

**Cutler Elementary School
Hamilton-Wenham Regional School District
Sustainability Workshop**

Rating System: LEED BD+C – Schools, v4.0

March 6, 2024

Attendees:

District: Eric Tracy- HWRSD Superintendent
Stacy Bucyk – HWRSD Director of Student Services
Peter Clay – School Building Committee Member
Dana Allara – HW School Committee Chair
Vicky Masone – Town of Hamilton Energy Manager
Greg Horner – Member of the HW Climate Action Team
Agnes Vorbrodt - Parent

OPM: PMA: Kevin Nigro, Nick Masse

Design Team: JCJ Architecture: Doug Roberts-PIC, Alicia Caritano-PM, Eric Haggstrom-Director of Sustainability, Dustin Lombardi-PA, Brian Stone-PA, Peter Morgan-Project Designer
Soden Sustainability: Colleen Soden, Kelley Tapia
GGD: Dom Puniello, David Periera, Keith Lane,
Samiotes: Steve Powers, Angie Howard
Warner Larson: Amy Allen
Crabtree McGrath: John Sousa
Crowley Engineering: Ralph Anatal
Cavanaugh Tocci: Kent McElvie

Discussion (supported by the attached presentation deck):

- ☐ Overview: Project is currently in the Preferred Schematic Report phase of the Feasibility Study. There are currently 14 Test-Fit Options for multiple enrollments being explored at the Cutler and Winthrop sites. A Preferred Option will be identified in the Preferred Schematic Report being submitted to the MSBA on 5/2/24.
- ☐ Approach: Guiding Principles
- ☐ MSBA Requirements (Project Advisory #81)
 - The school must meet the minimum energy efficiency requirements described in the MA DOER “Stretch Code Green Community” standards
 - The school must be solar ready

- Extra Reimbursement: 3% + 1%
- Inflation Reduction Act [IRA] + Utility Rebates
- Opt in Specialized Stretch Energy Code – additional 3%
- 2022 IRA – tax exempt entities (schools), can receive tax credits as direct pay. Would require a tax attorney to help with the IRA application. This pays for the entire system – for example, from geothermal well to HVAC diffusers
 - Credits will be available till 2032 or when U.S. greenhouse gas emissions from electricity are 25% of 2022 emissions or lower, whichever date is later.
- Mass Saves Path – EUI (energy use intensity) of less than 25 – would set up the project for incentives [this would be a direct pay]
- Total energy use – EUI. KBTU/SF/year – defining a comparable unit of energy use. Benchmark for how much energy the building uses per square foot.
- Net Zero does not need to be a day 1 solution but our team will help chart a path there that avoids costly rework while targeting those strategies that can leverage additional funding sources.
 - Solar panels may be part of the design; if there is room in the budget. In either way, the infrastructure will be set up for easy future installation. There are a number of ways ...
 - Direct ownership – Pro: the school gets the most operational savings, utility and federal rebates, and LEED points. Con: School is responsible for maintenance of the system.
 - Power purchase agreement (PPA) – lease the schools roof, they'll give back the savings to the school. Pros: Lowers utility bill without up-front or maintenance costs. Cons: Less total utility savings as direct ownership. No applicable for rebates such as the IRA and does not count toward LEED points.
 - RECs – purchasing virtual certificates
 - A local library has a successful project as a PPA
 - Solar is a great learning item
 - Greg Horner offered two local solar system analysis & design professionals who are part of the HW Climate Action team. They have a partnership with a local solar installer, Cazeault Solar.
- Difference between LEED System v4.0 and v4.1
 - V4.0 is the current baseline system projects must use
 - Select credits can be upgraded to v4.1, if it's beneficial for the project
 - Prerequisites are required, credits are optional + will be aligned with the school district's goals and priorities
- Thoughtful landscape design can pay for itself with less stormwater infrastructure needed
- Life Cycle Cost Analysis (LCCA) will be conducted when the project moves into the schematic design (SD) phase. All HVAC systems (minimum of 3 options) will be studied both in terms of first, operating and maintenance/replacement costs and 'costs with incentives + rebates'

