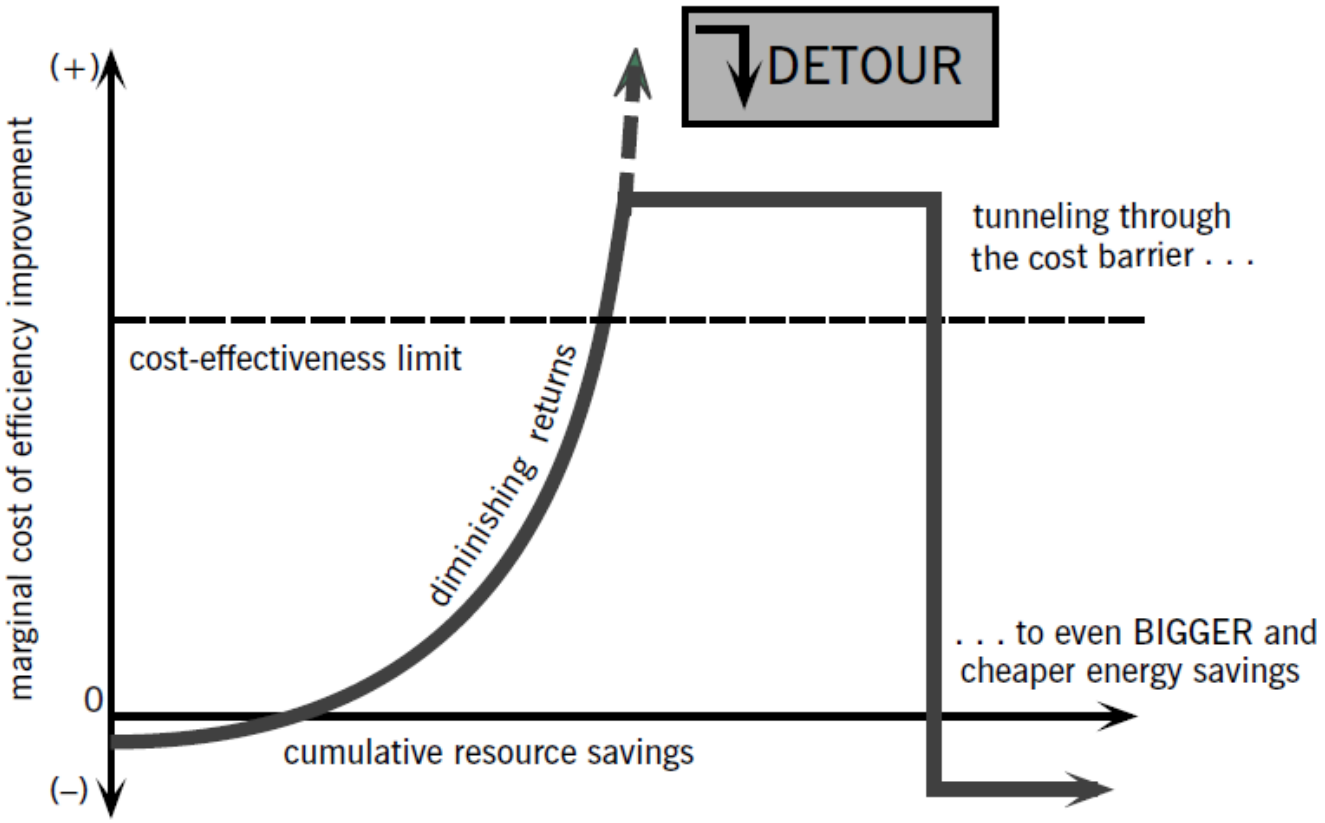
Diminishing Returns



From Natural Capitalism by Lovins, Lovins and Hawken, 1999, Chapter 6

Tunneling Through the Cost Barrier



From Natural Capitalism by Lovins, Lovins and Hawken, 1999, Chapter 6

Sarah E. Goode STEM Academy

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Context

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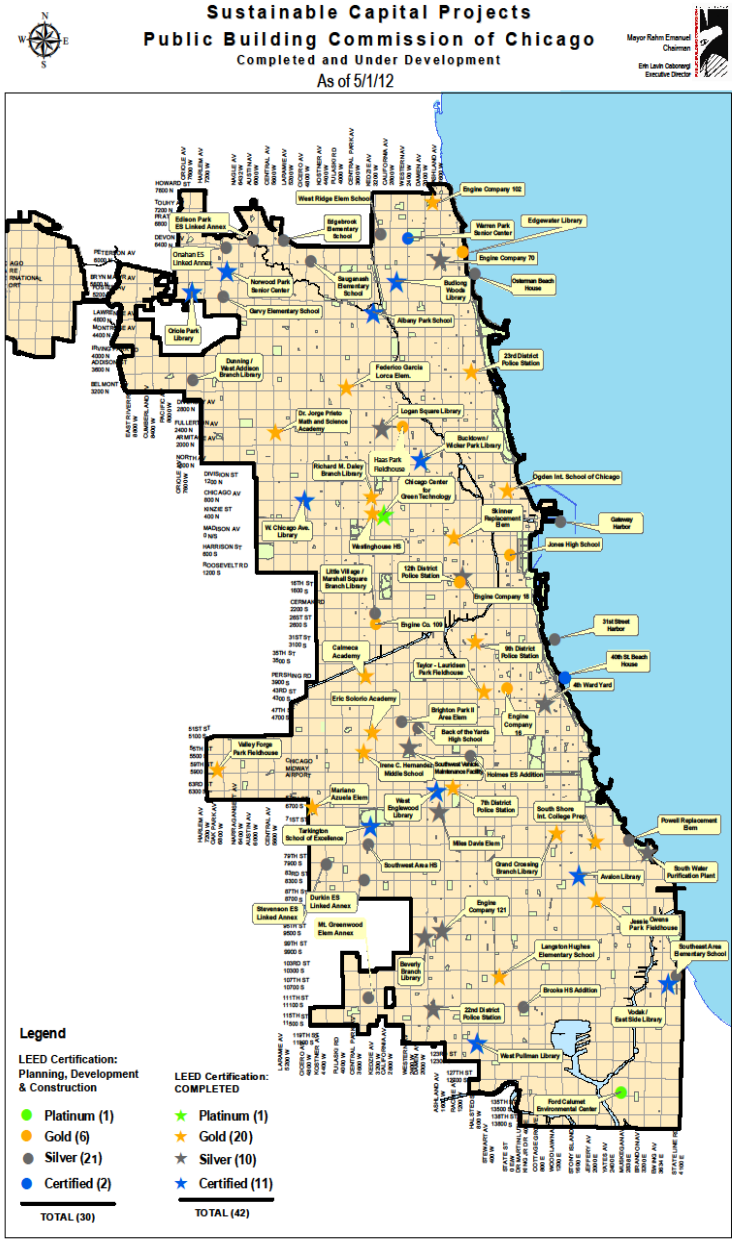
- Public Building Commission of Chicago
- Chicago Public Schools
- City of Chicago

