

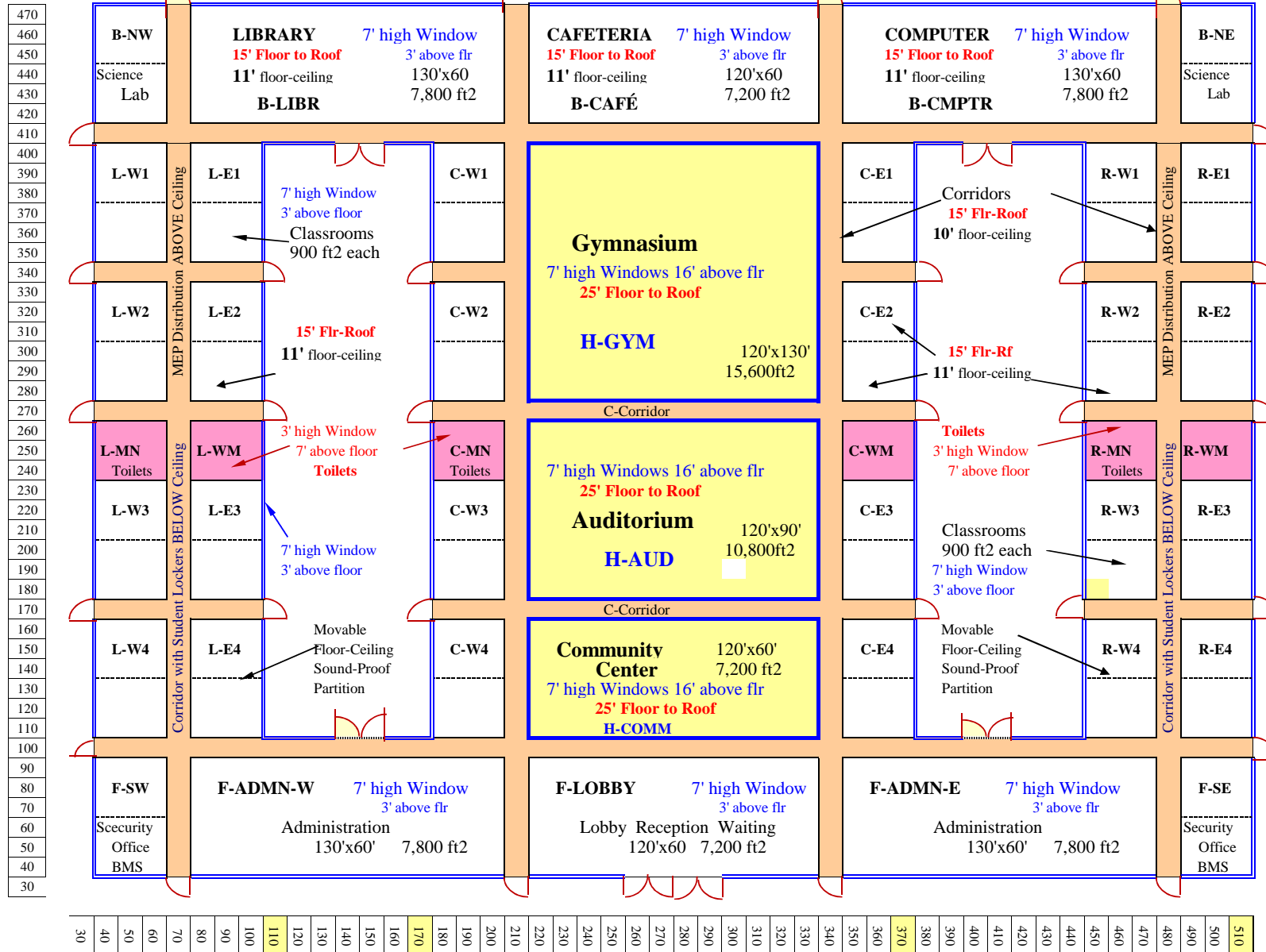
Middle School & Community Center Energy Study

