APPENDIX

TOWN OF BELMONT HIGH SCHOOL

MODULE 4: SCHEMATIC DESIGN REPORT

JULY 11, 2018

PERKINS+WILL

APPENDIX

APPENDIX

A. SUSTAINABILITY CHARRETTE 1

PERKINS+WILL

Belmont: SD Sustainability Workshop #1

To:	Belmont	Date:	April 23, 2018
From:	Perkins+Will Design Team	Project Name:	Belmont High School
Subject:	Belmont SD Sustainability Workshop #1	Project Number:	153003
	Patrick Cunningham, Perkins+Will Shane Nolan, DPI Tom Gatzunis, DPI Pat Brusch, BHSBC Mark Pugkese, BPD John Phelan, BPD Bill Lovallo, BHSBC Robert Diemer,In Posse Shannon Kaplan, In Posse David Bateman, Acentech Kevin Alles. BALA Brian Maseillo, Acentech Ashley K Lentz, BALA Edward G Dolan, EDG Bill Maidment, Crabtreee Mcgrath Phyllis Marchall, BHSBC Steve Dorrance, Facilities Director Dustin O'Brian, BHS Steve Mazzola, BHS		

Overview-

Over the course of the mtg the public attendees, design professionals and building committee members participated in a number of exercises focused on the topic of plug loads and their influence on the energy efficiency of educational facilities. The purpose of the meetings was to begin a dialog that would facilitate a transition to a more energy conscious high school community and to enable a more accurate energy modeling process during the SD phase of design.

Agenda Items-

1. **Discussion on the merits of energy saving measures**
2. **Discussion on the energy drivers in educational facilities**
    a. **A general overview of the definitions of plug loads vs system loads was presented**
    b. **A series of case studies including schools local to Belmont was presented illustrating their energy drivers and how they might be analogous to Belmont.**
3. **An Interactive break out session was facilitated to help estimate building energy usage, this facilitated a building of awareness of the importance of plug loads on whole building energy performance in high performing schools.**

225 Franklin Street, Suite 1100, Boston, MA 02110 t 617.478.0300 perkinswill.com

A. SUSTAINABILITY CHARRETTE 1

PERKINS+WILL

April 23, 2018
Re: **Belmont SD Sustainability Workshop #1**

a. **Plug load generators by category were discussed**

b. **Areas unique to the new Belmont high school were anticipated in a group exercise.**

4. **Belmont Energy Savings Brainstorming session**

   The design consultants, Facilities Committee and public attendees broke into small groups to discuss and report back on potential strategies for reducing energy usage in the new high school. These strategies were recorded and will be presented back to the group at Workshop 2 for further evaluation.

The following is a summary of what was presented and discussed.

Workshop 1 – Plug Loads – April 23, 2018 Workshop Recap

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Agenda

- Introduction & check-in
- Why should we save energy?
- Where do we use energy? (includes break out)
- Lunch
- How can we save energy? (includes break out)
- Next steps

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Check-in

- Name
- Organization / Role
- On a scale of 1 to 10 – How much do you know about saving energy? (1 = No Knowledge; 10 = Expert)

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Ground Rules

- This meeting is for YOU, please ask questions!
- Please participate! We want to hear from you.
- There are no stupid questions.
- Please respect the opinions and perspectives of others.
- Please put your cell phones on vibrate and put them away.

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Why is saving energy important for Belmont HS?

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Schools With Energy Goals (Zero Net Energy)…

- Can create a culture of working together to achieve a higher goal
- Can create opportunities for enriched student learning & leadership
- Can help foster collaboration
- Can energize the school community and the greater community

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A. SUSTAINABILITY CHARRETTE 1

Choices

- Not doing without – using only what you need
- Choices based on awareness
- Behavior directly impacts energy use

Information to Act On and Learn From

- Real-time data on energy use
- Building dashboards
- Network accessible
- Used to manage energy use
- Used for student projects and research

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Pop Quiz

- How much energy did you use at your house last year?
- Last month?
- How much energy does your refrigerator use?
- How much energy does your TV use when it is on?
- How much energy does your TV use when it is off?

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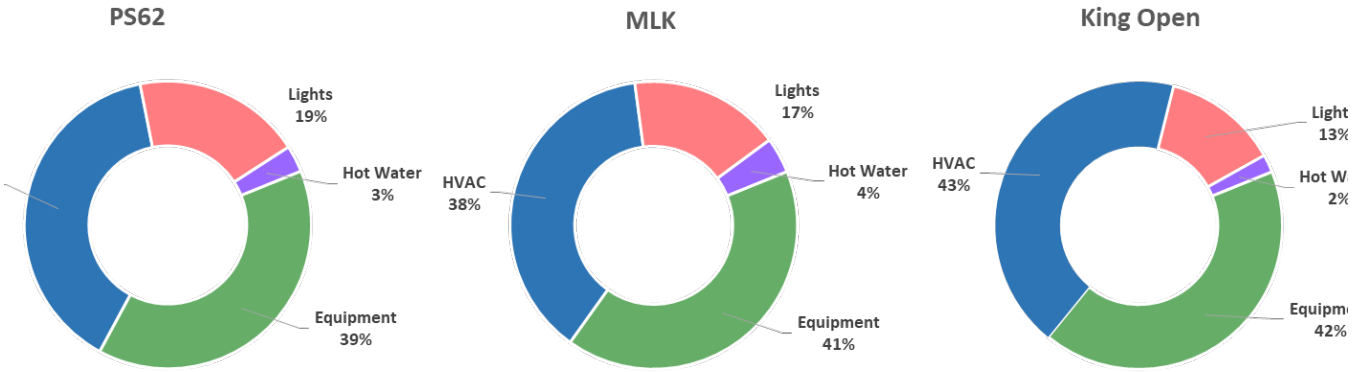
Guess How Much....

Belmont High School

Plug Load Workshop 1 – April 23, 2018

AKF | i:p

Energy Use in High-Performance Schools



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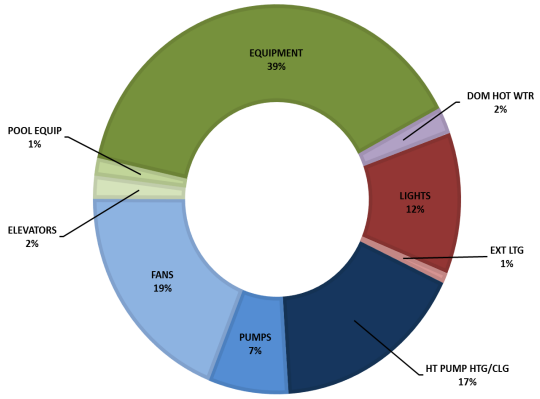
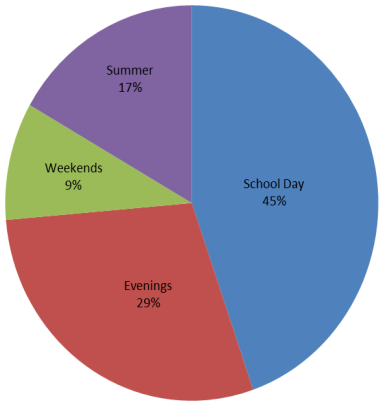
King Open School – Cambridge, MA

Annual Energy Use by End Use



Annual Energy Use by Time of Day & Season



Plug Loads

Plug Loads

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Break Out Session: What Equipment is in our School?

- Each team needs to list all the equipment that uses energy in the school
- Write down 1 piece of equipment per post-it note
- Take 5 min. to think about it first then as a group create the list on post-its
- Sort the post-it notes into the following categories:
  - General Classrooms
  - Specialty Rooms (Art, Science, Gym, Media Center, etc.)
  - Offices
  - Food Service
  - Building Wide Services (wi-fi, PA system, etc.)
- Total Time: 30 Minutes

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Break Out Session: What Equipment is in our School?

- In your group determine what percentage of the total equipment energy is used by each equipment group:
  - General Classrooms
  - Specialty Rooms (Art, Science, Gym, Media Center, Makerspace, etc.)
  - Offices
  - Food Service
  - Building Wide Services

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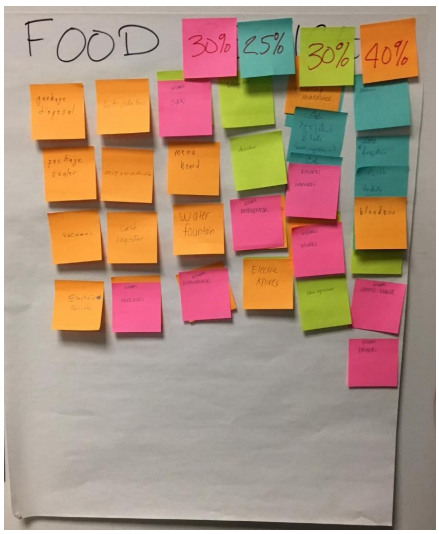
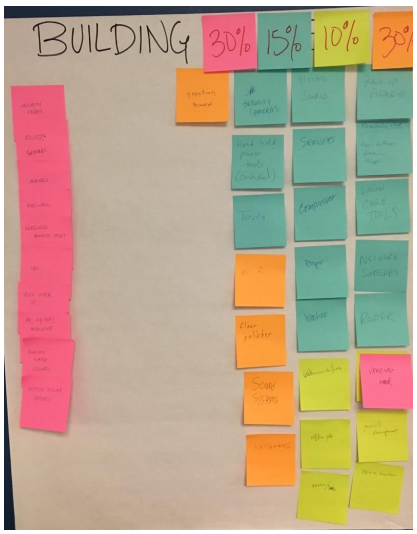
Break Out Session: What Equipment is in our School?





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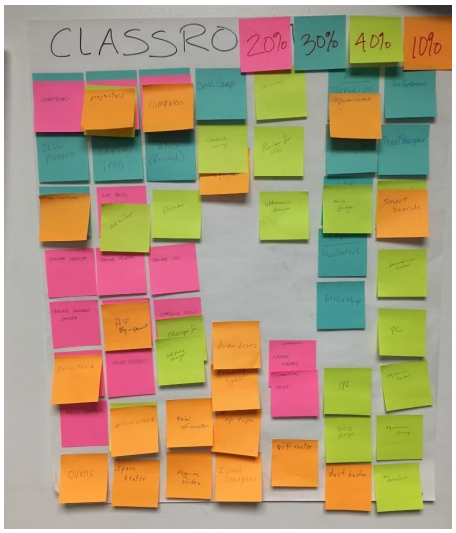
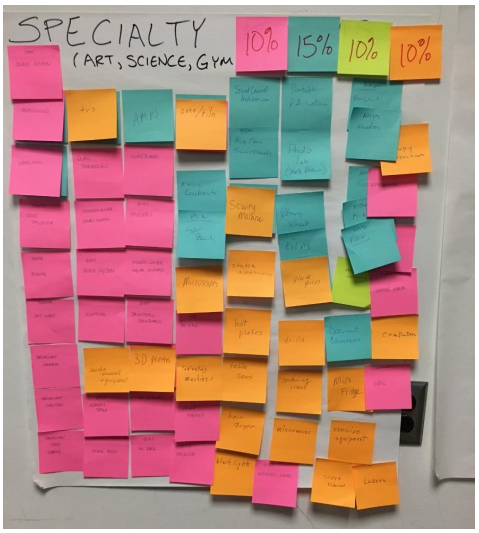
Break Out Session: What Equipment is in our School?





