



Patrick Allen | Rachel Barrow | Alex Byard | Melanie Fonner | Brad Frederick | Mike Palmer



nexus

Our mission is to develop a design that merges education with the community in a facility that is safe and cost effective while functioning as a learning tool.

reading elementary school

nexus

introduction

process map

envelope

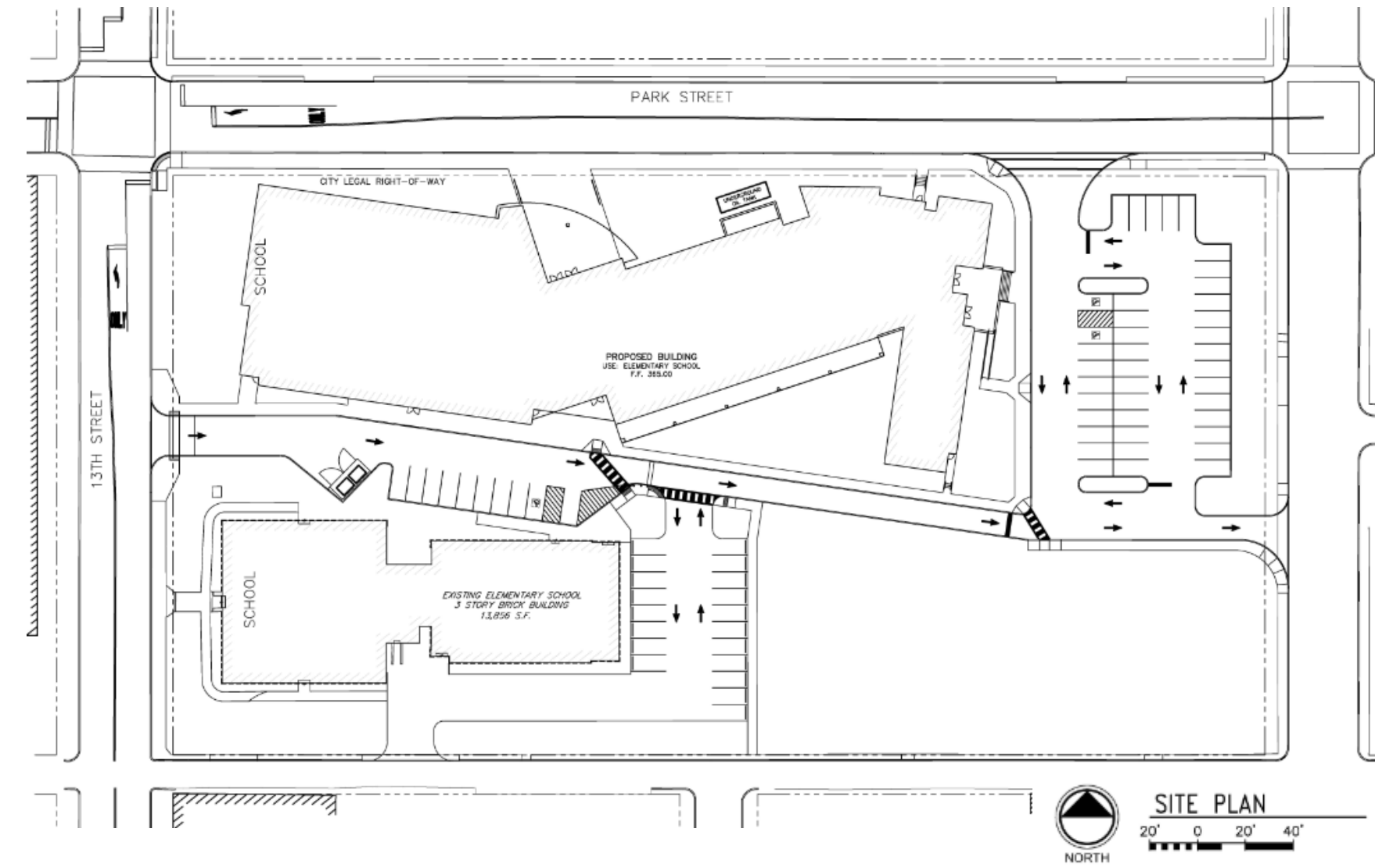
hvac

integration

sustainability

conclusion


appendix



Our mission is to develop a design that merges education with the community in a facility that is safe and cost effective while functioning as a learning tool.

owner goals

 **Safety & Security**

 **Lifecycle & Maintenance**

 **Cost Effective**

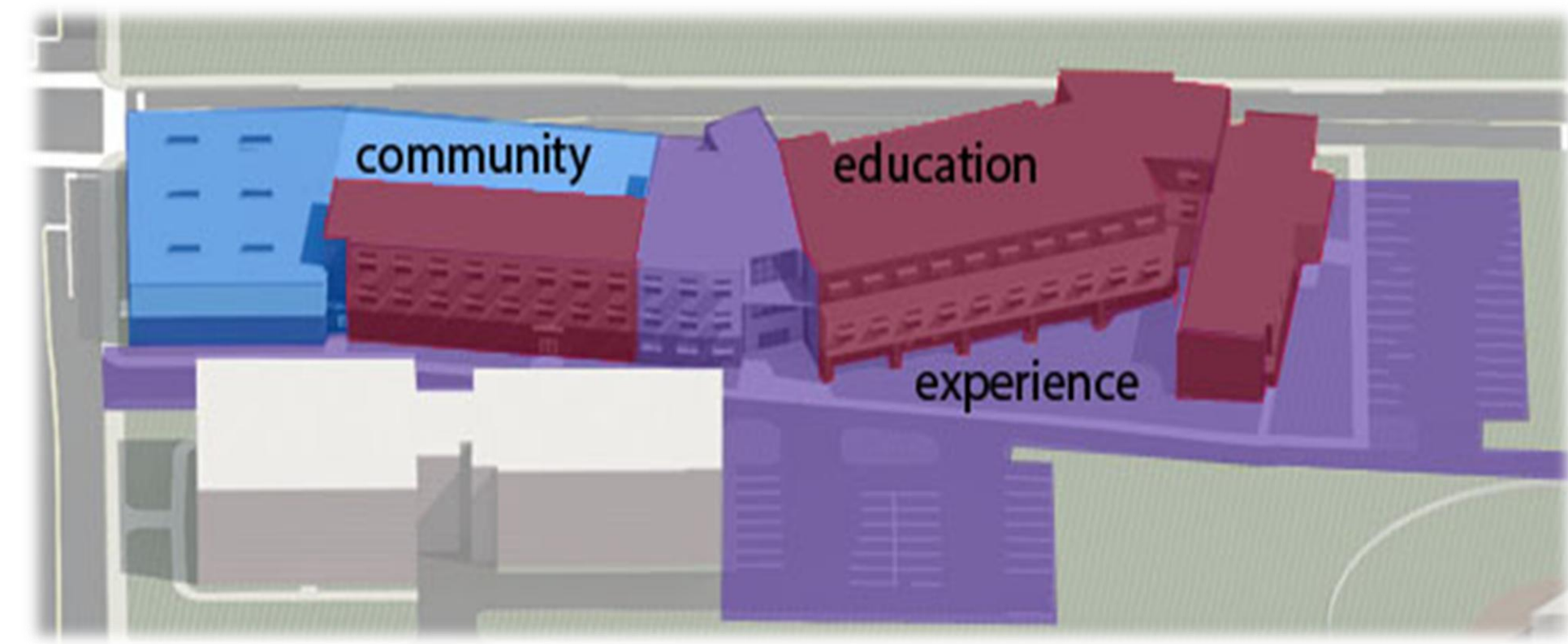


nexus goals

Integration 

Reduce, Reuse, Recover 

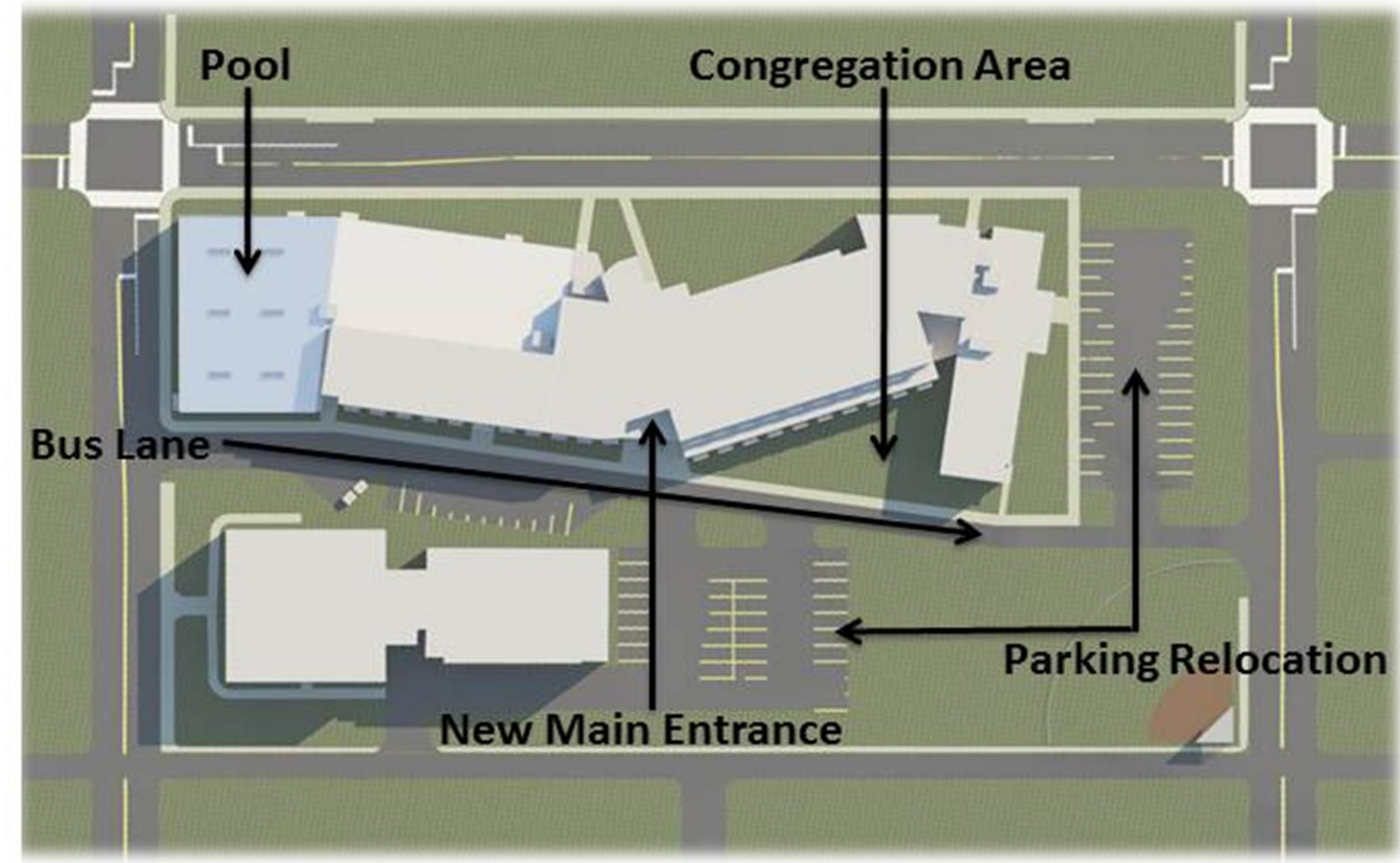
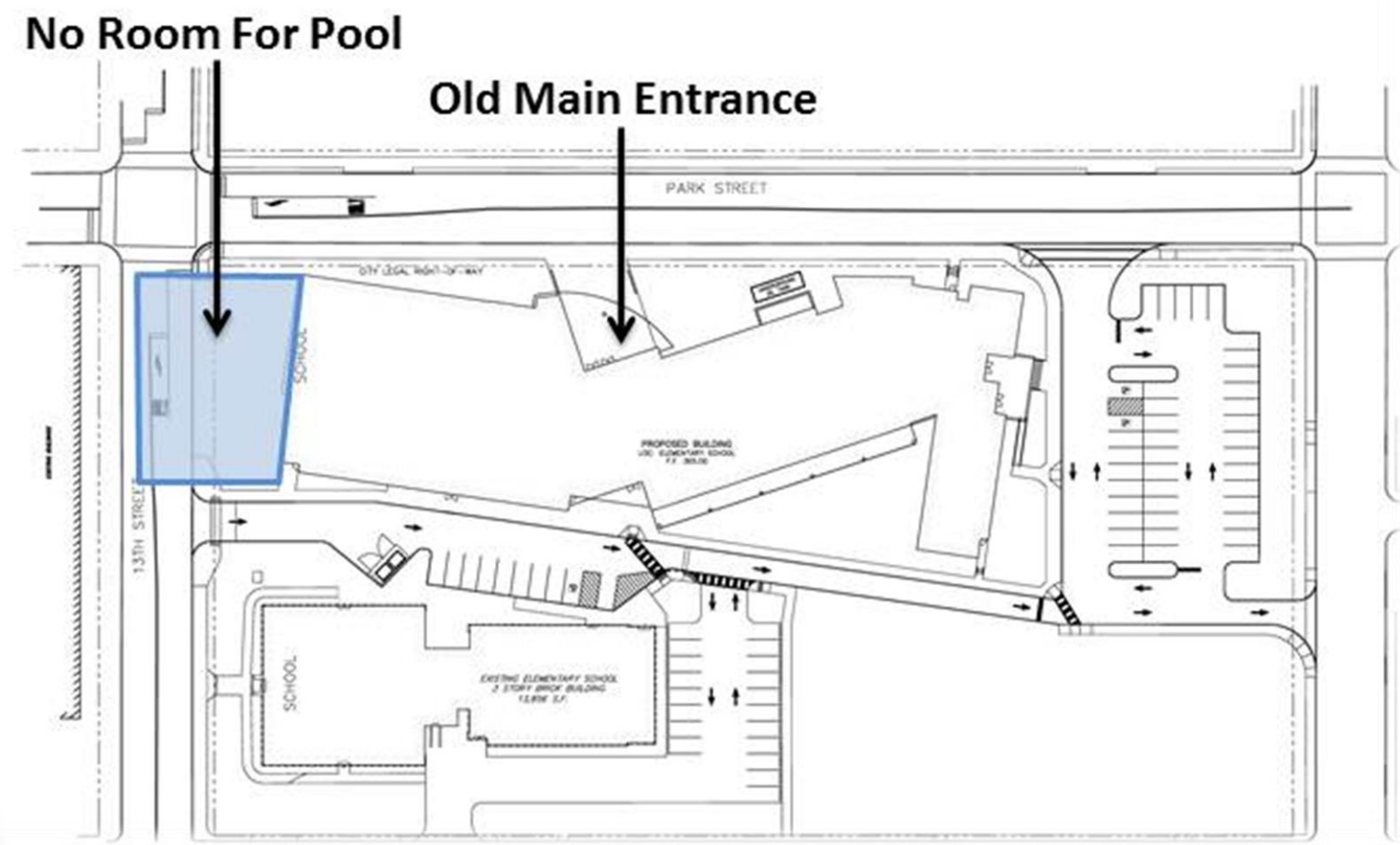
Learning Tool 



Our mission is to develop a design that merges education with the community in a facility that is safe and cost effective while functioning as a learning tool.

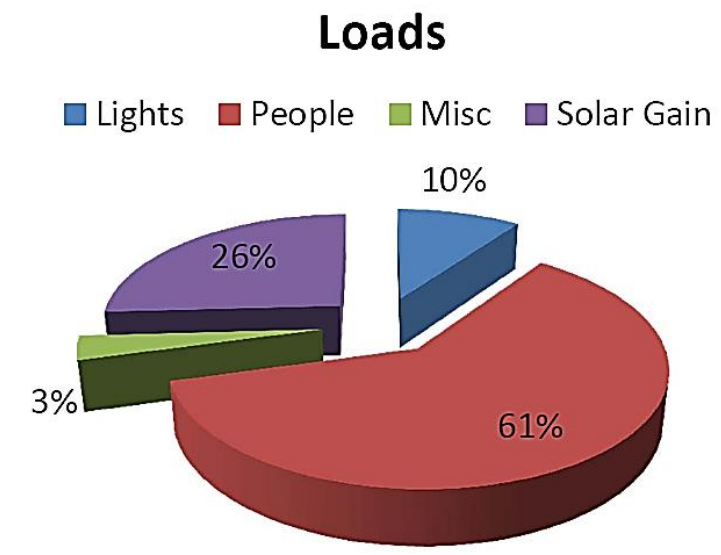
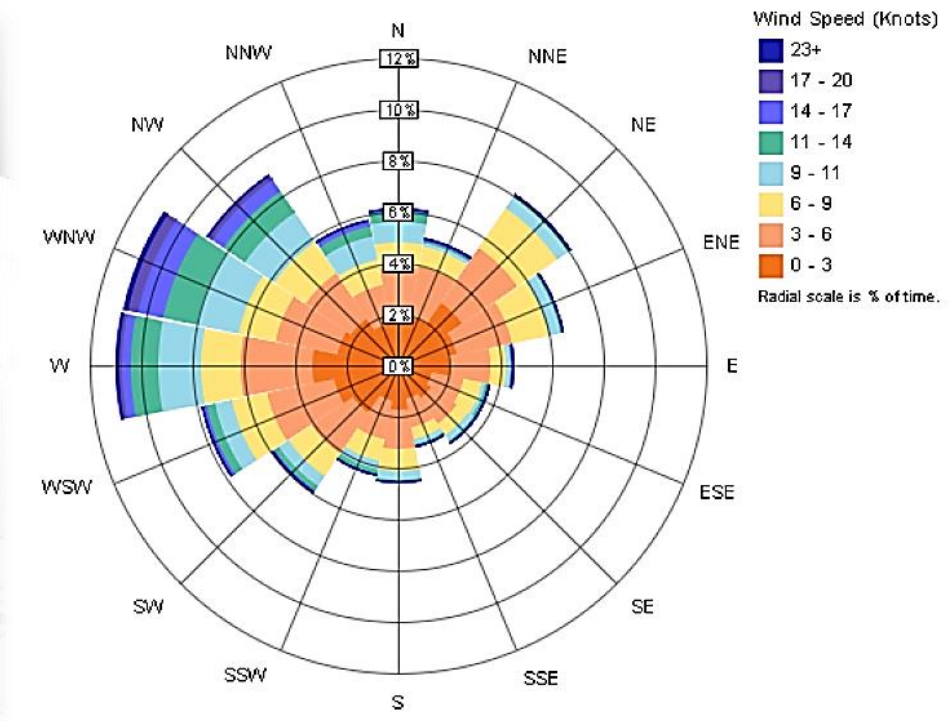
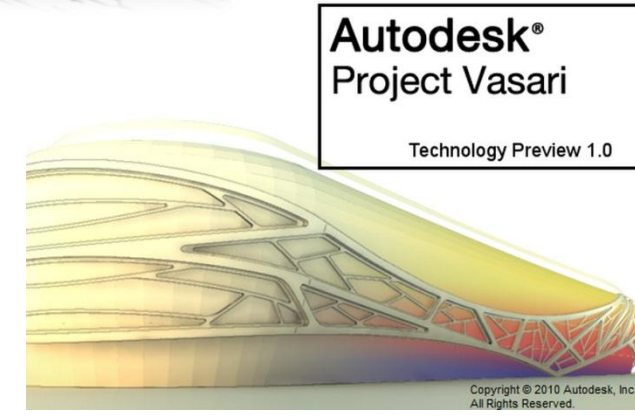
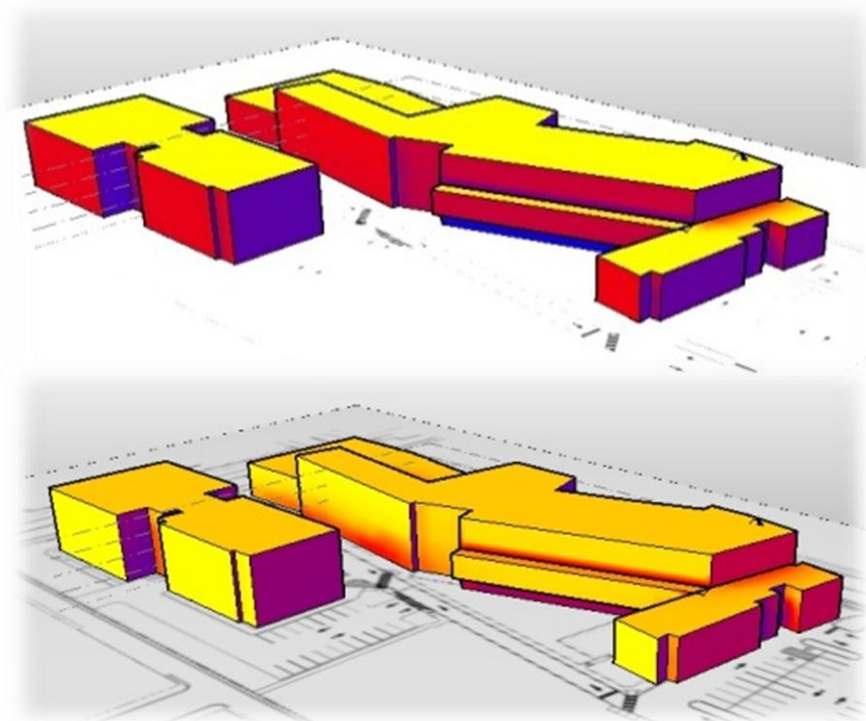
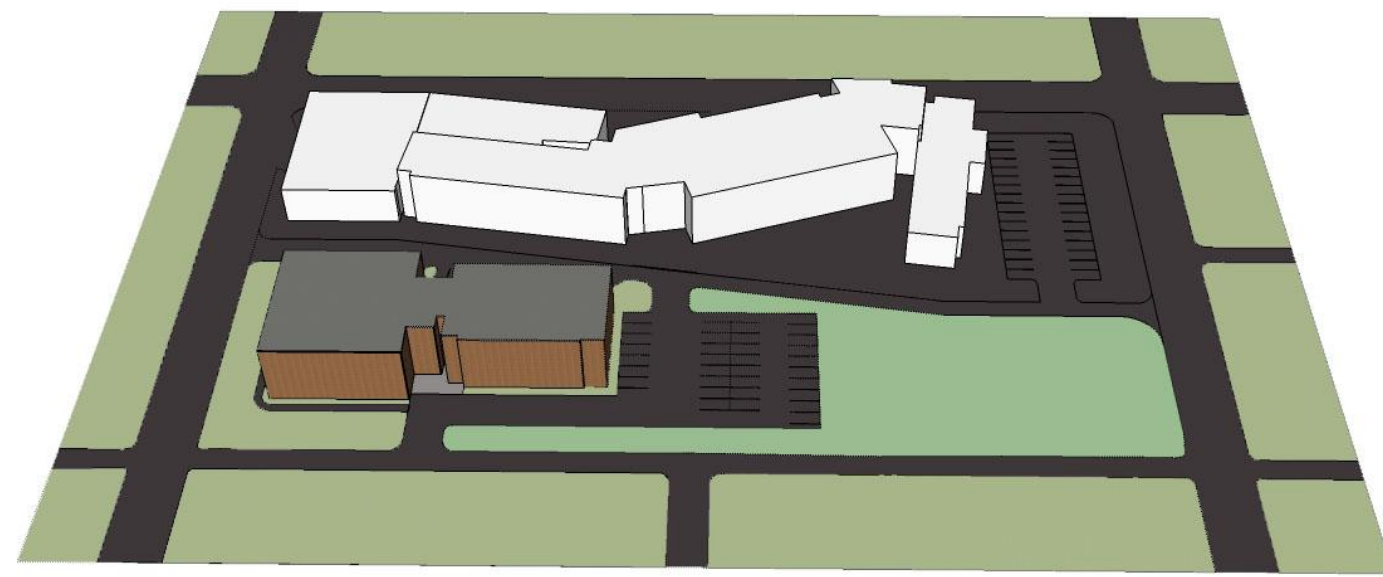
reading elementary school

- nexus
- introduction**
- process map
- envelope
- hvac
- integration
- sustainability
- conclusion
- appendix



mechanical design process map

- nexus
- introduction
- process map**
- envelope
- hvac
- integration
- sustainability
- conclusion
- appendix

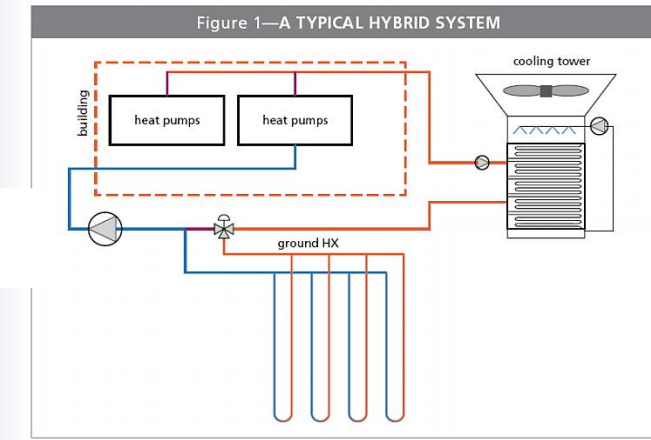


Baseline Building Loads				
Zone		Cooling Capacity [TONS]	Heating Capacity [TONS]	Airflow [CFM]
1	Academic	165.2	85.3	42,120
2	Community	127.4	48.7	28,735
3	Pool	14.1	36.4	9,100
TOTAL		306.7	170.4	79,955