Chicago

Latitude = 42°

Longitude = 88°

ASHRAE Std 90 Climate Zone = 5A

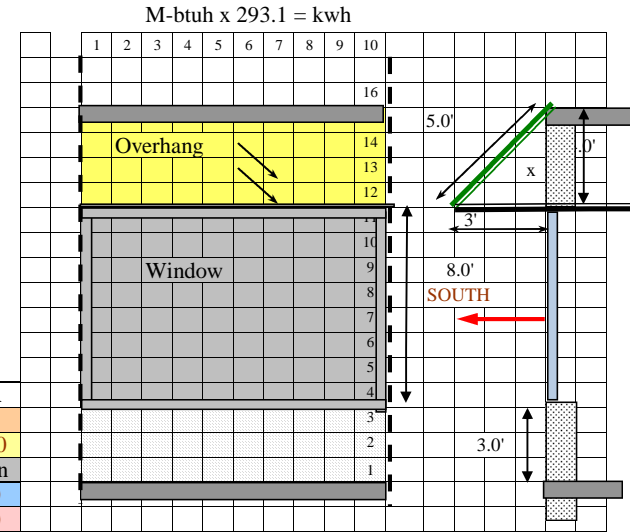


Based on Chicago (42° latitude) & Weather (CC) Optimum Tilt Angle for PV-Panel facing South

From DOE2.1E Run "PV-Chi42.inp"

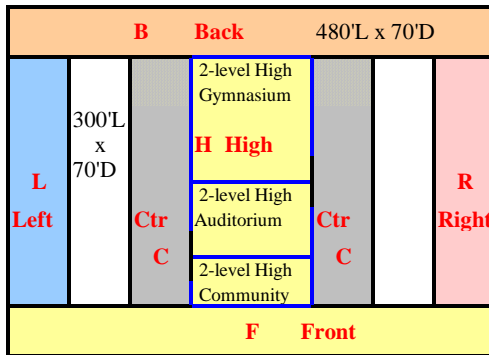
Total PV Surface Area **50,950**

TILT Angle	Solar Rad.	M-btuh/ft2 MAX	M-btuh/ft2 AVG	M-btuh/ft2 SUM	10% of SUM	M-btuh / ft2 / Yr	KW / ft2/Yr	Total kwh/Yr	Total Mbtuh/Yr
15°	Total	325.4	56.2	491,925	49,193	0.049	14.4	734,572	2,506
	Direct	267.5	34.0	297,878	29,788	0.030	8.7	444,808	1,518
30°	Total	333.6	58.9	516,044	51,604	0.052	15.1	770,587	2,629
	Direct	276.9	36.1	315,875	31,587	0.032	9.3	471,683	1,609
45°	Total	337.9	58.5	512,382	51,238	0.051	15.0	765,119	2,611
	Direct	275.4	35.7	312,507	31,251	0.031	9.2	466,654	1,592
60°	Total	330.7	54.9	481,217	48,122	0.048	14.1	718,582	2,452
	Direct	271.4	32.9	287,940	28,794	0.029	8.4	429,969	1,467
75°	Total	311.5	48.6	425,678	42,568	0.043	12.5	635,648	2,169
	Direct	260.2	27.9	244,699	24,470	0.024	7.2	365,399	1,247



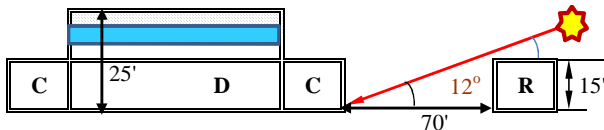
BLOCKS

10' High Penthouse over B Block for MEP



Roof-U = 0.065 Wall-U = 0.085

Walls & Windows (Upper levels of H Blocks)



Middle School & Community Center Energy Study

Service	Area ft2	Service	Area ft2
BMS	F 3,600	Sciences	B 3,600
Admin	F 15,600	Library	B 7,800
Lobby	F 7,200	Computers	B 7,800
Comm	H 7,200	Cafeteria	B 7,200
Auditor	H 10,800	Classrooms	43,200
Gymnas	H 15,600	Sub-Total-1	129,600