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Plug Loads

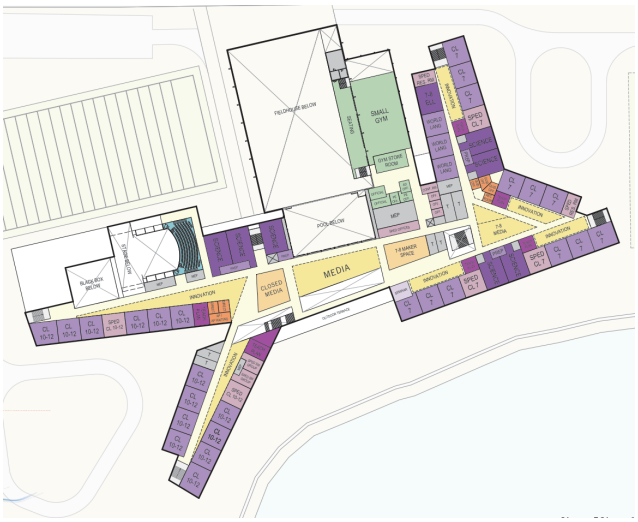
Belmont High School Plug Load Workshop 1 – April 23, 2018

Where will energy be used?

- Kitchen/Servery (cooking, refrigeration & hoods)
- Pool (pumps & heaters)
- Auditorium (lighting & sound)
- Video Production (equipment)
- Offices (computers, printers)
- Science Rooms (hoods)
- Art Rooms (kiln)

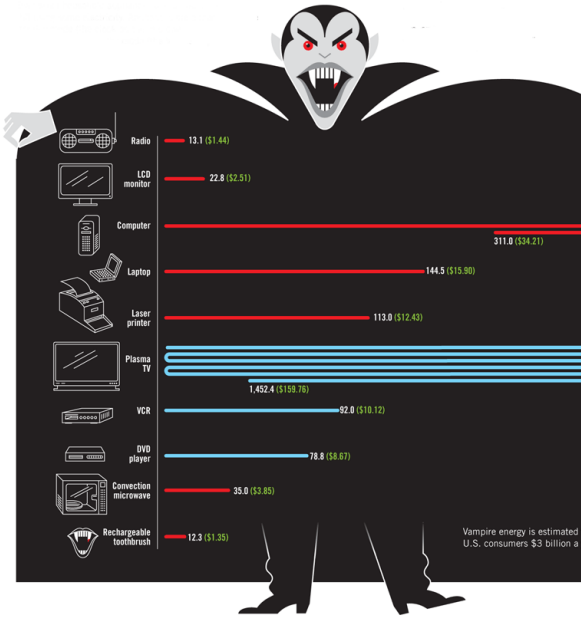
Where will energy by used?

- Classrooms (smart boards)
- Media Center (computers, A/V)
- Innovation Areas (equipment?)
- Maker Spaces (equipment?)
- Robotics (robots)



Energy Saving Ideas

- **Kill vampire loads**
- Many plug loads use energy when we aren't using them and even when we think they are off
- This power draw is called "Vampire Loads"
- The energy code requires that 50% of receptacles be shut off when the building is unoccupied – ***can we go further?***

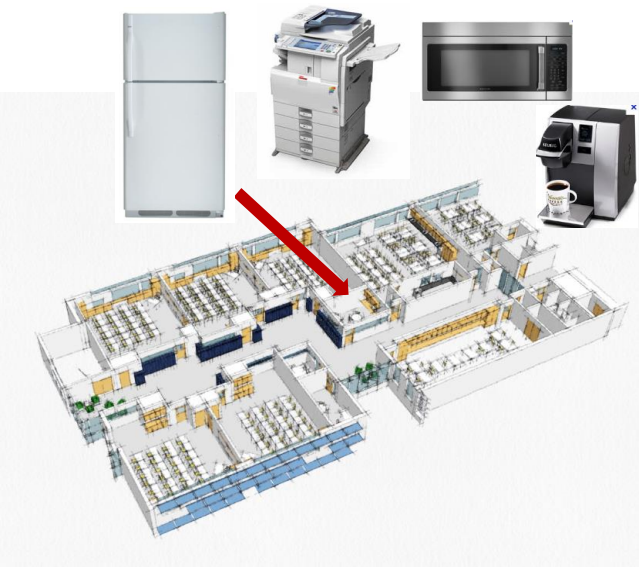


Energy Saving Ideas

- **Richardsville Elementary School "Energy Saving" menu**
- Developed a food menu that did not require cooking equipment to be turned on for an entire day
- Included this menu day every three to four weeks
- Can we do this or something similar?

Energy Saving Ideas

- **MLK School teacher workroom as an energy saving amenity space**
- Dis-incentivize teachers from keeping appliances in classrooms
- Provide nicer teacher workrooms with higher end appliances (that are more efficient)



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Energy Saving Ideas

- **Discovery Elementary School – low energy IT infrastructure**
- Cloud based applications
- All wireless
- No desktop computers
- Shut-down wireless when the building is unoccupied

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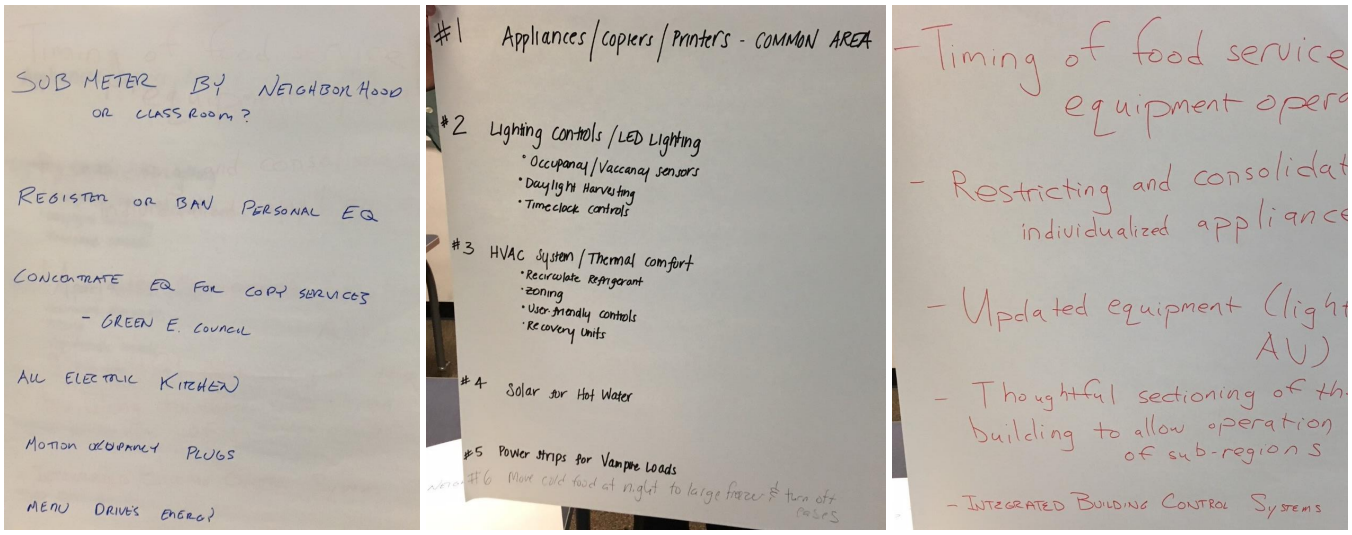
Break Out Session:
How can we save energy in our school?

- In your group, take 5 minutes to silently brainstorm ideas.
- Have each person share their ideas. One person should keep notes on each idea.
- When done, open for discussion and see if there are other ideas, or improvements to ideas.
- As a group vote on the top 5 ideas. These will be presented to everyone.
- Total Time: 45 Minutes

Break Out Session:
How can we save energy in our school?



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BELMONT HIGH SCHOOL HVAC SYSTEM REVIEW

AGENDA

01 / Mechanical System Review
02 / Energy Comparison
03 / Life Cycle Costing
04 / Comparrison Summary

HVAC SYSTEM GOALS

- ALL SYSTEMS TO EXCEED MASS ENERGY CODE BY 20%
- MINIMIZE ANNUAL ENERGY COST & FOSSIL FUEL EMISSIONS
- EXPLORE ZERO NET ENERGY SITE

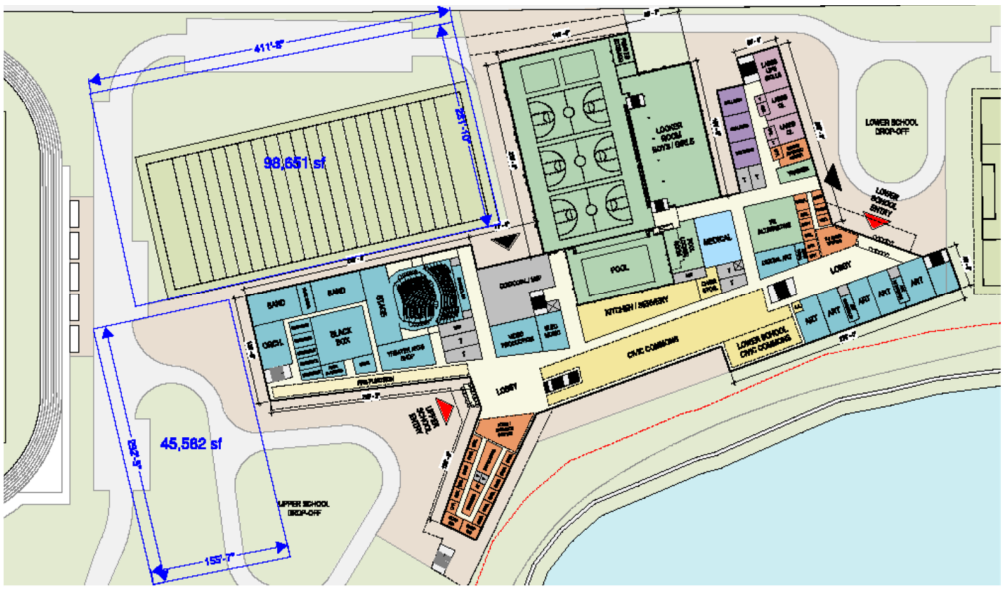
GEO-EXCHANGE SYSTEM WITH INDUCTION UNITS

- GEO-EXCHANGE BOREHOLE FIELD
- HIGH EFFICIENCY WATER-TO-WATER CHILLER-HEATERS
- VARIABLE SPEED PUMPS
- INDUCTION UNITS IN CLASSROOMS
- RADIANT FLOOR HEATING AND COOLING
- VARIABLE AIR VOLUME SINGLE ZONE AIR HANDLING UNITS FOR AUDITORIUM, STAGE, FIELD HOUSE, BLACK BOX
- VARIABLE AIR VOLUME HEAT RECOVERY OUTSIDE AIR UNITS SERVING CLASSROOMS, MEDIA SPACES, INNOVATION SPACES
- CO_2 DEMAND CONTROL VENTILATION IN CLASSROOMS AND SPACES WITH HIGH OCCUPANT DENSITY
- OCCUPANCY SENSORS FOR DAY-TIME TEMPERATURE SET BACK AND VENTILATION REDUCTION