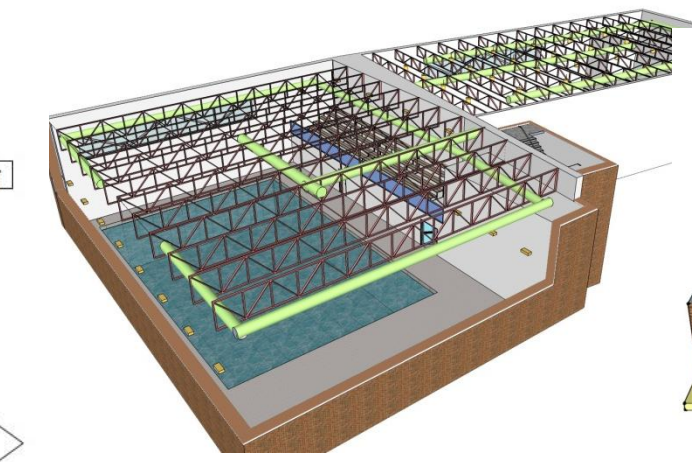
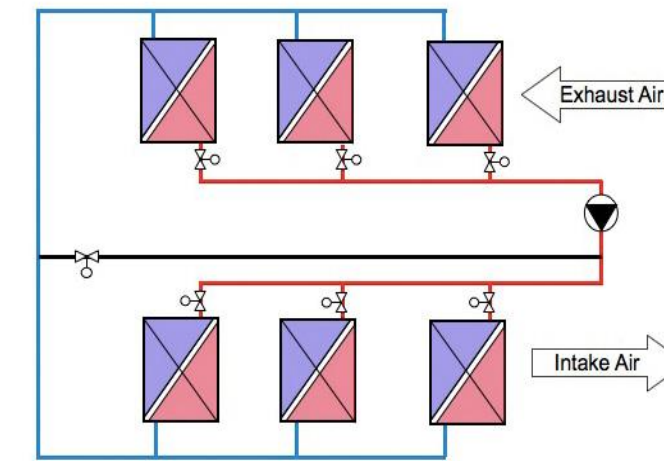


mechanical design process map

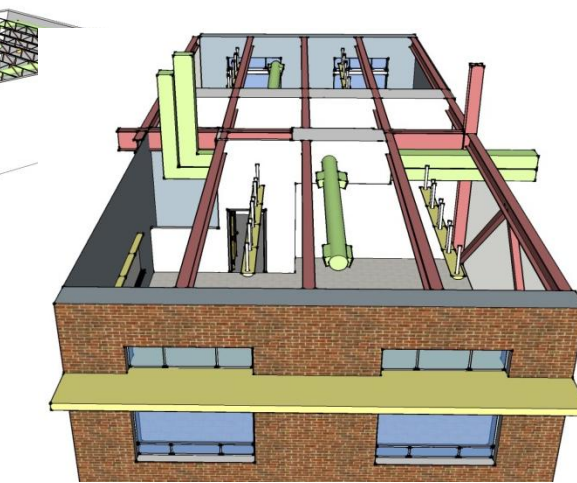
- nexus
- introduction
- process map**
- envelope
- hvac
- integration
- sustainability
- conclusion
- appendix



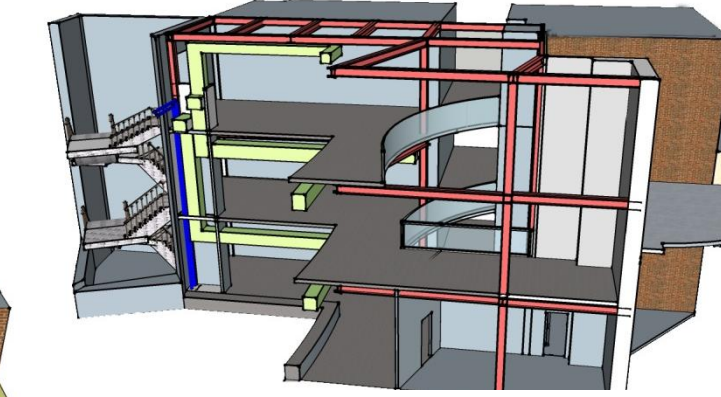
vs



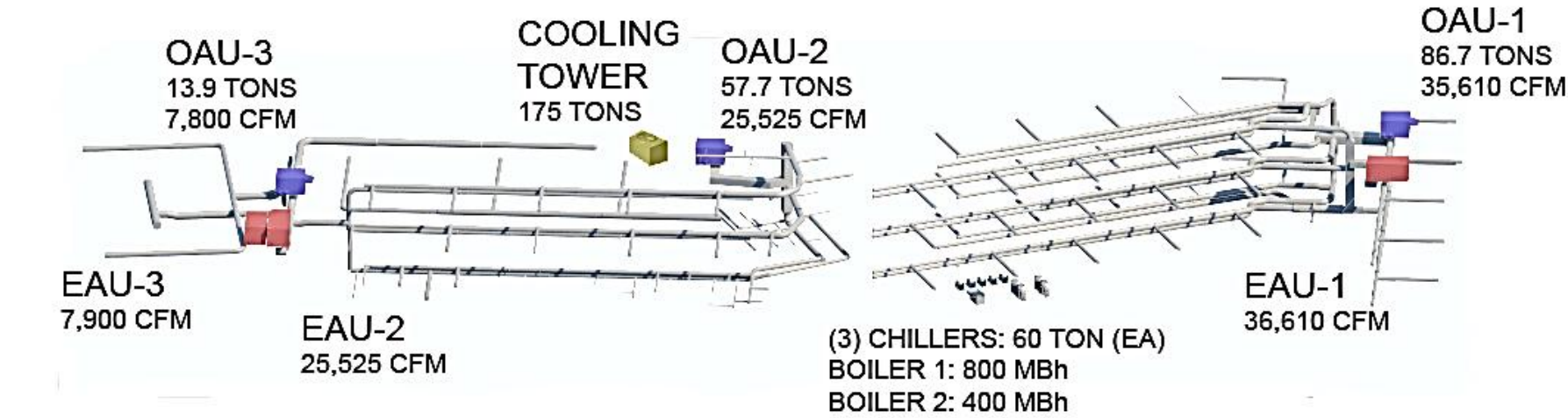
pool / gym



classroom



lobby

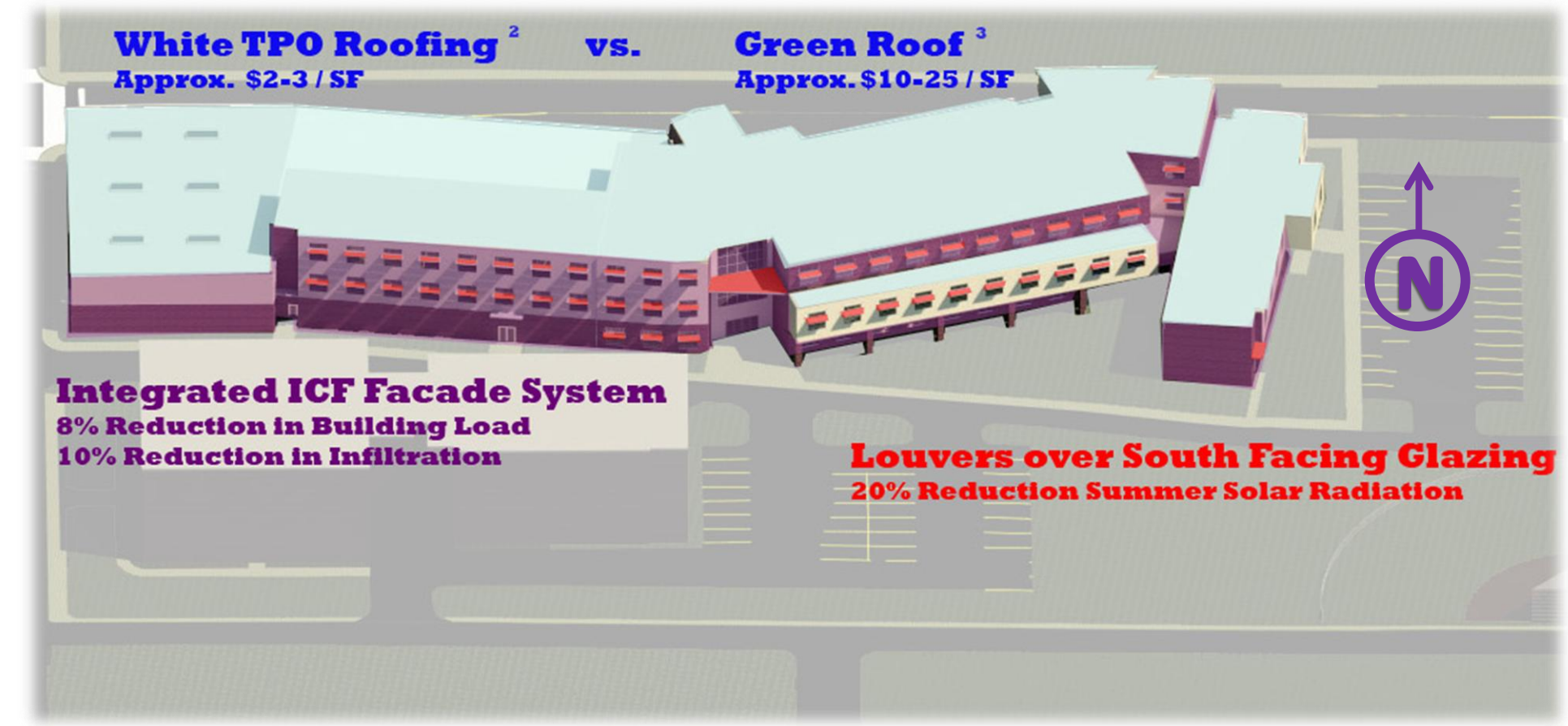
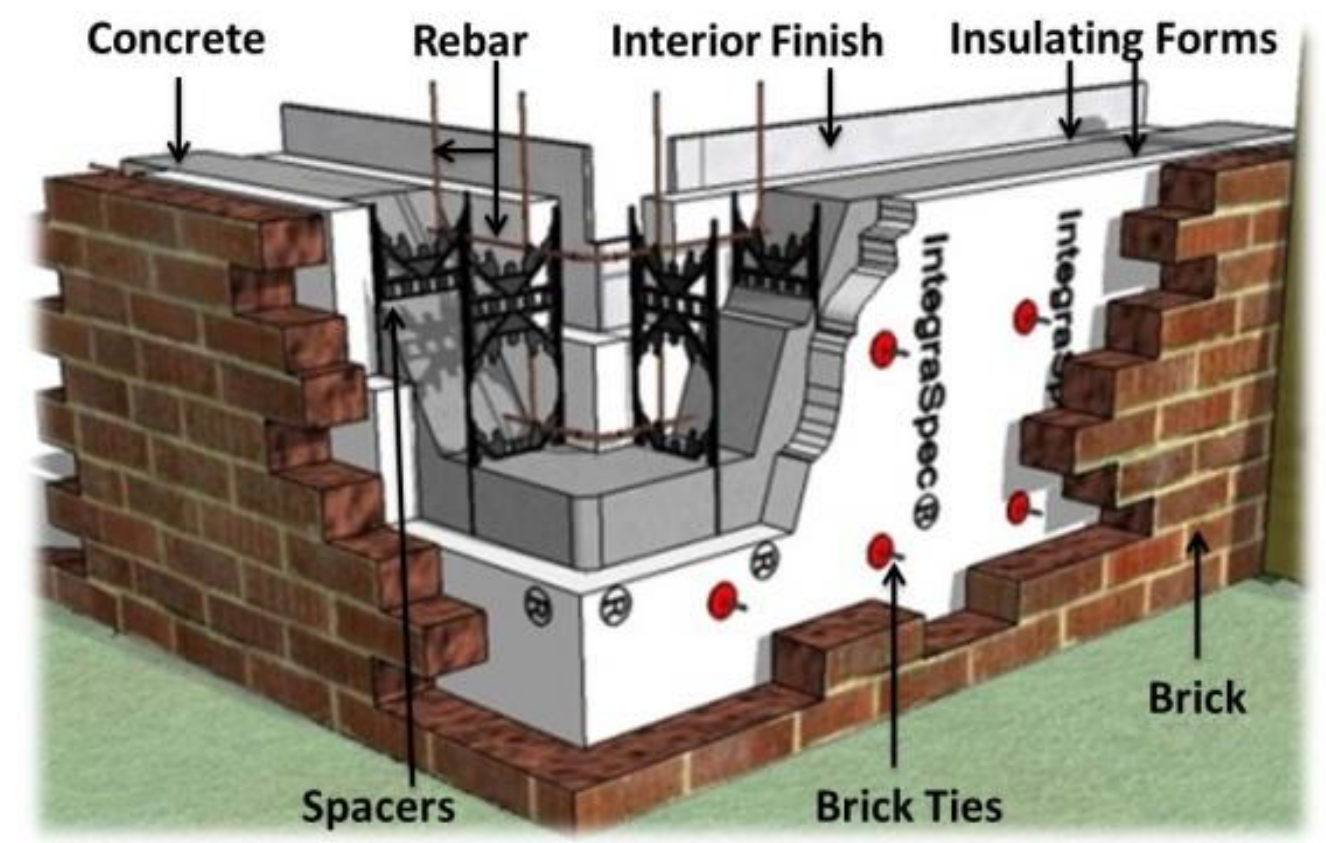


system selection



coordination / layout

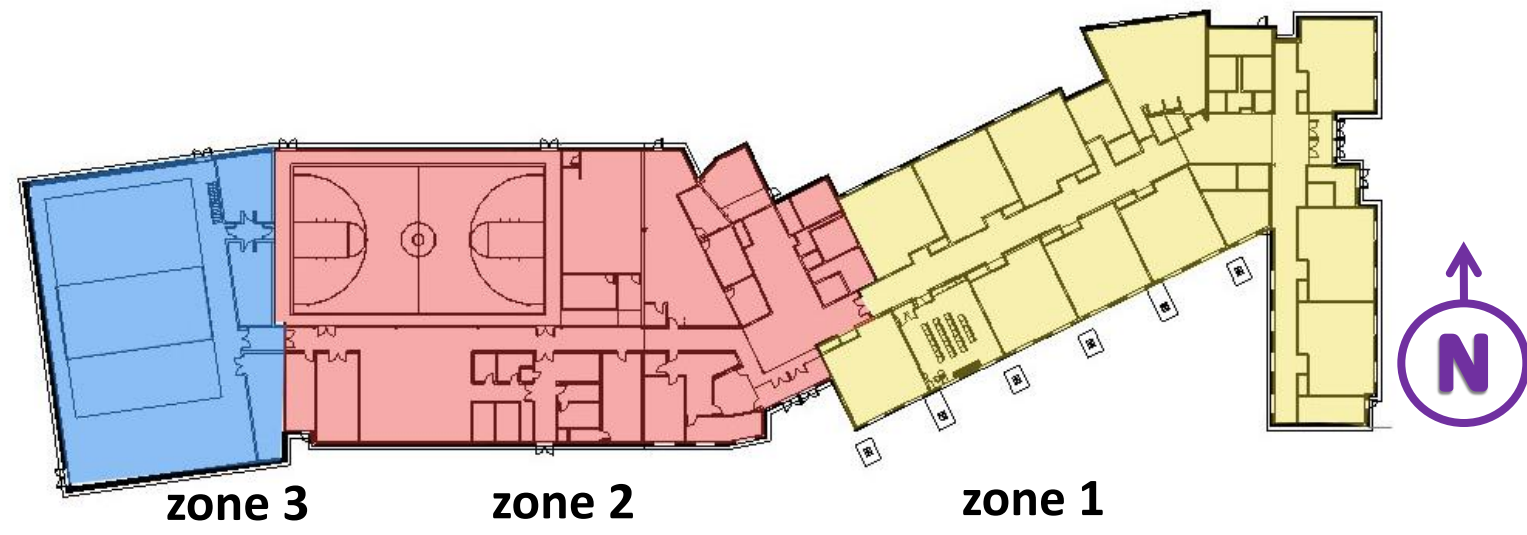




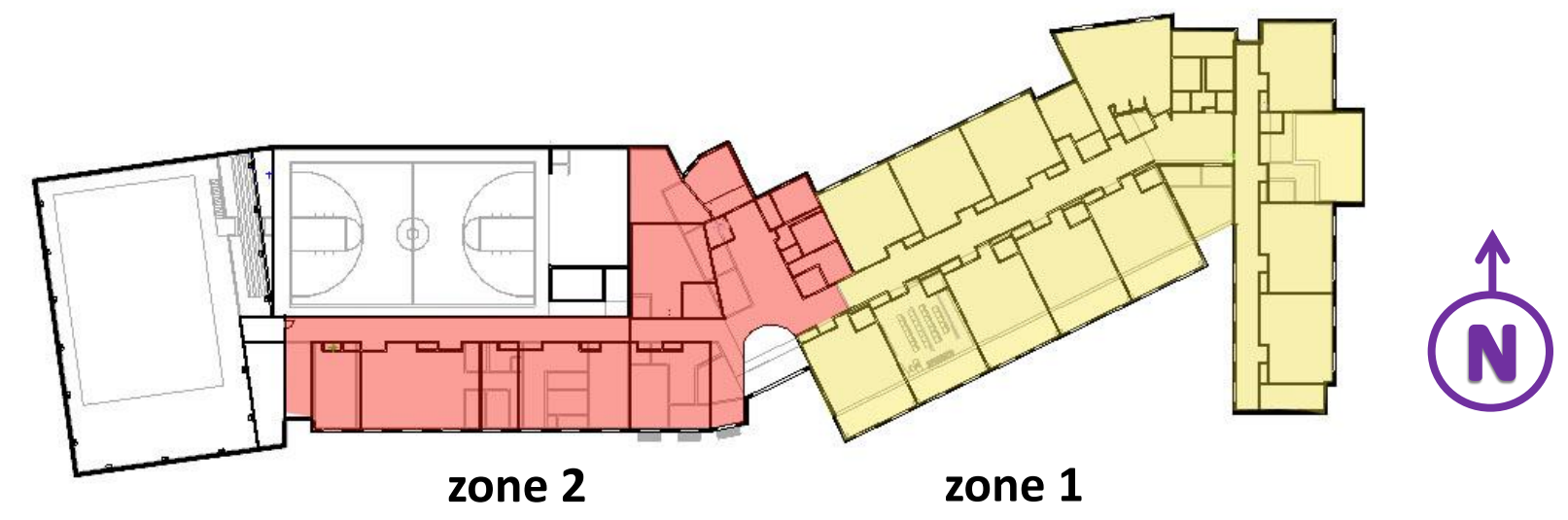
zone breakdown

- nexus
- introduction
- process map
- envelope
- hvac**
- integration
- sustainability
- conclusion
- appendix

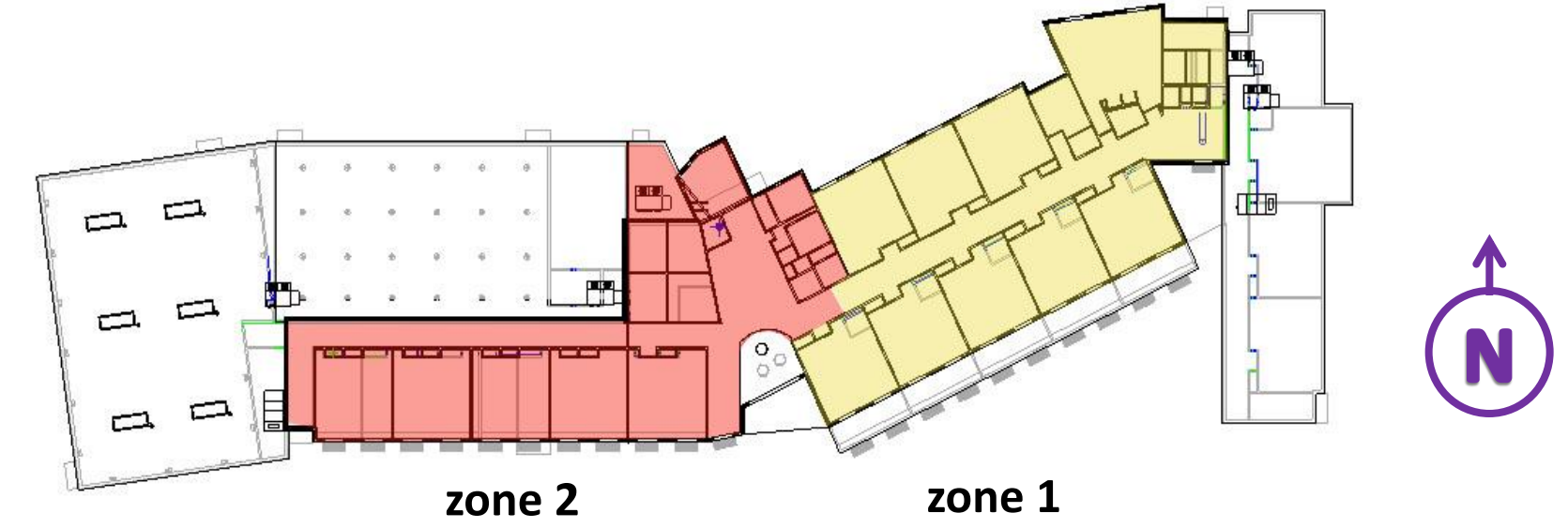
pool community academic



community academic

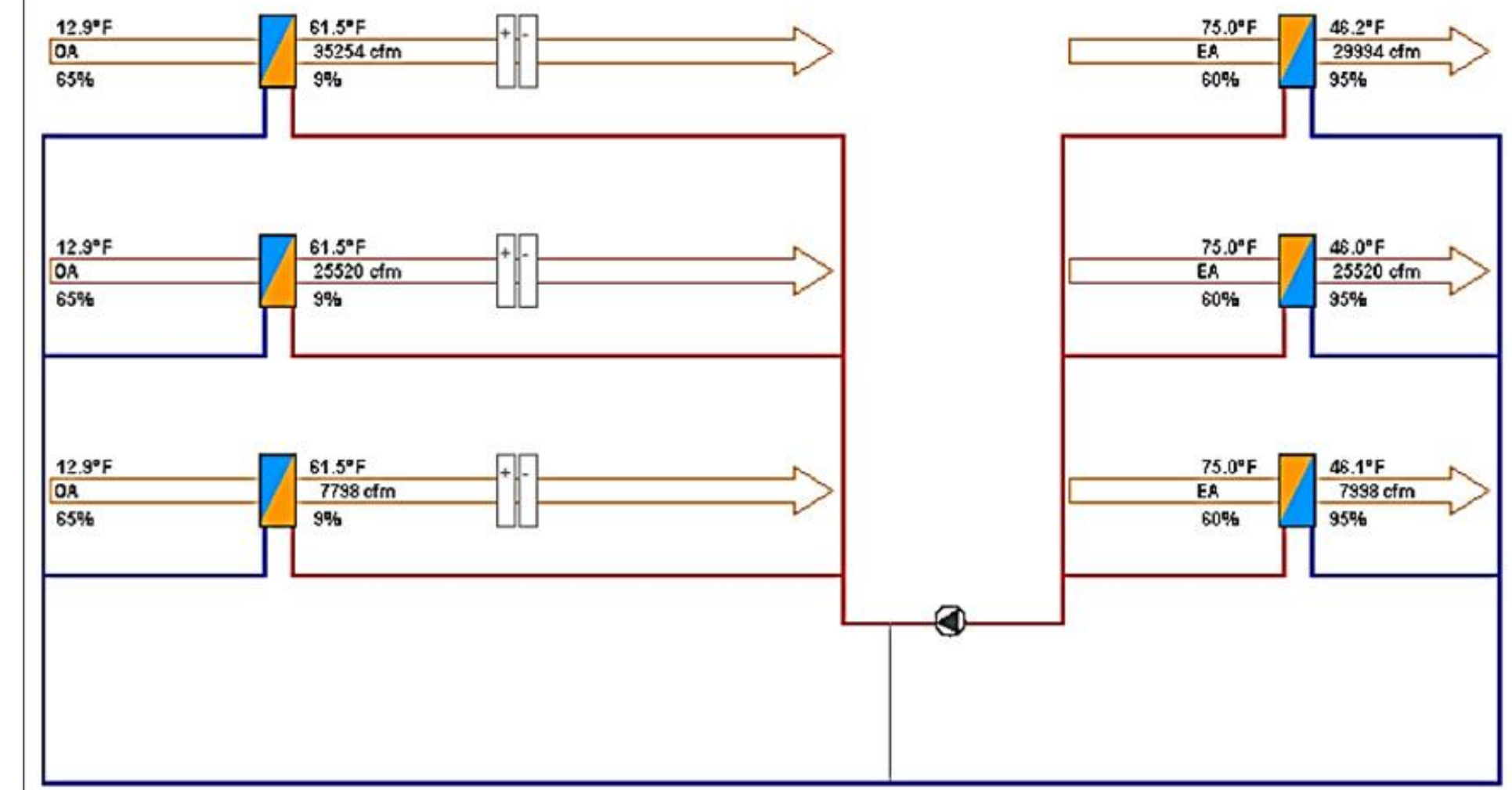
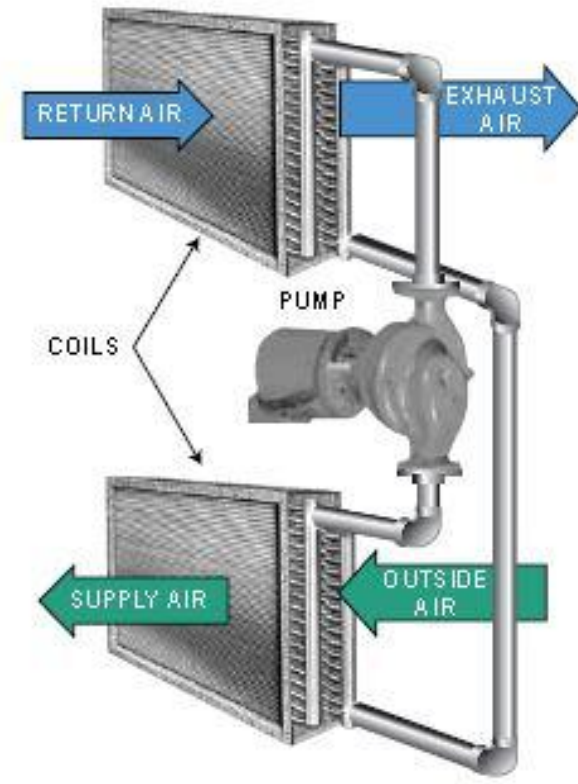


community academic

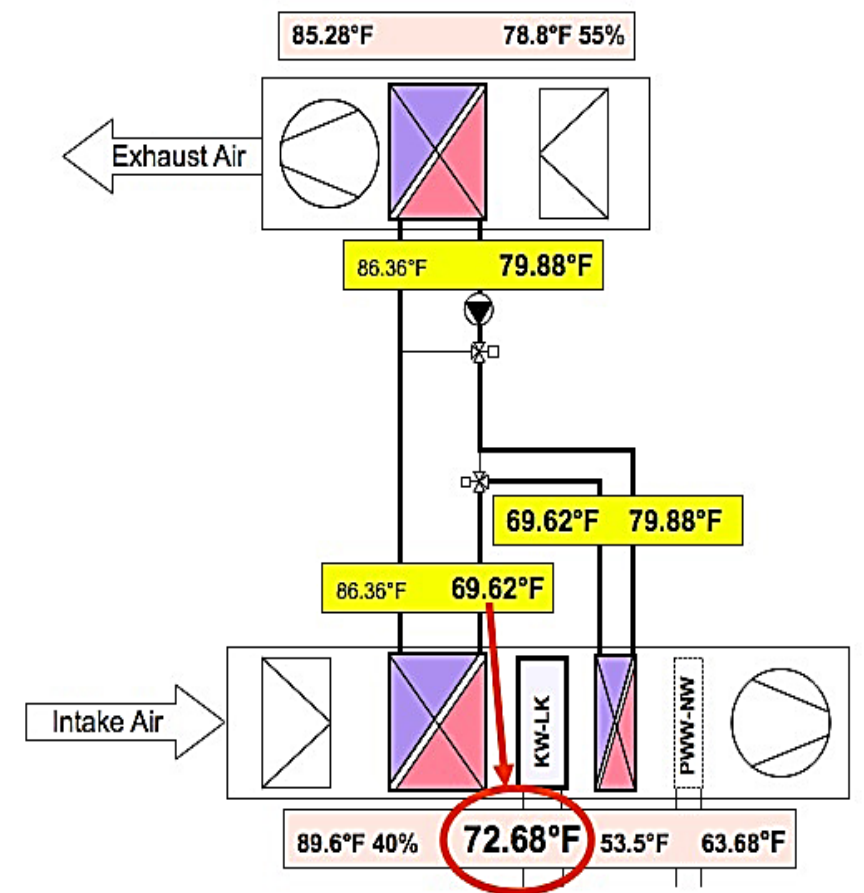


ethylene-glycol

- nexus
- introduction
- process map
- envelope
- hvac
- integration
- sustainability
- conclusion
- appendix