- Geothermal systems will typically achieve the lowest EUI and typically have the lowest maintenance costs.
- When factoring in Utility incentives and Federal Tax Credits, Geothermal systems can result in the lowest overall capital investment cost option.
- Utility Incentives are not available for building with Natural Gas Service or Fossil Fuel (Gas/propane/oil) heating systems.
- Only Geothermal based HVAC systems qualify for Federal Tax Credits.
- One option that will be studied during Schematic Design is Displacement Ventilation (DV) DV has been designed for many schools. The system works by supplying ventilation air low within the space at a low velocity and slightly cooler temperature. This allows the air to be heated and rise upwards when it comes into contact with heat sources (people, lights, equipment) in space.
- DV is also a very efficient system as it results in a thermal gradient within the space and reduced cooling loads because only the occupied areas of the building. This allows for reduced HVAC equipment and distribution cost because the systems can be 'right sized' to result in a lower system first cost. DV also provides higher ventilation effectiveness since any particle, pathogens in the air are also displaced and return back to the central air handling system where they are filtered.
- GGD has designed many DV systems for schools since 2008. The Schools with DV systems performed best to handle the COVID pandemic due to the high level of filtration and ventilation effectiveness.
- For any HVAC system, high efficiency MERV-14 filters will be installed in ventilation air handling units.
- CO2 sensors will be installed at all densely occupied spaces – which will sense the levels of carbon dioxide in a space and control the system to provide additional outdoor air from the central air handling unit when necessary.
- Additional IAQ measures such as IAQ sensors that measure VOCs and other particulates, and air cleaning systems such as Ultraviolet UVc or Ionization cleaning systems. These systems can provide improved IAQ but also have higher first cost and maintenance costs. For some projects which have had first cost and/or maintenance budget concerns we have designed AHU system to be able to accommodate Air Cleaning devices in the future so the system can be upgraded if there was another Pandemic.
- Healthy Materials - we will select materials and coatings that are low in Volatile Organic Compounds (VOCs). VOCs are chemicals that off-gas into the air and can be potentially harmful. We will avoid the use of Red List materials in high-touch areas.
- Rainwater harvesting may be considered (team has experience with irrigation and flushing). The town has an avid gardening club, this could be a good alignment with the school districts priorities, explore cost benefits analysis for ranges of systems
- How can we best support the students and teachers? Response: do sustainability interventions that are useful to teachers and classrooms [will tie in with the STEM curriculum with project-based learning]. The required metering for LEED might help



fuel the students learning, potentially interface with an energy dashboard [student sustainability task force]

- "Data Acquisition System" (making the building a learning tool), Energy Dashboards will be explored.

Next Steps

- Soden Sustainability to share more information on EcoRise curriculums:
<https://learn.ecorise.org/s/>
- Identify ways to introduce teachers/students into the design process including Schematic Design Sustainability Workshop

Enc: Presentation PDF



Cutler Elementary School: Sustainability Workshop

March 6, 2024

Overview

- Design Team Introductions
- Project Understanding + Requirements
- Sustainability Initiatives
- Opportunities
- LEED Introduction
- Next Steps