✓ Aligned Goals

✓ Shared Commitment

✓ *Sustainable Chicago 2015*



Aligned Goals

- Program-wide: Make “green” routine
- Excellent student experience / learning environment
- Use LEED to help meet goals

Context

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City of Chicago Sustainability Goals

From Green Medians to Sustainable Chicago 2015

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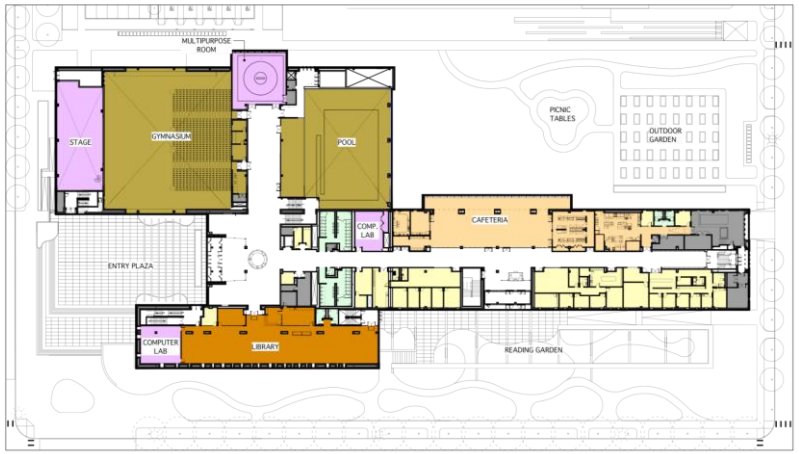
Context - The Evolving Prototype

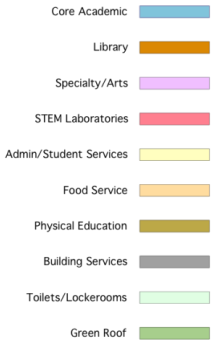
- Urban Model High School - Chicago Public Schools
- Minimum LEED Silver certification
- Design Standards Constraints