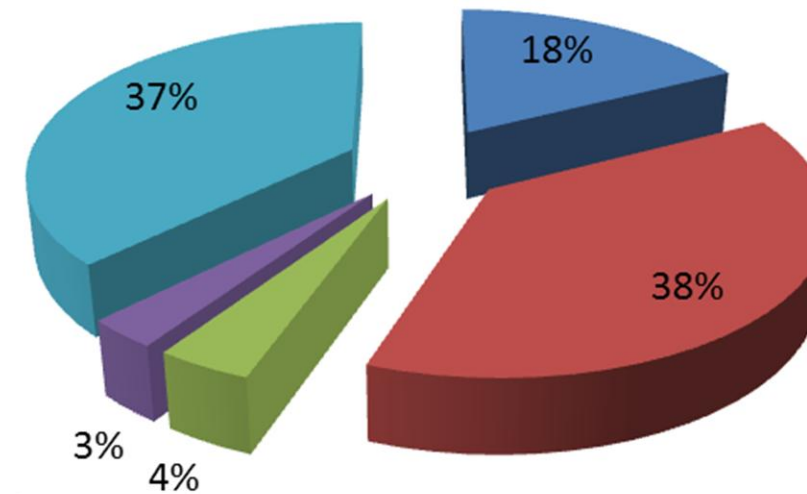
Pennsylvania State University 6/8 RR Cu (100% air volume) 13°F / 65% konvekta-usa inc.



hvac equipment selection

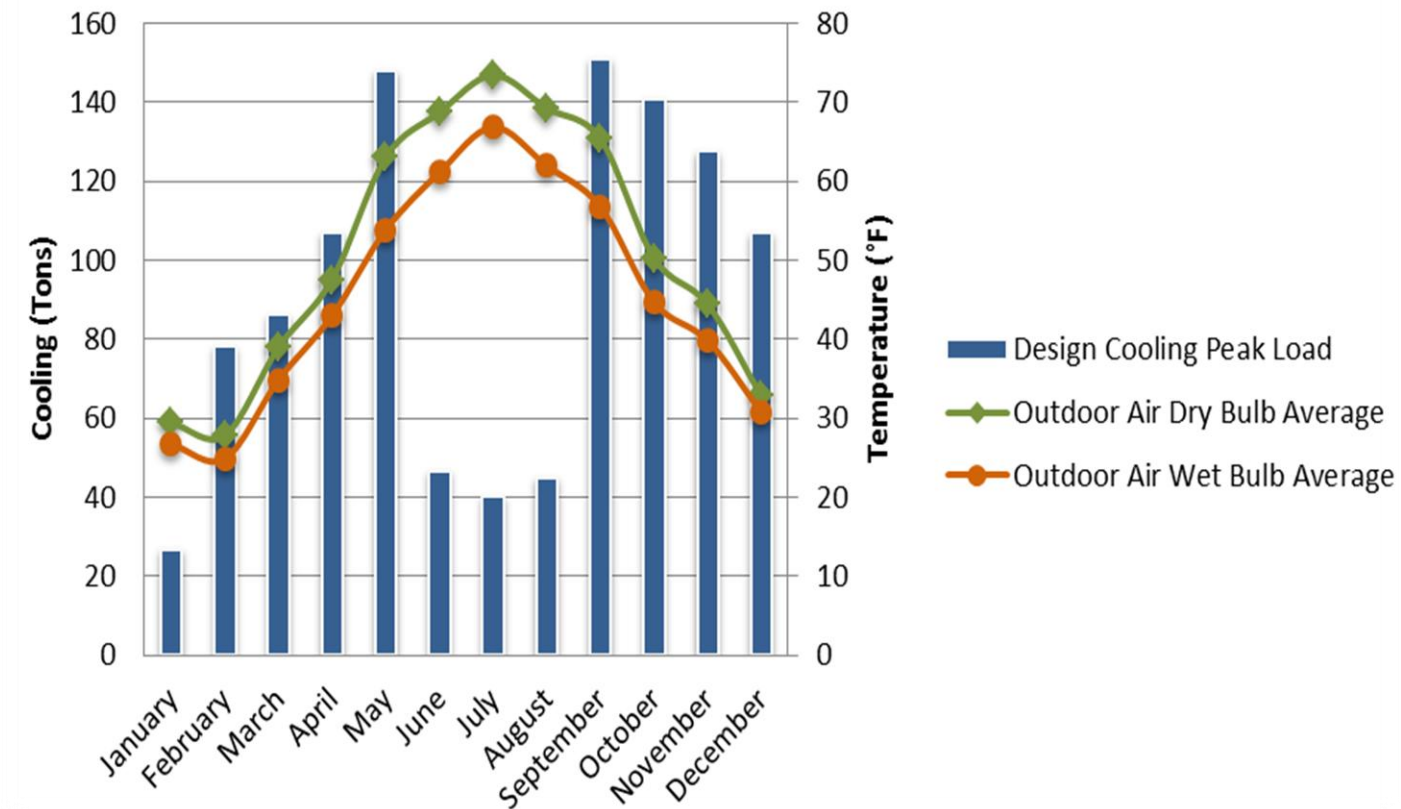
Full Building Load Breakdown

■ Lights ■ People ■ Miscellaneous ■ Infiltration ■ Envelope



Total: 1,643,205 BTU/hr

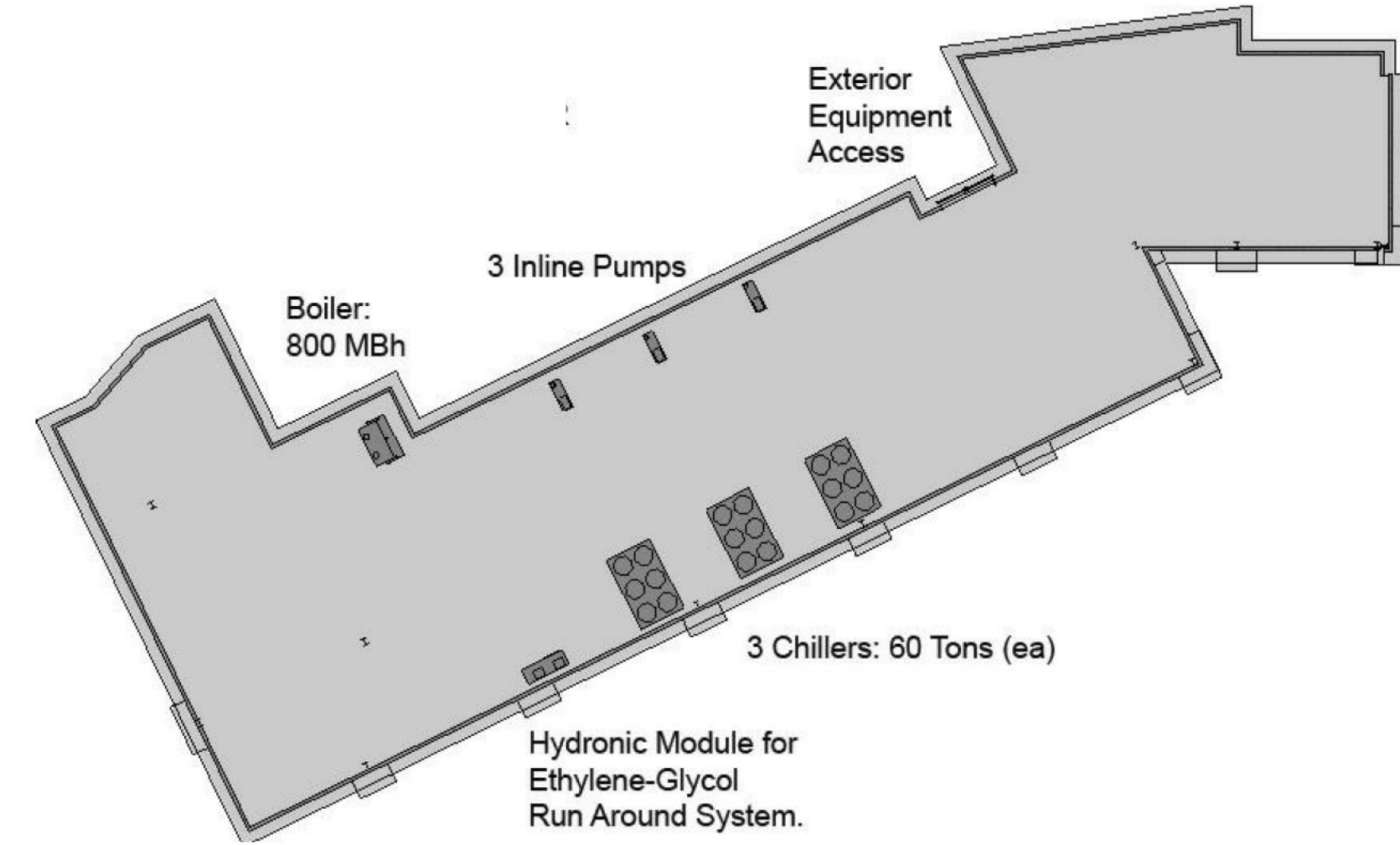
Chiller Plant Analysis



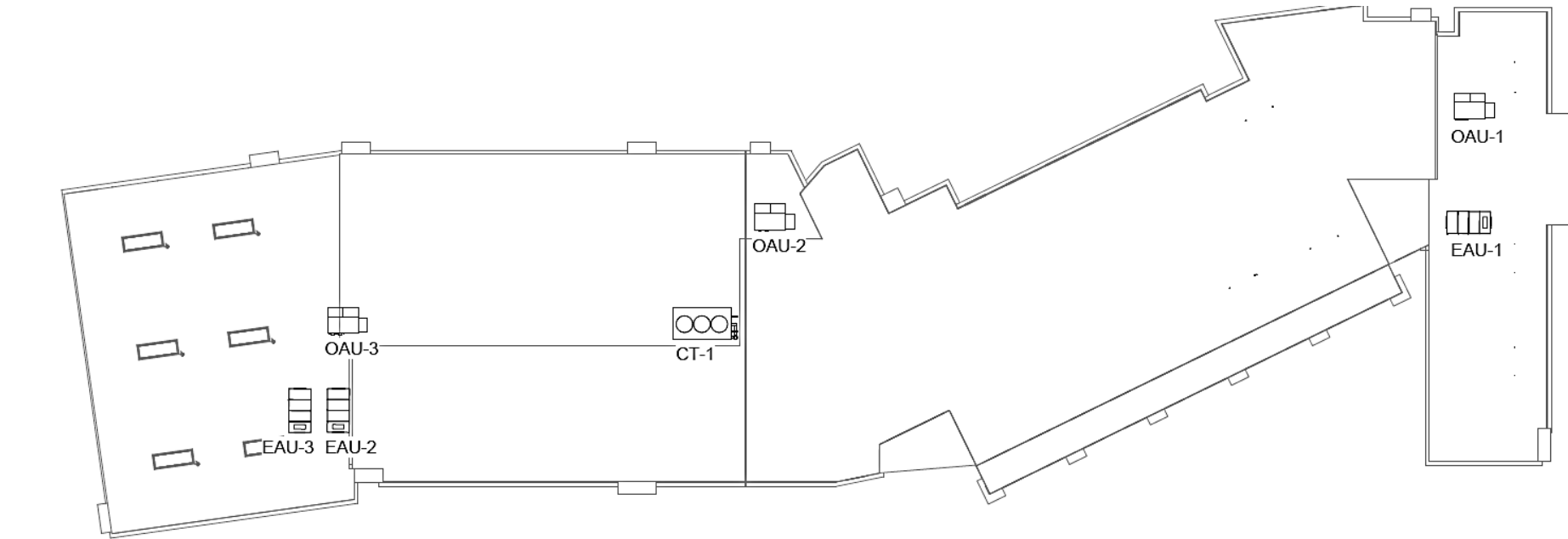
	AHU 1	AHU 2	AHU 3	EAHU 1	EAHU 2	EAHU 3
Design						
type	(fin spacing - mm)	3.0	3.0	3.0	3.0	3.0
height	(inch)	49.4	41.5	47.4	45.5	47.4
length	(inch)	145.7	15.9	70.9	135.8	126.0
installed depth	(inch)	16.3	15.9	15.9	16.3	15.9
weight (dry)	(lb)	4498.0	3264.0	1058.0	3880.0	3264.0
water capacity	(gal)	128.6	91.0	30.6	111.2	91.0
corrosion protection		KO31	KO31	KO31	KO32	KO33
Materials						
tubes		copper	copper	copper	copper	copper
fins		alu (0.0157 inch)	alu (0.0157 inch)	alu (0.0157 inch)	alu (0.4 inch)	alu (0.0157 inch)
collectors		steel	steel	steel	steel	steel
Rating data air side						
Media		AIR	AIR	AIR	AIR	AIR
volume flow	(cfm)	35254.0	25520.0	7799.0	29994.0	25520.0
intake	(°F/%r.h.)	30.0 / 65	30.0 / 65	30.0 / 65	75.0 / 60	75.0 / 61
outlet	(°F/%r.h.)	64.9 / 17	64.9 / 17	64.9 / 17	52.5 / 96	52.5 / 97
pressure drop	(inch H2O)	0.6	0.6	0.6	0.7	1.7
Rating data water side						
Media		ETH-GLY 30%w	ETH-GLY 30%w	ETH-GLY 30%w	ETH-GLY 30%w	ETH-GLY 30%w
volume flow	(gpm)	96.2	69.7	21.3	88.4	75.2
intake / outlet	(°F)	71.6 / 41.6	71.6 / 41.6	71.6 / 41.6	41.4 / 71.5	41.4 / 71.8
pressure drop	(ft H2O)	97.0	97.0	101.0	92.0	89.0
Performance	(BTU/h)	1365016.0	988256.0	301739.0	1255404.0	1079422.0

equipment sizing

Equipment Breakdown		
Equipment	Description	Capacity
Chiller-1	Rotary-Screw Water Chillers	60 Tons
Chiller-2	Rotary-Screw Water Chillers	60 Tons
Chiller-3	Rotary-Screw Water Chillers	60 Tons
Cooling Tower	Axial Fan, Induced Draft	175 Tons
Boiler-1	Gas-Fired Boiler	800 MBh
Boiler-2	Gas-Fired Boiler	350 MBh
OAU-1	Dedicated Outdoor Air	38,000 CFM
OAU-2	Dedicated Outdoor Air	27,000 CFM
OAU-3	Dedicated Outdoor Air	8,000 CFM
EAU-1	Exhaust Air Unit	34,500 CFM
EAU-2	Exhaust Air Unit	24,500 CFM
EAU-3	Exhaust Air Unit	9,000 CFM
Ethylene-Glycol System	Without Pool	65,000 CFM
Ethylene-Glycol System	With Pool	8,000 CFM
Total	Without Pool	
Total	With Pool	



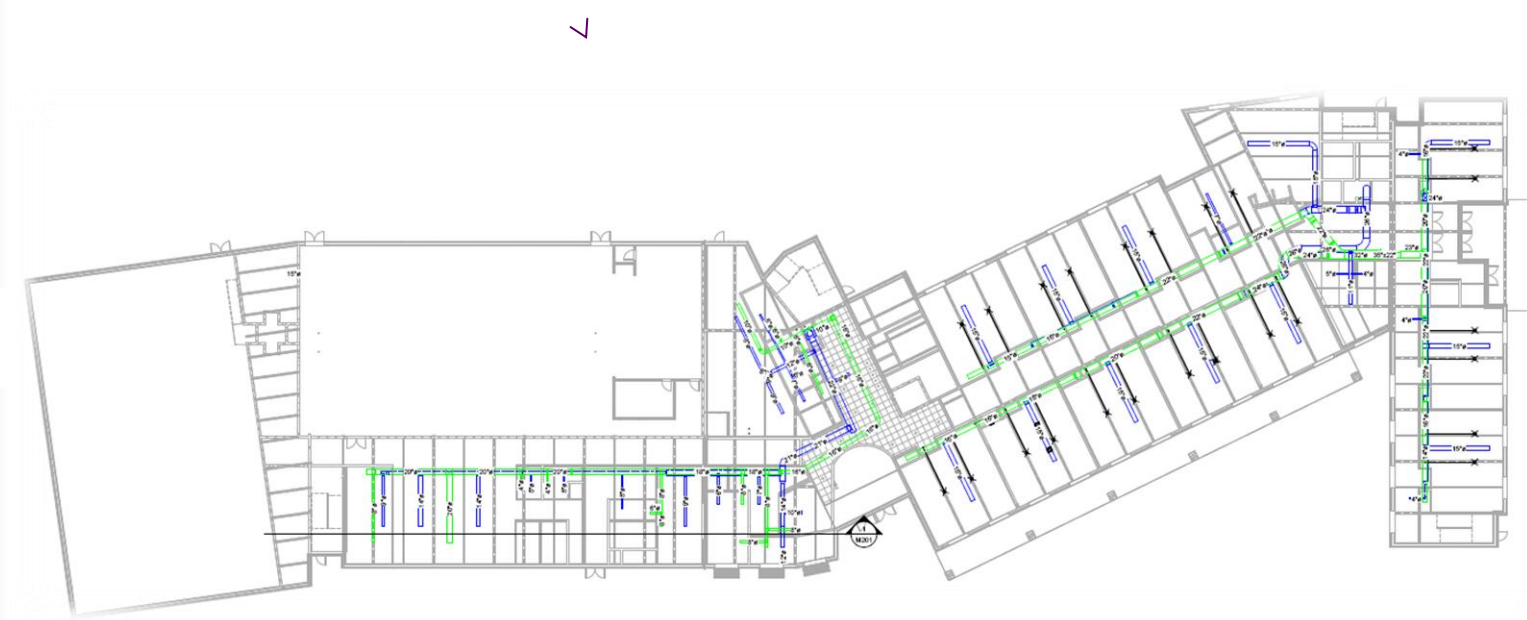
Basement Mechanical Room Layout



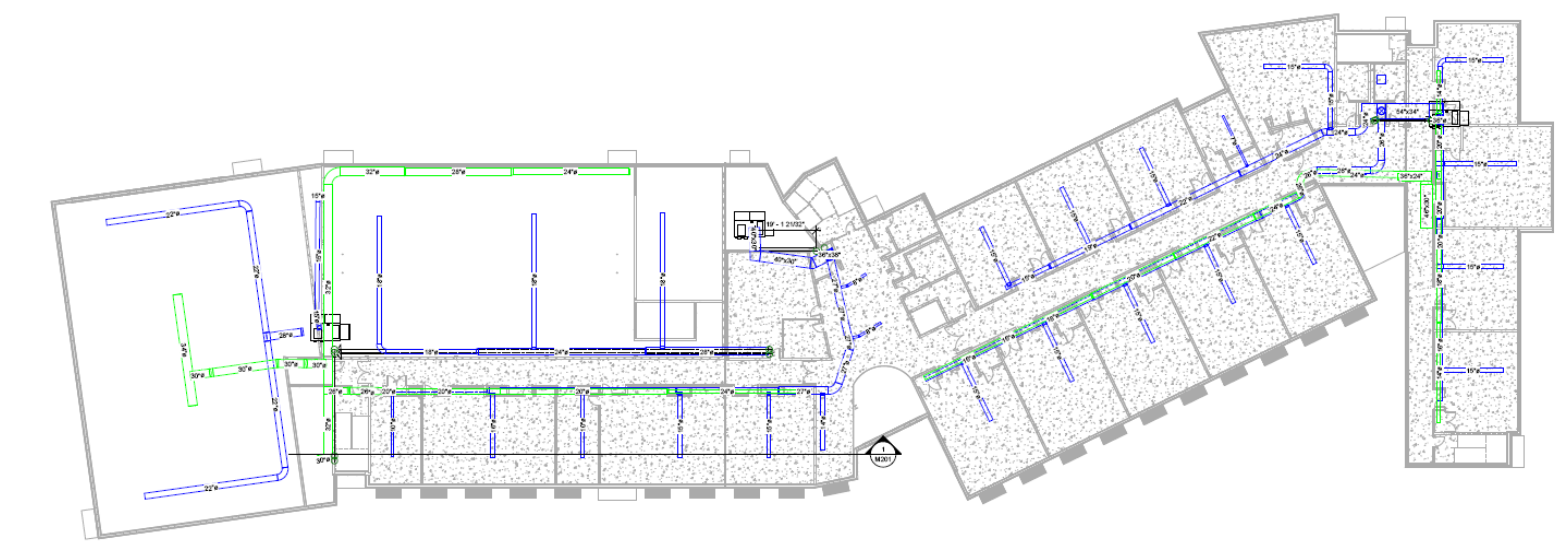
Roof Mechanical Layout

duct layout

- nexus
- introduction
- process map
- envelope
- hvac**
- integration
- sustainability
- conclusion
- appendix