Design Team Introductions

Introductions



Colleen Soden

LEED BD+C
LEED ID+C



Kelley Tapia

AIA
WELL AP
LEED BD+C
Fitwel Ambassador



Eric Haggstrom

Director of Sustainability
AIA
LEED AP



Dominick Puniello

PE
CEM
LEED AP



Keith Lane

CEM
LEED AP





Project Understanding + Requirements

Approach: Guiding Principles

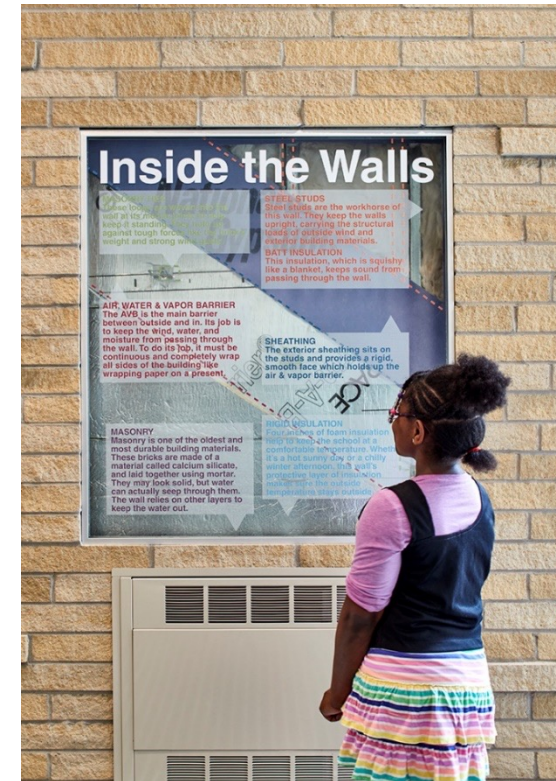
- **Small learning neighborhoods**, with embedded media, STEAM, and Special Education
- **Adaptability & Flexibility** to support growth and varied student needs
- Building that promotes **curiosity, sensory experiences**, and educational **play**
- **Indoor + outdoor** connectedness
- **Sustainable building** as a **learning tool**
- Space to celebrate and **honor student work**



Approach: Design Team

We approach these from a lens that **learning is the top priority**:

- Minimize first cost
- Minimize maintenance
- **Maximize value to district**
- Offer **training** opportunities (students, staff + teachers)
- Considering positioning now for **future incentives**
- Importance of **healthy indoor environments**



MSBA Requirements (Project Advisory #81)

Minimum Requirements per MSBA Project Advisory #81:

- Achieve **Silver** using LEED-Schools v4.0 / v4.1
- Achieve a minimum of 3 (out of 7) points in the following:
 - MR – Building Product Disclosure and Optimization, v4.1 – Material Ingredients (1 point)
 - Specify at least 20 different products from 5 different manufacturers that meet green certification standards
 - EQ – Low Emitting Materials, v4.1 (1 point)
 - Pursuing: Walls, Flooring, Ceilings
 - Optional: Paints + Coatings, Adhesives + Sealants, Walls, Furniture, Composite wood
 - EQ – Indoor Air Quality Assessment, v4.0 (1 point)
 - Perform pre-occupancy building flush-out

The school must meet the minimum energy efficiency requirements described in the MA DOER “Stretch Code Green Community” standards

The school must be solar ready.



Sustainability Initiatives

Sustainability Initiatives: Hamilton-Wenham

- **Hamilton and Wenham Select Boards approved a non-binding Climate Action Resolution in 2022 outlining the following targets:**
 - 20% Reduction of Fossil Fuels by 2025
 - 50% Reduction of Fossil Fuels by 2030
 - 75% Reduction of Fossil Fuels by 2035
 - Net Carbon Zero by 2040.
- **Stakeholders:**
 - Hamilton Wenham Climate Action Team
 - Hamilton Environmental Impact Committee
 - Wenham Climate Action & Sustainability Committee



Opportunities

MSBA PA#81: Extra Reimbursement: 3% + 1%

- For an **extra 3% reimbursement** the project must meet the **Opt-In Specialized Stretch Energy Code**
 - To meet the Opt-In Code you can either be:
 - Net Zero (Zero Energy Pathway)
 - **All Electric Pathway - baseline assumption**
 - Mixed Fuel Pathway (not recommended b/c lose utility incentives)

- For an **additional 1% reimbursement** the project must earn additional material/air quality points (earn 5 of 7 available)
 - MR – Building Product Disclosure and Optimization, v4.1 – Material Ingredients (1 point)
 - EQ – Low Emitting Materials, v4.1 (1 point)
 - EQ – Indoor Air Quality Assessment, v4.0 (1 point)

Finding Value: IRA + Utility Rebates

Inflation Reduction Act

- **Inflation Reduction Act (IRA): provides a 25.5% tax credit** (or grant in the case of non-taxable entities) **for geothermal and solar installations.** *25.5% from the full system – from wells to diffusers for completed system.*
- **Mass Saves Path:**
 - New Construction Path 1 requires EUI < 25, which will require an all-electric HVAC system and no gas connection to the site to qualify. (utility incentives are phasing out for 'mixed fuel' buildings and requiring all electrification)



Impact of IRA + Utility rebates : Geothermal

Geothermal systems have the lower operating costs and lower maintenance costs than other systems. In the past this was offset by a higher initial cost but the Inflation Reduction Act has changed the game.