Block-H: Floor-Roof = 25' Floor to Underside of Truss = 23'

Blocks L, R, C, F, B : Flr-Roof = 15' Flr-Ceilg = 11' Corrid-Ceilg-Hgt = 9'

Bldg	X	Y	Floor-A	PV-L	# of	PV-A
B	480	70	33,900	408	7	MEP
F	480	70	33,900	408	7	16,450
C	80	300	26,400	68	30	Garden
L	70	300	21,000	60	30	9,000
R	70	300	21,000	60	30	9,000
H	120	300	33,600	102	30	16,500
			169,800	Total A		50,950

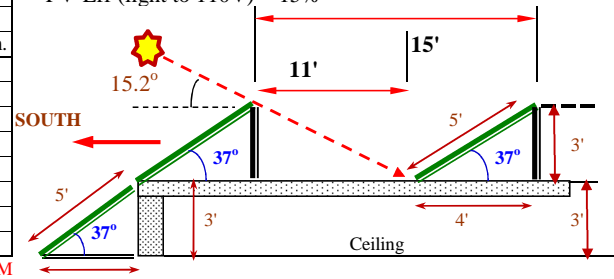
Block F includes window overhang PV panels

All PV panels face South. Tilt = 40 degs

Time		Latitude = 42 (Chicago)			
AM	PM	Altit.	Azim.	Altit.	Azim.
5	7	4	63		
6	6	15	72		
7	5	26	80		
8	4	37	89	5	127
9	3	49	100	14	138
10	2	60	114	21	151
11	1	69	138	25	165
12	12	73	180	27	180

Jun-21 : 6 AM to 6 PM Dec-21 : 9 AM to 3 PM

PV Length = E-W Width * 0.85 = X * 0.85
 # of PV Panels = Block N-S Length / 10 = Y / 10
 PV Area = PV-Length * 5 * (# PV Pane % Net Area = 75%
 PV-Eff (light to 110V) = 15%



Baseline : Wall-U = 0.084 Roof-U = 0.065 Glass-U = 0.46 Glass-SC = 0.31
 Proposed Glass Viracon VE3-2M #2 (frit spandrel) U = 0.27 SC = 0.43 VLT = 0.68