first floor duct layout



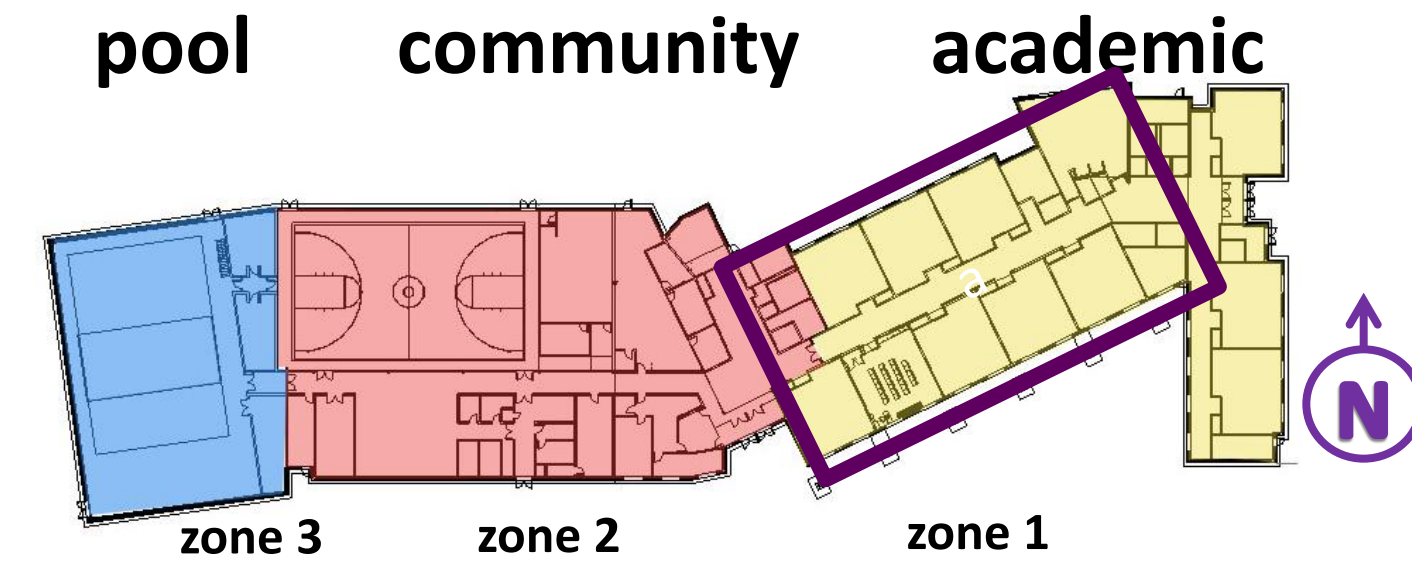
second floor duct layout



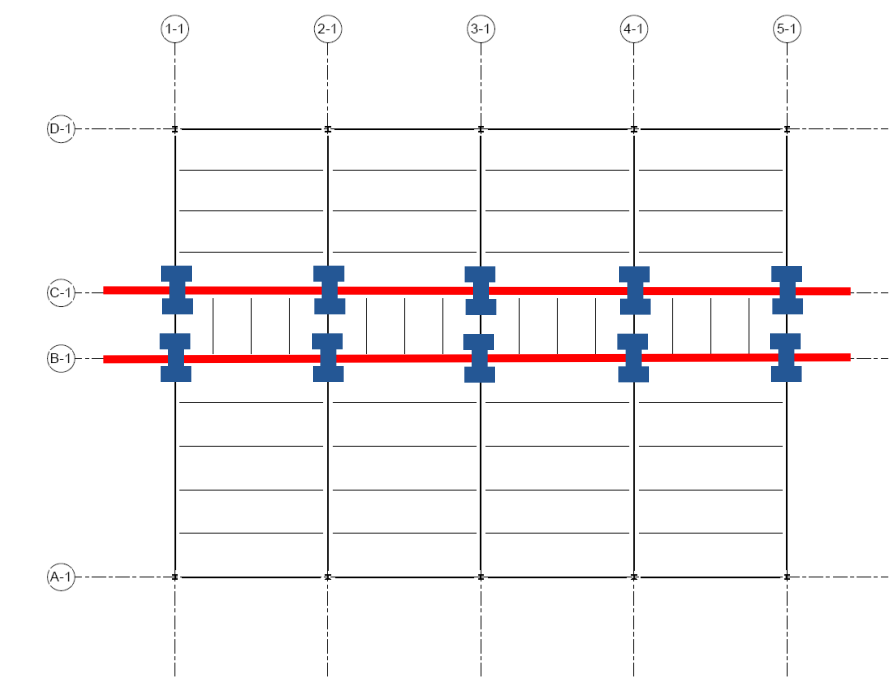
third floor duct layout

academic – classrooms

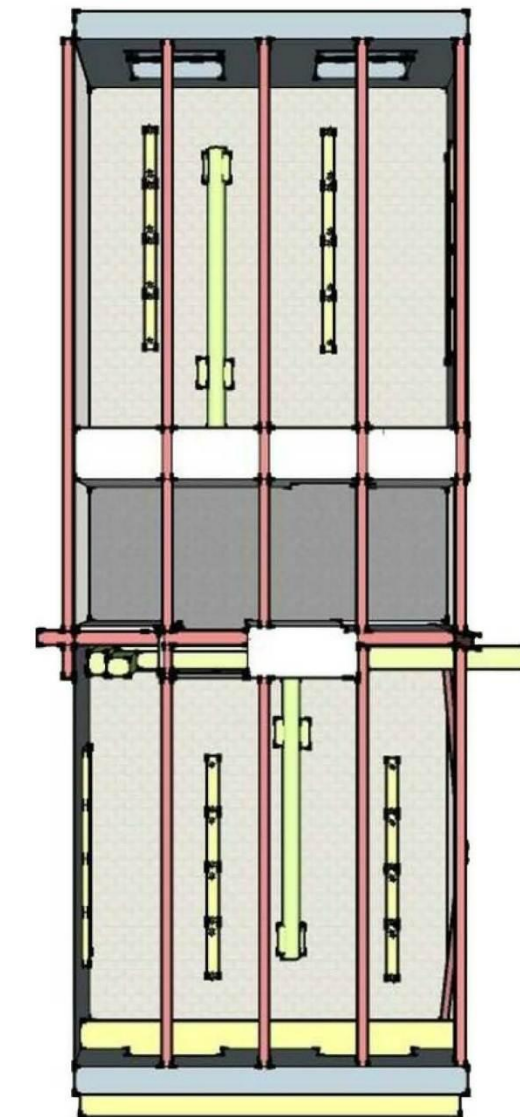
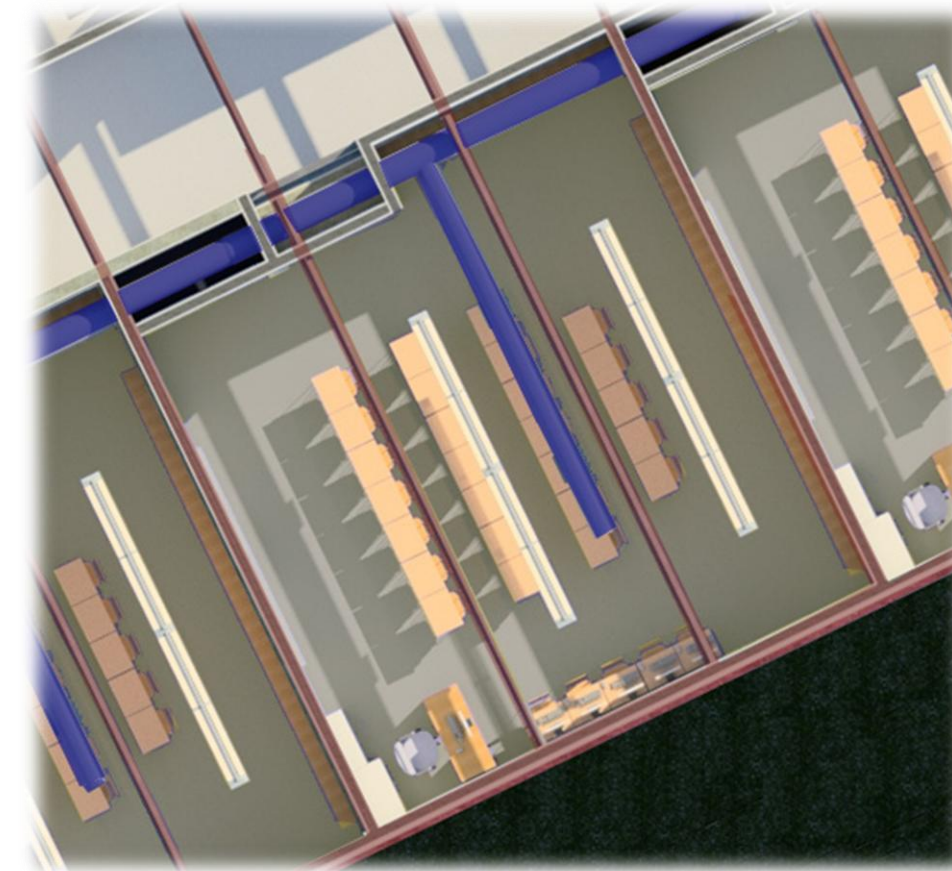
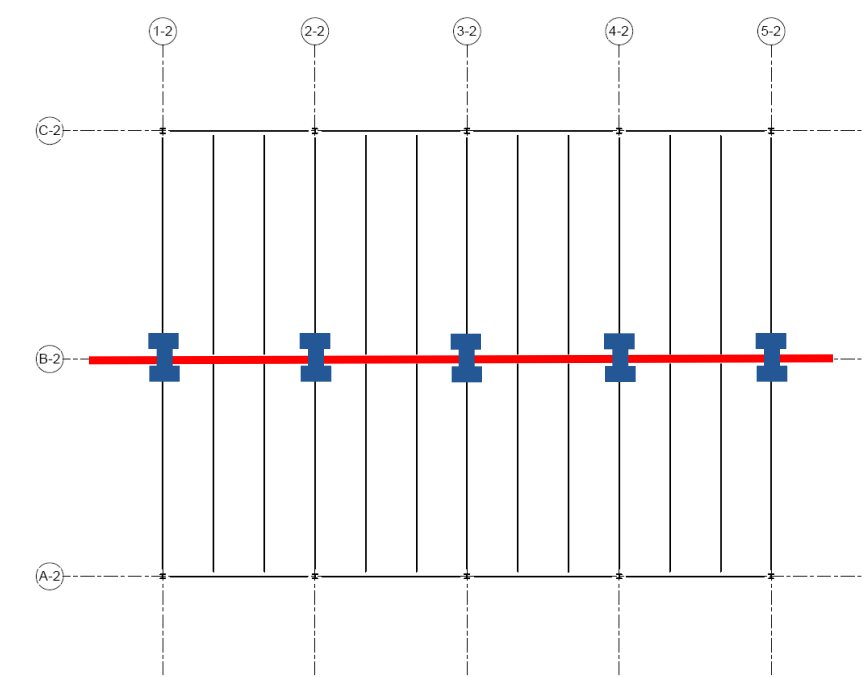
- nexus
- introduction
- process map
- envelope
- hvac
- integration
- sustainability
- conclusion
- appendix

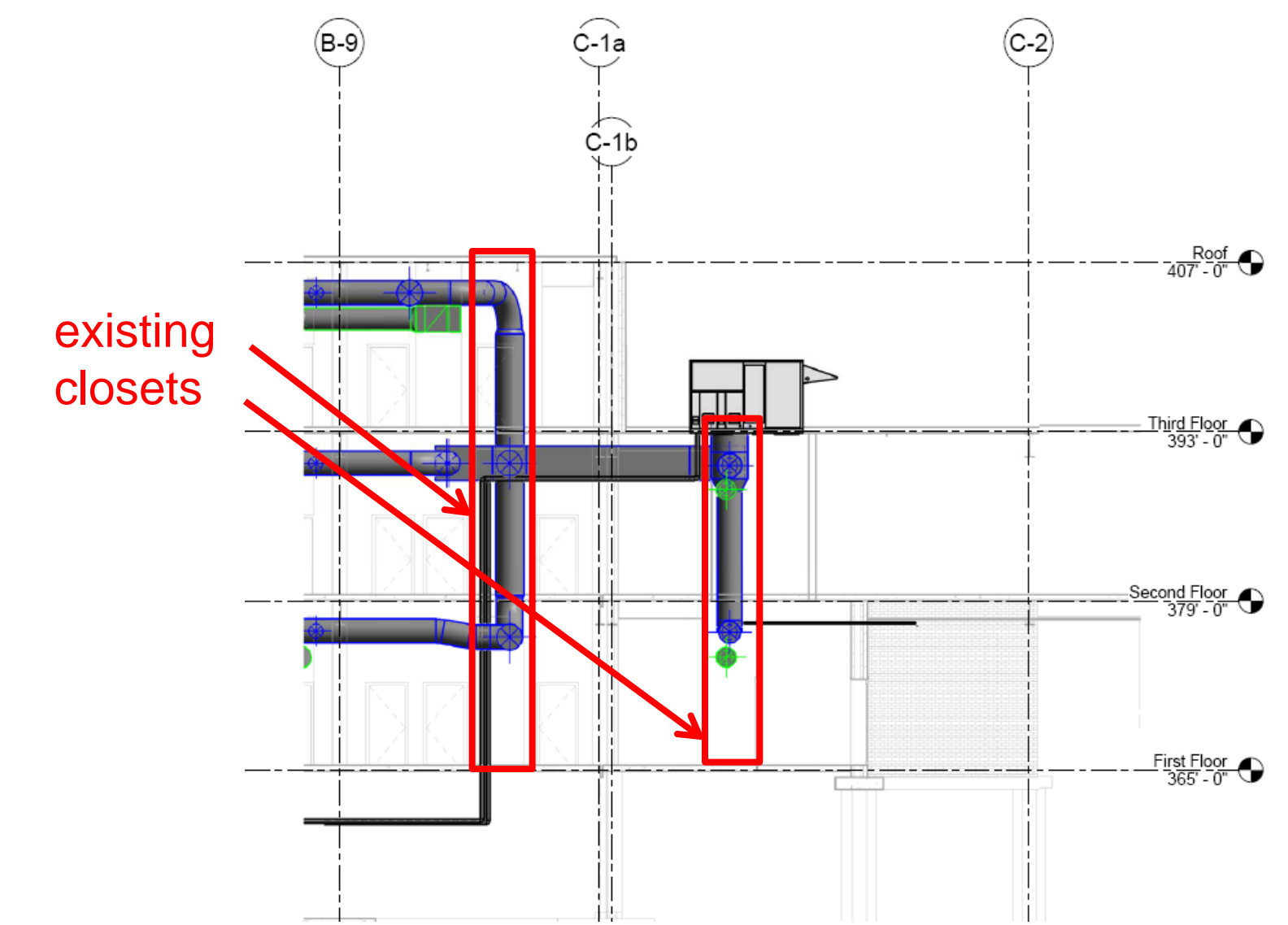
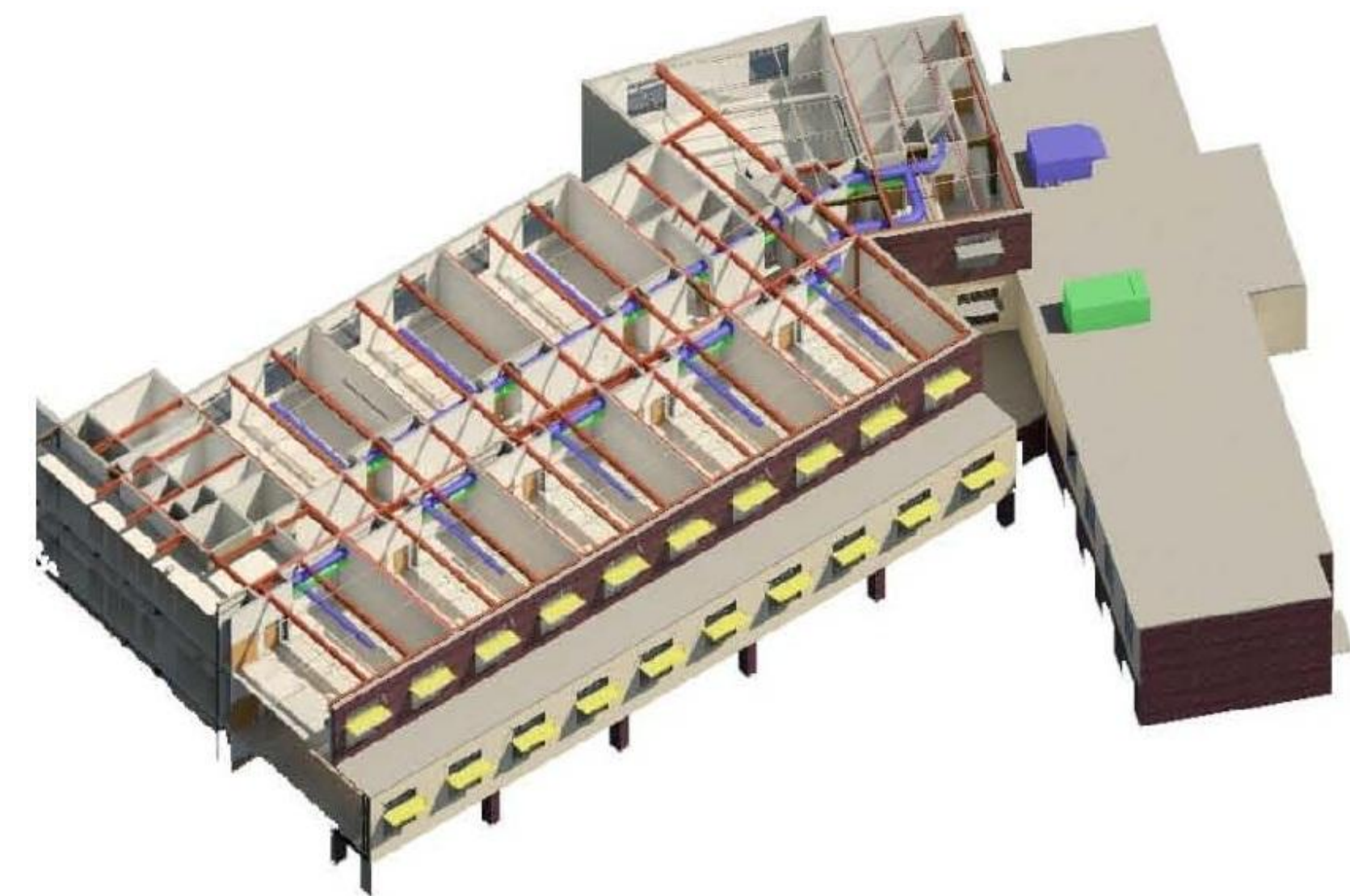
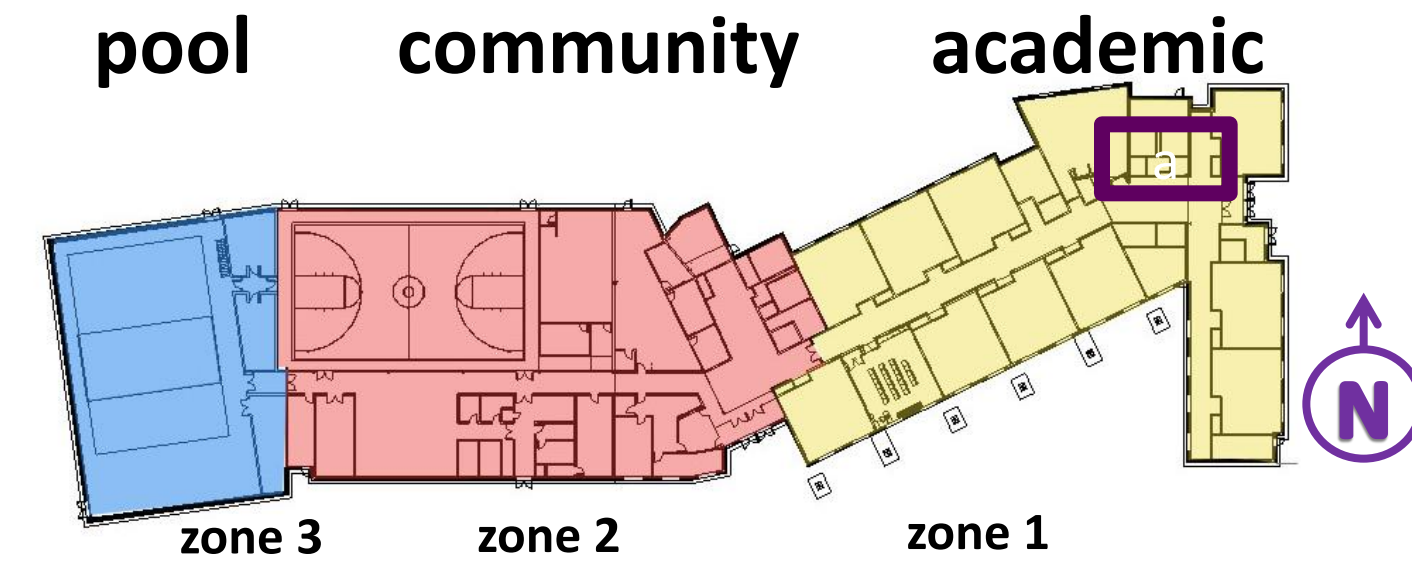


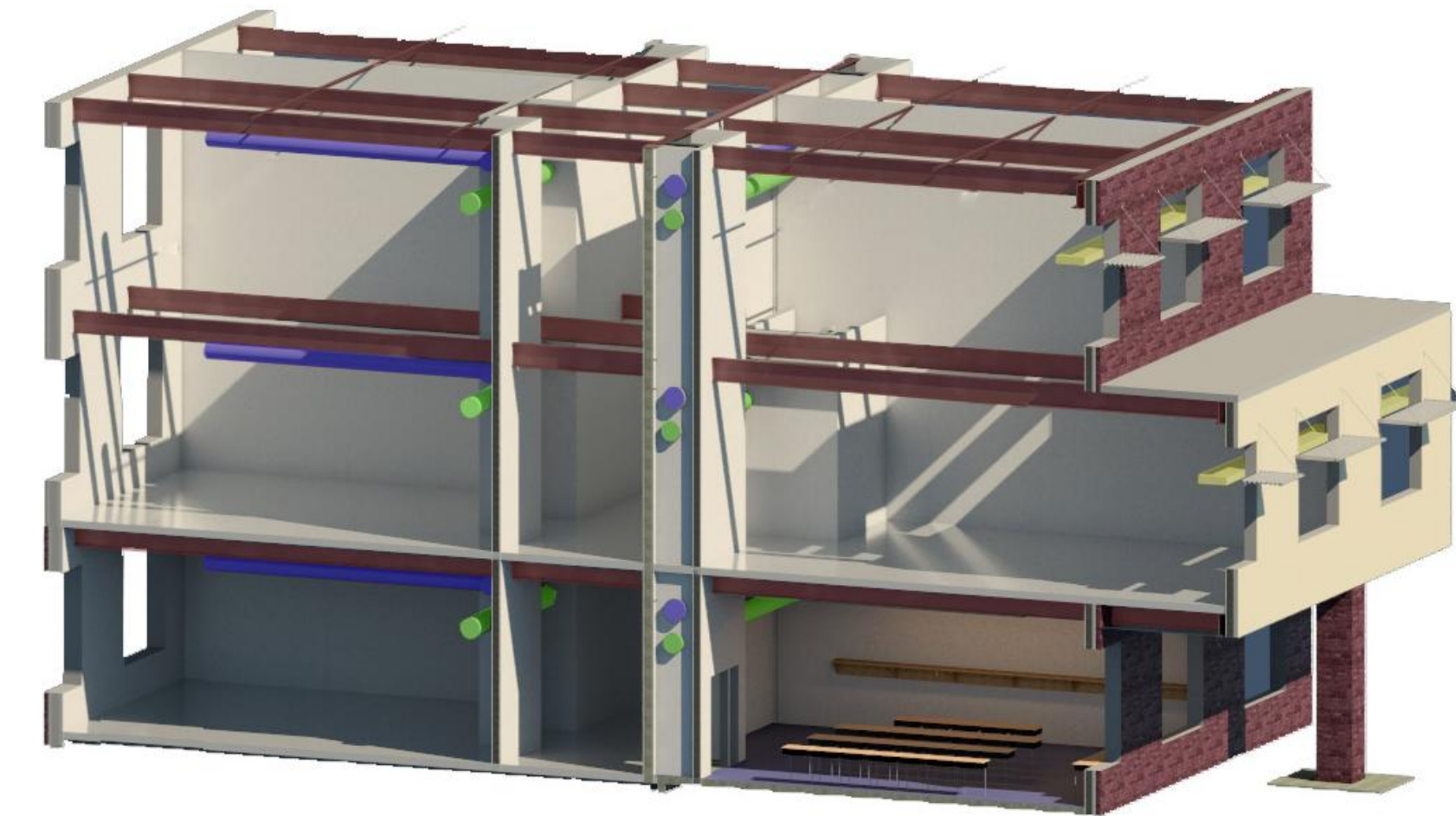
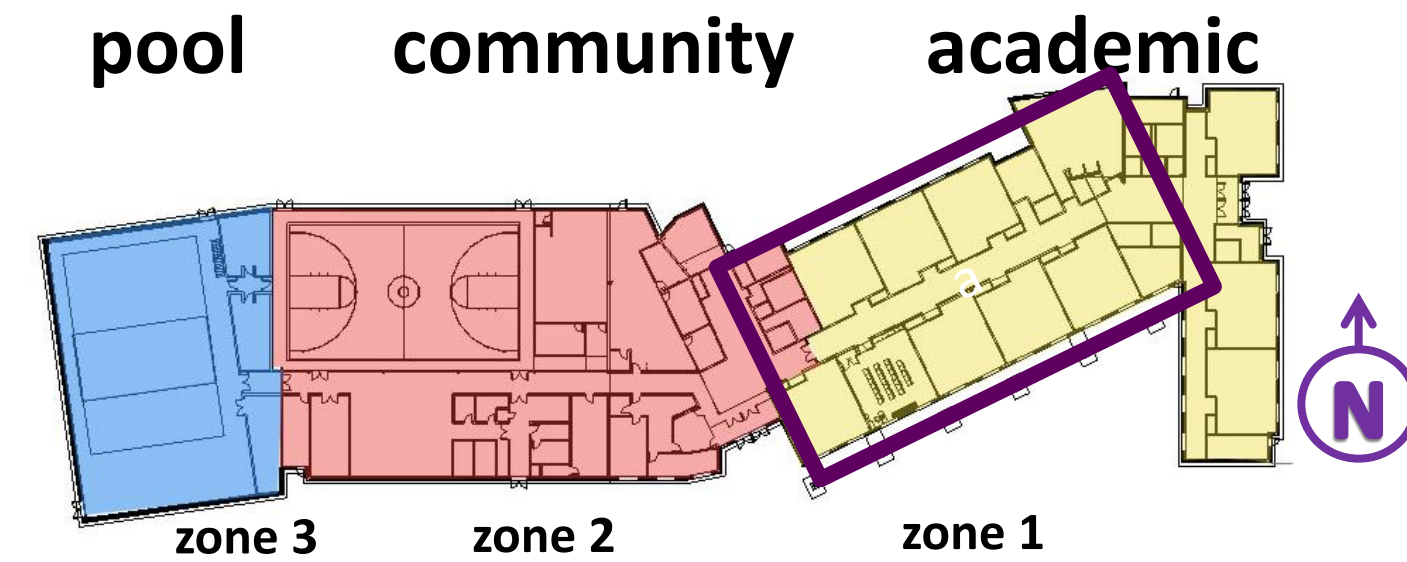
Existing Structural Bay Configuration



Proposed Structural Redesign







academic – acoustics

nexus

introduction

process map

envelope

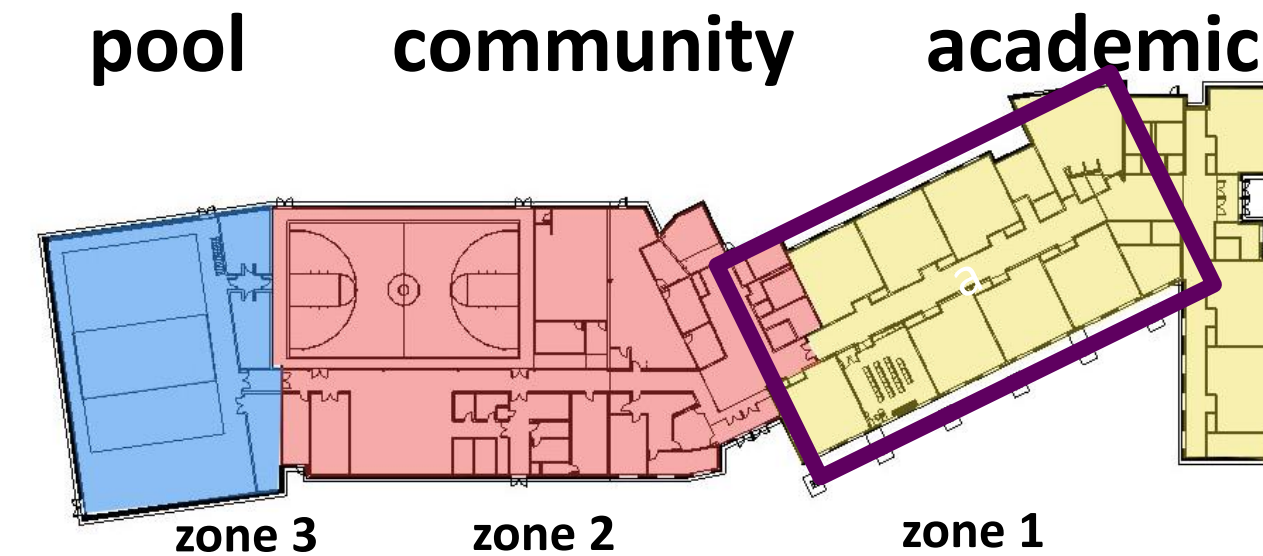
hvac

integration

sustainability

conclusion

appendix



TYPICAL CLASSROOM ACOUSTIC ANALYSIS

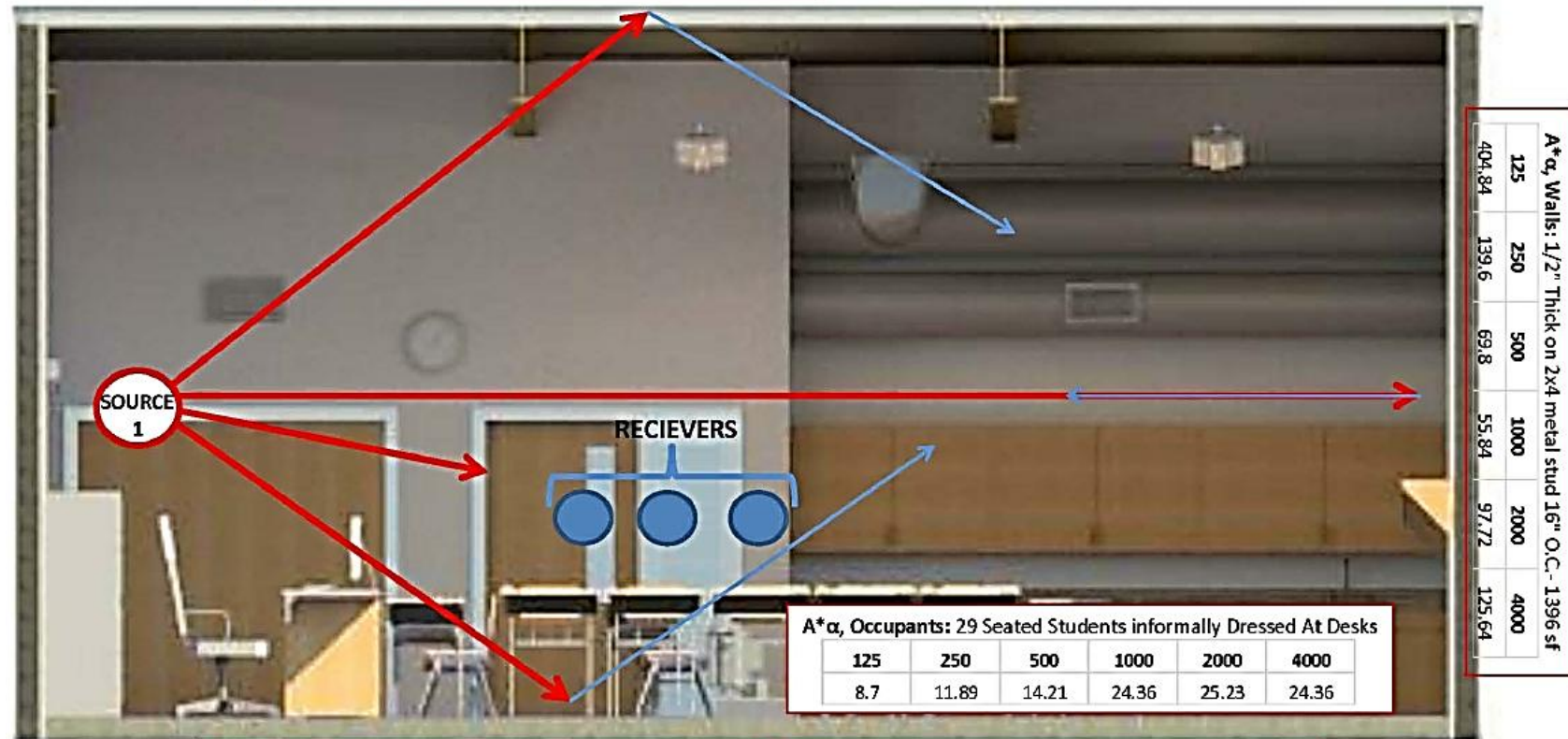
Room Dimensions
Height: 13 ft
Width: 30 ft
Length: 28 ft
Volume: 10,920 cf