EXAMPLES OF SYSTEM CHOICES



Baseline	System	First Cost	Combined Utility Cost	EUI	Annual Maint. Cost	Replacement Costs	Total Life-Cycle Savings	Payback (Years)	HVAC SYSTEM LCCA RESULT SUMMARY
1	CODE BASELINE	\$31,080,060	\$634,770	45.9	\$233,140	11,517,600.0	-	-	
2	AIR SOURCE VRF	\$32,013,900	\$587,559	31.8	\$270,060	17,591,200.0	-\$4,691,961	Not Reached	
3	AIR SOURCE HYDRONIC HEAT PUMP	\$32,806,620	\$529,440	29.3	\$238,800	13,720,100.0	\$335,546	44	
4	GEO THERMAL HEAT PUMP	\$39,406,620	\$487,999	27.2	\$226,760	7,802,100.0	-\$382,184	Not Reached	

Payback over 50+ years

Baseline	System	First Cost	Utility Incentive	Net Investment	Combined Utility Cost	EUI	Annual Maint. Cost	Replacement Costs	Total Life-Cycle Savings	Payback (Years)	INCLUDING UTILITY INCENTIVES
1	CODE BASELINE	\$31,080,060	\$520,000	\$30,560,060	\$634,770	45.9	\$233,140	11,517,600.0	-	-	
2	AIR SOURCE VRF	\$32,013,900	\$1,000,000	\$31,013,900	\$587,559	31.8	\$270,060	17,591,200.0	-\$4,211,961	Not Reached	
3	AIR SOURCE HYDRONIC HEAT PUMP	\$32,806,620	\$760,000	\$32,046,620	\$529,440	29.3	\$238,800	13,720,100.0	\$575,546	41	
4	GEO THERMAL HEAT PUMP	\$39,406,620	\$4,275,000	\$35,131,620	\$487,999	27.2	\$226,760	7,802,100.0	\$3,372,816	41	

Payback over 41 years

Baseline	System	First Cost	Utility Incentive	Federal Tax Credit	Net Investment	Combined Utility Cost	Annual Utility \$/s.f.	Annual Maint. Cost	Replacement Costs	Total Life-Cycle Savings	Payback (Years)	INCLUDING UTILITY INCENTIVES & FEDERAL TAX CREDIT
1	CODE BASELINE	\$31,080,060	\$560,000	\$0	\$30,520,060	\$634,770	\$1.68	\$233,140	11,517,600.0	-	-	
2	AIR SOURCE VRF	\$32,013,900	\$1,000,000	\$0	\$31,013,900	\$587,559	\$1.56	\$270,060	17,591,200.0	-\$4,211,961	Not Reached	
3	AIR SOURCE HYDRONIC HEAT PUMP	\$32,806,620	\$760,000	\$0	\$32,046,620	\$529,440	\$1.40	\$238,800	13,720,100.0	\$575,546	41	
4	GEO THERMAL HEAT PUMP	\$39,406,620	\$4,275,000	\$11,821,986	\$23,309,634	\$487,999	\$1.29	\$226,760	7,802,100.0	\$15,194,802	Instant	

With all incentives the system became the lowest first cost

Baseline	System	First Cost	Utility Incentive	Federal Tax Credit	Net Investment	Combined Utility Cost	Annual Utility \$/s.f.	Annual Maint. Cost	Replacement Costs	Total Life-Cycle Savings	Payback (years)
4	GEO THERMAL HEAT PUMP	\$39,406,620	\$4,275,000	\$11,821,986	\$23,309,634	\$487,999	\$1.29	\$226,760	7,802,100.0	\$15,194,802	Instant