APPENDIX

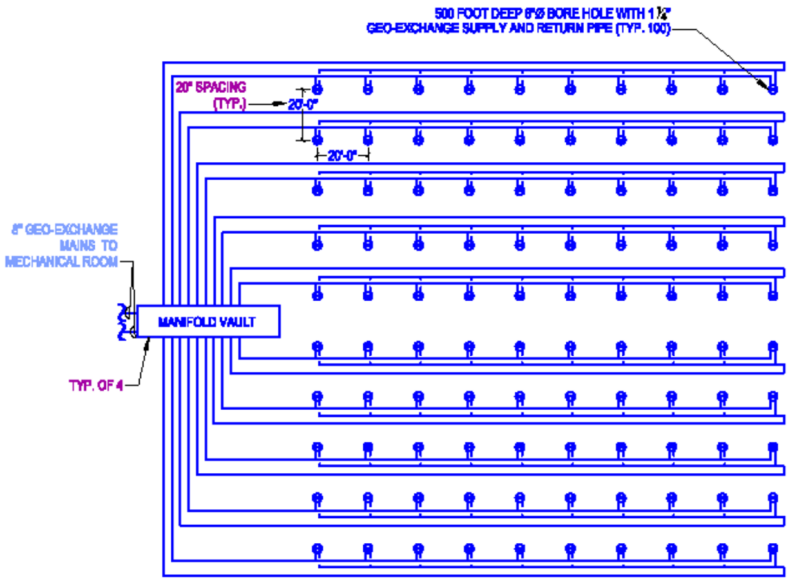
B. FACILITIES ENERGY REVIEW

GEO-EXCHANGE SYSTEM WITH INDUCTION UNITS



GEO-EXCHANGE BOREFIELD AREA

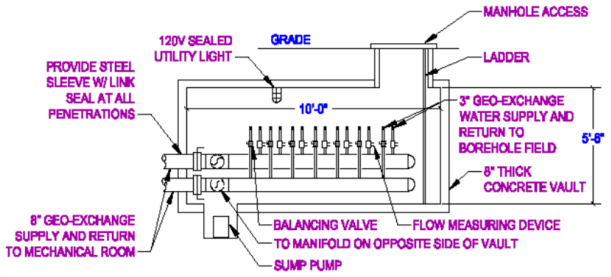
GEO-EXCHANGE SYSTEM WITH INDUCTION UNITS



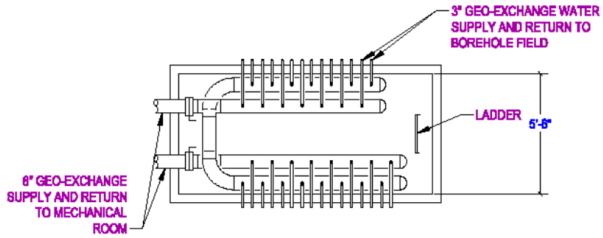
GROUND SOURCE HEAT PUMP BOREHOLE FIELD
(NOT TO SCALE): ALL PIPING BELOW FROST LINE

B. FACILITIES ENERGY REVIEW

GEO-EXCHANGE SYSTEM WITH INDUCTION UNITS

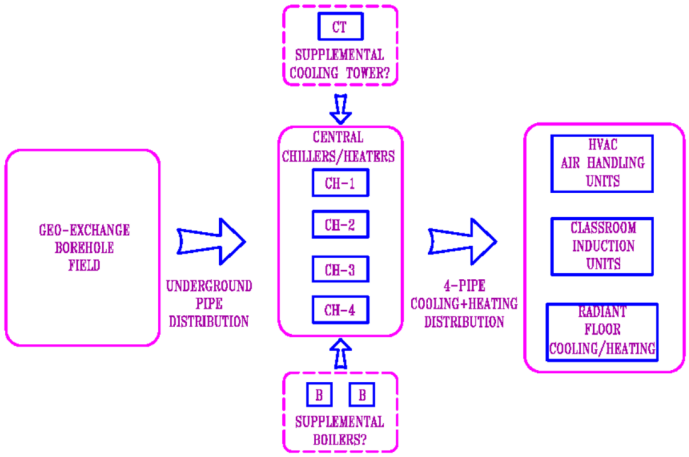


MANIFOLD VAULT WITH TWO SUPPLY AND TWO RETURN MANIFOLDS SECTION VIEW (NOT TO SCALE)



MANIFOLD VAULT WITH TWO SUPPLY AND TWO RETURN MANIFOLDS PLAN VIEW (NOT TO SCALE)

GEO-EXCHANGE SYSTEM WITH INDUCTION UNITS



GEO-EXCHANGE SYSTEM
BASE - NET ZERO OPTION

CHILLER / BOILER SYSTEM WITH INDUCTION UNITS

- HIGH EFFICIENCY WATER COOLED CHILLERS WITH COOLING TOWERS
- GAS-FIRED CONDENSING HOT WATER BOILERS
- VARIABLE SPEED PUMPS
- INDUCTION UNITS IN CLASSROOMS
- RADIANT FLOOR HEATING AND COOLING
- VARIABLE AIR VOLUME SINGLE ZONE AIR HANDLING UNITS FOR AUDITORIUM, STAGE, FIELD HOUSE, BLACK BOX
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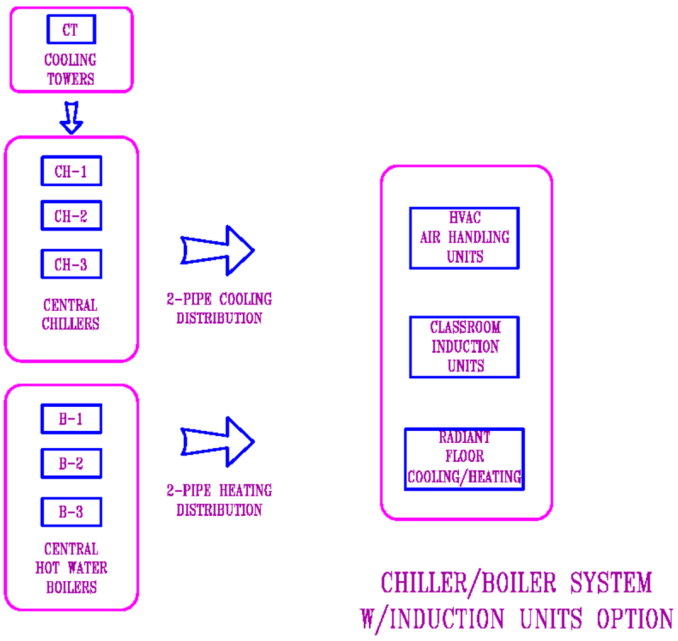
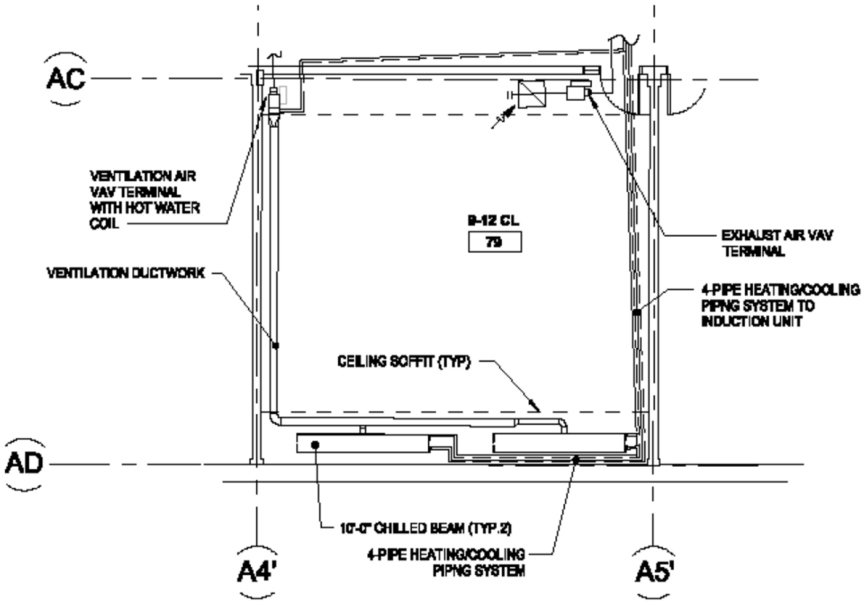
CHILLER / BOILER SYSTEM WITH INDUCTION UNITS



B. FACILITIES ENERGY REVIEW

INDUCTION UNIT CLASSROOM LAYOUT



CHILLER / BOILER SYSTEM WITH FAN COIL UNITS

- ❑ HIGH EFFICIENCY WATER COOLED CHILLERS WITH COOLING TOWERS
- ❑ GAS-FIRED CONDENSING HOT WATER BOILERS
- ❑ VARIABLE SPEED PUMPS
- ❑ FAN COIL UNITS IN CLASSROOMS
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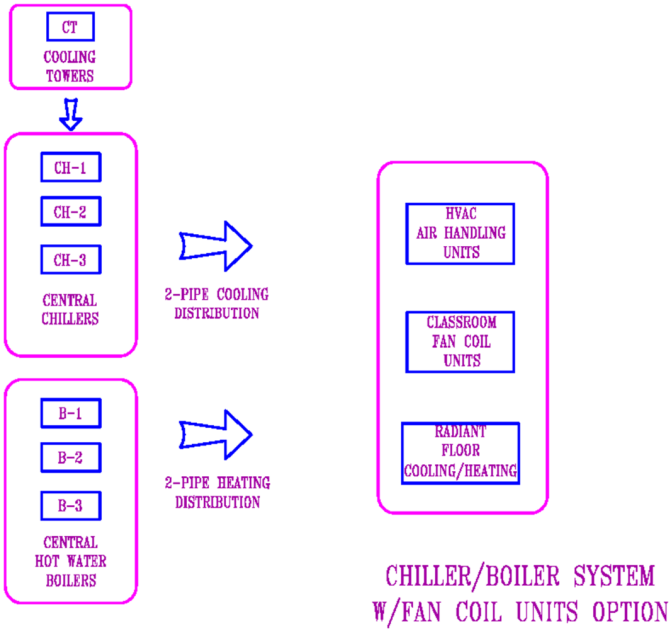
B. FACILITIES ENERGY REVIEW

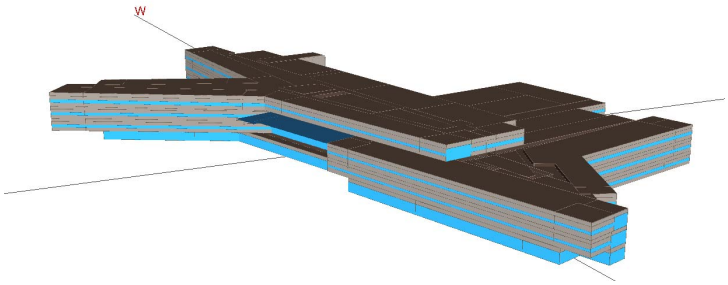
CHILLER / BOILER SYSTEM WITH FAN COIL UNITS



ENERGY COMPARISON

HVAC System Options:

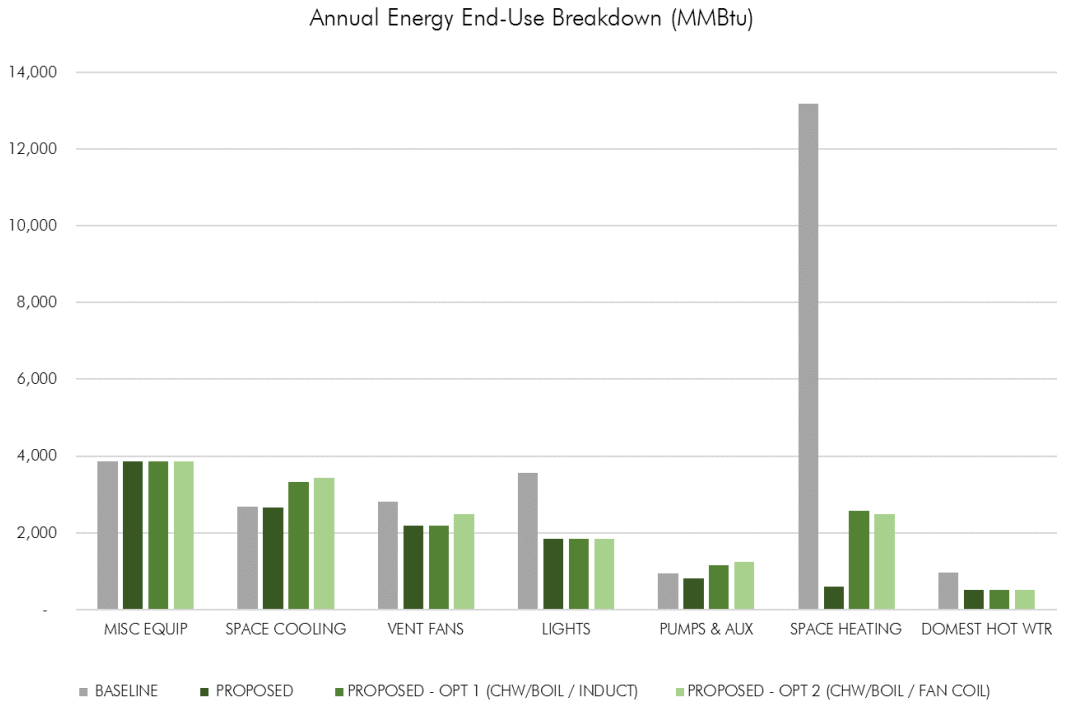
- Proposed (Geothermal & Induction Units
- Option 1 (Chiller/Boiler & Induction Units)
- Option 2 (Chiller/Boiler & Fan Coils)