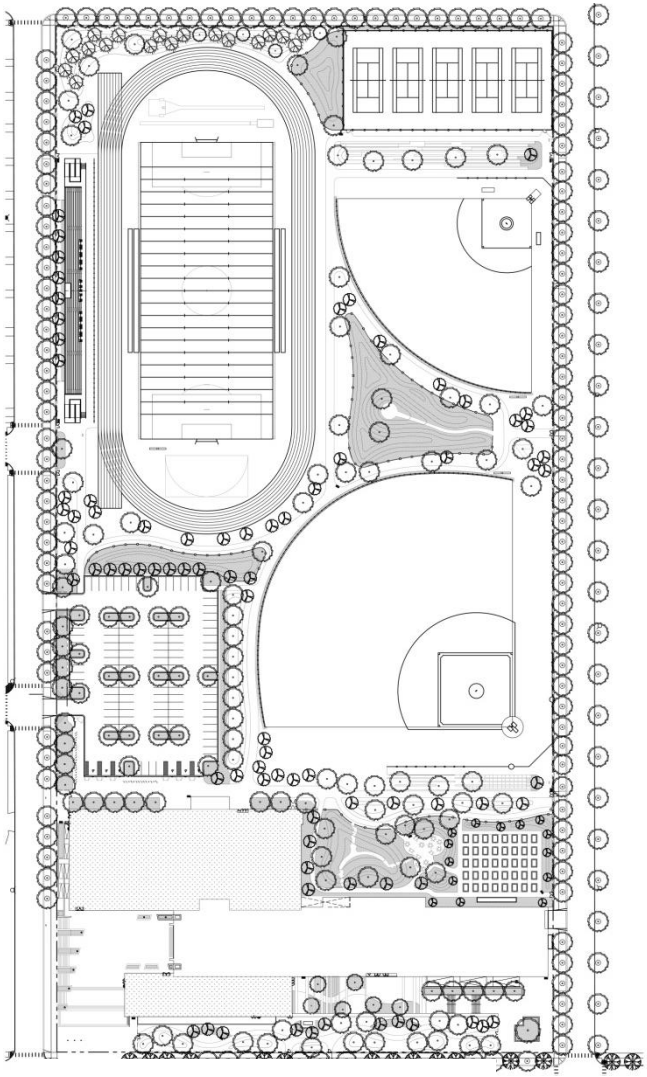
Prototype Layout

Lower Level Plan



Main Level Plan

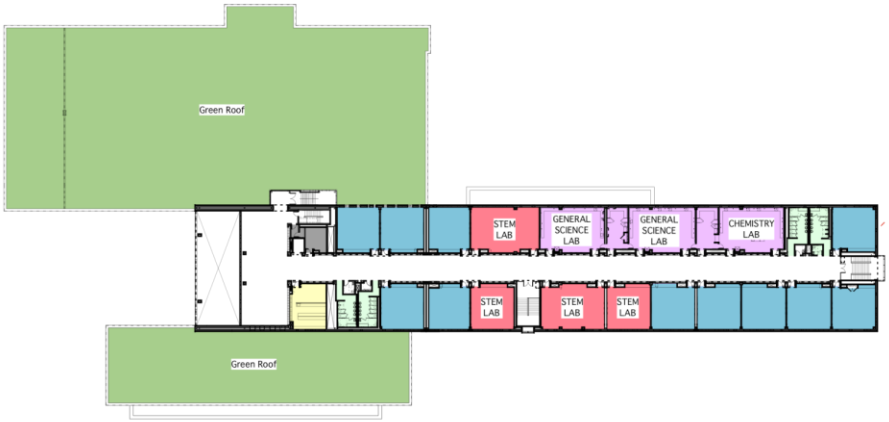




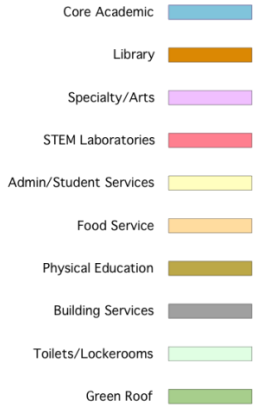
Site Plan

Prototype Layout

Second Floor Plan

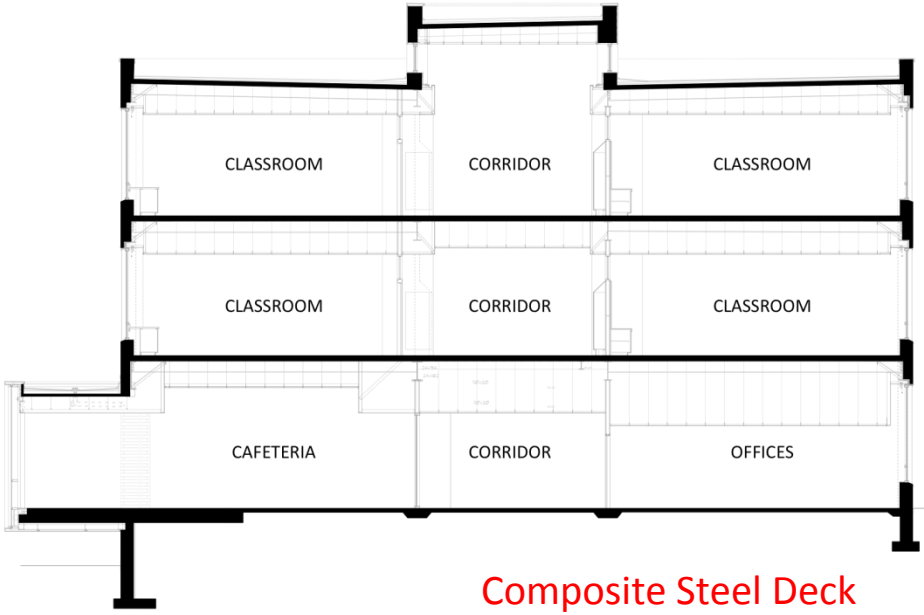


Third Floor Plan



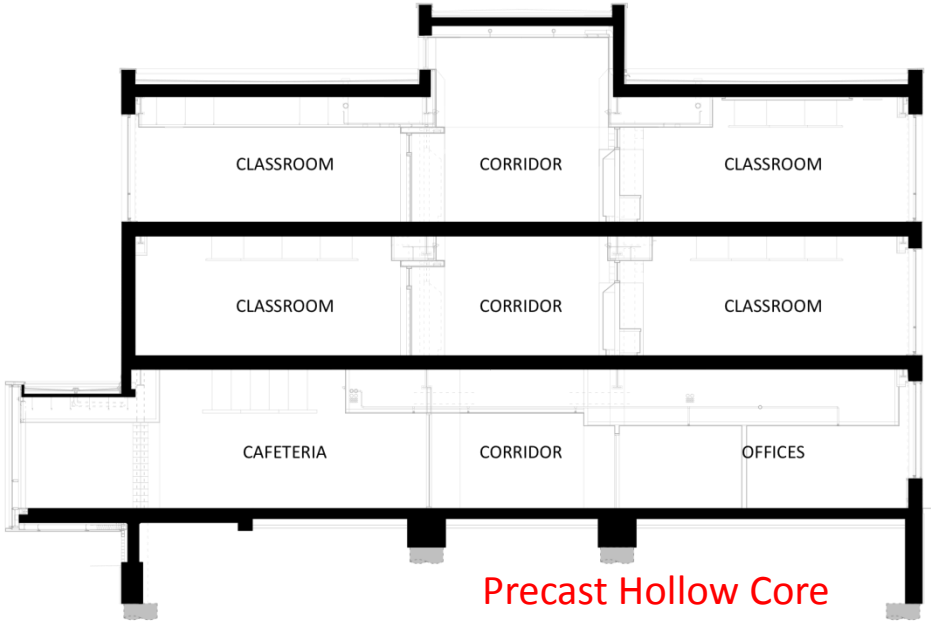
Good(e) Charrette Goals:

- Simplify Construction
- Increase Daylight
- Reduce Cost
- Implement Geothermal System
- Engage Community



Composite Steel Deck
w/ Concrete Topping

Sarah E. Goode Building Section



Precast Hollow Core
Concrete Planks

Prototype Building Section

Structural System

OPTION 2:
INTERIOR VIEW IN TYPICAL CLASSROOM

41% Glazing Area

OPTION 1:
INTERIOR VIEW IN TYPICAL CLASSROOM

BASE CONCEPT DESIGN:
INTERIOR VIEW IN TYPICAL CLASSROOM

28% Glazing Area

Study: Glazing Properties

Table 1: Cost and Energy Comparison							
Simulation Option	Glazing Area (% of Total Wall Area)	Electrical Energy		Gas Energy		Total Energy	
		Usage (kWh)	Cost ($)	Usage (Therms)	Cost ($)	Usage (10^6 Btu)	Cost ($)
Option 1[a]	28%	941,500	30,214	62.04	1,220	3,833	31,434
Option 2[a]	41%	918,377	29,471	72.86	1,433	3,862	30,904
Option 2[b] - Scenario 1	41%	946,073	30,360	68.71	1,352	3,915	31,711
Option 2[b] - Scenario 2	41%	944,431	30,307	69.06	1,358	3,913	31,666
Option 2[b] - Scenario 3	41%	934,379	29,985	67.10	1,320	3,859	31,305