A*α, Ceiling: 3VLP Metal Deck w/Insulation- 840 sf

	125	250	500	1000	2000	4000
	336	470.4	898.8	655.2	478.8	294

T_{60} (Reverb Time) = 0.05V/A
Recommended Time For Elementary School Classrooms: 0.6-0.8 seconds

Frequency (Hz)	125	250	500	1000	2000	4000
Room T ₆₀ (s)	0.682551	0.785962	0.48628	0.516361	0.827285	1.085314



A*α, Flooring: Heavy Traffic Carpet Tile on Concrete- 840 sf

	125	250	500	1000	2000	4000
	16.8	50.4	117.6	310.8	50.4	54.6

A*α, Glazing: Double Pane Argon – 122sf

	125	250	500	1000	2000	4000
	33.6	22.4	22.4	11.2	7.8	4.5

A*α, Occupants: 29 Seated Students informally Dressed At Desks

	125	250	500	1000	2000	4000
	8.7	11.89	14.21	24.36	25.23	24.36

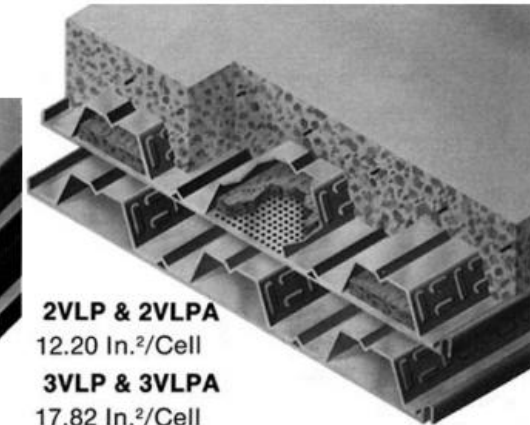
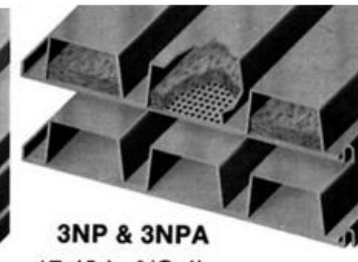
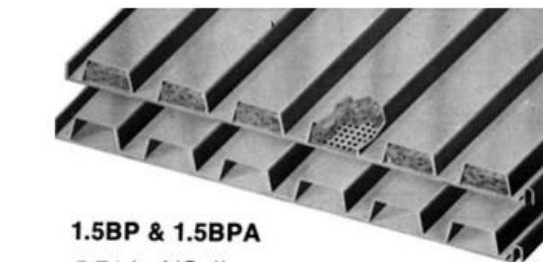
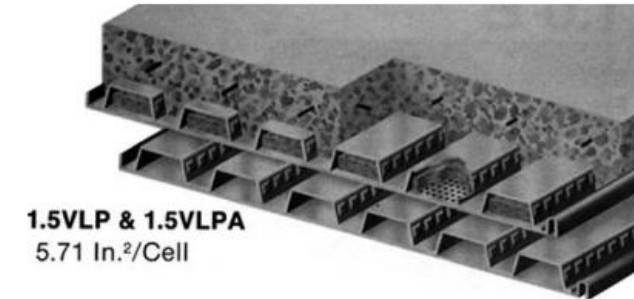


CELLULAR DECK

Galvanized Only
For: Electrified Raceways — Canopies — Long Spans
Heavy Forms — Flat Acoustical Ceilings

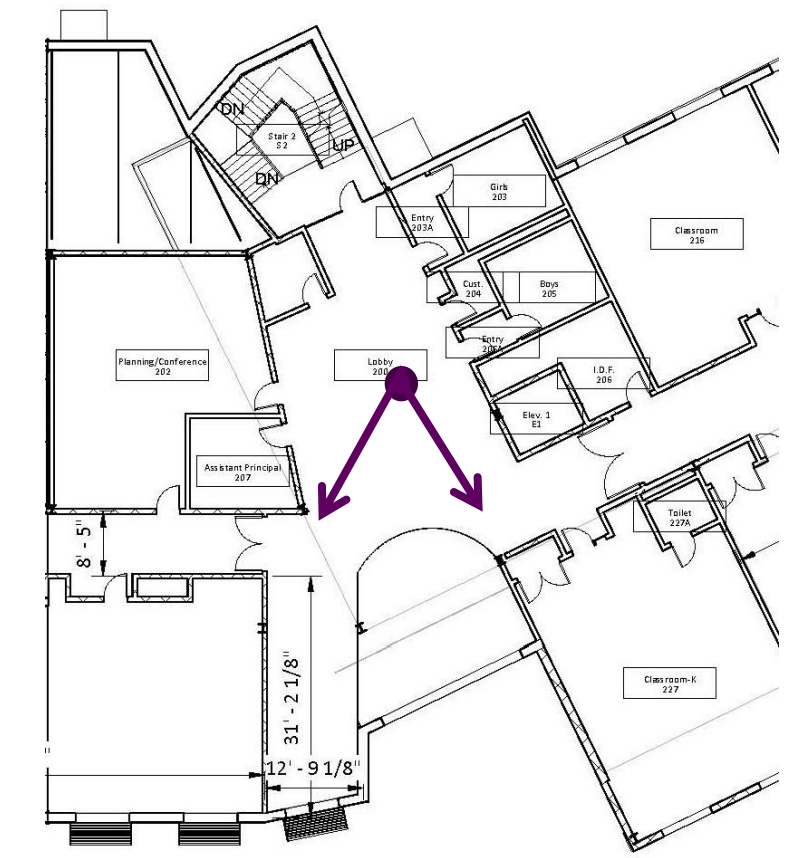
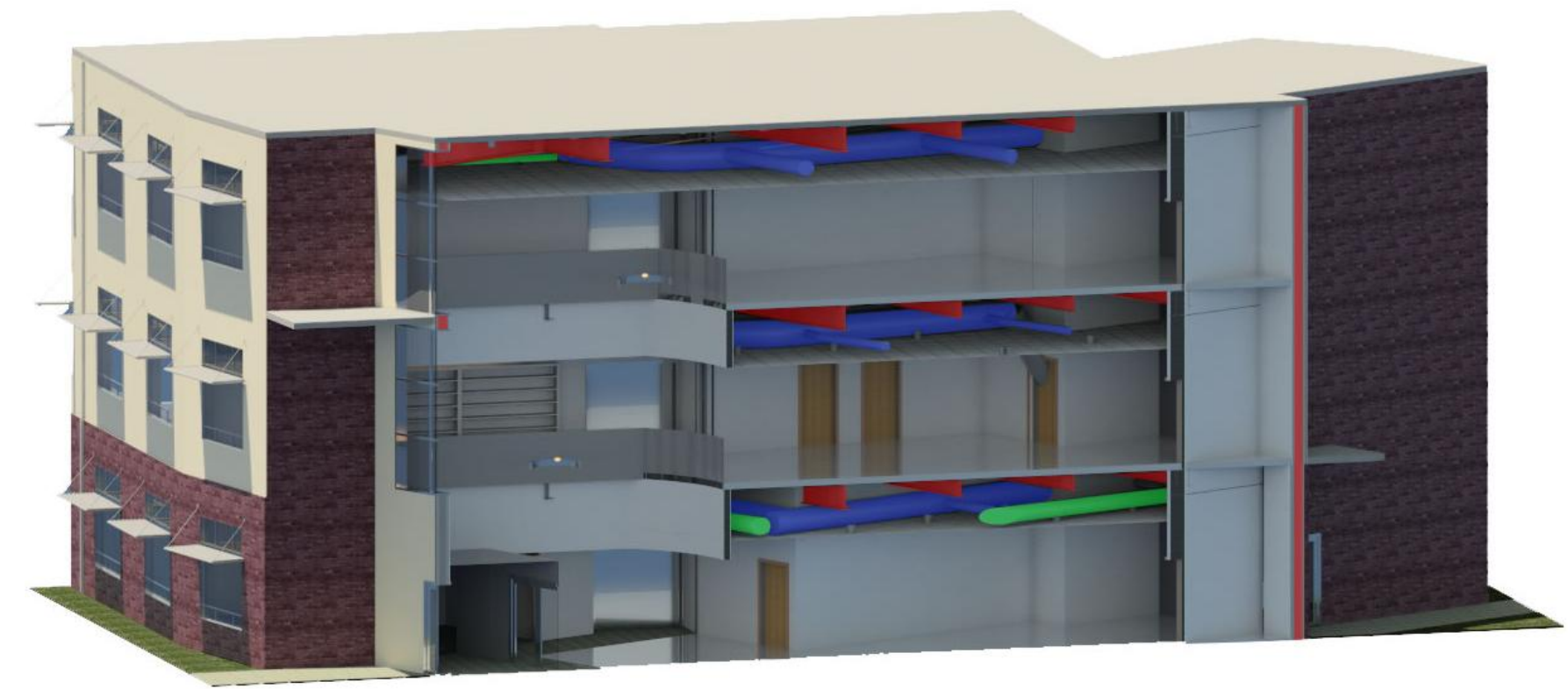
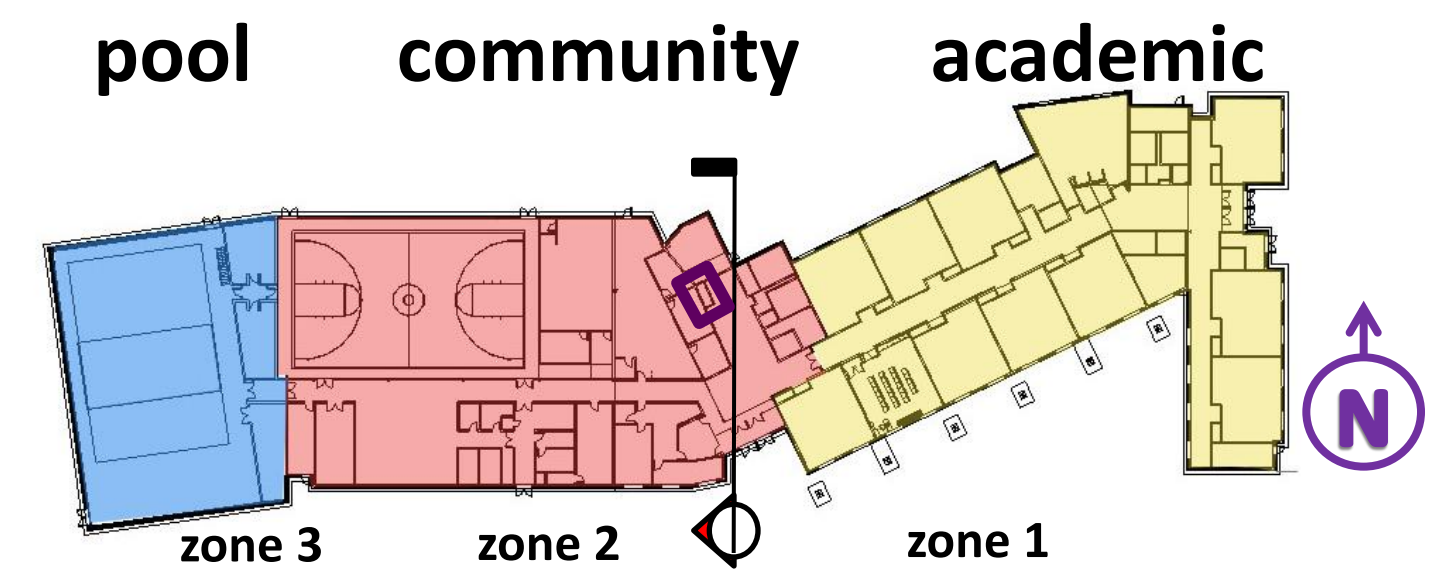
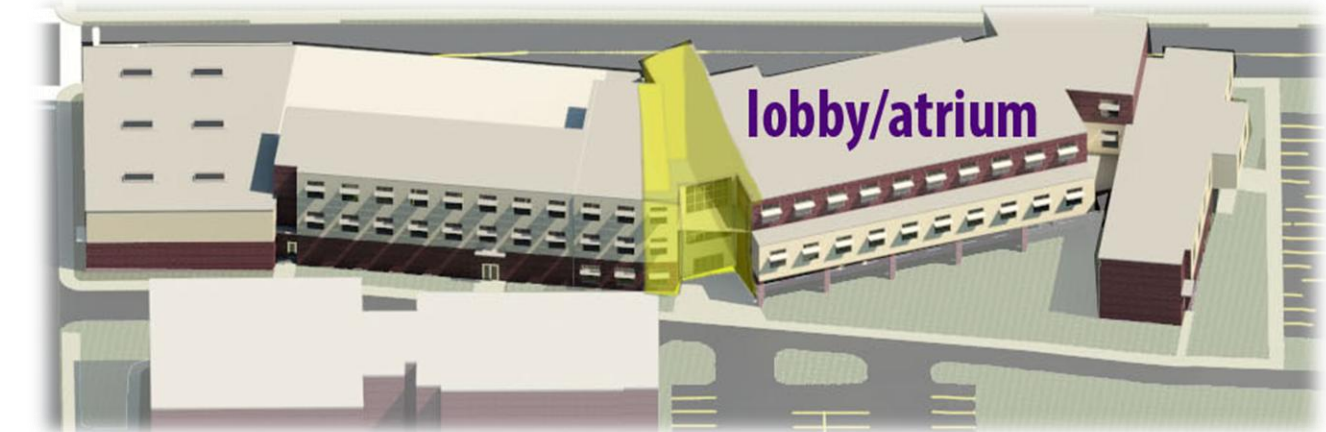
Vulcraft Cellular Units are approved by U.L. for use as Electrical Raceways.

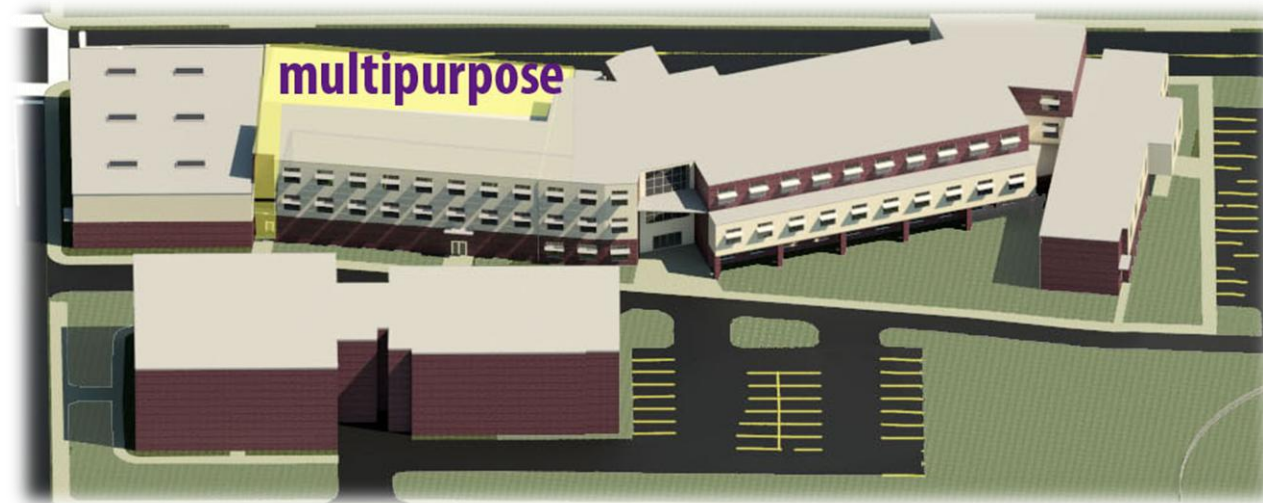
NOTE:
Insulation not installed by Vulcraft.



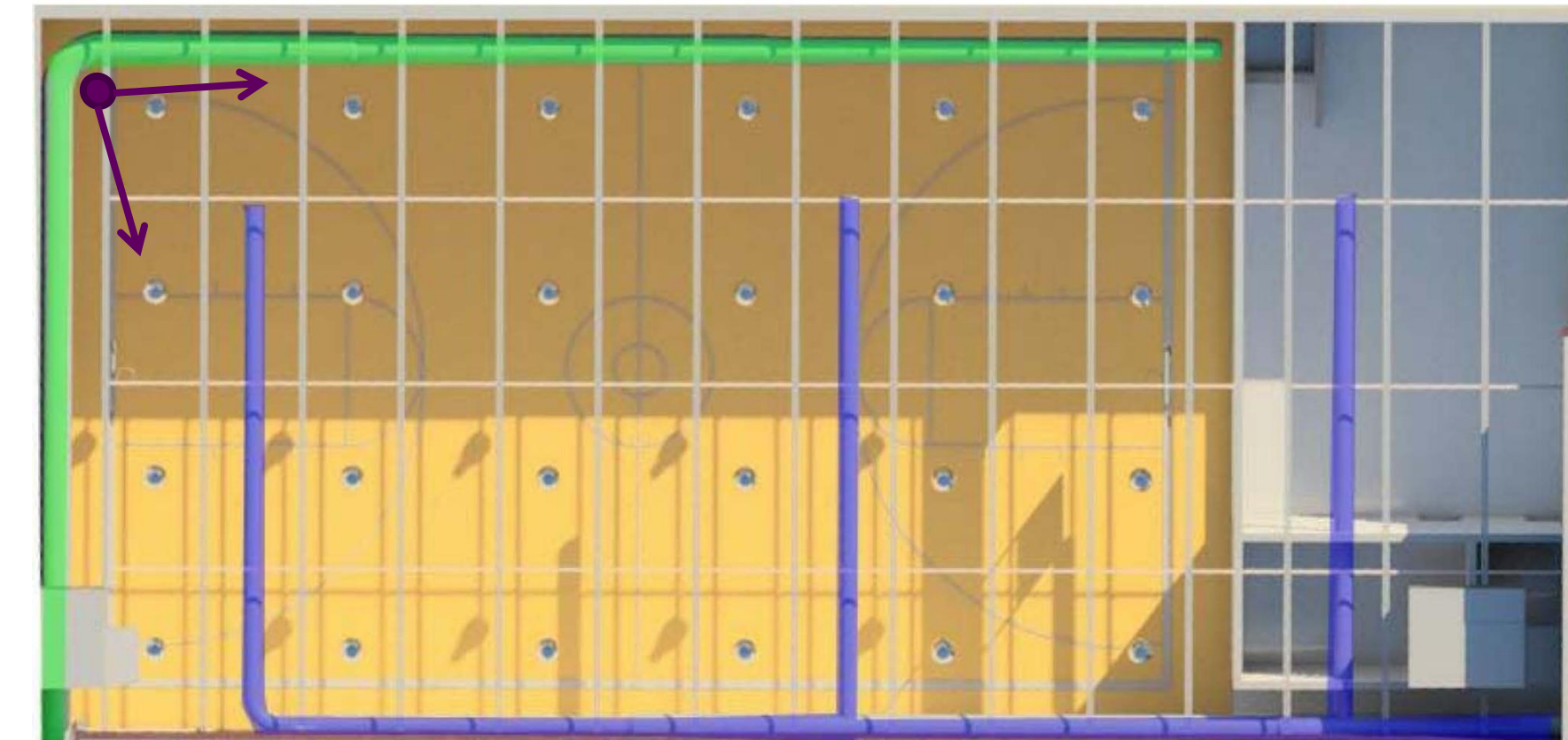
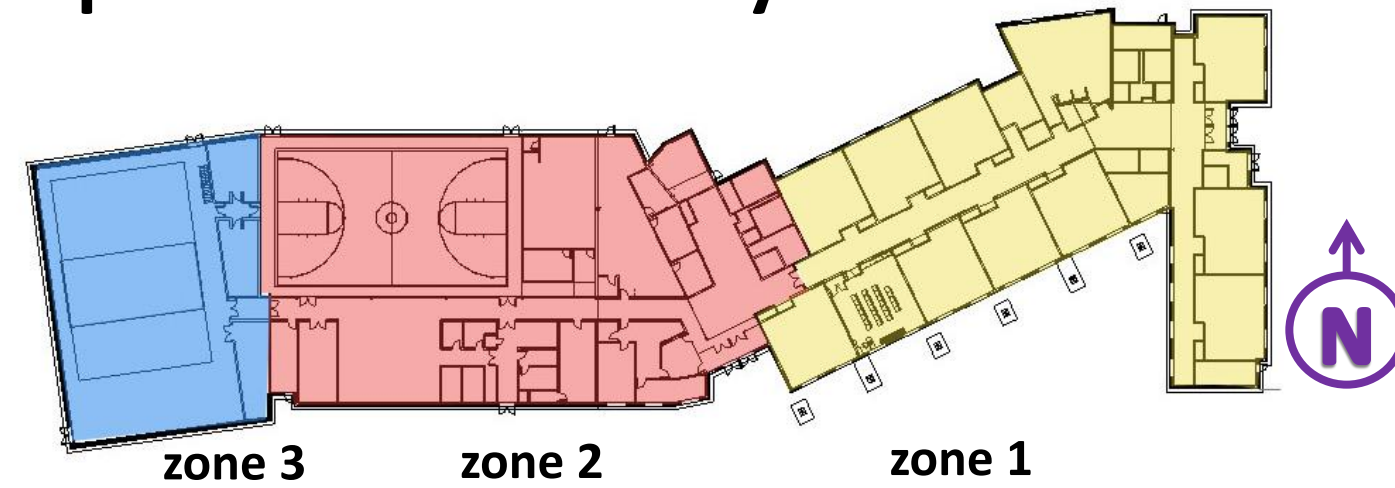
ACOUSTICAL DATA