Path to Net Zero: Establishing Priorities

Net Zero does not need to be a day 1 solution but our team will help chart a path there that avoids costly rework while targeting those strategies that can leverage additional funding sources

Massing & Solar Orientation

Geothermal System

Improved Envelope

Efficient HVAC Systems

Electrification

Improved Filtration

Solar/PV Arrays

Difficult, Costly or
Impossible to Retrofit



Project can be ready for these
solutions to be easily added

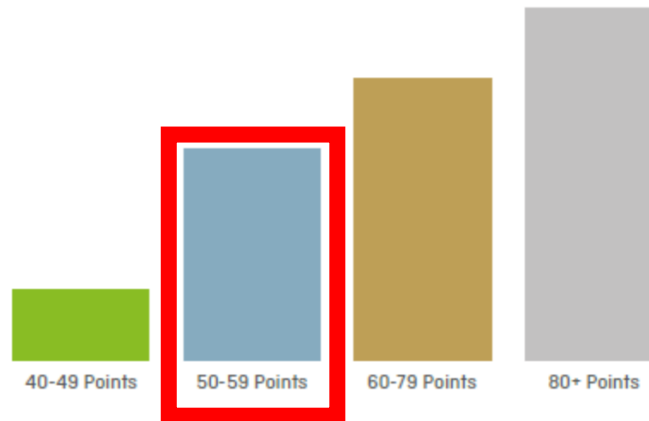


LEED Rating System

LEED Rating System: Overview



The number of points that a project earns determines its level of LEED® certification.



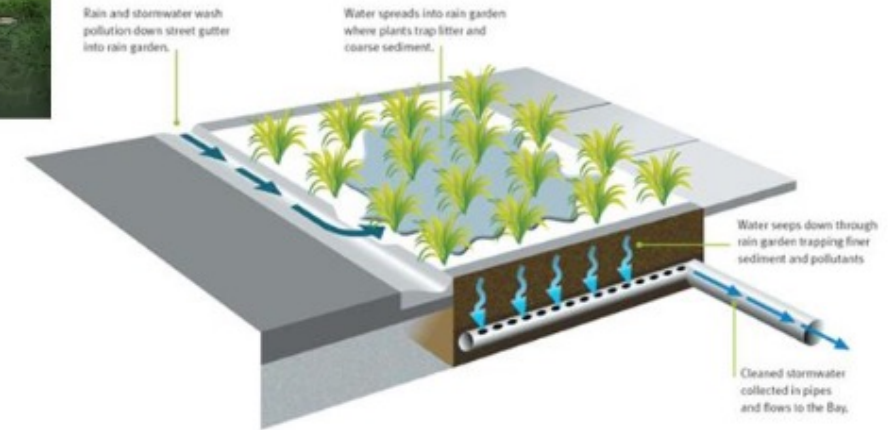


Sustainable Sites

Rain Gardens

Rain Gardens treat stormwater runoff, promote evapotranspiration, and serve as visual amenities

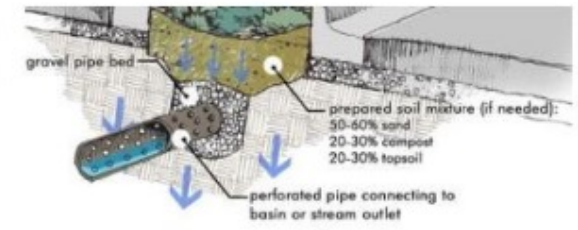
- **Building/Site Element Orientation:** To maximize solar gain and limit energy requirements
- **Stormwater Management:** Bioswales, rain gardens, constructed wetlands, green roof technologies
- **Native Plantings:** To reduce water intake requirements that are typically necessary for non-native and/or exotic plant species
- **Biodiversity:** Introduce varied plant species and ecotones to encourage the creation of diverse natural habitats
- **Recycled Materials:** Utilize site materials (i.e.: furnishings, pavement materials) that maintain recycled content and are reflective of the local context (to limit shipping distances)