B. FACILITIES ENERGY REVIEW

ENERGY COMPARISON

SUMMARY - ENERGY AND COST	TOTAL CONSUMPTION (MMBTU)	EUI (kbtu/sf/yr)	SITE ENERGY SAVINGS (%)	ESTIMATED ANNUAL UTILITY COST ($)	UTILITY COST SAVING (%)	ANNUAL UTILITY COST DELTA vs. PREFERRED/ PROPOSED DESIGN
ASHRAE 90.1-2013 BASELINE	28,039	58.42	-	$697,770	-	-
PROPOSED (GEOTHERMAL / INDUCTION UNITS)	12,490	26.02	55%	$539,431	23%	-
PROPOSED - OPT 1 (CHILLER/BOILER/ INDUCT)	15,494	32.28	45%	$563,248	19%	$23,817
PROPOSED - OPT 2 (CHILLER/BOILER/ FAN COIL)	15,894	33.11	43%	$582,901	16%	$43,469

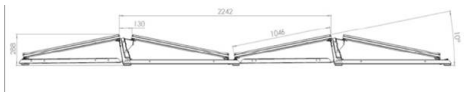


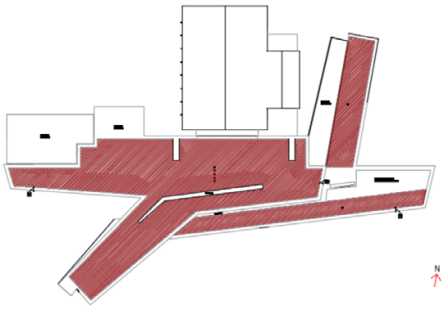
APPENDIX

B. FACILITIES ENERGY REVIEW

PV PRODUCTION ON ROOF

- Possible PV locations have been shown in red. Approximately 3,394 Panels, 95,900 SF
- Panels would be mounted in bi-fold manner – 'east' & 'west'
- SD estimated roof energy generation based on a 340W PV panel is 1,190,650 kWh





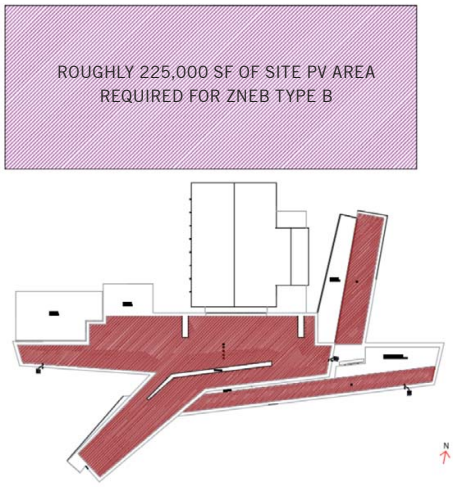
PV REQUIREMENTS

	Total Consumption (MMBTU)	Equivalent kWh	% Offset by 95,900 SF of Panels on Roof	Energy Remaining	# of Panels	Site PV Canopy Area Required (SF)
ASHRAE 90.1-2013 BASELINE	28,039	8,217,420	14%	7,026,764	17,061	482,045
PROPOSED (GEOTHERMAL / INDUCTION UNITS)	12,490	3,660,458	32%	2,469,802	5,997	169,431
PROPOSED - OPT 1 (CHILLER/BOILER/INDUCT)	15,494	4,540,843	26%	3,350,187	8,134	229,827
PROPOSED - OPT 2 (CHILLER/BOILER/ FAN COIL)	15,894	4,658,072	26%	3,467,416	8,419	237,869

B. FACILITIES ENERGY REVIEW

PV PRODUCTION ON ROOF

- Overall, PV on the roof would offset roughly 14% of the baseline building's annual energy
- PV on the roof would offset roughly 25 - 32% of the improved HVAC cases.
- To get the Geothermal Case to Net Zero, an additional approximately 6,000 panels would need to be mounted on the site. (This does not include any contingency)
- The purple area shows how much more PV would be needed.



NET ZERO ENERGY

NZEB:A	**Renewable energy harvested within the building footprint**
NZEB:B	Renewable energy harvested within the building footprint and on the site
NZEB:C	Renewable energy harvested within the building footprint, 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

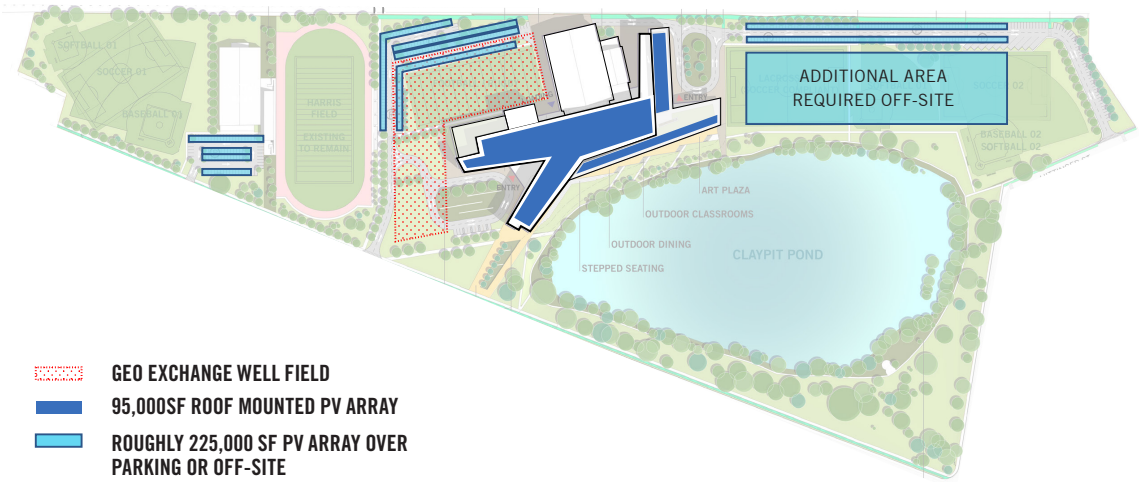
Net-Zero Energy Buildings: A Classification System Based on Renewable Energy Supply Options, NREL, June 2010

APPENDIX

B. FACILITIES ENERGY REVIEW

SITE PLAN

SITE PLAN WITH ESTIMATED PV REQUIRED TO ACHIEVE NET ZERO ENERGY



B. FACILITIES ENERGY REVIEW

LIFE CYCLE COST SUMMARY

Life Cycle Cost Analysis for HVAC Options

30 year life-cycle cost analysis for three HVAC system options.

Type of Analysis ..... Public Sector Lifecycle Analysis
Type of Design Alternatives ..... Independent
Length of Analysis ..... 30 yrs
Discount Rate ..... 2.25 %

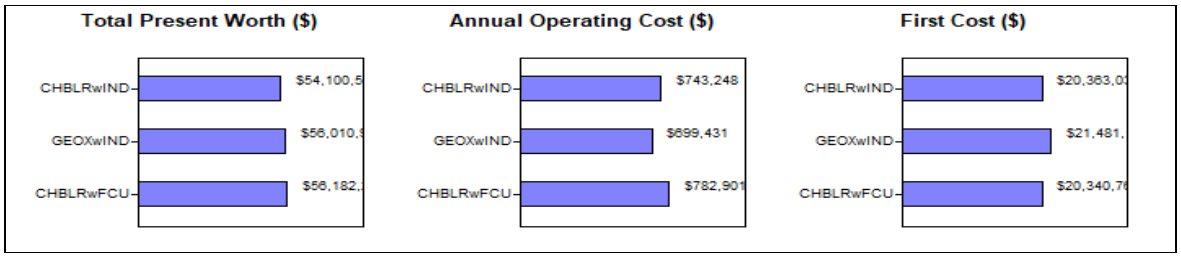


Table 1. Executive Summary

Economic Criteria	Best Design Case for Each Criteria	Value ($)
Lowest Total Present Worth	Chiller/ Boiler with Induction	$54,100,534
Lowest Annual Operating Cost	Geo-Exchange with Induction	$699,431
Lowest First Cost	Chiller/ Boiler with Fan Coil Units	$20,340,759

Table 2. Design Cases Ranked by Total Present Worth

Design Case Name	Design Case Short Name	Total Present Worth ($)	Annual Operating Cost ($/yr)	First Cost ($)
Chiller/ Boiler with Induction	CHBLRwIND	$54,100,534	$743,248	$20,363,034
Geo-Exchange with Induction	GEOXwIND	$56,010,898	$699,431	$21,481,139
Chiller/ Boiler with Fan Coil Units	CHBLRwFCU	$56,182,200	$782,901	$20,340,759