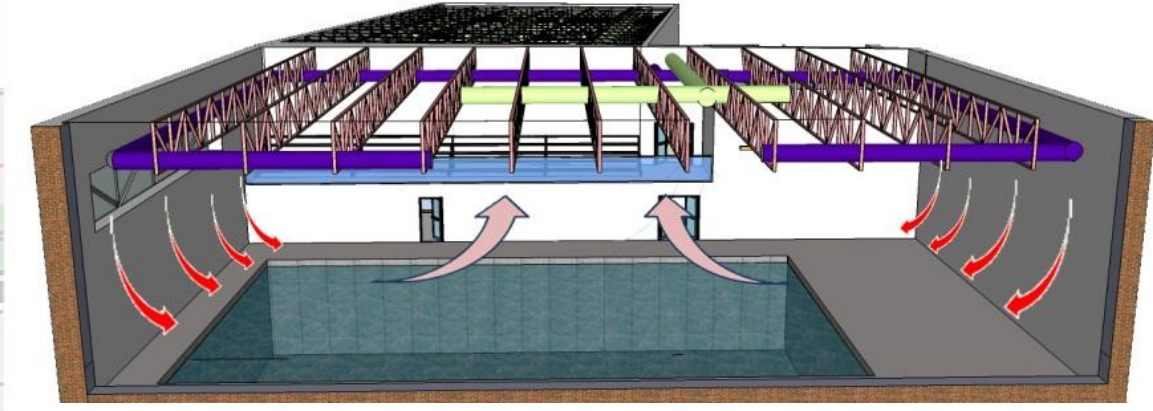
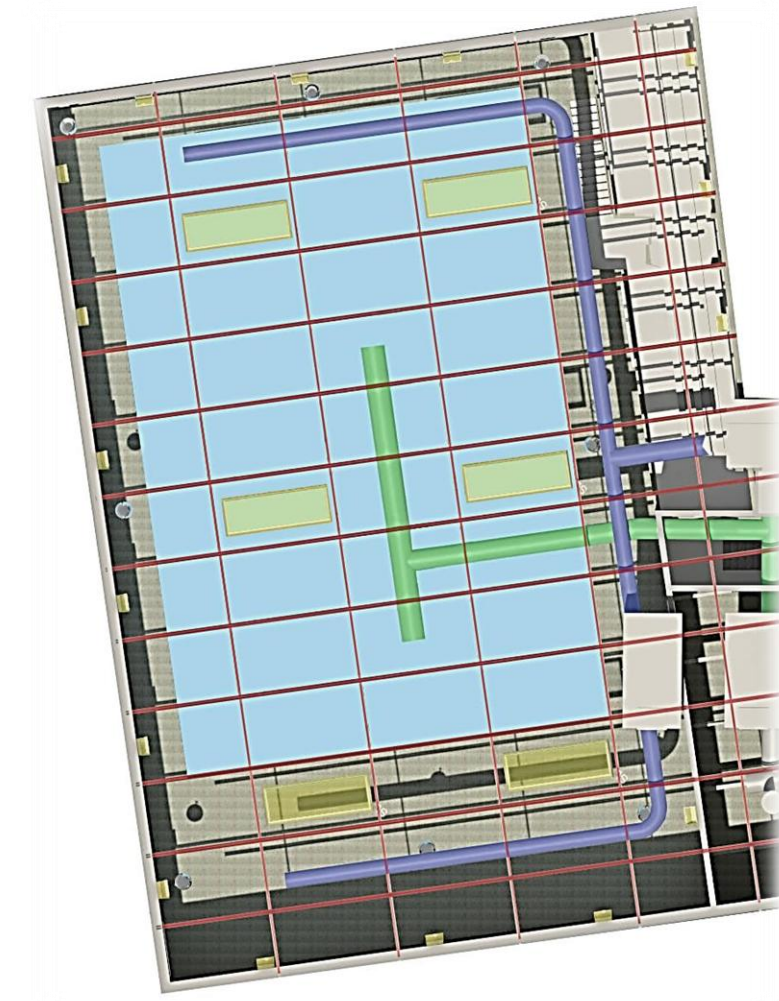
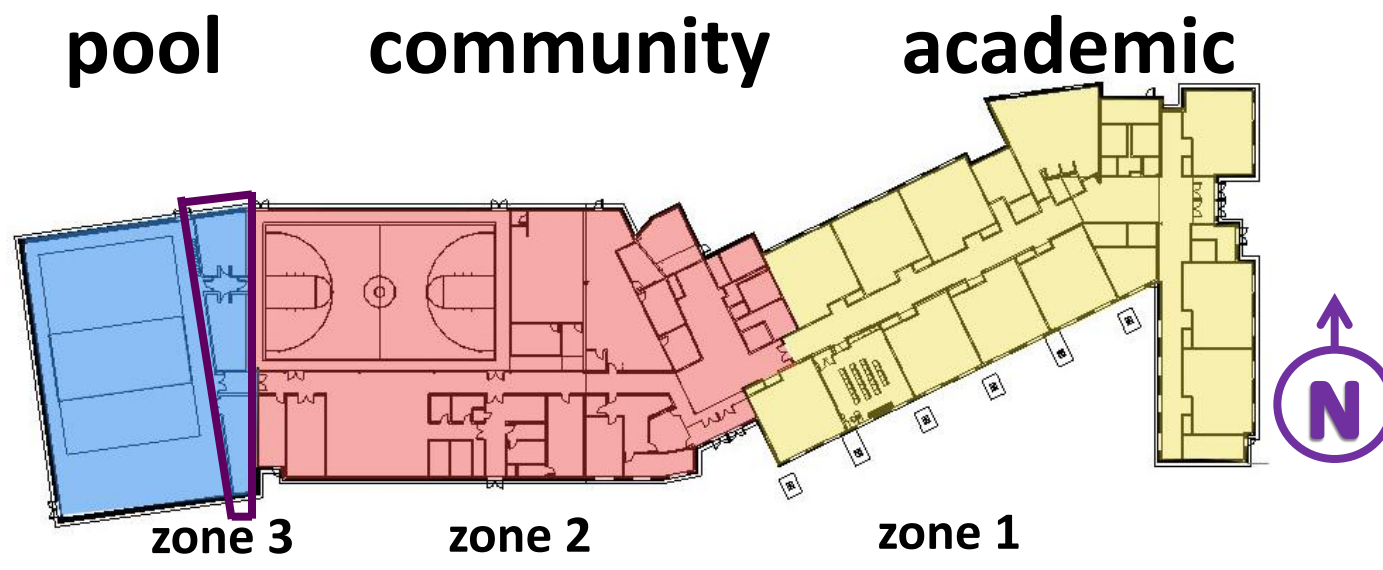
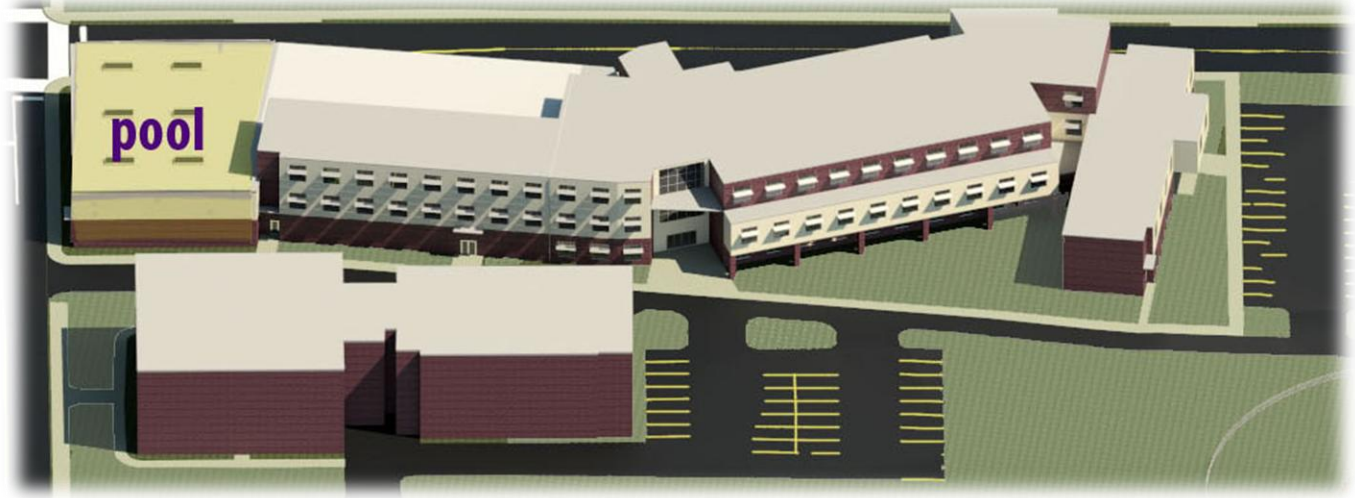
Deck Type	Absorption Coefficients						Noise Reduction Coefficient	RAL™ Test No.
	125	250	500	1000	2000	4000		
1.5BPA	0.34	0.42	0.36	0.22	0.17	0.17	0.30 W/O Insulation	A85-154
3NPA	0.40	0.38	0.47	0.19	0.11	0.17	0.30 W/O Insulation	A85-156
1.5VLP	0.09	0.11	0.25	0.14	0.16	0.28	0.15 W/O Insulation	A86-317
2VLP	0.12	0.24	0.20	0.14	0.07	0.18	0.15 W/O Insulation	A86-319
3VLP	0.33	0.31	0.30	0.14	0.09	0.01	0.20 W/O Insulation	A86-321
1.5BPA	0.38	0.49	0.63	0.98	0.74	0.54	0.70 W/ Insulation	A85-155
3NPA	0.48	0.56	0.98	0.92	0.72	0.58	0.80 W/ Insulation	A85-157
1.5VLP	0.14	0.21	0.61	0.99	0.69	0.27	0.65 W/ Insulation	A86-318
2VLP	0.31	0.41	0.94	0.88	0.56	0.44	0.70 W/ Insulation	A86-320
3VLP	0.40	0.56	1.07	0.78	0.57	0.35	0.75 W/ Insulation	A86-322





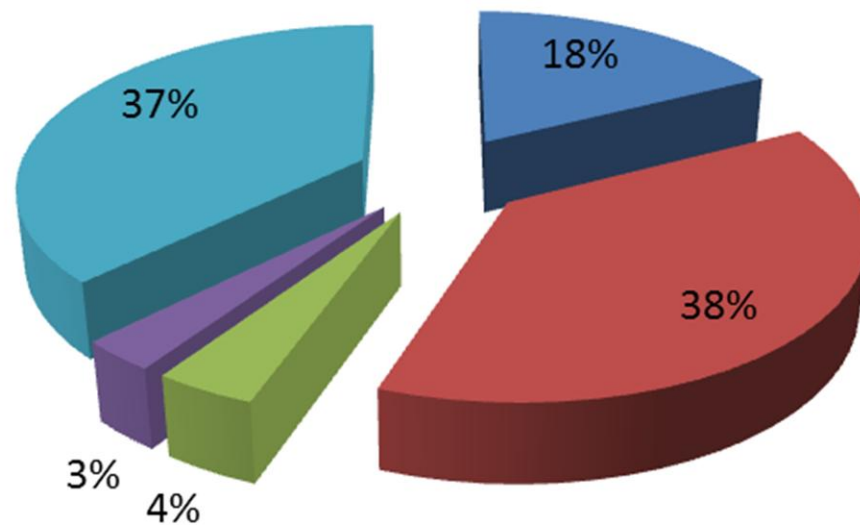
pool **community** **academic**





Full Building Load Breakdown

■ Lights ■ People ■ Miscellaneous ■ Infiltration ■ Envelope



Total: 1,643,205 BTU/hr

Baseline Building Loads						
Zone		Cooling Capacity [TONS]	Heating Capacity [TONS]	Airflow [CFM]	kWh/a	sf/ton
1	Academic	165.2	85.3	42,120	609,496	291.37
2	Community	127.4	48.7	28,735	441,265	270.53
3	Pool	14.1	36.4	9,100	134,680	368.35
	TOTAL	306.7	170.4	79,955	1,185,560	

VS

Nexus Building Load						
Zone		Cooling Capacity [TONS]	Heating Capacity [TONS]	Airflow [CFM]	kWh/a	sf/ton
1	Academic	86.7	64.2	35,610	321,059	424.23
2	Community	57.7	39.6	25,525	232,429	554.12
3	Pool	13.9	28.3	7,800	70,986	524.34
	TOTAL	158.3	132.1	68,935	624,474	

LEED 2009 for Schools

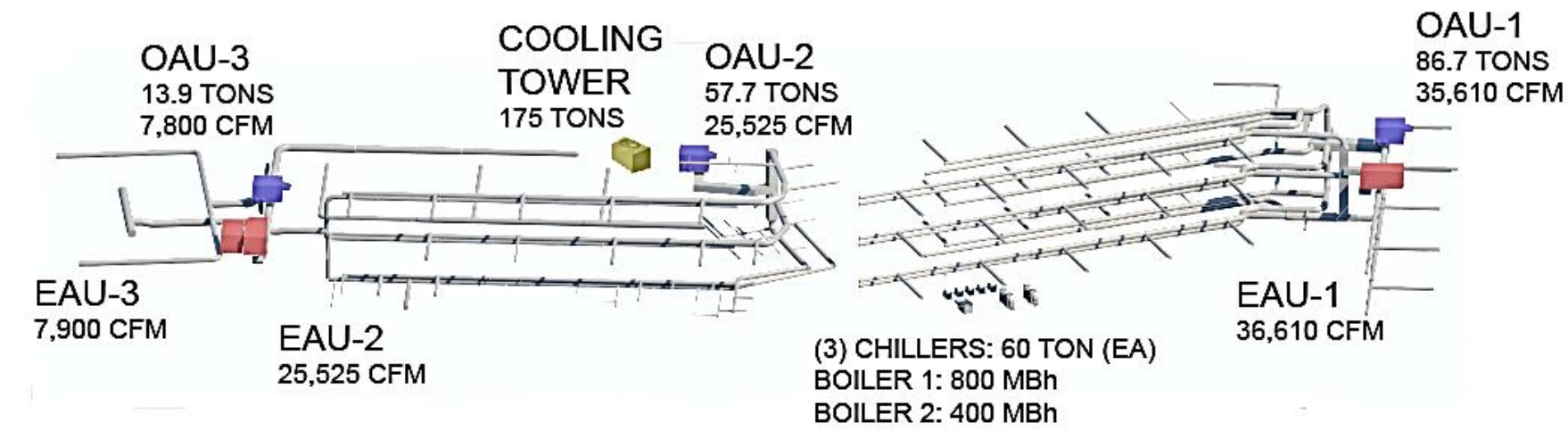
Sustainable Site	13
Water Efficiency	7
Energy and Atmosphere	14
Materials and Resources	4
Indoor Environmental Quality	15
Innovation and Design Process	2
Regional Priority Credits	0
Total	55

recover



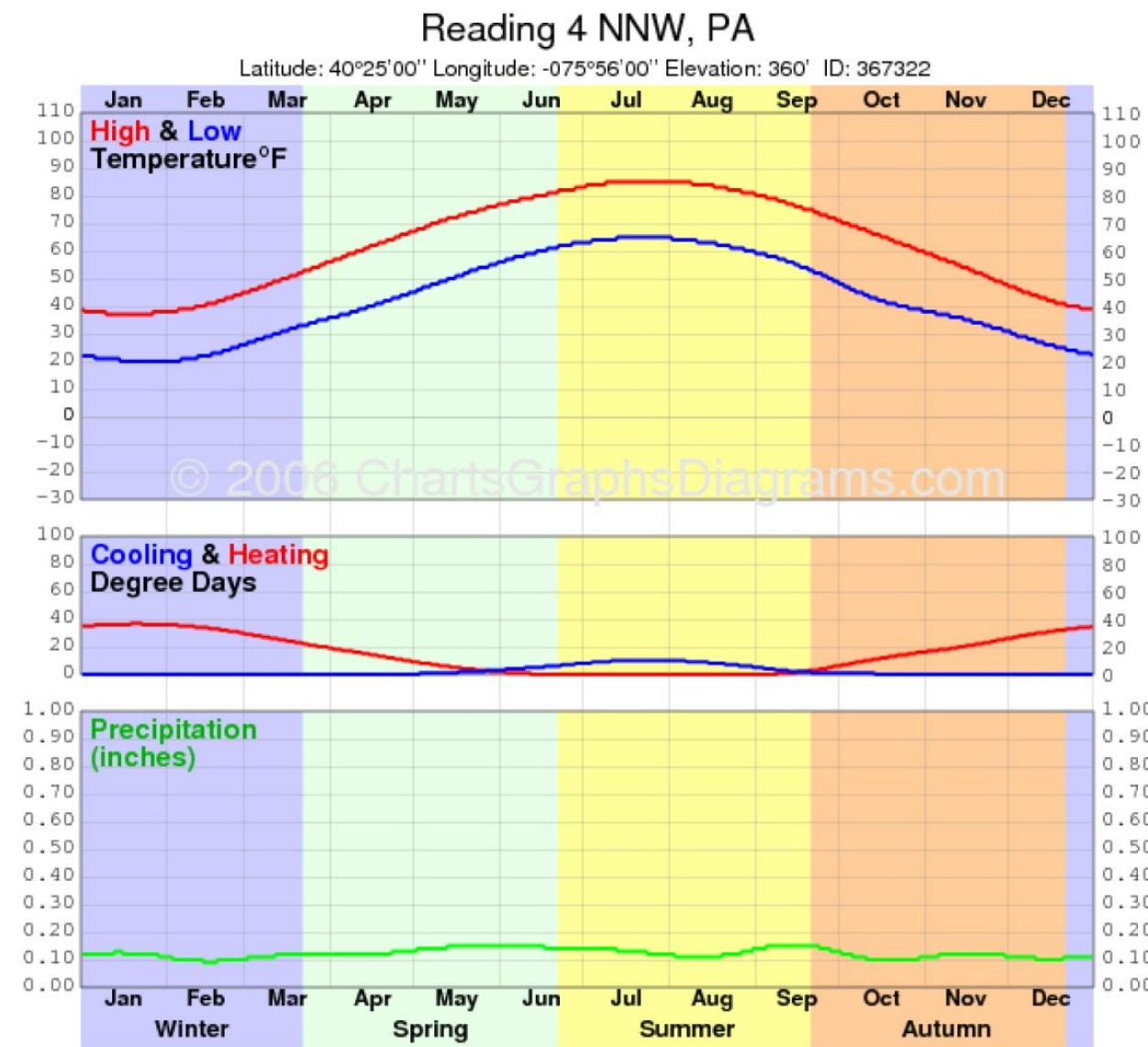
reduce

reuse

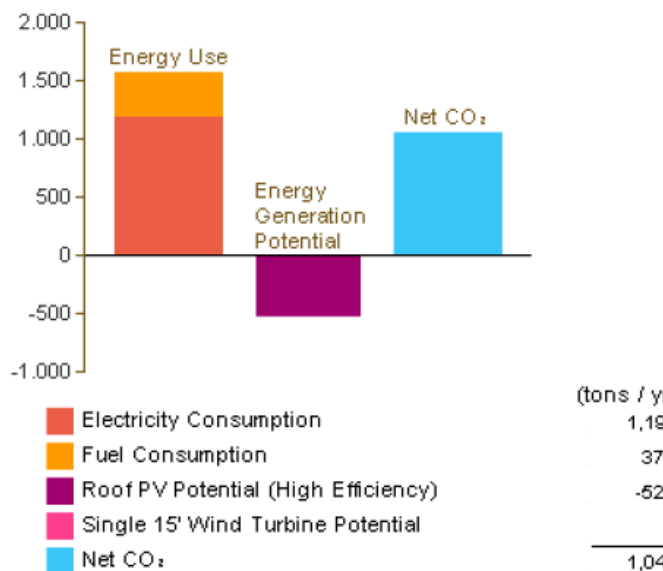
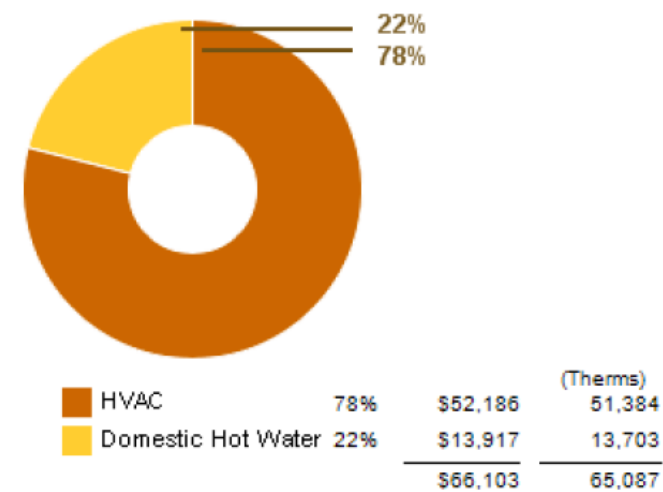


appendix

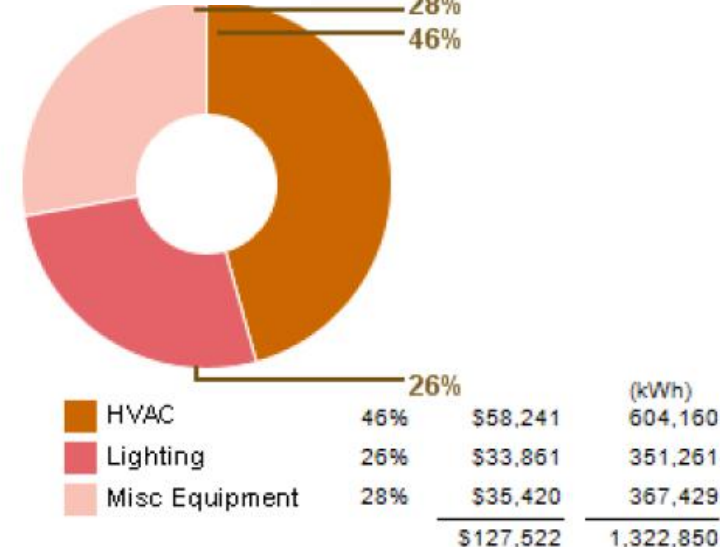
project vasari preliminary energy outputs



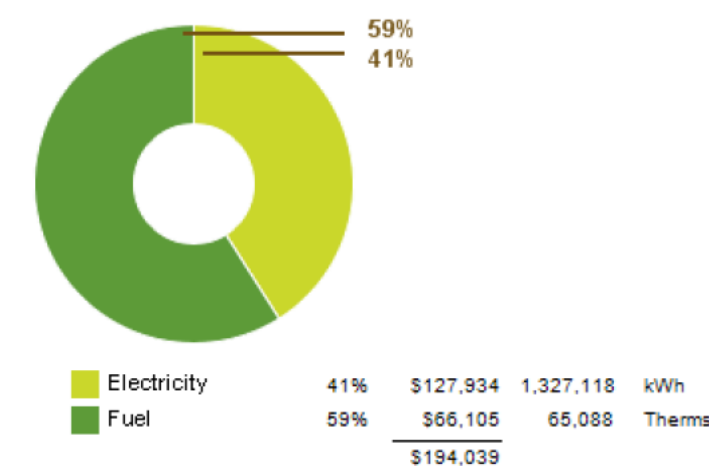
Energy Use: Fuel



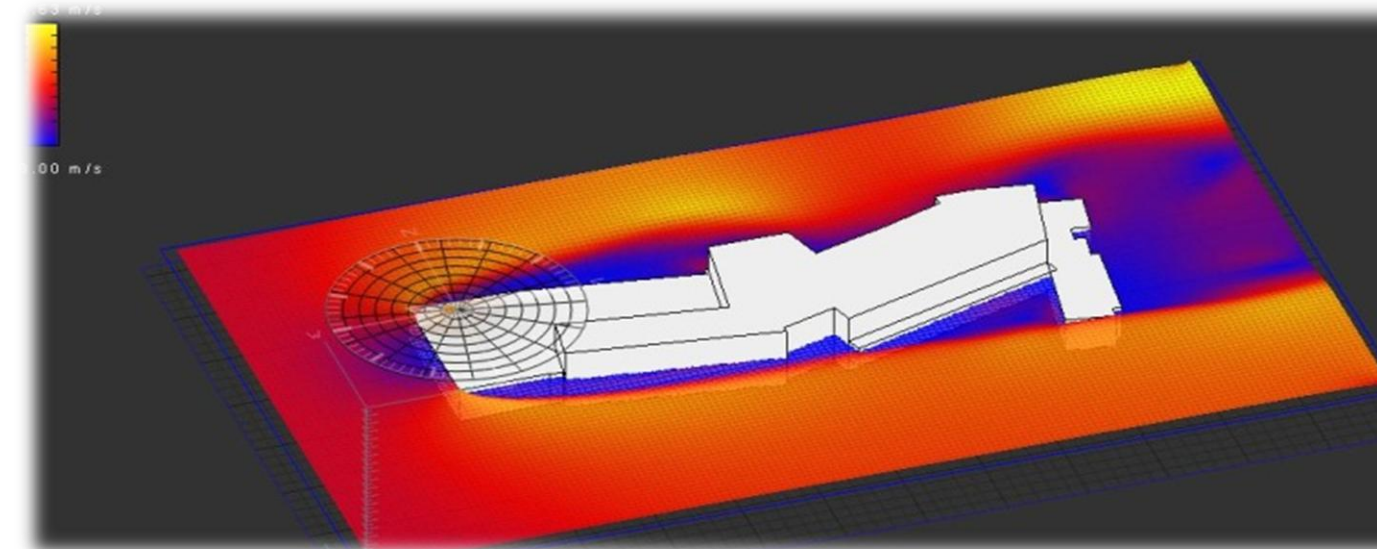
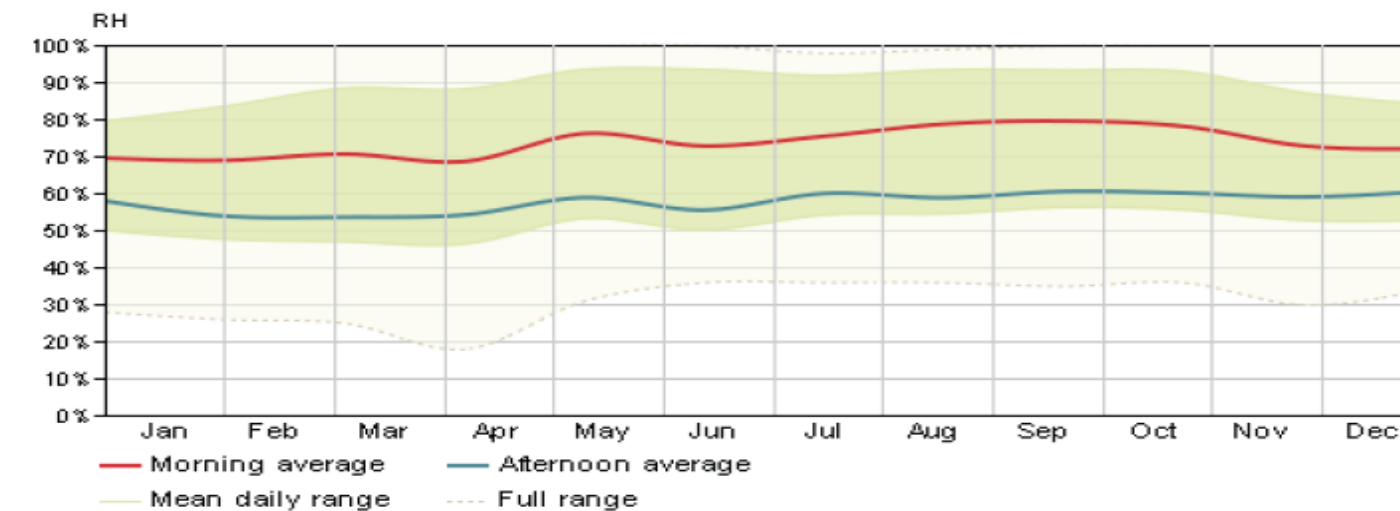
Energy Use: Electricity