Prototype

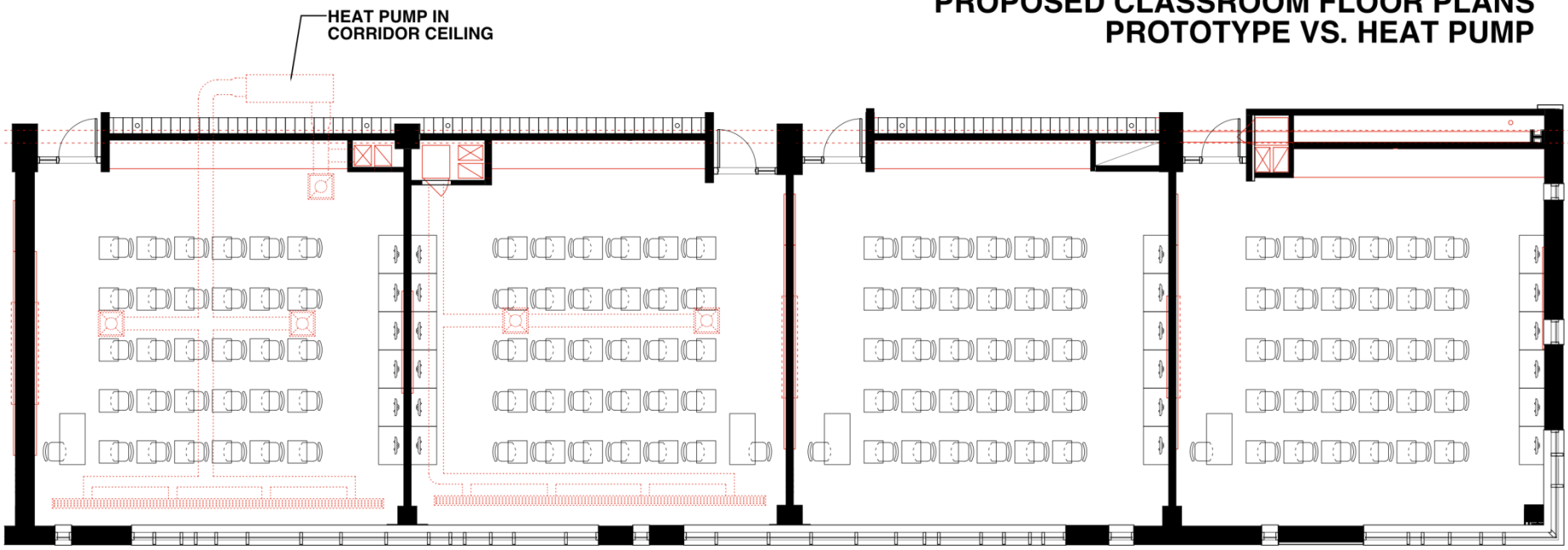
Sarah E. Goode

System Life-Cycle Cost Analysis

HVAC SYSTEM COMPARISON FOR SOUTH WEST AREA HIGH SCHOOL

	Ashrae 90.1 Baseline Water Cooled VAV	Alternate 1 Air Cooled VAV	Alternate 2 Water Cooled VAV	Alternate 3 GSHP VAV	Alternate 4 GSHP
53	VAV Boxes (80 boxes)		$240,000	$240,000	$240,000	NA
54	Controls		$150,000	$150,000	$150,000	$150,000
55	Water Treatment					
56	**COST SUMMARY**					
57	Total Equipment Cost		$2,598,000	$2,553,000	$2,180,000	$1,980,000
58	Total Installed Cost		$7,794,000	$7,659,000	$6,540,000	$5,940,000
59	Geo-Exchange Wells		N/A	N/A	$2,000,000	$1,700,000
60	Capital Cost (Note 2)		$7,794,000	$7,659,000	$8,540,000	$7,640,000
61	Federal Tax Credit (10% for Geothermal)		$0	$0	-$854,000	-$764,000
62	Total Cost of System to Owner		$7,794,000	$7,659,000	$7,686,000	$6,876,000
63	$/sq ft		$46.20	$45.40	$45.56	$40.76
64	**ENERGY SUMMARY**					
65	Electric Consumption (kWh) - (Note 3)	1,007,516	1,000,746	971,117	885,189	735,811
66	Gas Consumption (THERMS) - (Note 3)	34,506	7,313	7,313	3,272	3,807
67	Annual Energy Cost	$93,261	$70,580	$68,582	$59,488	$50,247
68	Performance Improvement	0.0%	24.3%	26.5%	36.2%	46.1%
69	LEED For Schools Points		4	5	8	10
70	**METRICS**					
71	$/Sq.ft Energy Cost	$0.55	$0.42	$0.41	$0.35	$0.30
72	Cooling (sf/ton)	375	482	482	475	359