CURBS/GUTTERS



INFILTRATION AND IMPROVED WATER QUALITY



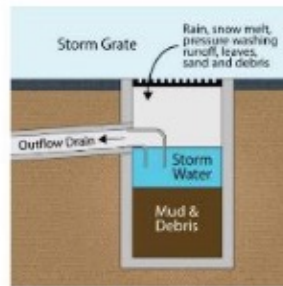
OVERFLOW TO INFILTRATION SYSTEM



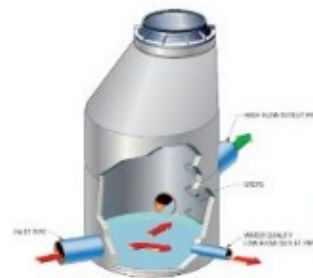


Sustainable Sites

Infiltration Systems



CB



DMH



INF. SYST.



OVERFLOW TO WETLANDS





Energy & Atmosphere: System Selection

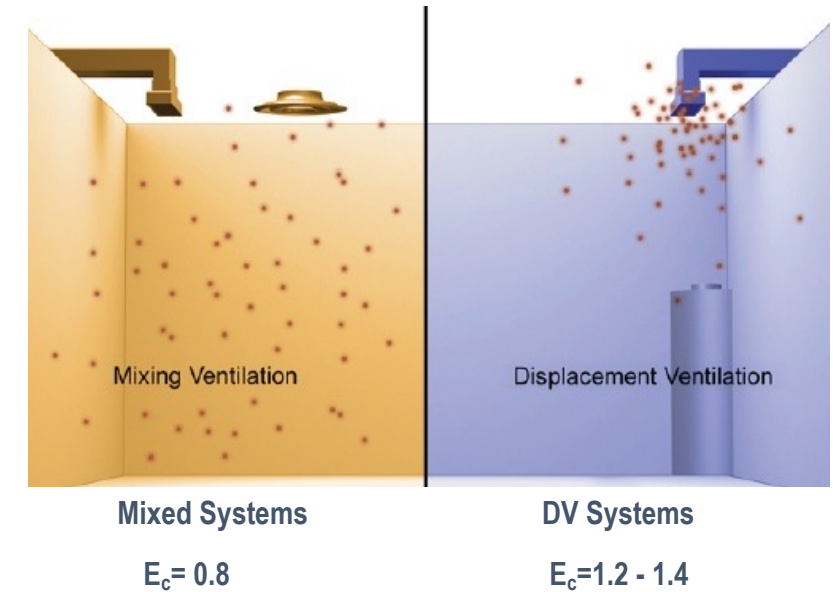
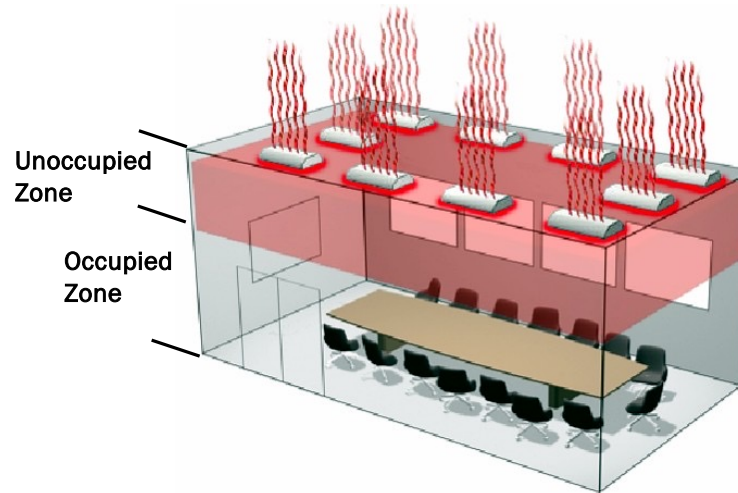
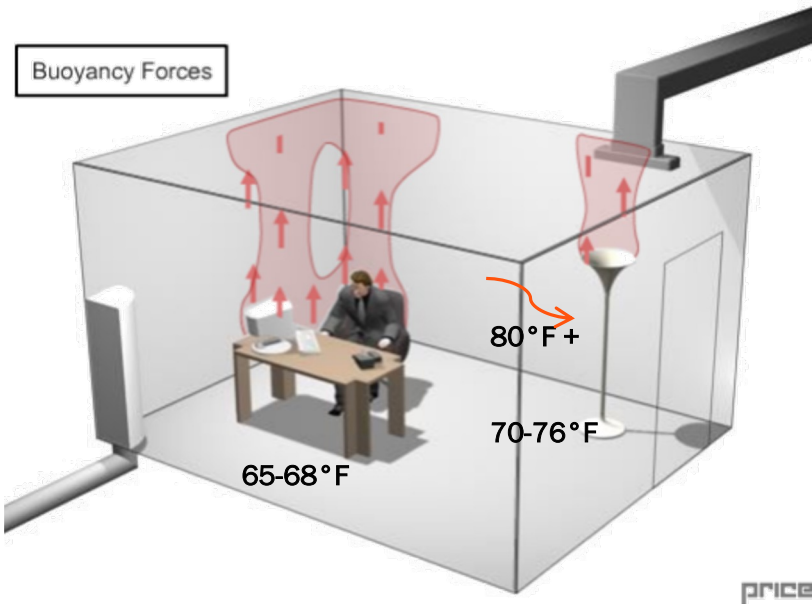
	Option 1 Air-Source VRF System	Option 2 Displacement w/ Air- Source Heat Pump Chiller/Heater Plant	Option 3 Displacement w/ Geothermal Heat Pump Chiller/Heater Plant	Option 4 Air-Source Heat Pump Displacement w/ Supplemental Gas-Fired Boiler Plant
First Cost	\$\$	\$\$\$	\$\$\$\$	\$\$
Cost w/ Incentives & Rebates	\$	\$\$	\$	\$\$
Energy Usage Intensity (EUI)	23-28	22-26	20-24	30-35
Solar PV Required for Code	No	No	No	Yes
Solar PV Required for NZE	Yes	Yes	Yes	Yes
On Site Carbon Emissions	No	No	No	Yes