SYSTEM PROS AND CONS

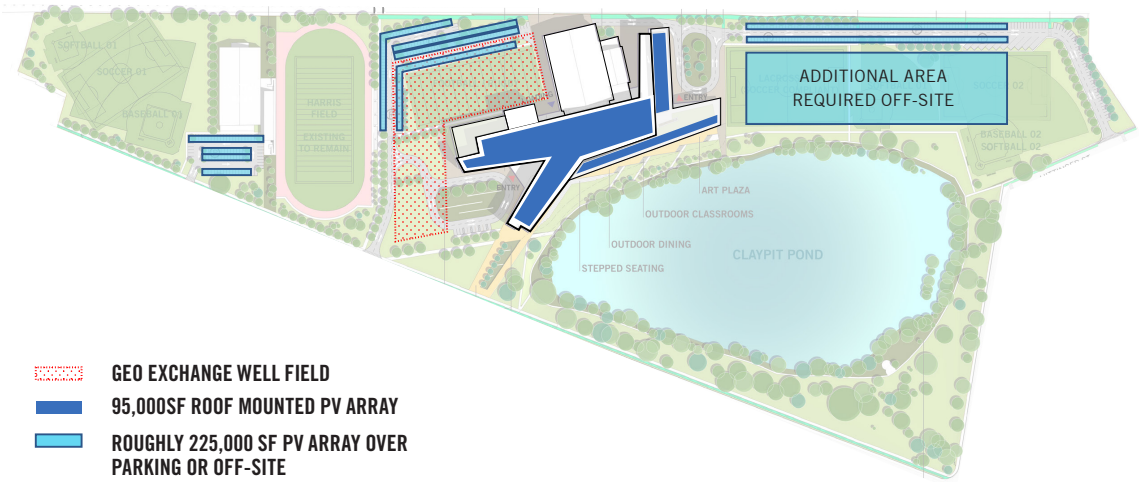
SYSTEMS	GEO-EXCHANGE w/INDUCTION	CHILLER/BOILER w/INDUCTION	CHILLER/BOILER w/FAN COIL UNITS
PROS	HIGHEST EFFICIENCY COOLING AND HEATING	HIGH EFFICIENCY COOLING AND HEATING	HIGH EFFICIENCY COOLING & HEATING
	LOWEST ANNUAL OPERATING COST	CONVENTIONAL CHILLER/BOILER CENTRAL PLANT	CONVENTIONAL CHILLER/ BOILER CENTRAL PLANT
	CENTRAL PLANT PRIMARILY CHILLER AND PUMP MAINTENANCE	LOWEST 30 YR LIFE-CYCLE COST	LOW MAINTENANCE INDUCTION UNITS AND RADIANT FLOOR SYSTEMS
	CENTRAL PLANT WITH NO OUTDOOR EQUIPMENT NOISE	LOW MAINTENANCE INDUCTION UNITS AND RADIANT FLOOR SYSTEMS	
	POTENTIAL FOR NO FOSSIL FUEL		
	GREATEST POTENTIAL FOR NET ZERO		
	CENTRAL PLANT WITH HIGH LIFE EXPECTANCY		
	LOW MAINTENANCE INDUCTION UNITS AND RADIANT FLOOR SYSTEMS		
CONS	HIGHEST FIRST COST w/GEO-EXCHANGE BOREHOLES & ASSOCIATED PIPING	MODERATE FIRST COST W/INDUCTION UNITS	MODERATE FIRST COST w/FAN COIL UNITS
	HIGHEST 30 YR LIFE-CYCLE COST	HIGH LEVEL CHILLER/COOLING TOWER CENTRAL PLANT CONTROLS	HIGH LEVEL CHILLER/COOLING TOWER CENTRAL PLANT CONTROLS
	SOPHISTICATED CHILLER-HEATER CONTROLS/ TECHNICAL EXPERTISE	HIGH LEVEL COOLING TOWER MAINTENANCE (WATER TREATMENT)	HIGH LEVEL COOLING TOWER MAINTENANCE (WATER TREATMENT)
	MAY REQUIRE SUPPLEMENTAL HEAT REJECTION OR HEAT ADDITION INITIALLY OR IN THE FUTURE	LOWER LIFE EXPECTANCY CENTRAL PLANT COMPONENTS (COOLING TOWERS & BOILERS)	LOWER LIFE EXPECTANCY CENTRAL PLANT COMPONENTS (COOLING TOWERS & BOILERS)
		COOLING TOWER OUTDOOR NOISE	COOLING TOWER OUTDOOR NOISE/ FAN COIL UNITS MODERATE INDOOR NOISE
			HIGH FAN COIL UNIT MAINTENANCE (FILTERS, MOTORS, CONDENSATE)
COMMON FEATURES			
RADIANT FLOOR COOLING & HEATING	VERY LOW MAINTENANCE/ HIGHEST COOLING & HEATING EFFICIENCY/ REDUCES DUCTWORK DISTRIBUTION FOR COOLING		
DEMAND CONTROL VENTILATION	REDUCES OUTSIDE VENTILATION AIR WHEN OCCUPANCY IS LOW OR SPACE IS UNOCCUPIED/ REDUCES ENERGY CONSUMPTION		
HEAT RECOVERY VENTILATION UNITS	PRE-CONDITIONING OF OUTSIDE VENTILATION AIR USING EXHAUST AIR/ SIZED FOR VENTILATION/ REDUCES DUCT SIZES AND FAN ENERGY		
VAV AIR HANDLING UNITS	REDUCES FAN ENERGY DURING PERIODS OF LOW DEMAND		

APPENDIX

B. FACILITIES ENERGY REVIEW

SITE PLAN

SITE PLAN WITH ESTIMATED PV REQUIRED TO ACHIEVE NET ZERO ENERGY



B. FACILITIES ENERGY REVIEW

LIFE CYCLE COST SUMMARY

Life Cycle Cost Analysis for HVAC Options

30 year life-cycle cost analysis for three HVAC system options.

Type of Analysis ..... Public Sector Lifecycle Analysis
Type of Design Alternatives ..... Independent
Length of Analysis ..... 30 yrs
Discount Rate ..... 2.25 %

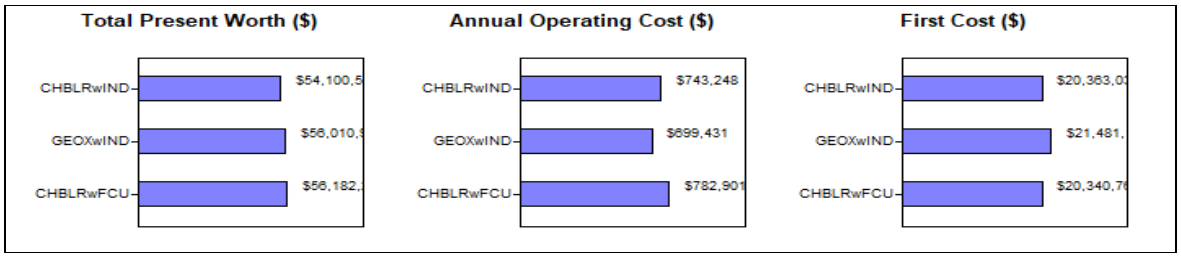


Table 1. Executive Summary

Economic Criteria	Best Design Case for Each Criteria	Value ($)
Lowest Total Present Worth	Chiller/ Boiler with Induction	$54,100,534
Lowest Annual Operating Cost	Geo-Exchange with Induction	$699,431
Lowest First Cost	Chiller/ Boiler with Fan Coil Units	$20,340,759

Table 2. Design Cases Ranked by Total Present Worth

Design Case Name	Design Case Short Name	Total Present Worth ($)	Annual Operating Cost ($/yr)	First Cost ($)
Chiller/ Boiler with Induction	CHBLRwIND	$54,100,534	$743,248	$20,363,034
Geo-Exchange with Induction	GEOXwIND	$56,010,898	$699,431	$21,481,139
Chiller/ Boiler with Fan Coil Units	CHBLRwFCU	$56,182,200	$782,901	$20,340,759

SYSTEM PROS AND CONS

SYSTEMS	GEO-EXCHANGE w/INDUCTION	CHILLER/BOILER w/INDUCTION	CHILLER/BOILER w/FAN COIL UNITS
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	CENTRAL PLANT PRIMARILY CHILLER AND PUMP MAINTENANCE	LOWEST 30 YR LIFE-CYCLE COST	LOW MAINTENANCE INDUCTION UNITS AND RADIANT FLOOR SYSTEMS
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	CENTRAL PLANT WITH HIGH LIFE EXPECTANCY		
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CONS	HIGHEST FIRST COST w/GEO-EXCHANGE BOREHOLES & ASSOCIATED PIPING	MODERATE FIRST COST W/INDUCTION UNITS	MODERATE FIRST COST w/FAN COIL UNITS
	HIGHEST 30 YR LIFE-CYCLE COST	HIGH LEVEL CHILLER/COOLING TOWER CENTRAL PLANT CONTROLS	HIGH LEVEL CHILLER/COOLING TOWER CENTRAL PLANT CONTROLS
	SOPHISTICATED CHILLER-HEATER CONTROLS/ TECHNICAL EXPERTISE	HIGH LEVEL COOLING TOWER MAINTENANCE (WATER TREATMENT)	HIGH LEVEL COOLING TOWER MAINTENANCE (WATER TREATMENT)
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		COOLING TOWER OUTDOOR NOISE	COOLING TOWER OUTDOOR NOISE/ FAN COIL UNITS MODERATE INDOOR NOISE
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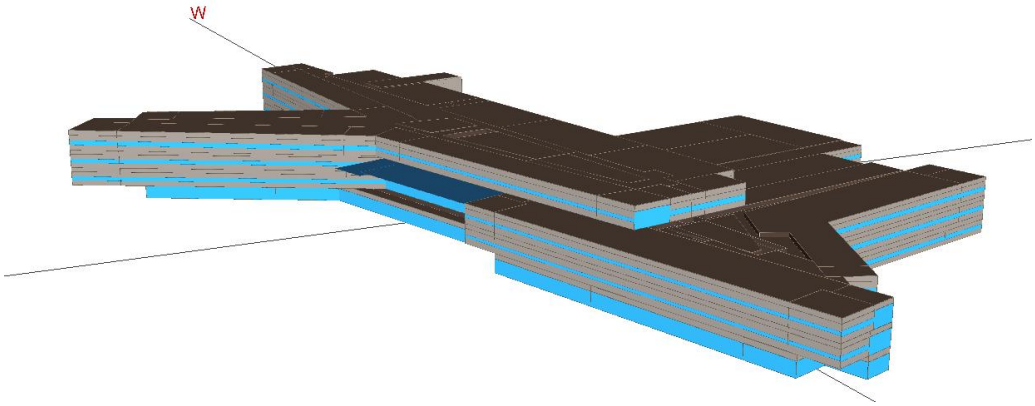
VAV AIR HANDLING UNITS	REDUCES FAN ENERGY DURING PERIODS OF LOW DEMAND		

APPENDIX

C. LEED BASELINE ENERGY MODEL REPORT

DRAFT – Preliminary Design Energy Model LEED Summary Report

Belmont High School
Belmont, MA



June 20, 2018
AKF Project No. 180358-000

C. LEED BASELINE ENERGY MODEL REPORT

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

The Belmont High School project contains approximately 480,000 SF of built space, which includes classrooms, maker space, a general purpose gym, a field house, a kitchen/cafeteria, and a variety of auditorium/band/learning commons programmatic area. The purpose of the energy model is drive design decisions, reduce energy consumption towards Net Zero Energy, show Massachusetts Stretch Energy Code Compliance and provide LEED Optimize Energy Credit documentation. This report specifically focuses on the LEED goals, and identifies the proposed design's performance relative to an ASHRAE 90.1-2010 Appendix G baseline model in order to demonstrate LEED v4 compliance and understand the number of LEED "Optimize Energy Performance" points anticipated to be achieved for the current design.

Inputs for the proposed energy model are based on the April 2018 Revit Model, ASHARE 90.1-2010 Appendix G baseline assumptions, the April 2018 BHS Envelope Summary, and the April 2018 HVAC Narratives provided by Bala Consulting Engineers.

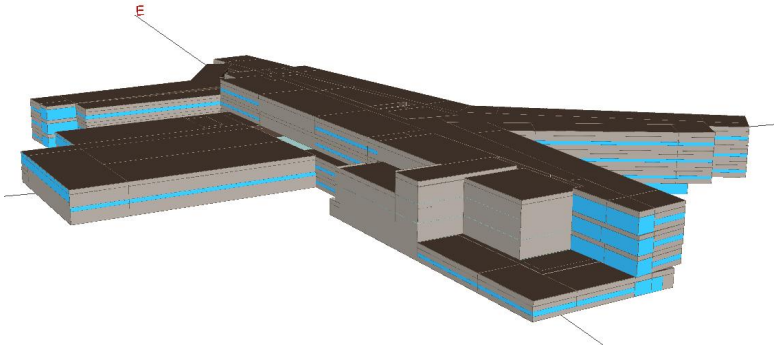
The following table shows the modeled results for total annual energy consumption and annual energy cost for the proposed design as it relates to the LEED ASHRAE 90.1-2010 Appendix G Baseline.