Annual Energy Use/Cost

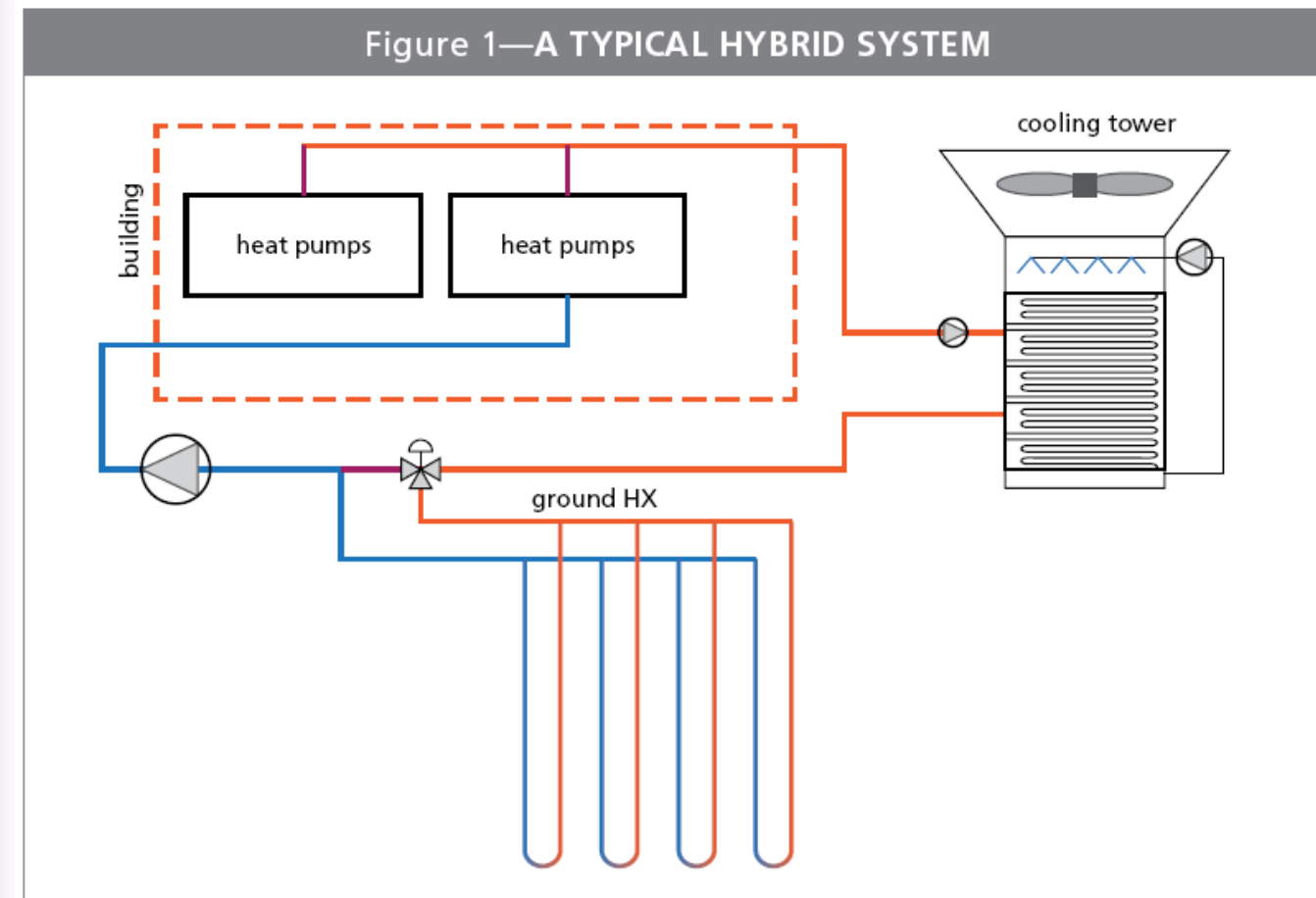


Humidity



hybrid geothermal analysis

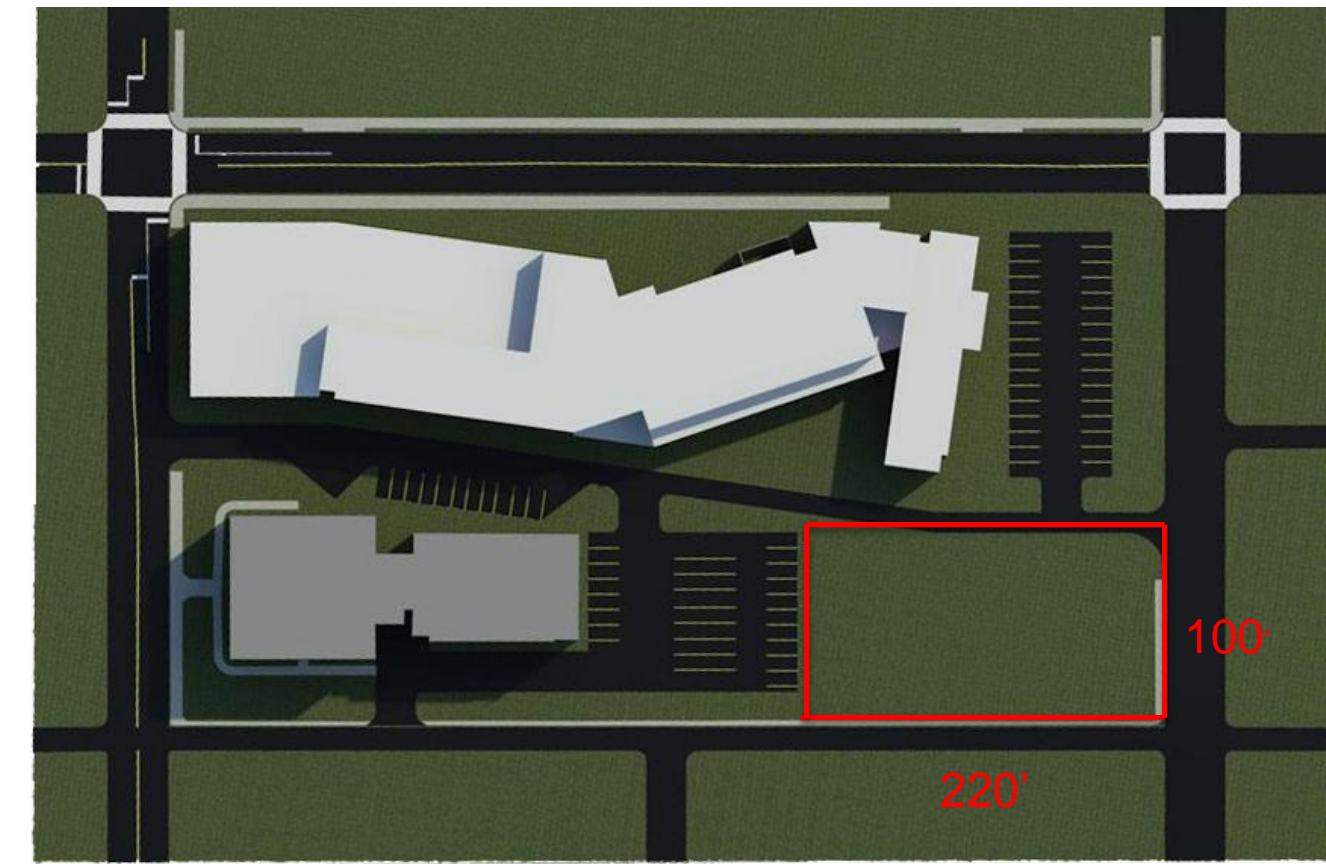
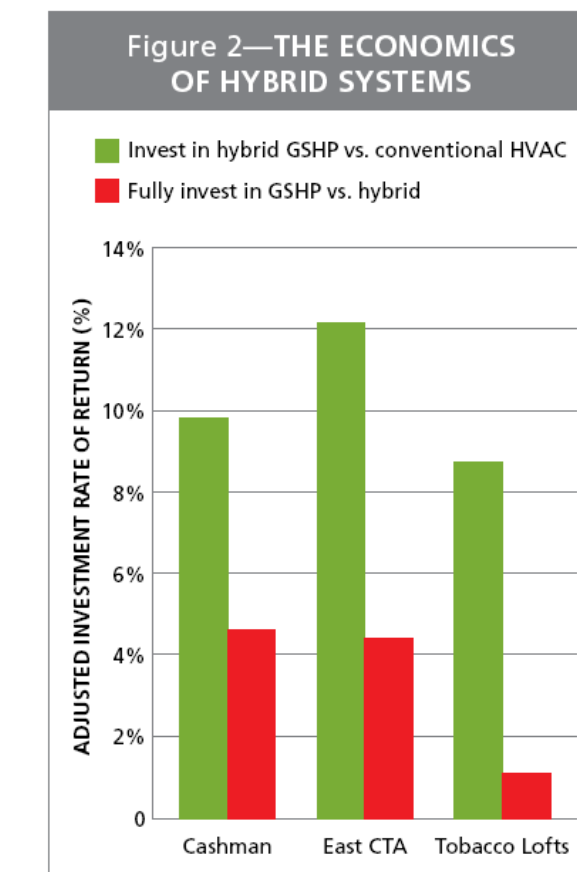
- nexus
- introduction
- process map
- envelope
- hvac
- integration
- sustainability
- conclusion
- appendix**



Equipment	Capacity	Unit Price	Quantity	Price
Geothermal Wells	130 Tons	\$ 5,000.00	48	\$ 240,000.00
WSHP-1	2 Tons	\$ 2,345.00	50	\$ 117,250.00
WSHP-2	15 Tons	\$ 16,650.00	2	\$ 33,300.00
Total				\$ 390,550.00

VS.

Equipment	Capacity	Price
Ethylene-Glycol System	65,000 CFM	\$ 295,000.00





academic

trace700 zone checksum outputs

community

pool

nexus

introduction

process map

envelope

hvac

integration

sustainability

conclusion

appendix

Academic Zone

Academic Zone summary table with columns for Cooling Coil Peak, CLG Space Peak, Heating Coil Peak, Temperatures, and Airflows.

Academic Zone Temperatures and Airflows sub-tables.

Academic Zone Engineering CKS sub-table.

Community Zone

Community Zone summary table with columns for Cooling Coil Peak, CLG Space Peak, Heating Coil Peak, Temperatures, and Airflows.

Community Zone Temperatures and Airflows sub-tables.

Community Zone Engineering CKS sub-table.

Pool Zone

Pool Zone summary table with columns for Cooling Coil Peak, CLG Space Peak, Heating Coil Peak, Temperatures, and Airflows.

Pool Zone Temperatures and Airflows sub-tables.

Pool Zone Engineering CKS sub-table.

Academic Zone COOLING COIL SELECTION and HEATING COIL SELECTION tables.

Academic Zone AREAS table.

Community Zone COOLING COIL SELECTION and HEATING COIL SELECTION tables.

Community Zone AREAS table.

Pool Zone COOLING COIL SELECTION and HEATING COIL SELECTION tables.

Pool Zone AREAS table.



ventilation calculations

nexus

introduction

process map

envelope

hvac

integration

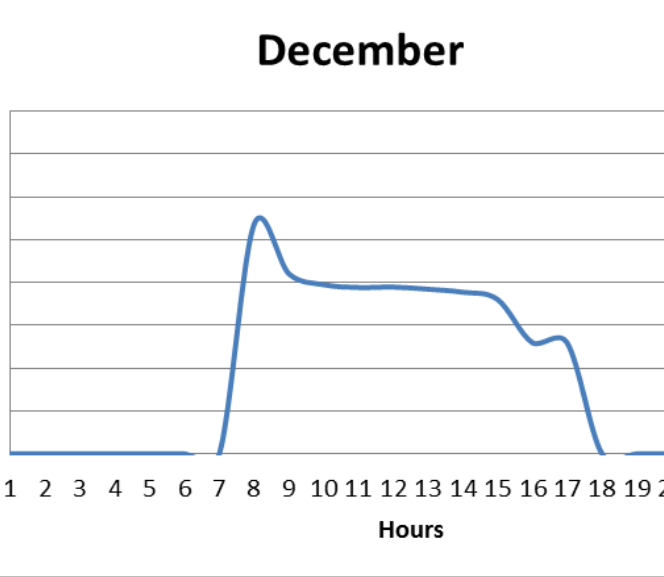
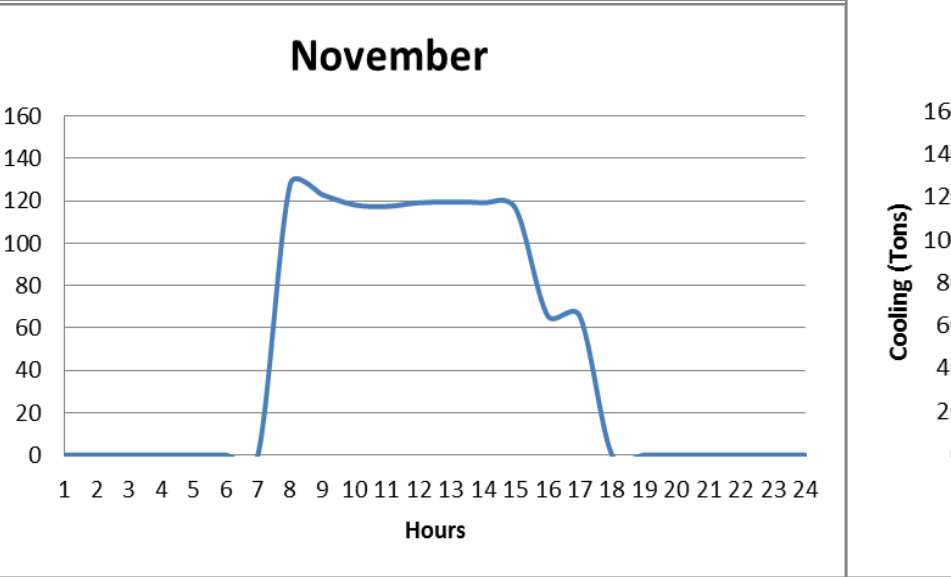
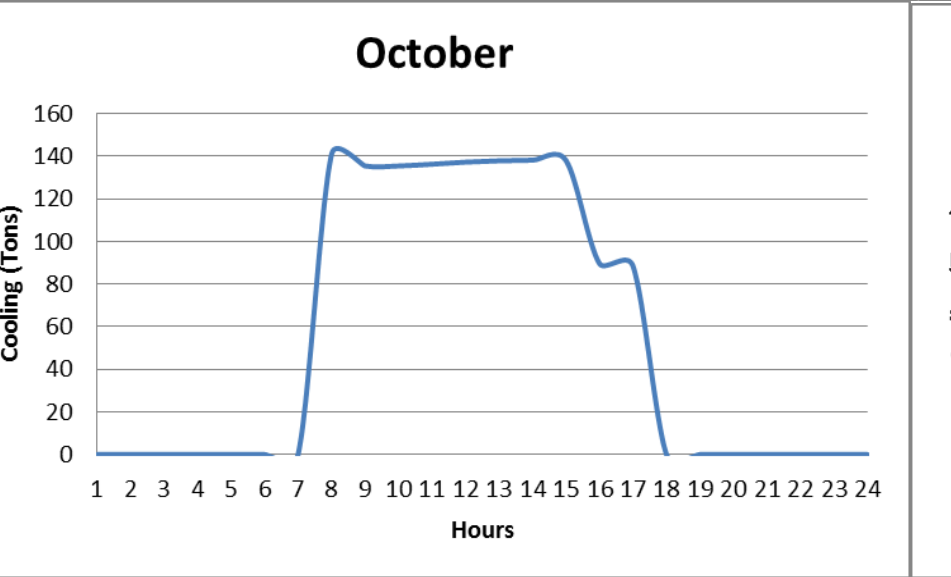
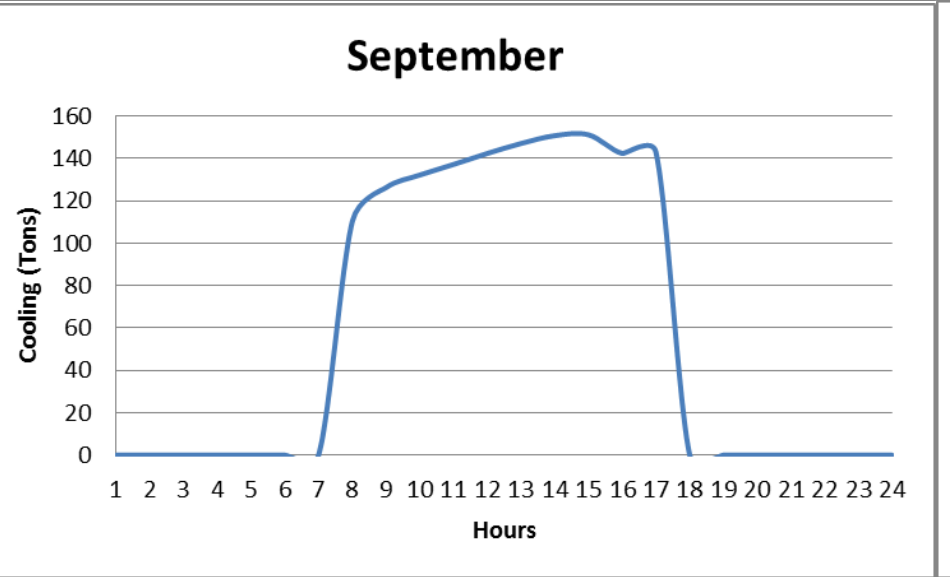
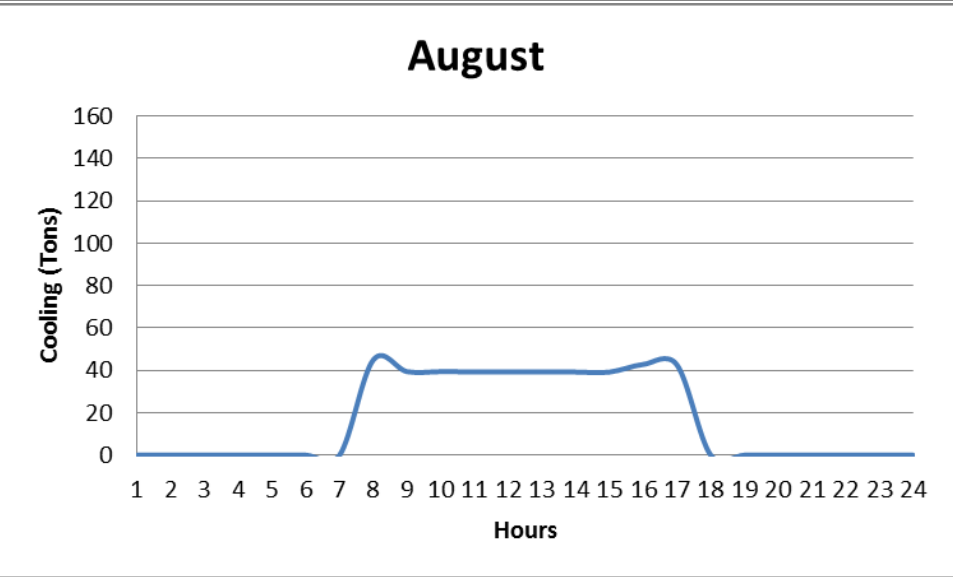
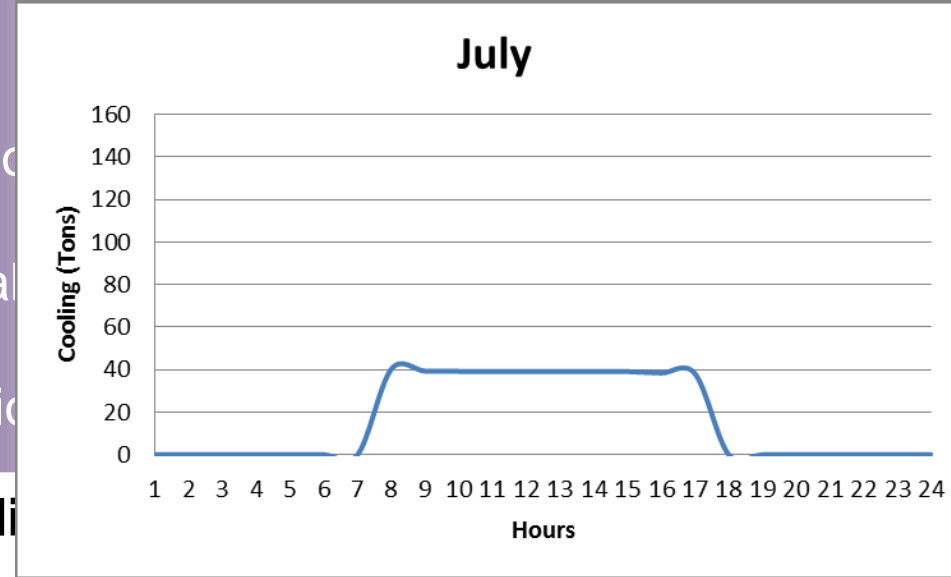
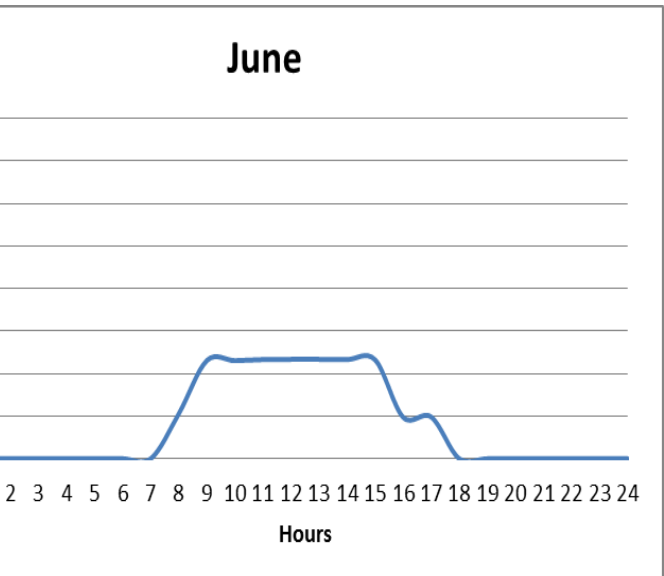
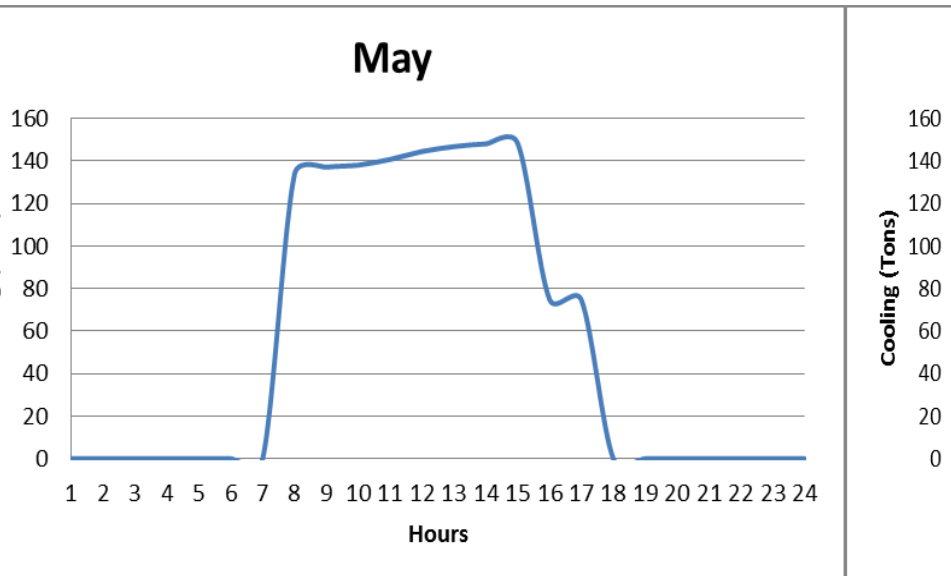
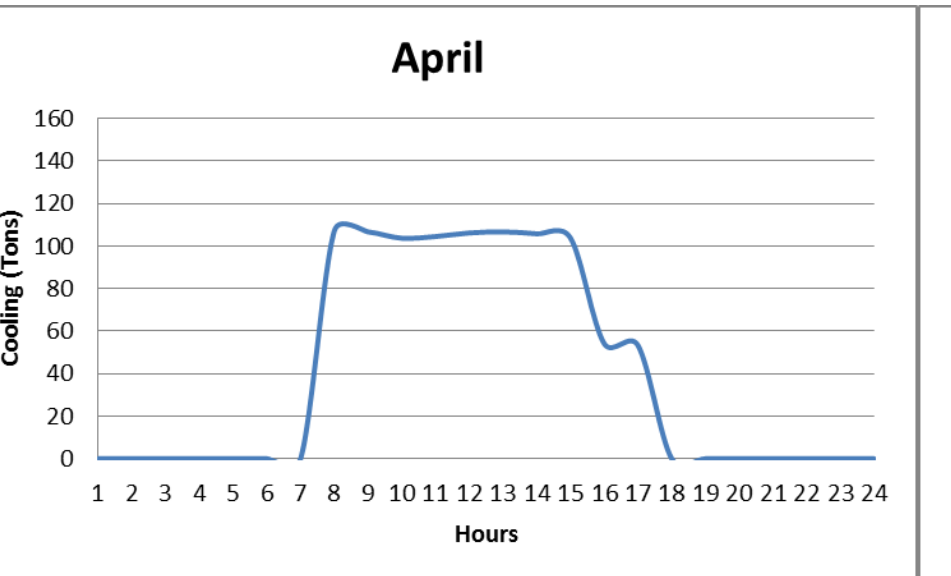
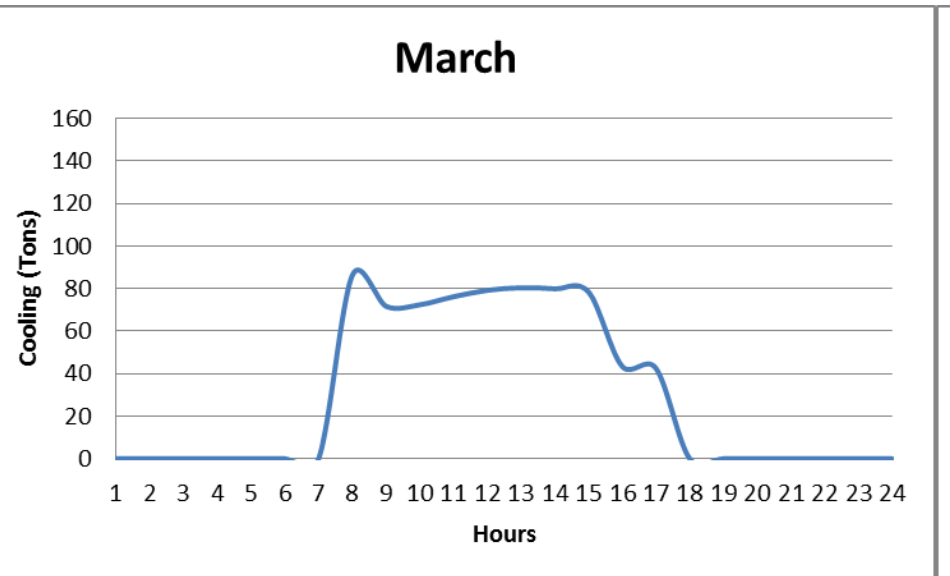
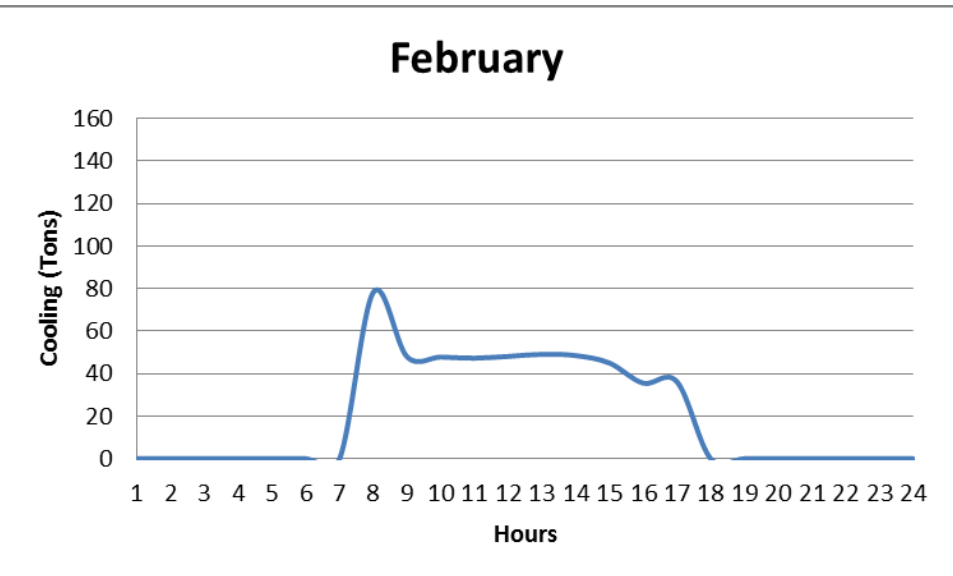
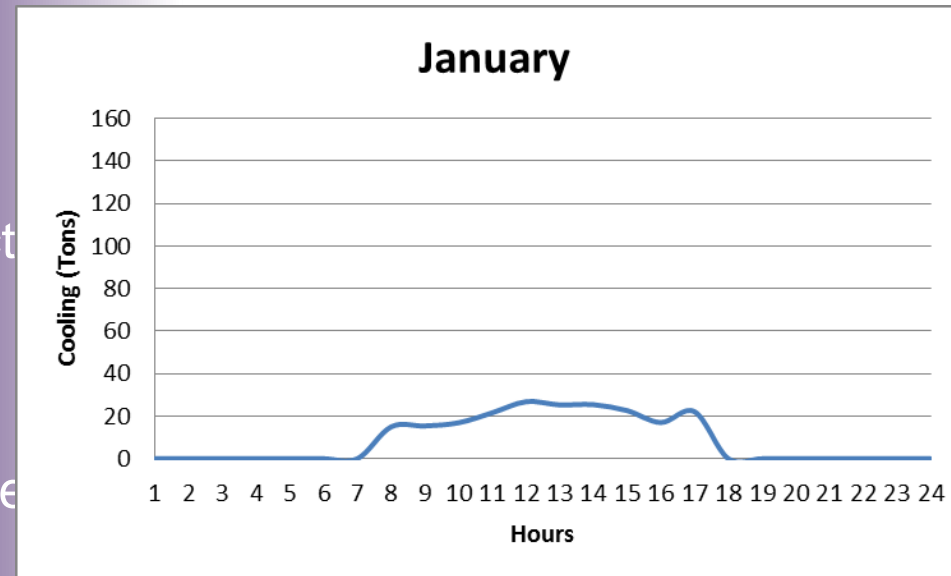
sustainability