Indoor Air Quality: Displacement Ventilation

- Displacement Ventilation provides air at the floor which increases the effectiveness and reduces the amount of air mixing compared to traditional ceiling systems. This results in a **more energy efficient** solution that also provides **better air quality**.





Indoor Air Quality: Filtration

- **Best Practice:** The use of MERV-14 filters and space level and centralized CO2 sensors



- *Space Wall CO2 sensor*



- *Unit/Duct CO2 sensor*



- *MERV-14 Filter*

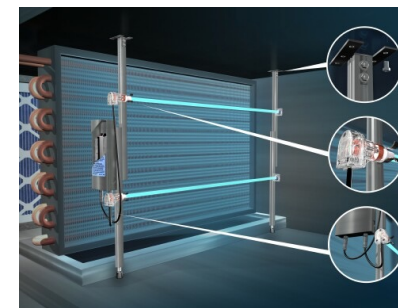
- **Additional Options:** Digital IAQ Sensor Systems and Air Cleaning Systems



- *IAQ Sensors*



- *Ionization Air Cleaning*



- *UVc (germicidal ultra-violet)*





Healthy Materials

- The Living Building Challenge maintains a list of materials known to be harmful to human health referred to as the **Red List**. Careful selection of materials to avoid the use of these materials in high-touch areas with Student and Community Use.
- We will select materials and coatings that are low in Volatile Organic Compounds (VOCs). VOCs are chemicals that off-gas into the air and can be potentially harmful.