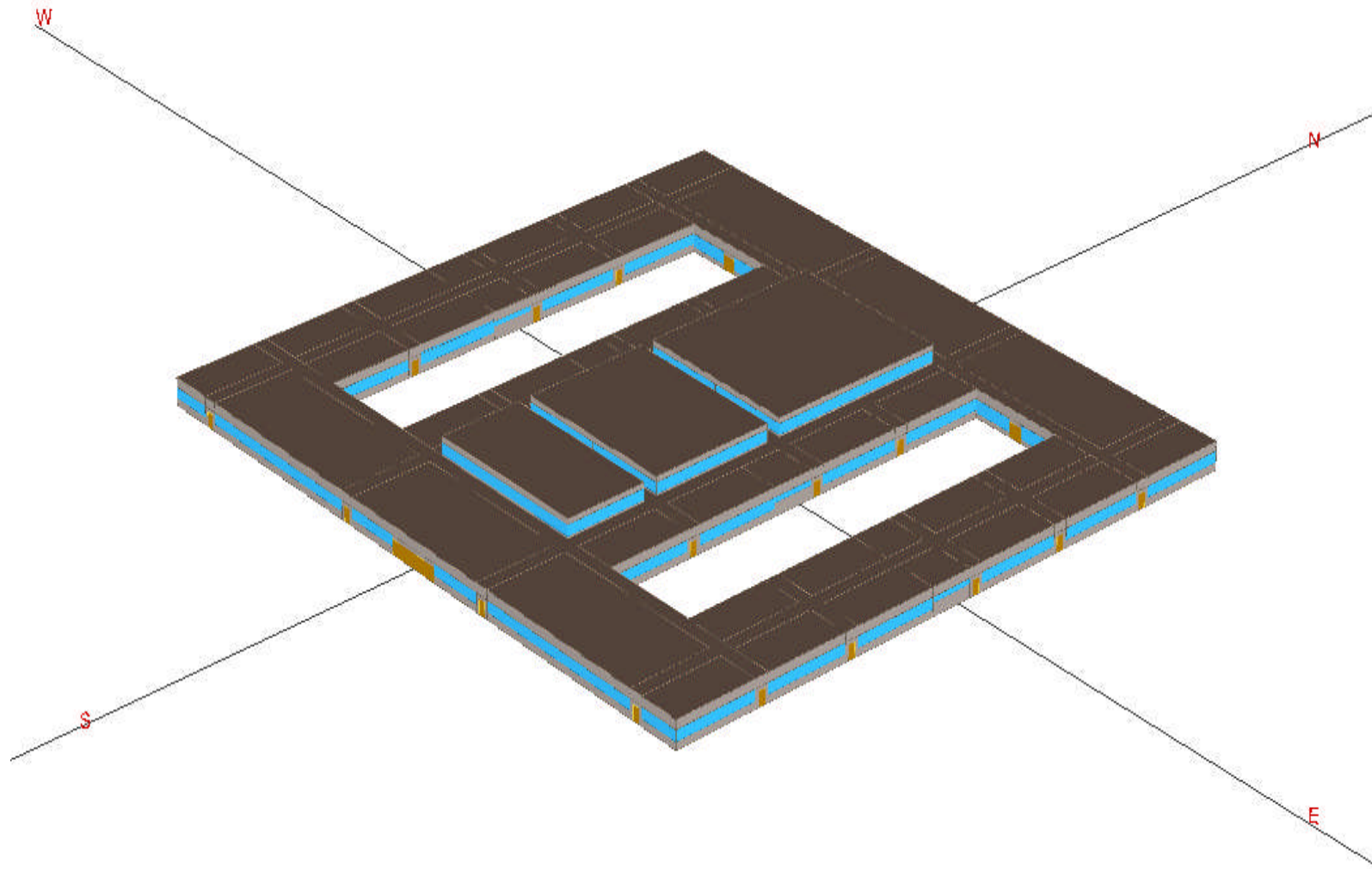
Prescriptive Envelope Energy Code Compliance Data

Bldg	Floor-A	Corrd-A	Total-A	Wall-A	Glass-A	Door-A	Dor+Glss	% WII	AHU
B	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#####	B
F	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#####	F
C	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#####	C
L	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#####	L
R	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#####	R
H	#REF!	0	#REF!	#REF!	#REF!	0	#REF!	#####	H
Sum	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#####	

Middle School & Community Center Energy Study

Chicago Latitude = 42°

Longitude = 88°



Middle School & Community Center Energy Study
DESIGN CRITERIA Baseline and Proposed

Location: Chicago Latitude = 42.0 Longitude = 88.0 Time-Zone = 6
 ASHRAE STD90.1-2004 Climate Zone = 5A Maximum Glass Percentage = 50.0
 Page 27

EXTERIOR ENVELOPE DATA

0 = Baseline STD90.1		1 = Proposed		Glass = PPG Solarban-70 Starphire		INTERIOR Surfaces		
						Baseline & Proposed		
ROOF-0 U	0.065	ROOF-1 U	0.050	Metal Bldg Roof	different			
WALL-0 U	0.084	WALL-1 U	0.060	Steel Framed Wall	from		U	Reflect
GLASS-0 U	0.460	GLASS-1 U	0.290	Glass U-Value	baseline	CEILING	0.50	0.70
GLASS-0 SC	0.310	GLASS-1 SC	0.310	Glass Shading Coefficient		INT_WALL	0.90	0.50
GLASS-0 SHGC	0.260	GLASS-1 SHGC	0.260	Glass Solar Heat Gain Coeff		M-FLOOR	0.20	0.20
GLASS-0 VLT	X	GLASS-1 VLT	0.630	Glass Visible Light Transm		GRND-FLR	0.10	0.20
GLASS-0 OHD	X	GLASS-1 OHD	3.00	Window Over-Hang Depth (ft).	Over-Hang Width = Wall Width			