SUMMARY TABLES - ENERGY AND COST	TOTAL CONSUMPTION (MMBTU)	EUI (kbtu/sf/yr)	SITE ENERGY SAVINGS (%)	ESTIMATED ANNUAL ENERGY COST ($)	ENERGY COST SAVINGS (%)	LEED Points
BASELINE (LEED)[1]	24,406	55	-	$ 991,131	-	-
PROPOSED	15,342	34	37%	$ 539,431	46%	16

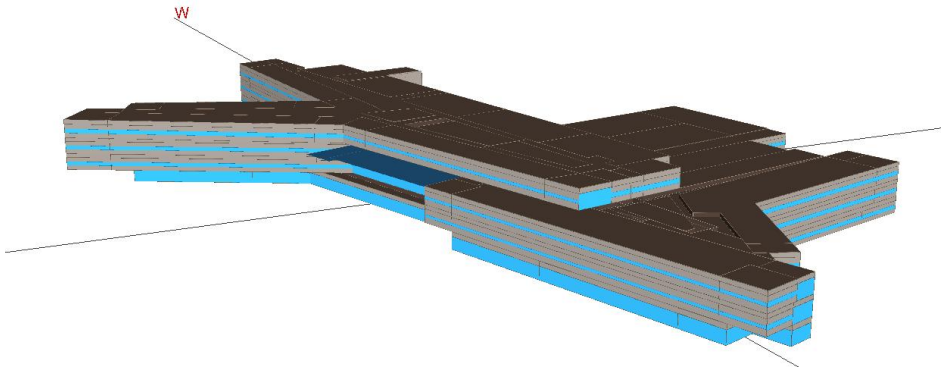
[1] For the purposes of demonstrating MA Stretch code compliance, an ASHRAE 90.1-2013 baseline model was previously developed. Although it is not the focus of this report, it is noted that the Code/90.1-2013 baseline outperforms the LEED/90.1-2010 Baseline by 30% on an annual cost basis, but it underperforms it by 15% on site energy consumption. This discrepancy is a result of the Code/90.1-2013 model's HVAC systems using relatively inexpensive natural gas heating (with a site energy disadvantage), whereas the LEED/90.1-2010 Baseline model uses electric resistance heating which is more expensive than natural gas but comes with a site energy advantage.

C. LEED BASELINE ENERGY MODEL REPORT

Energy Model Images



Northwest Corner View



Southeast Corner View

Energy Modeling Disclaimer

Building energy modeling is a comparative tool used for understanding the relative impact of alternate strategies and systems on annual energy use and cost. Energy modeling is not an absolute predictor of actual energy use or cost and shall not be relied on to predict actual building performance. Changes in construction, variable weather conditions, operational characteristics, end-user input, miscellaneous electrical and gas loads, controls alterations and other unpredictable metrics prevent energy models from predicting the actual annual energy consumption of any facility.

2. ENERGY MODEL RESULTS

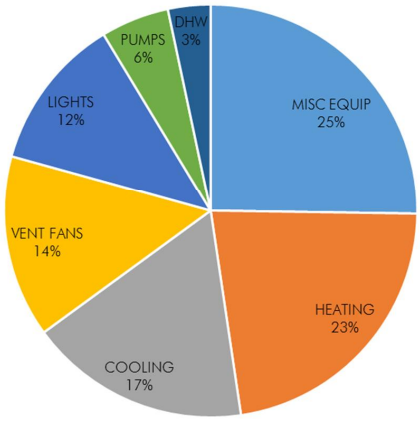
General

The following charts and tables show a breakdown of energy consumption by end-use for the proposed design and ASHRAE 90.1-2010 LEED baseline model.

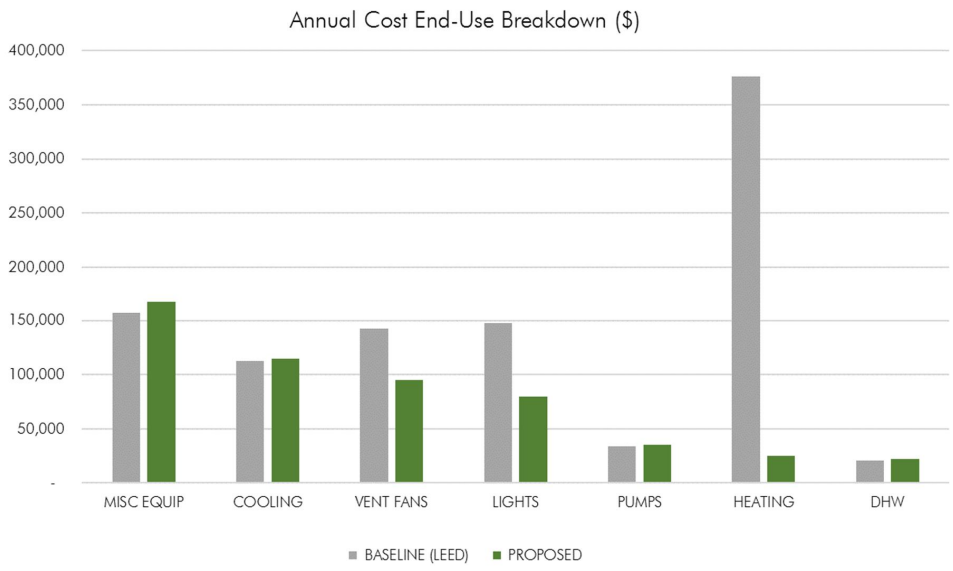
SUMMARY TABLES - COST ($)	Electricity ($)	Gas ($)	Total Cost ($)	COST SAVINGS (%)	LEED Points
BASELINE (LEED)	991,131	-	991,131	-	-
PROPOSED	539,431	-	539,431	46%	16

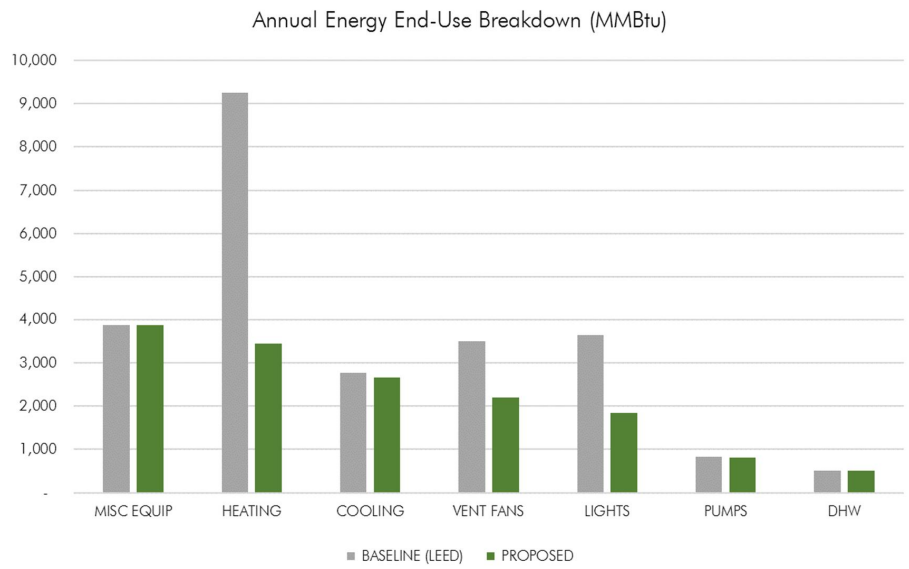
SUMMARY TABLES - ENERGY	Site MMBtu	EUI (kBtu/sf/yr)	SITE ENERGY SAVINGS (%)
BASELINE (LEED)	24,406	55	
PROPOSED	15,342	34	37%

Proposed Design Annual Energy End-Use Breakdown (MMBtu)



C. LEED BASELINE ENERGY MODEL REPORT





3. ENERGY MODEL INPUTS

Code Assumptions for Proposed Model

Unless otherwise noted, proposed design assumptions for unknown model inputs are set to ASHRAE 90.1-2013 requirements (based on MA Stretch Energy Code), whereas the LEED baseline model performance is based on ASHRAE 90.1-2010.

Project and Site Information

Energy Baseline (LEED)	ASHRAE 90.1-2010 Appendix G
Weather	TMY3\MA_Boston_Logan_Intl_Arp.bin
Orientation	Plan North = North
ASHRAE Climate Zone	5A

Utility Rate Structure

Electricity	Belmont Large Municipal with Demand Rate. Distribution Charge: $190.8 / month Sum of Energy Charges: $0.113/kWh Sum of Demand Charges: $6.36/kW Winter, $8.48/kW Summer
Natural Gas	EIA State Average: $0.986 / Therm

C. LEED BASELINE ENERGY MODEL REPORT

Geometry and Architecture

	Proposed Design
Zoning	Based on April 18, 2018 Revit Model
Gross Area	▪ Total Conditioned Space: ~445,000 ▪ Modeled Area by Floor: – 1: 159,600 SF – 2: 113,000 SF – 3: 102,100 SF – 4: 70,200 SF
Floor to Floor Heights	▪ Floor-to-Floor Height: – 1: 13'-8" – 2: 14'-3" – 3: 14'-3" – 4: 16'-0"

Occupancy and Load Profiles

The table at the end of this report provides a detailed analysis of modeling assumptions made for occupancy scheduling, population density, lighting w/sf and equipment w/sf for specific spaces.

Building Envelope Performance

	Baseline Design	Proposed Design
Window-to-Wall Ratio (Gross wall - floor-to-floor)	Window-to-Wall Ratio: Same as Proposed	Window-to-Wall Ratio: 28% per April 11, 2018 Belmont Envelope Summary and April 11, 2018 BHS Façade Analysis showing Glazing/Curtainwall Façade and Academic Mass (Combo Glazing/Solid)
Glazing Performance (assembly values)	ASHRAE 90.1-2010. Vertical Glazing: – U-assembly: 0.45 – SHGC: 0.4	Per 04/11/2018 Belmont Envelope Summary: Glass Type 1: U-0.29 / SHGC-0.29 Glass Type 2: U-0.28 / SHGC-0.29 Glass Type 3: U-0.74 / SHGC-0.42
External Shades	N/A	Various shades throughout building, based on April 2018.
Above Grade Walls, Steel Frame	ASHRAE 90.1-2010: U-assembly: 0.064	Per 04/11/2018 Belmont Envelope Summary: Wall Type 1: U-0.042 Wall Type 2: U-0.036 Wall Type 3: U-0.036
Sub-grade Walls	N/A	N/A
Slab-on-Grade	N/A	N/A
Roof – Insulation entirely above deck	ASHRAE 90.1-2010: U-assembly: 0.048	Per 04/11/2018 Belmont Envelope Summary: U-assembly: 0.024

C. LEED BASELINE ENERGY MODEL REPORT

Equipment Loads (same for baseline and proposed)

Equipment (Includes Diversity)	Hourly Average EPD
General Space	0.5 w/sf peak load
Kitchen	141 kW peak load estimated for kitchen electric load
IT Closets	11 kW peak load estimated for IT Loads

Internal Electrical Loads

	Baseline Design	Proposed Design
Lighting	ASHRAE 90.1-2010 building area method LPD. School/University: 0.99 w/sf	0.45 w/sf for entire building
Exterior Lighting	tbd	tbd
Daylighting	Automatic Daylighting Controls for Primary Sidelighted Areas as per ASHRAE 90.1-2010 section 9.4.1.4, with one control step at 60% of design lighting power and another control step at 30% of design lighting power.	Automatic Daylighting Controls for Primary Sidelighted Areas as per ASHRAE 90.1-2013 section 9.4.1.4, with power ramped linearly to 18% and turned off when possible.
Lighting Controls	Same as Proposed	Occupancy Sensors in all areas required by code

HVAC

General HVAC

	Proposed Design
ASHRAE Climate Zone	Climate Zone 5A
Thermostat Setpoints	75°F / 70°F occupied, 64°F heating setback with no cooling after hours. Field House/Pool: Heated Only

Airside HVAC

Proposed System Sizing Summary:

SYSTEM NAME	Supply CFM	OA CFM	EXHAUST CFM	AREA SERVED (SF)	Supply Static (in wg)	Return Static (in wg)	Exhaust Static (in wg)
H&V - Pool	4,300	4,310		7,183	2.5		
RTU - Small Gym	5,208	1,590		7,868	5	3	
RTU - Field House	21,813	21,813		32,506	5	3	
RTU - Auditorium	9,003	3,444		9,216	5	3	
RTU - Band/Chorus	6,559	5,538		11,677	5	3	
RTU - Black Box	4,391	2,892		5,720	5	3	
RTU - Dining Commons	18,348	10,369		29,417	5	3	
RTU - Media Center	7,055	5,311		13,156	5	3	
DOAS - Classrooms	133,508	133,508		338,627	6	3.5	
ERV - Admin Offices	920	920		7,353	6	3.5	
Kitchen MUA Sys	2,500	2,500	5,000	9,255	2.5		1.5