Current LEED Scorecard

LEED BD+C: Schools Scorecard



LEED v4 for BD+C: Schools Project Checklist

Y	MY	MN	N		
1				Credit	Integrative Process
2	0	5	8	Location and Transportation	
0	0	0	0	Credit	LEED for Neighborhood Development Location
1				Credit	Sensitive Land Protection
		2		Credit	High Priority Site
	2	3		Credit	Surrounding Density and Diverse Uses
	1	3		Credit	Access to Quality Transit
		1		Credit	Bicycle Facilities
		1		Credit	Reduced Parking Footprint
1				Credit	Electric Vehicles
7	3	1	1	Sustainable Sites	
Y				Prereq	Construction Activity Pollution Prevention
Y				Prereq	Environmental Site Assessment
1				Credit	Site Assessment
	1	1		Credit	Site Development - Protect or Restore Habitat
1				Credit	Open Space
3				Credit	Rainwater Management
	2			Credit	Heat Island Reduction
1				Credit	Light Pollution Reduction
	1			Credit	Site Master Plan
1				Credit	Joint Use of Facilities
6	2	3	1	Water Efficiency	
Y				Prereq	Outdoor Water Use Reduction
Y				Prereq	Indoor Water Use Reduction
Y				Prereq	Building-Level Water Metering
1		1		Credit	Outdoor Water Use Reduction
4	1	1	1	Credit	Indoor Water Use Reduction
	1	1		Credit	Optimize Process Water Use
1				Credit	Water Metering (assuming: tbd)
19	7	5	0	Energy and Atmosphere	
Y				Prereq	Fundamental Commissioning and Verification
Y				Prereq	Minimum Energy Performance
Y				Prereq	Building-Level Energy Metering
Y				Prereq	Fundamental Refrigerant Management
6				Credit	Enhanced Commissioning
12	4			Credit	Optimize Energy Performance (must meet the opt in energy code)
1				Credit	Advanced Energy Metering
	1	1		Credit	Grid Harmonization (Demand Response) - Building capable
	2	3		Credit	Renewable Energy Production
		1		Credit	Enhanced Refrigerant Management
				Credit	Green Power and Carbon Offsets



Must do for MSBA Project Advisory #81 (2023 Policy)

Project Name: Cutler Elementary School
tbd - 237 Asbury St, South Hamilton, MA 01982
Date: 3/6/24

Y	MY	MN	N		
3	5	2	3	Materials and Resources	
Y				Prereq	Storage and Collection of Recyclables
Y				Prereq	Construction and Demolition Waste Management Planning
	1	1	3	Credit	Building Life-Cycle Impact Reduction
1	1			Credit	Building Product Disclosure and Optimization - Environmental Product Declarations
		1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials
1	1			Credit	Building Product Disclosure and Optimization - Material Ingredients
1	1			Credit	Construction and Demolition Waste Management
8	4	4	0	Indoor Environmental Quality	
Y				Prereq	Minimum Indoor Air Quality Performance
Y				Prereq	Environmental Tobacco Smoke Control
Y				Prereq	Minimum Acoustic Performance
2				Credit	Enhanced Indoor Air Quality Strategies
3				Credit	Low-Emitting Materials
1				Credit	Construction Indoor Air Quality Management Plan
1		1		Credit	Indoor Air Quality Assessment
	1			Credit	Thermal Comfort
1		1		Credit	Interior Lighting
	1	2		Credit	Daylight
1				Credit	Quality Views
1				Credit	Acoustic Performance
6	0	0	0	Innovation	
1				Credit	Innovation credit one: Sustainable Purchasing Lamps
1				Credit	Innovation credit two: Green Building Education
1				Credit	EP: BPDO - EPD
1				Credit	EP: Material Ingredients (40 products from 10 manuf)
1				Credit	Pilot: Construction WM certified facility
1				Credit	LEED Accredited Professional
1	0	3	0	Regional Priority	
		1		Credit	Regional Priority: Building Life Cycle (2)
		1		Credit	Regional Priority: Outdoor Water (2)
1				Credit	Regional Priority: Optimize Energy (8)
		1		Credit	Regional Priority: Renewable (2)
Not pursuing: Density + Diverse (4), Site Development: Protect and Restore (2)					
53	21	23	13	TOTALS	
				Possible Points:	110

Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110



Next Steps

- **Schematic Design Sustainability Charrette**
- **Schematic Design HVAC System Options Review and Life Cycle Cost Analysis**

Q & A



Thank you!



Contact us for questions/follow-up

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