PROPOSED CLASSROOM FLOOR PLANS
PROTOTYPE VS. HEAT PUMP

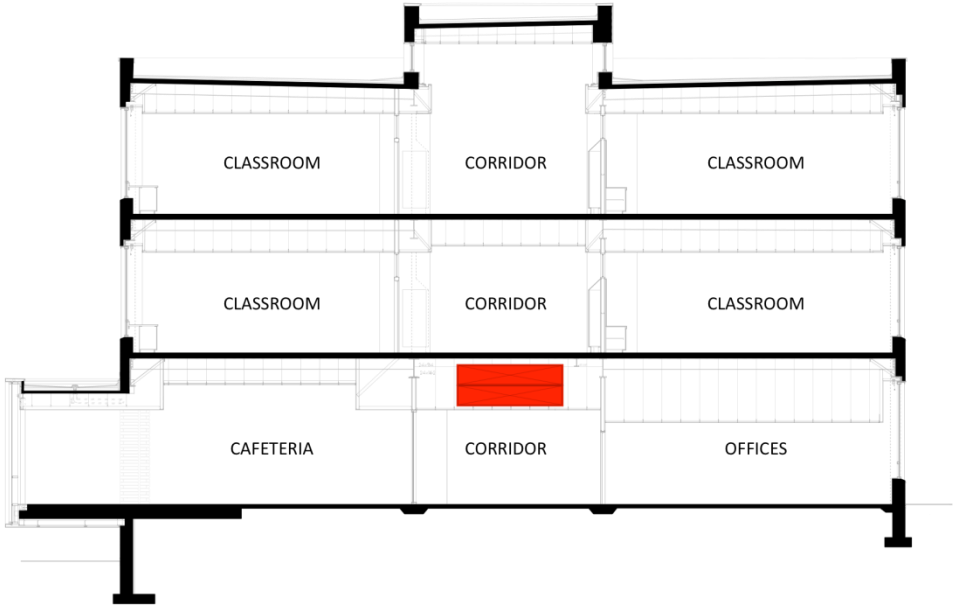


HORIZONTAL HEAT PUMP

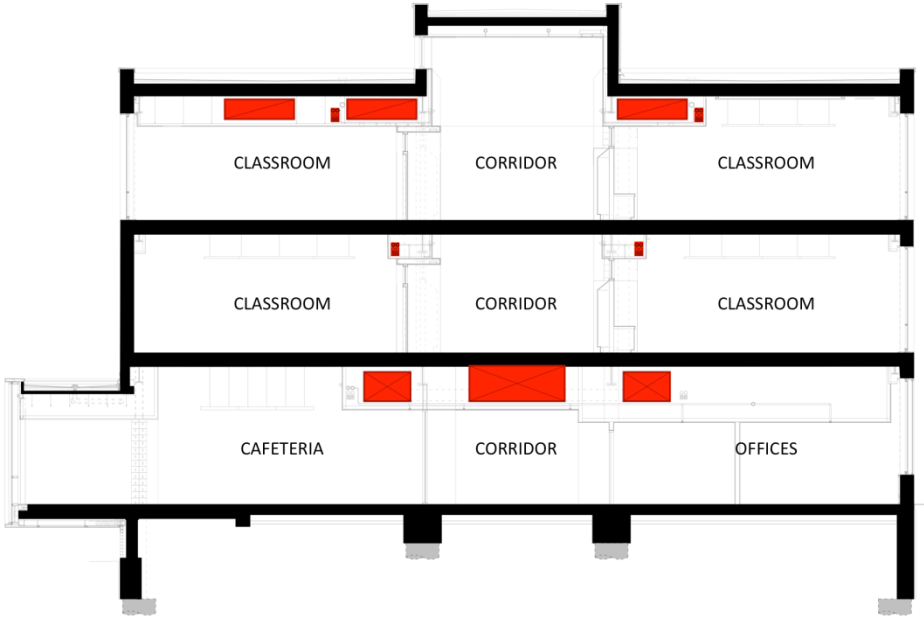
VERTICAL HEAT PUMP

PROTOTYPE DESIGN

CORNER CONDITION



Sarah E. Goode Building Section

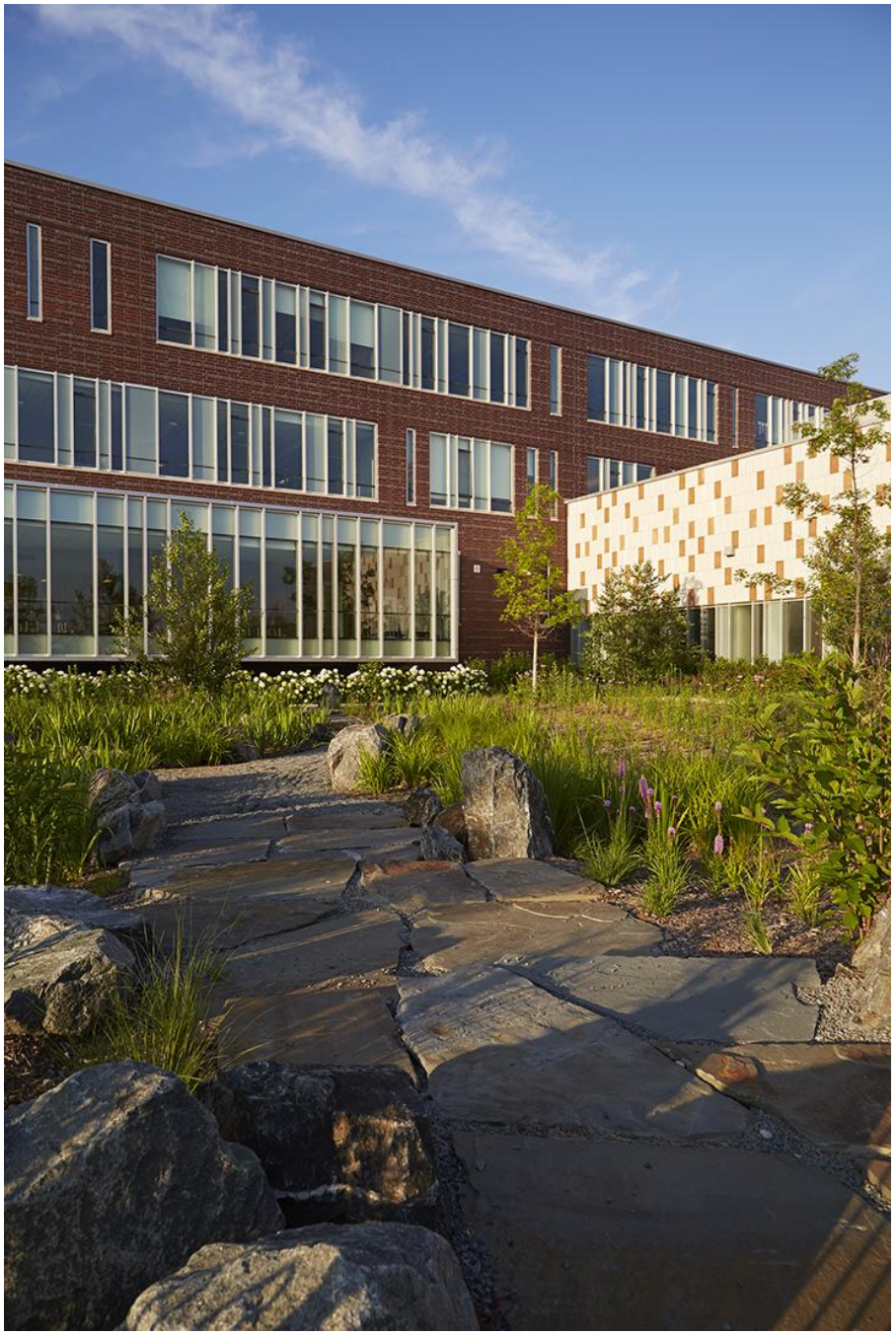


Prototype Building Section

Areas of Intense Mechanical Coordination


Midway Airport
Public Park
Industrial Corridor
Elementary School
Residential Neighborhood
Site for Sarah E. Goode STEM Academy
Vacant Industrial Land for Future Development
Railroad Lines
Residential Neighborhood
Major Street


Solar Panels
Bird Sanctuary
Elementary School
Community Garden
Bike Path
Cistern
Pedestrian Trails
Railroad Lines
Vacant Industrial Land for Future Development
Football and Baseball Fields and Tennis Courts for Student and Community Use



LEED Results - Sarah E. Goode STEM Academy vs. BOTYHS

	Goode	BOTYHS
Sustainable Sites	14	10
Water Efficiency	5	5
Energy and Atmosphere	12	8
Materials and Resources	7	7
Indoor Environmental Quality	16	10
Innovation	5	5
TOTAL	**59**	**45**
	Platimum	**Gold**

Sarah E. Goode vs. Evolving Prototype
A Side-By-Side Comparison

Goode	**$**	**62,452,000**	
BOTY	**$**	**63,822,440**	
	$	**(1,370,440)**	**@ $7/SF difference**
Significant Scope Differences:			
Masonry	Brick pattern regularized; Less quantity than prototype due to increase in windows and shorter building due to HVAC changes.		
Steel / Miscellaneous Metals	Goode changed from concrete deck to steel deck with concrete top. Shorter building due to smaller HVAC ductwork. Eliminated Penthouse. BOTY stayed with precast plank. Penthouse required with standard HVAC		
Spray Fireproofing and Insulation	Less Steel; less fireproofing.		
HVAC	Smaller ductwork – VAV versus distributed heat pumps with dedicated outside air; Added acoustic insulation at classroom heat pump closets;		
Geothermal wells	Boilers reduced from (3) 3,000 mbh to (2) 1,500 mbh; (1) 450 ton Chiller versus distributed heat pumps and geothermal pool dehumidification unit. Added geothermal wells – 170 wells at 450 feet deep each.		