C. LEED BASELINE ENERGY MODEL REPORT

	Baseline Design	Proposed Design
System	– ASHRAE 90.1-2010 Appendix G System 8 – VAV with Fan Powered Boxes, Electric Reheat and chilled water coils. – Air Handlers are modeled as separate floor-by-floor units with the exception of special-use spaces – Average fan power: 0.0011 kW/cfm	– Classrooms: DOAS Units for Classroom Ventilation, Induction Units (perimeter) and chilled beams (core) for space conditioning – Special use spaces: RTU's with HW/CHW coils – Office Space: VRF units for space conditioning and ERV for ventilation
DCV	n/a (not required)	DCV on all DOAS and RTU air handlers.
Energy Recovery	50% sensible/50% latent energy recovery on all air handlers	76% sensible/74% latent energy recovery on all DOAS and RTU air handlers
Airside Economizer	Drybulb Economizer with 70°F high limit shutoff	Dual Enthalpy economizer with 70°F high limit shutoff on RTUs
Exhaust Systems	same as proposed	Kitchen: 5,000 cfm exhaust

Waterside HVAC

	Baseline Design	Proposed Design
Chilled Water (CHW) Source	Same as Proposed	Heat recovery chillers, COP-6.0, fed from geothermal well loop
CHW Temperatures	44°F with 12°F delta T	45°F supply primary / 57°F supply secondary for induction units.
CHW Flow	Variable Primary	Variable Primary/Secondary pumps
CHW Pump	65 ft head	85 ft head
Hot Water (HW) Source	n/a (electric resistance heat)	Heat recovery chillers, COP-6.0, fed from geothermal well loop
HW Temperatures	-	180°F supply with 40°F delta T
HW Flow	-	Variable Primary
HW Pump	-	85 ft head
Well Loop Flow	-	Variable Primary
Well Loop Pump	-	100 ft head

Domestic Hot Water

	Proposed Design
General Usage	School Load: 172 kBtu, modulating according to school general occupancy profile
Heaters	Proposed Design: Electric Resistance Baseline Design: Electric Resistance

C. LEED BASELINE ENERGY MODEL REPORT

Occupancy and Load Profiles:

Occupancy and Load Matrix	Occupancy Schedules				Peak Loads		
Program Category	Weekday Profile	Weekend Profile	Holiday/Break Profile*	Events Profile	Occupancy (sf/person unless otherwise noted)	Equipment (w/sf)	Lighting (w/sf)
Lower School	7:00 am start M T R F : 2:25pm dismissal W: 1:15pm normal / 11:00am early dismissal	Sunday: Lexington Chinese School: 10 classrooms	Unoccupied	-	29	0.5	0.45
Upper School	7:00 am start M T R F : 2:25pm W: 1:25pm normal / 10:30am early dismissal	Unoccupied	Unoccupied	-	29	0.5	0.45
Maker Space	8:00am - 2:30pm, two blocks of two hours through day	Unoccupied	Unoccupied	-	40	0.8	0.45
Band/Rehearsal	8:00am - 2:30pm, two blocks of two hours through day	Unoccupied	Unoccupied	-	40	0.1	0.45
Field House	School Day: 8:00am - 2:30pm, two blocks of two hours through day Afterschool: 3pm - 9pm Monday thru Thursday, 3pm-7pm Friday	12:00pm - 5:00pm Saturday/Sunday	Summer/Winter Recess: Saturday Schedule	Pep Rallies: 2x/yr Misc assemblies: 5x/yrpeople	28 students in normal gym class Pep Rallies: 1,500 people Misc assemblies: /1,000 people	Normal Occupancy: 0.2 w/sf Full Occupancy: 0.5 w/sf	0.45
Small Gym	8:00am - 2:30pm, two blocks of two hours through day Nov-March: Afterschool Use 3-5pm Monday-Thursday All Year: Thursday: 7pm-9pm (pickleball)	Unoccupied	Unoccupied	-	75	0.1	0.45
Pool	Schoolday: 2 2hr blocks throughout day, 8am-2:30pm Afterschool: Monday-Friday 3:00pm - 7:00pm	12:00pm - 5:00pm Saturday/Sunday	Summer/Winter Recess: Saturday Schedule	-	100	0.1	0.45
Kitchen	6:00am - 9:30am kitchen active for hot breakfast 10am - 1pm kitchen active for lunch	Unoccupied	Unoccupied	-	50	50	0.45
Cafeteria	6:00am - 9:30am kitchen active for hot breakfast 10am - 1pm kitchen active for lunch, conditioned until 3pm	Sunday: Lexington Chinese School	Unoccupied	-	75 students from 7am thru 9pm 400 students from 10am thru 1pm	0.1	0.45
Office/Admin Space	7am - 4pm	12:00pm - 4:00pm Saturday	Summer/Winter Recess: Weekday/Weekend Schedule	-	200	0.75	0.45
Auditorium	3 hrs/day occupied	Sunday: Lexington Chinese School	Unoccupied	~15 full occupancy events/year	Normal Occupancy: 219 Full Occupancy: 8	0.2	0.45
Corridor/Lobby	M T R F: 7am - 8pm	Same as Weekday Schedule	Same as Weekday Schedule	-	400	0.1	0.45

PERKINS+WILL

Meeting Minutes: Board of Health/ Kitchen

By:	Perkins+Will	Date:	May 22, 2018
Meeting Date:		Project Name:	Belmont High School
Meeting Time:	1:15	Project Number:	153003.001
Meeting Location:	Selectman Meeting Room	Attendees:	Bill Lovallo, Chair Pat Brusch, Vice Chair Brie Gray, BoH Intern John Sousa Food Service Mary Contor Conant, Nurse Director Tom Gatzunis, DPI Dustin Obrien BPS Food Service Wesley Chin, BoH Daniella Wodnicki, BoH Brooke Trivas, P+W John Phelon, Superintendent

DISCUSSION

From Health Department Review:

Kitchen plan review: to be conducted by Board of Health.

Swimming Pool Renovation Plan Review: Outside door required for access to chlorine storage.

Hazardous Material Removal: Proper removal and disposal of hazardous materials such as asbestos, lead, mercury etc…Ensure state filing.

Pest control: pre and post demolition.

Clay Pit Pond: water testing for irrigation. Should we use wells to ensure not contaminated if it is used for irrigation.

Synthetic Fields: Ensure that the materials used are healthy.

Wells for Irrigation:

Pond Edge: Ensure a visible environment around the pond to ensure public safety.

LSP: Should a LSP be hired to conduct and environmental assessment of the land the high school is located.

Composting room: Refrigeration, space allocation. Belmont should determine if this should be in the project. Space and funding is an issue.

The foregoing constitutes our understanding of matters discussed and conclusions reached. Other participants are requested to review these items and advise the originator in writing of any errors or omissions.

Recycling/ Food Rescue: Some parents would like to take unopened food not used by students to take to food pantry. This would require extra walk in space to store goods. Belmont should determine if this should be in the project. Currently this is in place for only dry food. This needs to be separated with the food served for the students. Space and funding is an issue.

Zen Room: A place for students to find peace, mindfulness.

Nurse Office: Ensure safety and support in an event of an emergency. Good Respect for the space that is needed and the program of spaces.

Kitchen Layout: Look at access to freezer, janitor closet. Ensure no gaps between serving areas.

Lunches: 2 middle school lunches at 400 each. Staggered start will help the serving.

Kitchen Toilets: 10- 11 staff members currently. Board of Health would support having a uni-sex toilet as long as there is a separate dressing area for personal items.

ADA Serving Line: All the public can see the food in the serving lines. Milk containers should be accessible.

Adult education or Student Education: Would the space be used for students or outside educational purposes? At that time there is no plan on this at the BHS.

Nitsch Engineering

2 Center Plaza, Suite 430
Boston, MA 02108-1928
T: 617-338-0063
F: 617-338-6472
www.nitscheng.com

Belmont HS Regulatory Meeting
5/8/17 at 10am
Nitsch Notes (MLC)

- Fire Department (FD) brought up possibility of using Concord Avenue as drop-off area to relieve traffic through the site – widen roadway?
- Existing water main loop will need to be rerouted around the building
- Hydrants will be required around building/parking – no more than 12 hydrants, will need to be coordinated with the FD
- Dumpster location and access was an important issue to the FD
- Existing fiber line located near existing sewer will also need to be relocated
- Office of Community Development (OCD) stated that stabilization of the bank of Clay Pit Pond is a priority, more so than access to the pond
- Required vegetation near the pond also needs to be balanced with safety (brought up by Health Dept.)
- Vertical granite curbing is a priority, no sloped curb
- Proposed sidewalk should be reinforced
- Existing fiber runs through field house (which is to be demolished)
- 400 geothermal wells proposed near HS entrance, require vaults with manhole access – study underway
- Also looking at using Clay Pit Pond as location for geothermal
    - Temperature impacts to the pond likely to be concern for Conservation
- Separate lab waste system which passes through internal acid neutralization tank proposed, then will connect into exterior sanitary system
- Kitchen waste to be sent to exterior grease trap
- Portion of existing irrigation system draws from Clay Pit Pond – existing treatment?
    - Health Dept. to weigh in on continuing this in proposed condition
- Proposed fields are not artificial – push back from several members, especially for 2 season fields
- Proposed generator runs on diesel

After meeting MLC spoke with DPW:

- OCD will have feedback on use of permeable pavement, specific water quality structures, underground infiltration system preference
- DPW interested in permeable pavement, not much used throughout Town

PERKINS+WILL

Meeting Minutes: Regulatory

By:	Perkins+Will Design Team	Date:	May 8, 2018
Meeting Date:	May 8, 2018	Project Name:	Belmont High School
Meeting Location:	Town Hall	Attendees:	See attached list

Discussion

- Fire Department (FD) brought up possibility of using Concord Avenue as drop-off area to relieve traffic through the site – widen roadway?
- Existing water main loop will need to be rerouted around the building
- Hydrants will be required around building/parking – no more than 12 hydrants, will need to be coordinated with the FD
- Dumpster location and access was an important issue to the FD
- Existing fiber line located near existing sewer will also need to be relocated
- Office of Community Development (OCD) stated that stabilization of the bank of Clay Pit Pond is a priority, more so than access to the pond
- Required vegetation near the pond also needs to be balanced with safety (brought up by Health Dept.)
- Vertical granite curbing is a priority, no sloped curb
- Proposed sidewalk should be reinforced
- Existing fiber runs through field house (which is to be demolished)
- 400 geothermal wells proposed near HS entrance, require vaults with manhole access – study underway
- Also looking at using Clay Pit Pond as location for geothermal
    - Temperature impacts to the pond likely to be concern for Conservation
- Separate lab waste system which passes through internal acid neutralization tank proposed, then will connect into exterior sanitary system
- Kitchen waste to be sent to exterior grease trap
- Portion of existing irrigation system draws from Clay Pit Pond – existing treatment?
    - Health Dept. to weigh in on continuing this in proposed condition
- Proposed fields are not artificial – push back from several members, especially for 2 season fields
- Proposed generator runs on diesel

After meeting MLC spoke with DPW:

- OCD will have feedback on use of permeable pavement, specific water quality structures, underground infiltration system preference
- DPW interested in permeable pavement, not much used throughout Town

The foregoing constitutes our understanding of matters discussed and conclusions reached. Other participants are requested to review these items and advise the originator in writing of any errors or omissions.