conclusion

appendix

Reading Elementary School - Reading, PA																				
ASHRAE 62.1 2007 Minimum Ventilation Calculations																				
										System Population, P _s		871								
										Zone Population, P _z		700								
										Occupant Diversity, D = (P _s -P _z)/P _z		80%								
														b		a		=a/b		
Room Name	Room Number	Occupancy Category	Area (SF)	People O.A. Rate (cfm/person)	Area O.A. Rate (cfm/SF)	# of Occupants Furniture	Occupant Density	Breathing Zone O.A. Flow Required V _{bz}	Table 6-2 Zone Air Dist. Eff.	Zone outdoor airflow	Primary O.A. fraction	Table 6.3 System Vent. Eff.	Uncorrected O.A. Intake	Design O.A. Intake	Zone Primary Air Flow Set Point (cfm)	Percent OA	Actual O.A. Flow	% Above Min OA	Meets Standard?	Meets LEED 30%?
			A _z	R _{ip}	R _a	P _z /f		V _{bz} = R _{ip} *P _z + R _a *A _z	E _z	V _{oz} = V _{bz} / E _z	Z _p = V _{oz} / V _{pz}	E _v	V _{ou} = D*Σ(R _{ip} *P _z) + Σ(R _a *A _z)	V _{ot} = V _{ou} / E _v	V _{pz}		OA = % * V _{pz}	=(OA/V _{ot})-1		
RTU-1										12702.9	0.36	0.7	11432	15753	35310	100.0%	35210	124%	Yes	Yes
Classroom	134	Classroom	815	10	0.12	26	31.90	357.8	1.0	357.8	0.45	0.7	306.8	438.2	800		800.0	83%	Yes	Yes
Classroom	135	Classroom	815	10	0.12	26	31.90	357.8	1.0	357.8	0.45	0.7	306.8	438.2	800		800.0	83%	Yes	Yes
Classroom	136	Classroom	815	10	0.12	26	31.90	357.8	1.0	357.8	0.45	0.7	306.8	438.2	800		800.0	83%	Yes	Yes
Instructor Storage	137	Storage	245	0	0.12	0	0.00	29.4	0.8	36.8	0.27	0.7	29.4	42.0	135		135.0	221%	Yes	Yes
Special Education	140	Classroom	970	10	0.12	18	18.56	296.4	1.0	296.4	0.38	0.7	261.1	372.9	785		785.0	110%	Yes	Yes
Classroom	141	Classroom	790	10	0.12	26	32.91	354.8	1.0	354.8	0.35	0.7	303.8	433.9	1000		1000.0	130%	Yes	Yes
Classroom	142	Classroom	790	10	0.12	26	32.91	354.8	1.0	354.8	0.35	0.7	303.8	433.9	1000		1000.0	130%	Yes	Yes
Classroom	143	Classroom	790	10	0.12	26	32.91	354.8	1.0	354.8	0.35	0.7	303.8	433.9	1000		1000.0	130%	Yes	Yes
Classroom	144	Classroom	790	10	0.12	26	32.91	354.8	1.0	354.8	0.35	0.7	303.8	433.9	1000		1000.0	130%	Yes	Yes
Classroom	145	Classroom	790	10	0.12	26	32.91	354.8	1.0	354.8	0.35	0.7	303.8	433.9	1000		1000.0	130%	Yes	Yes
Custodial	147	Storage	55	0	0.12	0	0.00	6.6	1.0	6.6	0.33	0.7	6.6	9.4	20		20.0	112%	Yes	Yes
Corridor	149/150	Corridor	1670	0	0.06	0	0.00	100.2	1.0	100.2	0.40	0.7	100.2	143.1	250		250.0	75%	Yes	Yes
Conference	151	Conference	220	10	0.12	8	36.36	106.4	1.0	106.4	0.27	0.7	90.7	129.6	400		400.0	209%	Yes	Yes
Security	152	Office	65	5	0.06	1	15.38	8.9	1.0	8.9	0.30	0.7	7.9	11.3	30		30.0	165%	Yes	Yes
Corridor	153/154	Corridor	1085	0	0.06	0	0.00	65.1	1.0	65.1	0.33	0.7	65.1	93.0	200		200.0	115%	Yes	Yes
Classroom	155	Classroom	780	10	0.12	26	33.33	353.6	1.0	353.6	0.35	0.7	302.6	432.2	1000		1000.0	131%	Yes	Yes
Vestibule	156	Vestibule	100	0	0.06	0	0.00	6.0	1.0	6.0	0.01	0.7	6.0	8.6	760		760.0	8767%	Yes	Yes
Maintenance	157/158	Storage	275	0	0.12	0	0.00	33.0	1.0	33.0	0.33	0.7	33.0	47.1	100		100.0	112%	Yes	Yes
Classroom	159	Classroom	780	10	0.12	26	33.33	353.6	1.0	353.6	0.35	0.7	302.6	432.2	1000		1000.0	131%	Yes	Yes
Classroom	160	Classroom	780	10	0.12	26	33.33	353.6	1.0	353.6	0.35	0.7	302.6	432.2	1000		1000.0	131%	Yes	Yes
Conference	161	Conference	85	5	0.06	2	23.53	15.1	1.0	15.1	0.30	0.7	13.1	18.8	50		50.0	166%	Yes	Yes
Corridor	214/215	Corridor	1670	0	0.06	0	0.00	100.2	1.0	100.2	0.40	0.7	100.2	143.1	250		250.0	75%	Yes	Yes
Classroom	216	Classroom	815	10	0.12	26	31.90	357.8	1.0	357.8	0.45	0.7	306.8	438.2	800		800.0	83%	Yes	Yes
Classroom	217	Classroom	815	10	0.12	26	31.90	357.8	1.0	357.8	0.45	0.7	306.8	438.2	800		800.0	83%	Yes	Yes
Classroom	218	Classroom	815	10	0.12	26	31.90	357.8	1.0	357.8	0.45	0.7	306.8	438.2	800		800.0	83%	Yes	Yes
Instructor Storage	320	Storage	245	0	0.12	0	0.00	29.4	1.0	29.4	0.22	0.8	29.4	36.8	135		135.0	267%	Yes	Yes
Special Education	324	Classroom	970	10	0.12	18	18.56	296.4	1.0	296.4	0.38	0.8	296.4	370.5	785		785.0	112%	Yes	Yes
Classroom	325	Classroom	750	10	0.12	26	34.67	350.0	1.0	350.0	0.35	0.8	350.0	437.5	1000		1000.0	129%	Yes	Yes
Classroom	326	Classroom	750	10	0.12	26	34.67	350.0	1.0	350.0	0.35	0.8	350.0	437.5	1000		1000.0	129%	Yes	Yes
Classroom	327	Classroom	750	10	0.12	26	34.67	350.0	1.0	350.0	0.35	0.8	350.0	437.5	1000		1000.0	129%	Yes	Yes
Classroom	328	Classroom	750	10	0.12	26	34.67	350.0	1.0	350.0	0.35	0.8	350.0	437.5	1000		1000.0	129%	Yes	Yes
Classroom	329	Classroom	750	10	0.12	26	34.67	350.0	1.0	350.0	0.35	0.8	350.0	437.5	1000		1000.0	129%	Yes	Yes

chiller cooling load profiles





ethylene-glycol system efficiency & msds report



- nexus
- introduction
- process map
- envelope
- hvac
- integration
- sustainability
- conclusion
- appendix

Energy/Financial Comparison: Pennsylvania State AEI OAU-1/2, EAHU-1/2

		Without E Recovery	Konvekta System
SUMMARY			
Winter			
Heating Energy Requirement	kWh/a	856,050	402,000
Effectiveness Heating			0.53
Summer			
Cooling Energy Requirement	kWh/a	194,610	178,410
Effectiveness Cooling/Reheat			0.08
Year			
Heating Energy	kWh/a	856,050	402,000
Cooling Energy	kWh/a	194,610	178,410
Electricity (Δ Fans, Pumps)	kWh/a	0	14,503
Total Energy Consumption	kWh/a	1,050,660	594,913
Effectiveness			43%
Peak Demand			
Cooling	kW	1,525	1,355
	tons	433	385
Heat	kW	1,340	535
	MBTU/h	4,572	1,825

Energy/Financial Comparison: Pennsylvania State AEI OAU-1/2/3, EAHU-1/2/3

		Without E Recovery	Konvekta System
SUMMARY			
Winter			
Heating Energy Requirement	kWh/a	965,900	407,500
Effectiveness Heating			0.58
Summer			
Cooling Energy Requirement	kWh/a	219,660	200,460
Effectiveness Cooling/Reheat			0.09
Year			
Heating Energy	kWh/a	965,900	407,500
Cooling Energy	kWh/a	219,660	200,460
Electricity (Δ Fans, Pumps)	kWh/a	0	16,514
Total Energy Consumption	kWh/a	1,185,560	624,474
Effectiveness			47%
Peak Demand			
Cooling	kW	1,722	1,522
	tons	489	432
Heat	kW	1,512	411
	MBTU/h	5,159	1,402

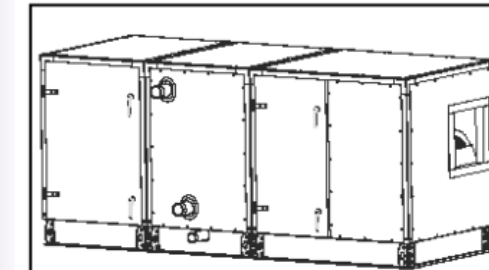
Material Safety Data Sheet Ethylene glycol MSDS

Section 1: Chemical Product and Company Identification								
Product Name: Ethylene glycol	Contact Information:							
Catalog Codes: SLE1072	Sciencelab.com, Inc.							
CAS#: 107-21-1	14025 Smith Rd.							
RTECS: KW2975000	Houston, Texas 77396							
TSCA: TSCA 8(b) inventory: Ethylene glycol	US Sales: 1-800-901-7247							
CI#: Not available.	International Sales: 1-281-441-4400							
Synonym: 1,2-Dihydroxyethane; 1,2-Ethanediol; 1,2-Ethandiol; Ethylene dihydrate; Glycol alcohol; Monoethylene glycol; Tescol	Order Online: ScienceLab.com							
Chemical Name: Ethylene Glycol	CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300							
Chemical Formula: HOCH2CH2OH	International CHEMTREC, call: 1-703-527-3887							
	For non-emergency assistance, call: 1-281-441-4400							
Section 2: Composition and Information on Ingredients								
Composition:								
<table border="1"> <thead> <tr> <th>Name</th> <th>CAS #</th> <th>% by Weight</th> </tr> </thead> <tbody> <tr> <td>Ethylene glycol</td> <td>107-21-1</td> <td>100</td> </tr> </tbody> </table>	Name	CAS #	% by Weight	Ethylene glycol	107-21-1	100		
Name	CAS #	% by Weight						
Ethylene glycol	107-21-1	100						
Toxicological Data on Ingredients: Ethylene glycol: ORAL (LD50): Acute: 4700 mg/kg [Rat]. 5500 mg/kg [Mouse]. 6610 mg/kg [Guinea pig]. VAPOR (LC50): Acute: >200 mg/m 4 hours [Rat].								
Section 3: Hazards Identification								
Potential Acute Health Effects: Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of inhalation. Severe over-exposure can result in death.								
Potential Chronic Health Effects: CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Non-mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.								
Section 4: First Aid Measures								

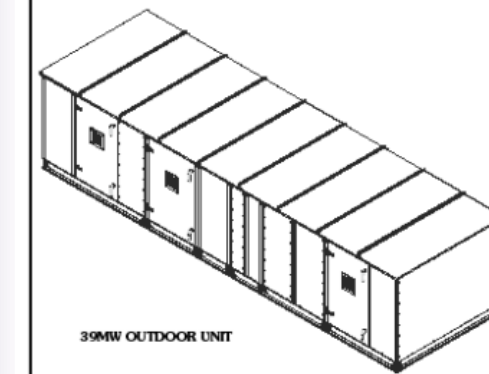
Product Data

AERO®
39MN, MW03-110
Indoor and Weathertight
Outdoor Air Handlers

1,500 to 60,500 Nominal Cfm



39MN INDOOR UNIT



39MW OUTDOOR UNIT

© Carrier Corporation 2012

- Carrier's 39M air handlers offer:
- Units are shrink wrapped for complete protection while in transit
 - Factory-supplied variable frequency drives that are programmed and started up at the factory
 - Sealed panel double-wall R-13 insulation system
 - Stacked indoor unit configurations for application versatility and maximum space utilization
 - Outdoor weathertight cabinets have sloped roofs to prevent standing water, and are gasketed in all critical areas
 - Factory-installed integral face and bypass coils for extreme conditions
 - Factory-installed humidifiers for precise indoor climate conditioning
 - Available factory-mounted controls, starters, disconnects and variable frequency drives
 - AHJBuilder® software for easy unit selection
 - Optional pre-painted unit exterior
 - Optional AgION® anti-microbial coated panel interior
 - Optional factory-installed UV-C germicidal lamps

Features/Benefits

The Aero 39M air handler is the only unit on the market that practically installs itself.

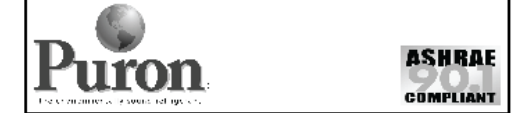
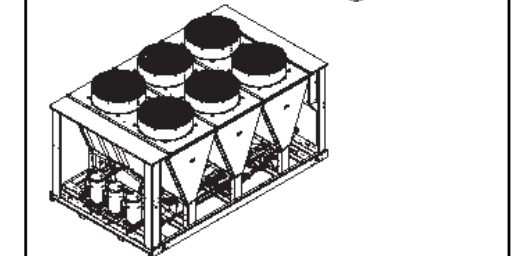
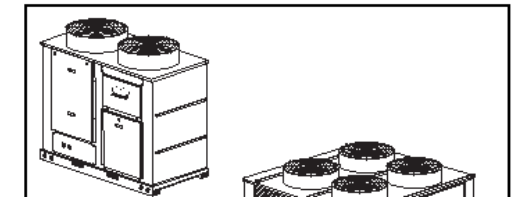
Easy Installation
Frames, corners and base rails of the 39M air handler are all easily disassembled and reassembled in minutes with as little as 3 standard tools. Carrier's 39M units can be ordered with shipping splits, which speed section to section assembly. All panels are easily removed in one piece for cleaning or access to components.

Form 99M-12PD

Product Data

AQUASNAP®
30RAP010-150
Air-Cooled Chillers
with PURON® Refrigerant (R-410A)

10 to 150 Nominal Tons
(35 to 528 Nominal kW)



Copyright 2012 Carrier Corporation

- The AquaSnap chiller is an effective all-in-one package that is easy to install and easy to own. AquaSnap chillers operate quietly and efficiently. Value-added features include:
- Rotary scroll compression
 - HFC Puron® refrigerant (R-410A)
 - Low-sound AeroAcoustic™ fan system
 - Easy to use ComfortLink controls
 - Optional integrated hydronic pump package with VFD (variable frequency drive) compatible motors, with optional VFD on 070-150 models
 - Microchannel condenser coil technology
 - Accessory fluid storage tank on 010-090 models
 - Optional digital scroll compressors on 010-090 models

Features/Benefits

Carrier's superior chiller design provides savings at initial purchase, at installation, and for years afterward. Costs less right from the start Carrier's AquaSnap chillers feature a compact, all-in-one package design that installs quickly and easily on the ground or the rooftop. The optional pump and hydronic components are already built in, this costs less than buying and installing the components individually. The chiller's fully integrated and pre-assembled hydronic system installs in minutes. No other chiller in this class installs so easily and inexpensively. The pre-assembled and integrated hydronic module utilizes top-quality components and pumps to ensure years of reliable operation.

Form 30RAP-9PD

80 BOILER

80 Commercial Boiler
Weil-McLain

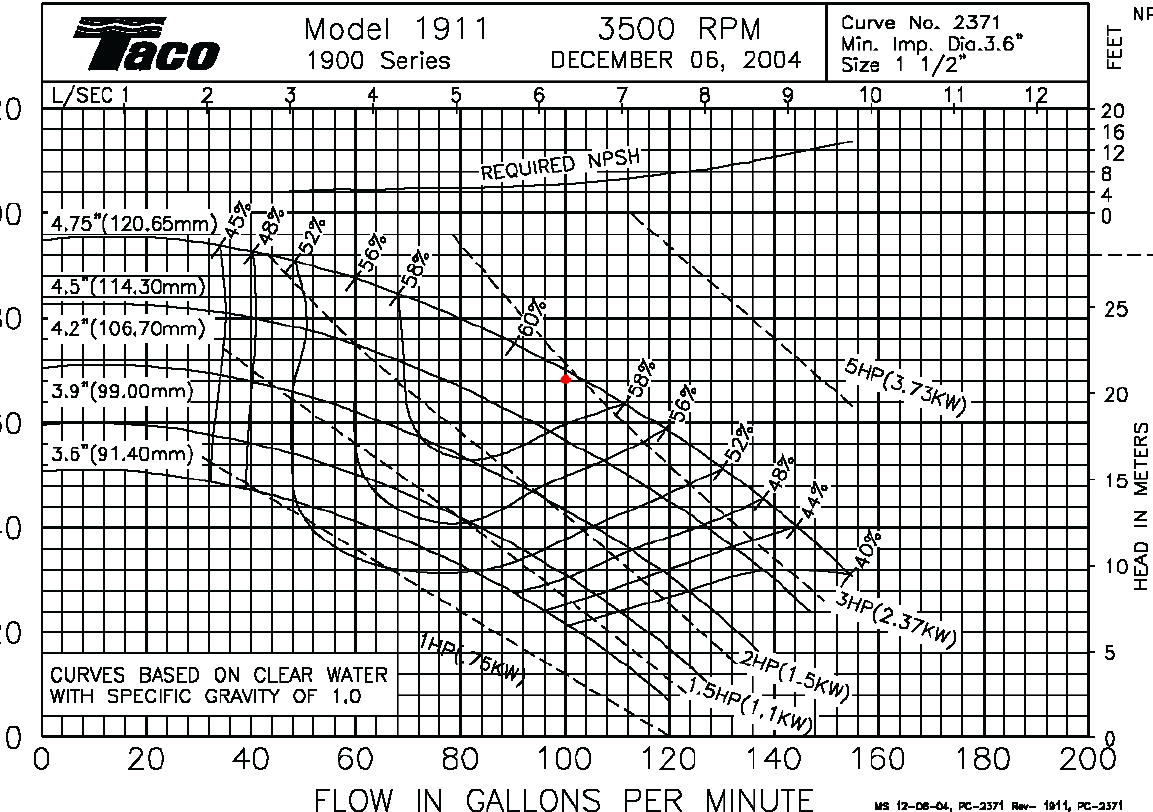
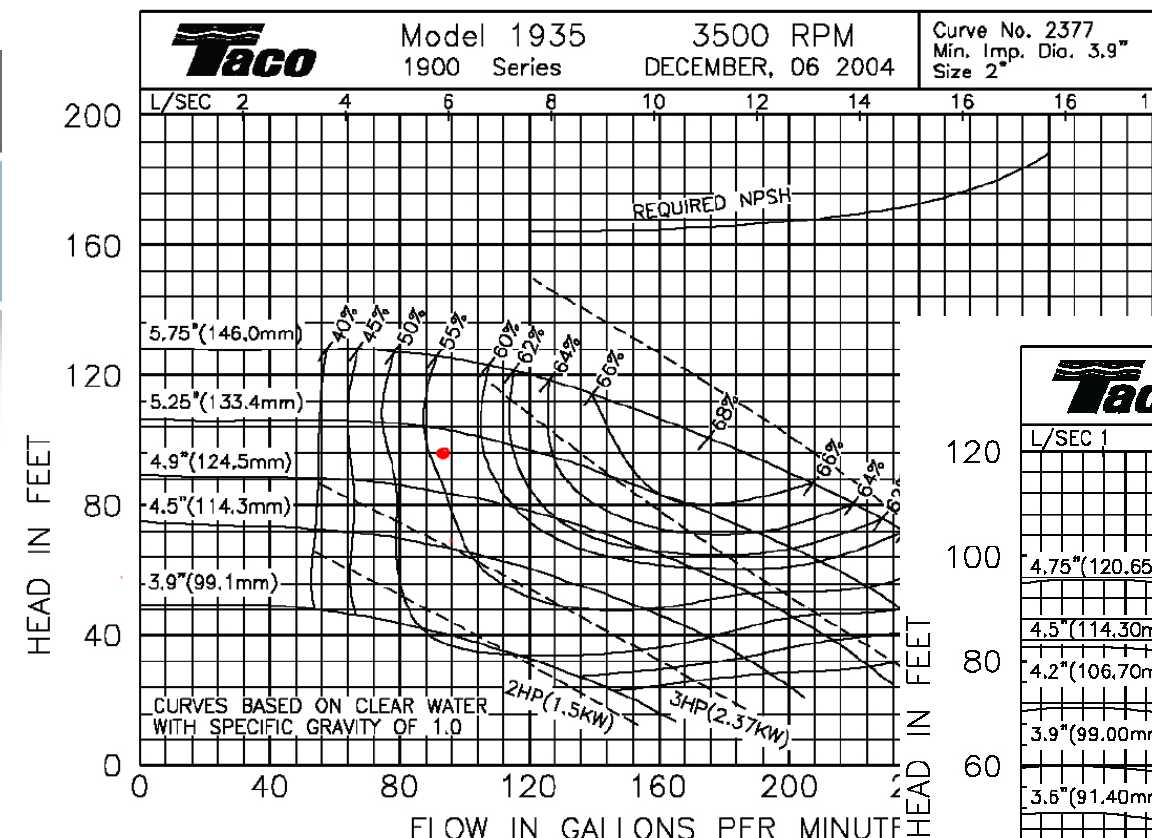
Gas, Oil & Gas/Oil
Water or Steam
MBH: 346-1,674
Combustion Eff.: 85%

- Weil-McLain captured seal design
- For Light Oil, Gas and Dual Fuel Combustion
- Packaged, Assembled Block or Knock-down
- Available for Water and Steam Heating Systems
- Available as Forced or Chimney draft venting



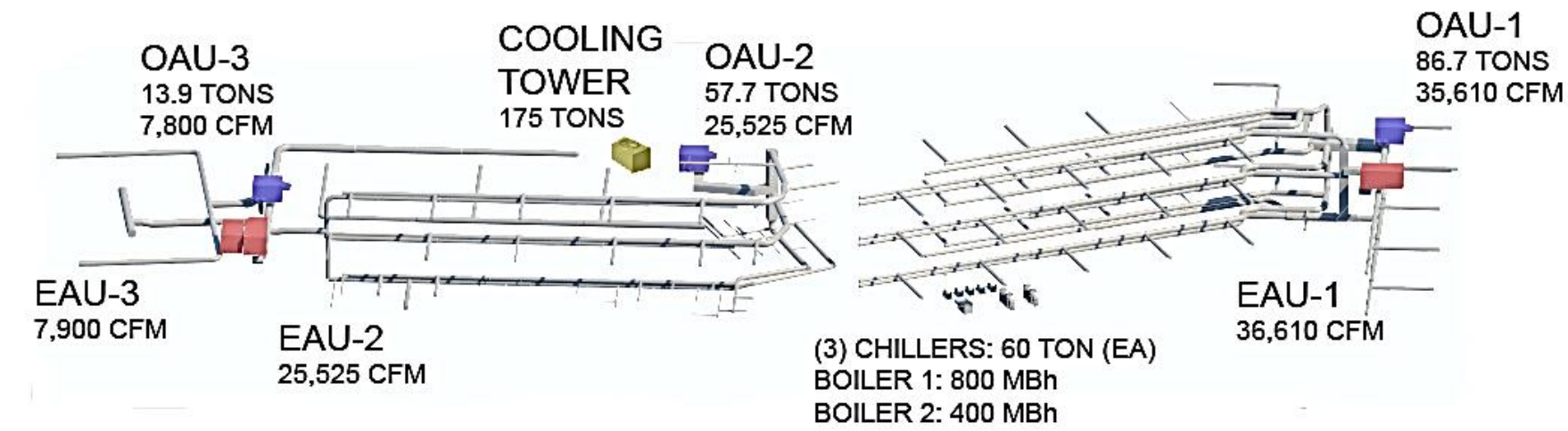
SPX

NC® 8400 steel
COOLING TOWER



MS 12-06-04, PC-2371 Rev. 1911, PC-2371

recover



reduce

reuse