The Wolcott School

Integrative Design

18 April 2014

CHICAGO'S VERY OWN

WOLCOTT SCHOOL

POWERSCHOOL SUPPORT US

ABOUT US ADMISSIONS ACADEMICS CAMPUS LIFE TYREE CENTER CONTACT

WOLCOTT SCHOOL IS BUILT AROUND THE STRENGTHS OF OUR STUDENTS


Gov. Peter Shumlin
(D) Vermont

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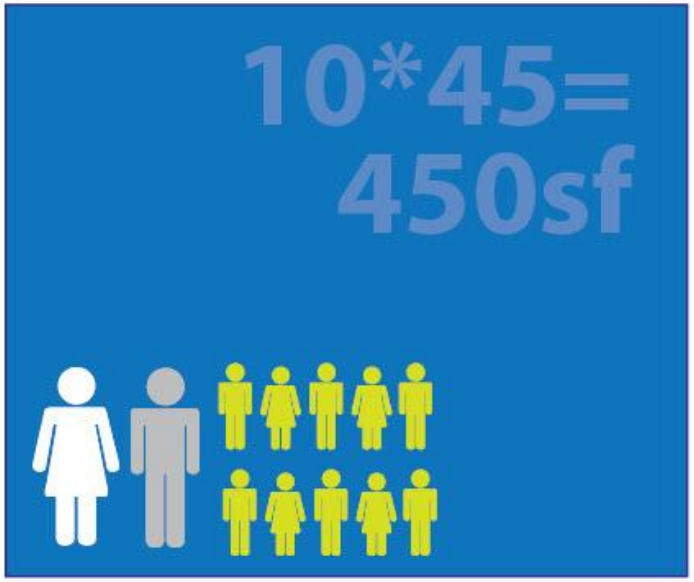
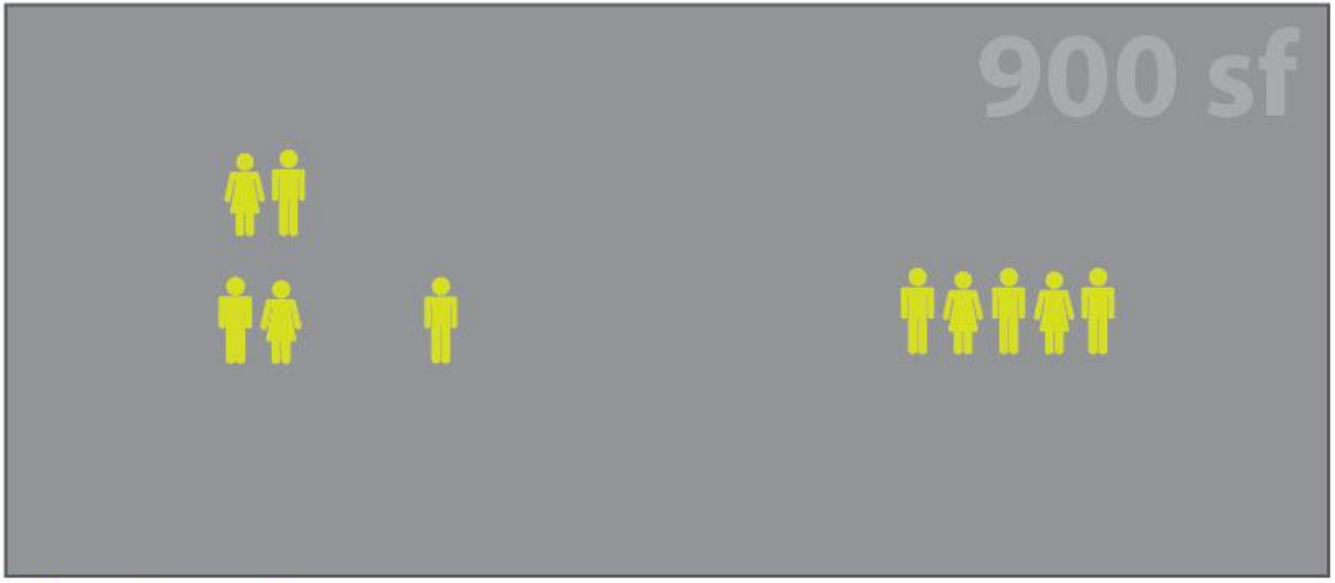
18 April 2014