PERKINS+WILL

BELMONT HIGH SCHOOL REGULATORY: Meeting Agenda

Meeting Date:	May 8, 2018		
Meeting Time:	10:00 AM	Project Name:	**Belmont High School**
Meeting Location:	Town Hall/ Second Floor	Project Number:	153003.001

OBJECTIVE #1: Review schedule, status of site plan and building plans with regulatory group. Net Zero Update, Survey update.

Outcomes: Listen to feedback and answer questions regarding site plan and plans.

OBJECTIVE #2: Review with group:

Site Plan: Emergency Access, Visibility, Pedestrian, and Vehicular circulation,

Maintenance: snow removal, field.

DPW/ Engineering:

- Plan Review process for water, sewer, drain connections, street openings, etc…
- Standards/ Specs/ Policies for Utilities
- Utility Connections

Conservation: Review Process/ Timelines for NOI, Additional Guidelines or Policies

Board of Health: Storm water Permit review process, standards/specs/policies, flood zone Town standards and proprietary items.

Generator

Heating and Cooling Center

Traffic Update

Permitting Process

ZONING: The Dover Amendment (MGL Chapter 40A Section 3) provides an exemption from some zoning regulations for educational facilities (among others), but permits reasonable regulation related to a building's height and mass, along with yard sizes, lot area, set backs, open space, parking, lighting, and building coverage requirements.

Storm water-

- Meet requirements for Storm water Management and Erosion Control Permit? Project subject to MassDEP Storm water Standards through Conservation Commission filing.
- Thoughts on pervious pavement?
- Preferred underground storage system? (perf. pipe, chambers, etc)
- Preferred water quality units?
- Follow Sanitary and Storm Drain Regulations and Specifications? (called out as residential requirements, are there separate regulations?)

Public Works

- Engineering – details & standards
- Maintenance: drainage, snow removal/storage

Cooling and Heating Center

Outcomes: Determine town requirements for schematic design documents.

OBJECTIVE #3: Breakout sessions as needed by regulatory participants.

Outcomes: Design Team to understand specific needs of the regulatory personal.

PERKINS+WILL

Meeting Minutes

By:	Brooke Trivas	Date:	March 27, 2018
Meeting Date:	3.27.2018	Project Name:	Belmont High School
Meeting Time:	1:00 PM	Project Number:	
Meeting Location:	Town Hall Selectman Office	Attendees:	Chris Messer, BHSBC Shane Nolan, OPM Tom Gatzunis, OPM Mark McAllister, Chenery Dan Richards, HS Pat Brusch, BHSBC John Phelan, Superintendent Lisa Fiore, School Comm Pam Perini, Security Consultant Ken Gardiner, Fire J. Peter Hoerr, Police James MacIsaac, Police Wayne Haley, FD Bill Lovallo, BHSBC Mark Blundell, Electric Consultant
Next Meeting Date:	May 8,2018	Cc:	Team, BHSBC, OPM

Discussion

Pam Perini Security Consultant: Introduction/Certifications. Goal to create secure environment while understanding the educational purpose and design goals.

MS/ HS Entry Areas: Belmont double entry doors, ring to get into vestibule, camera to view body, than buzz into administration area. Then proceed into the facility after clearance

Panic Button: in Administration areas to both security company and police station.

Cameras: First thoughts on camera locations: inside corridors, not toilets, exterior parking lots, corners and hallways, ensure visible sidelines in corridors, going into the toilet rooms and locker rooms, rear of the building. Camera inside vestibule. Loading area.

Cameras in Stairs: Further discussion and consideration about cameras in stairs.

Sequence Model: Follow the sequence in the building to see where they are going to determine camera locations.

Cameras: Kids seem to find the location where cameras are not located.

Camera Access/Loop: Who has access to the fotage? What is the duration of the loop?

Open Campus: 9-12 has flow.

Exterior Doors: May limit the access to entries and doors.

Compartmentalize Areas: Compartment and control. Heavy community use- if community areas can have its own compartment with toilets that is good. Code, police and fire must all be working together.

Exterior Site Lines: Simple exterior shaped Buildings are good. Easier to see where people are doing the day and night. Façade relief is preferred on the second floor not the first floor. But there is an understanding of site impact and design.

Cameras: Any door where people will enter- needs to have a good video at that location. Good to see who comes in and out of the building.

Landscape: Ground cover and landscape located away from the building. NO landscape close to building to hide. Need vegetation cleared at the 7'0" height for full visibility.

Where there are hiding places: utilize lights and cameras

Public is around the School: That is challenging because of the community path. What does that mean? Classrooms connecting to the site where the public may intersect. Cafeteria looking to the pond- that could conflict with public. This should be considered but not eliminated from the site design.

Schools are NOT Prisons: More kids get killed in parking lot or by suicide in schools than shootings.

Community Path: Greater concern is about what happens after school.

Open Campus 1: Allows students in the HS/ 9-12 to go outside by pond.

Open Campus 2: Seniors and juniors/ second semester off campus. Downtown and access off campus.

Exterior Exists: 3 locations currently for exterior exists. That may be reduced.

All entry Doors Lock at 8:15am: enter at the front door location after 8:15.

Entries and Exists: limit the entries and exists. Create a policy around entries/exits.

7-8 Middle School: One stair, locked down very limited exterior

7-8 Middle School Café: has their own identity. May not have doors to the exterior but private space.

What are the best practices:

Toilets with no doors- visible to the interior toilet area for supervision.

Graffiti- materials used for corrido/interor and exterior should be cleanable.

Keys, Fabs, vs. card swipes?

Doors between classrooms/ not?

Glazing into classroom/ not?

7-3, 3-6, Community: Access to the building. NO key or FAB to those areas because the custodian is there. Lock down is important.

Door Contact Panel: to show which doors ajar.

Security Alarm: 3rd party monitoring company and they call the police. Double Pull and Double throw call police and 3rd party monitoring company.

Security Monitors: Where is it located? Different for MS or HS. Police has web-based access to the cameras.

Windows: how much they are open?

Motion detection: at the windows.

Bullet Proof Glass or Film: Should vestibule glazing be bullet proof glass at admin and inside vestibule doors. Film slows bullets down.

Police Station Front Lobby: Nicest room. Ballistic glass.

Prevent someone from Driving into the front door: planters, bollards

Forensics: Cameras can be used after the school, during the school day. Need to have the storage capacity for the film to look back 30 days.

Communications from the Classroom: Can a teacher call out and use PA from a classroom? ALICE protocols.

Security Gates/ door hold open for lockdown: gates are heavy. Doors on hold opens are better.

Main office at front office: Front door with clean site lines to interior.

Middle School: Feel welcoming.

AM: kids enter at main doors. After hours they go through the office.

Pool: would like to open to seniors and have access through administration.

Pool Gym Access. Have doors that can lock the building down afterhours. Look at community access points at the pool and field house. Compartmentalize for park and recreation coming in the after-hours use.

Café/ Pre function: how does that lockdown for after hours access?

Stairs area of refuge: Makes it difficult to lock down stairs.

Communicating stairs: keeps floors open- discuss security issues with open stairs.

Door Hardware: thumb latch, but use a key to get into the room. Should master lock get teachers into all hardware? To be discussed.

FAB: used to get into major areas.

Lockdown procedure: screen all the doors. Can the rooms with lots of glazing have access to spaces that offer protection?

Shades: Keep shades up on the exterior windows.

Glass in doors and spaces: Typical Classroom/ glass can be a deterrent. Hard to hide in classroom. Prefer sidelight vs. window on the door (JP).

Core spaces: Provide more glazing to make learning visible. Ensure there is a corner to hide in the classroom. Keep outside window shades up. Interior room with all glass. The rooms that have a lot of glazing could have an adjacent room that they can go and hide- storage room for example?

Ability to get outside: Exterior doors to be used to get outside in the event of an event.

Connecting Classrooms: Doors that connect? Teachers monitor classroom when there is access?

Exterior Pond Area: Access to outside. Open for fire access at the original pond road. How do we stop a vehicle from driving around the Pond Road? Gate? Meccanized bollards? Hydraulics/retractable? Driven electrically as opposed to a gate or standard Bollard. If the emergency road does not look like a road than it may not need a gate. Kids are outside enjoying a nice day don't want cars to drive down the path. Geo-grid? 20' wide area only used for emergency. Never used unless an emergency. NEED MORE CONSIDERATION.

Fire Access: Need 360 access/ maintained, not overgrown, 20 ' wide fire lane, how close can we be to the building with fire lane? (40' tall wall at 60' away in collapse zone)

Front Door Mostly glass: Will bollards or planters be needed.

Fire Alarm control Panel: at the front doors, 2 annunciator panels.

Fire Access at North side / south football field: Requires access.

Visitor parking and ADA Parking at front: This is acceptable.

Drop off lane at Concord Avenue: mentioned to cut a drop off lane at concord at Pond.

BDA/ Duel Band: Required by police and fire.

Lighting Protection: BHSBC to determine requirements. Wellington- no. Fire Station- yes.

Turning Radius width Truck: 8' track/ lock to lock time 6'-0" / 8.5/ 40 feet long truck (email to follow)

Geo grid: PSI on grid

PERKINS+WILL

Meeting Minutes

By:	Pam Perini Consulting	Date:	May 16, 2018
Meeting Date:	May 8, 2018	Project Name:	Belmont High School
Meeting Location:	Town Hall	Attendees:	

Discussion

• Lock Down Buttons in the ADMIN Offices (and perhaps other offices) were discussed

• 2 levels of Lockdown o Vestibule ONLY and ALL Building

• Access Control Doors at the Main 2 entrances, vestibules configuration detail being worked on.

All perimeter doors to have door contacts/alarming.

• We will make more detailed decisions at 60% CDs

• The School needs to begin to implement change in Policy/Procedure for Access Control Doors and access to building. Superintendent was speaking, commenting and made notes.

• Main doors will be open in the morning for full free student entrance. Then there after need to be buzzed in and check in with front office. NEED CLEAR WAYFINDING so there are no wonderers if there is that capability.

• There will be no exception made with Security as it relates to policy (Superintendent)

• The Security Server Room may/may not be separate from the IT Closets. Discussion of Switching in closets to connect the systems. Not to have exceed 330FT., and limit cable runs with a large multi floor building, strategically place switches in closets to interconnect. Create an infrastructure for security. Security to have its own VLAN. Will need bank of internal IP addressing.

• IT currently handles most systems as they are IT centric-databases, network, software, programming, etc.

• School district will assess the connection between school and PD in order to check speed, size of pipe, etc. for incident response/video feed, and after-hours PD onsite.

• Lenel and BCM are the current Vendor and ACS System

• May need the Raptor System (visitors management & checking system)

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• Need Training Incorporated into spec for all security systems

• Video Recording will be discussed length, storage and frame rates

• May utilize Cloud for Video storage

• Storage is to be determined

• Hardware will be finalized at a later date

• Wayfinding needs to be assessed but later • Will there be interconnects in the Classrooms?

• The Interconnects will be clustered perhaps in Departments or Areas

• The Room dividers will have acoustical challenges

• Some Rooms will be interconnected/connected

• Discussed compartmentalizing areas in school for lock down early in meeting.

• There will be no Video in Locker Rooms or Bath Rooms BUT there will be Cameras to see who comes out of bathrooms if the budget warrants.

• Keys-

o Limit keys o Grandmasters

o No keys to teachers for perimeter doors—they bust use card keys/fobs

o Class Room Hold Open clips for bell time and flow of students during class changes was requested

• Shades/Side Lights and Glazing in classrooms was discussed again. Nothing 100% finalized

• AEDs at Athletic Fields discussed.

• Code Blue/Emergency Phones possibly at Athletic fields as well discussed but may not be in scope

• Code Blue Phones need power & data.