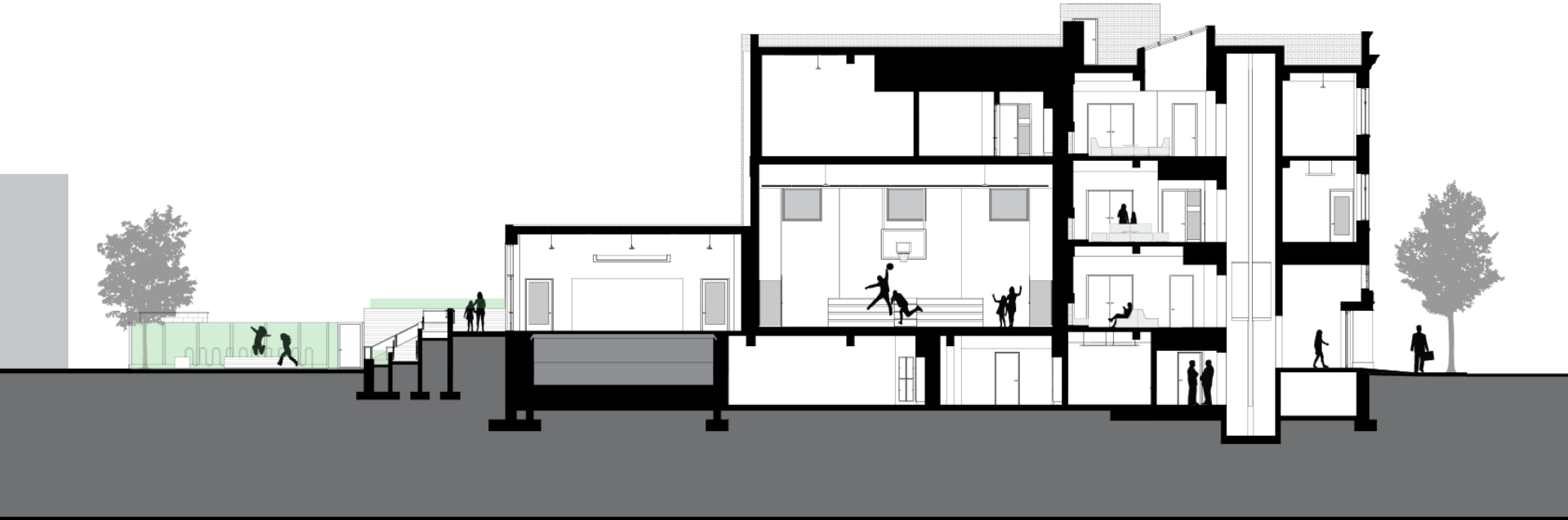


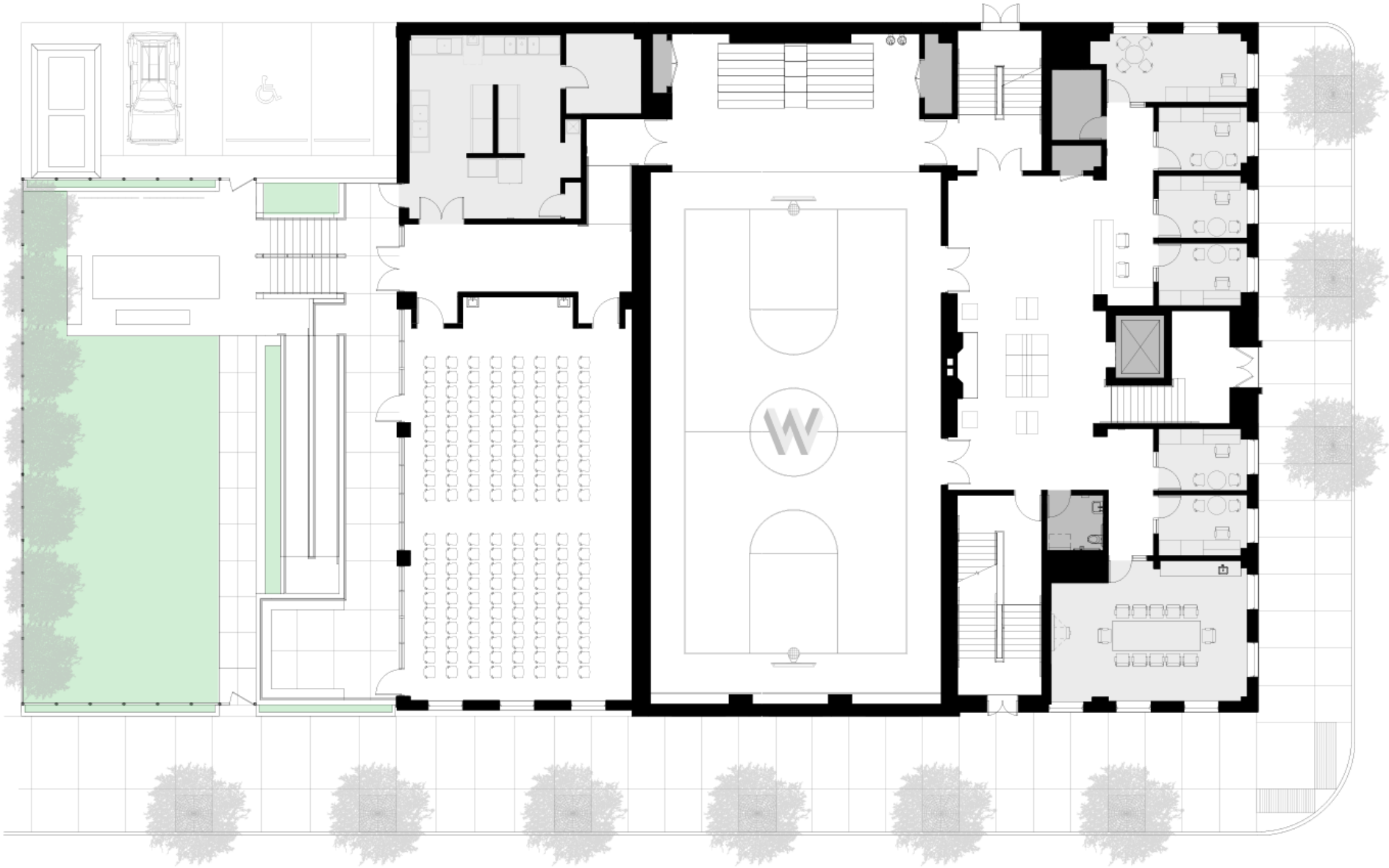
Classroom

Huddle Room



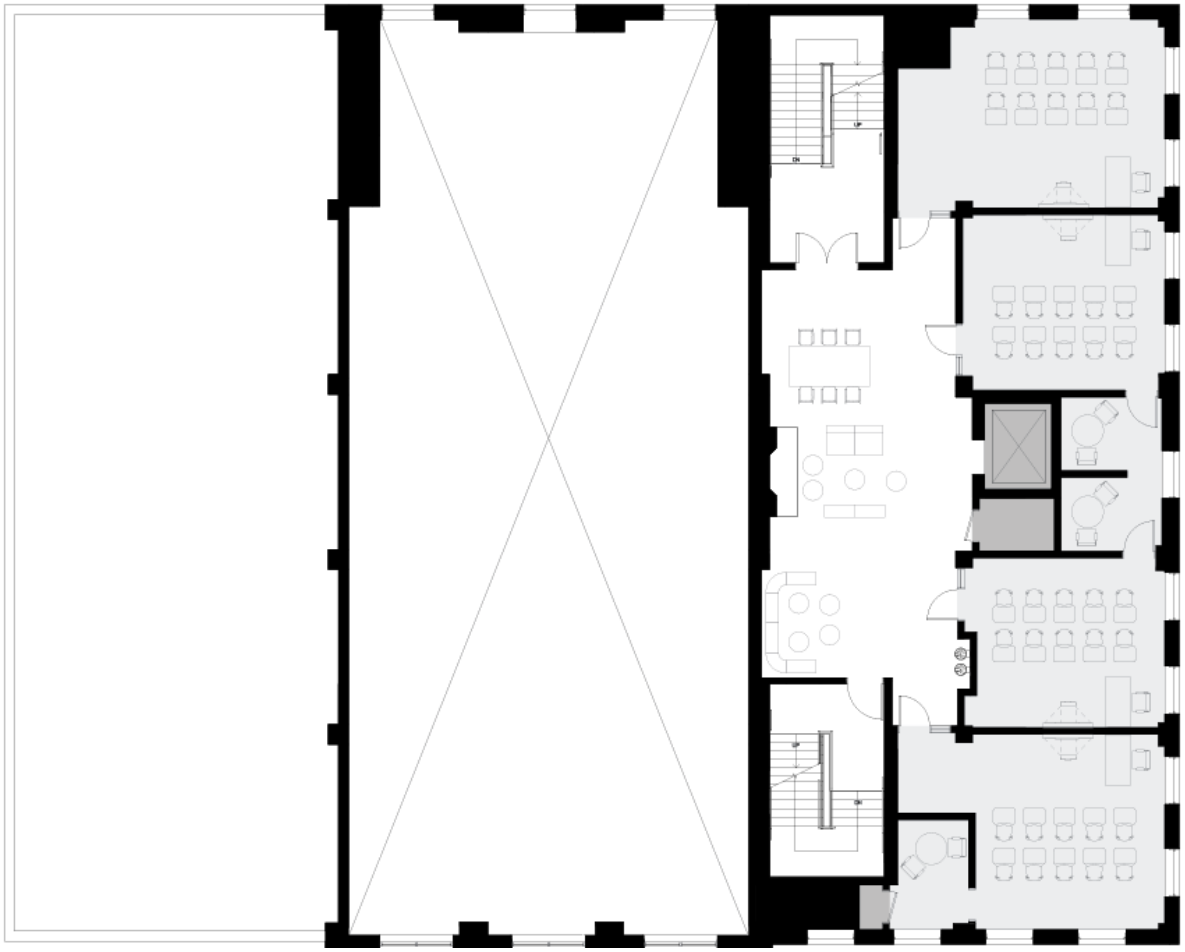
Fireplace Core



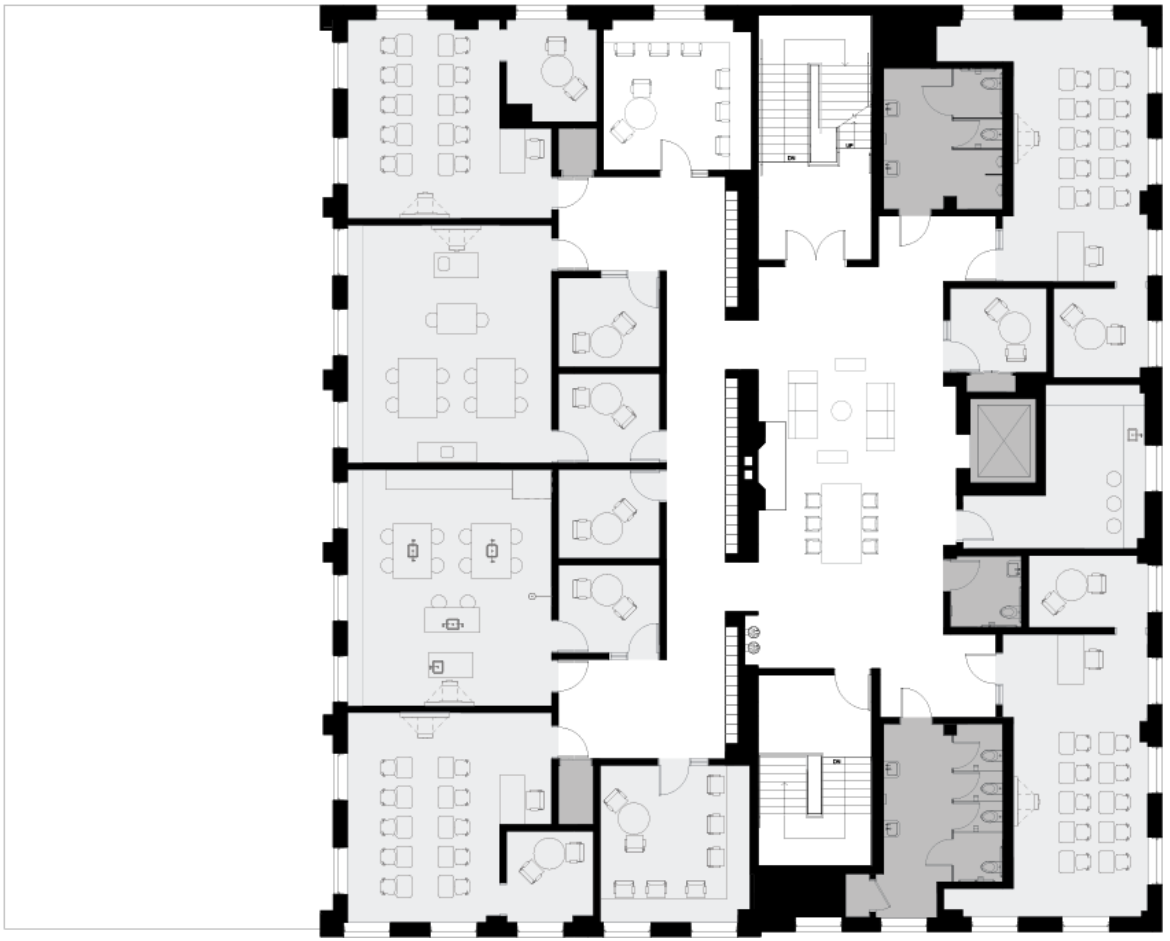


FIRST FLOOR


ping-pong

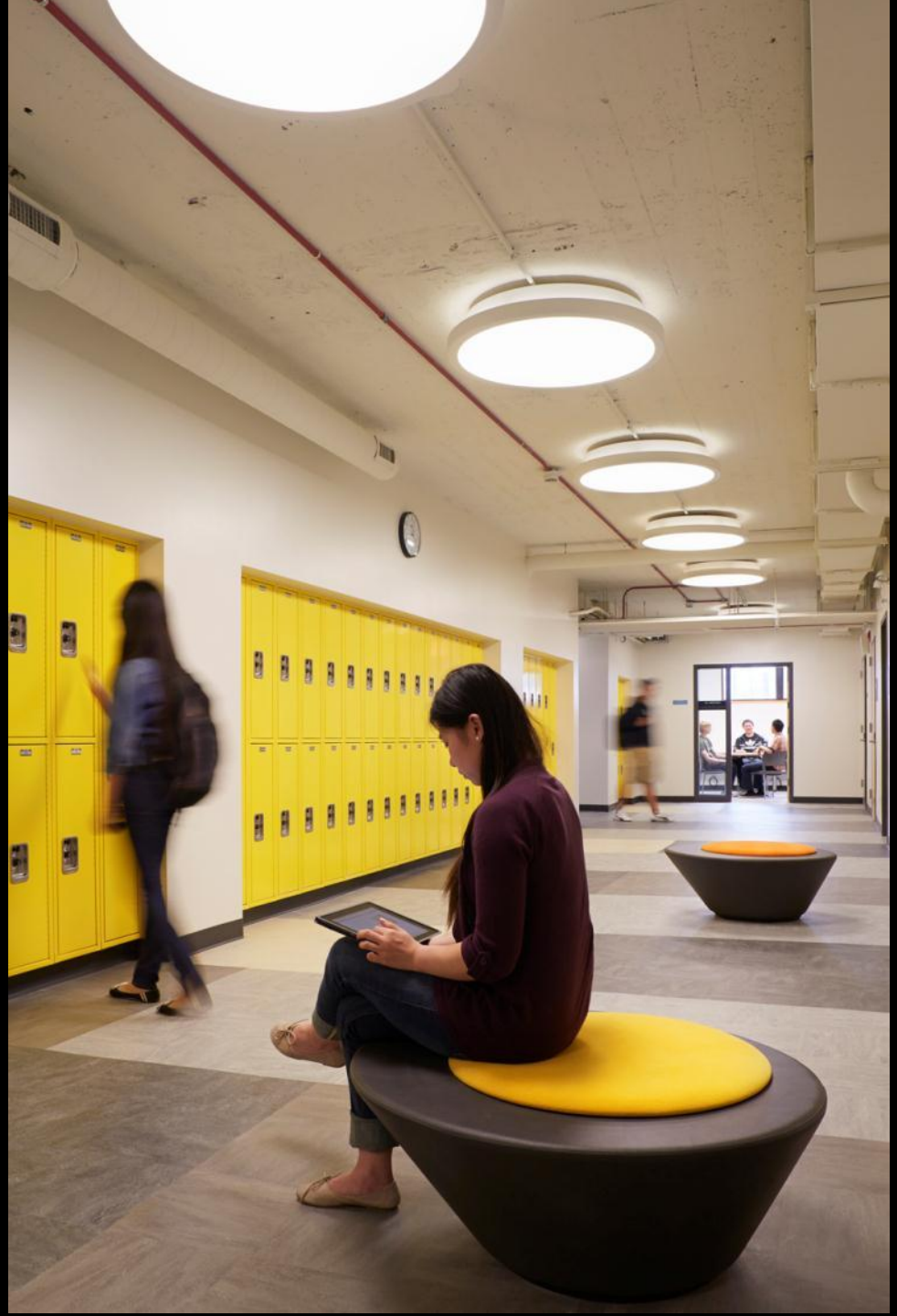


SECOND FLOOR



THIRD FLOOR

LOWER LEVEL



Questions?

Contact Info

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- Jennifer Costanzo, STR Partners, LLC
  jennifer@strpartners.com
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