INFILTRATION (Typical) 60' Wall 30' Room-D
Baseline and Proposed

ROOM-A = 7,800 sf Ceiling-H = 10'
 Room-V = 7800x10 = 78,000 cf
 Wall-A = 130x10 = 1,300 sf
 Infiltration CFM/SF (Wall Area) = 0.06
 Infl-cfm 1300x0.06 = 78 Infl-cfh 78x60 = 4,680
Infl-ACH = 4680 / 78000 = 0.06
Infl-cfm/sf = 78 / 7800 = 0.01

From Sheet "Dimensions-Coords" Window Height - All Blocks (ft) = 7.0 Window Width as % of Wall Width = 95
 Building Floor / Roof Area = #REF! Wall+Window+Door Area (Vert Expos) = #REF! Window Area = #REF! Door Area = #REF! % Wndw+Door / Vert-Expos = #REF!
 Total Exposure Area = #REF! A Single Floor Building has a high Exposure to Floor Area which provides surfaces for Daylighting and PhotoVoltaic Panels % Exposure/Floor = #REF!

Design Criteria

Space Type	Area ft2	Peak Design Values / Zone (Hour Value adjusted with Diversity-Schedule)					Proposed Lights				
		OCCUPANCY Baseline & Proposed					LIGHTING		EQUIPMENT		% of Baseline
		ft2/P	People	cfm/P	CFM	W/ft2	Watts	W/ft2	Watts	0.85	Watts
Cafeteria	7,200	20	360	10	3,600	2.10	15,120	2.00	14,400	1.79	12,852
Lobby + Recept	7,200	33	218	10	2,182	1.40	10,080	0.50	3,600	1.19	8,568
Circ-Lckrs-HS	34,800	30	1,160	10	11,600	1.60	55,680	0.50	17,400	1.36	47,328
Toilets	5,400	50	108	50	5,400	0.90	4,860	0.50	2,700	0.77	4,131
Library	7,800	25	312	15	4,680	1.70	13,260	1.00	7,800	1.45	11,271
Administration	15,600	150	104	20	2,080	1.10	17,160	1.00	15,600	0.94	14,586
Security - BMS	3,600	150	24	20	480	1.00	3,600	1.00	3,600	0.85	3,060
Science Labs	3,600	25	144	17	2,448	1.40	5,040	3.00	10,800	1.19	4,284
Classrooms	43,200	33	1,309	13	17,018	1.40	60,480	0.50	21,600	1.19	51,408
Computer Lab	7,800	33	236	15	3,545	1.60	12,480	2.00	15,600	1.36	10,608
Auditor-Assmb	10,800	40	270	15	4,050	1.70	18,360	0.50	5,400	1.45	15,606
Gym - Basktbl	15,600	33	473	20	9,455	1.40	21,840	1.00	15,600	1.19	18,564
Community Cntr	7,200	50	144	15	66,538	1.40	10,080	1.00	7,200	1.19	8,568
Total / Average	162,600	75	4,718	14	66,538	1.46	237,960	0.82	134,100	1.24	202,266
	People Diversity			0.46							

Service Water Heater

Service Hot Water Schedule
 Schedule = 3A

AM/PM	AM	PM
1	0.00	0.80
2	0.00	0.30
3	0.00	0.30
4	0.00	0.30
5	0.00	0.50
6	0.30	0.80
7	0.80	0.30
8	0.50	0.20
9	0.30	0.00
10	0.30	0.00
11	0.30	0.00
12	0.80	0.00
Total Daily Hours	6.80	

High School

Data from ASHRAE
Baseline & Proposed

Gallons/Student:

Hourly Max	1.0
Daily Max	3.6
Avg gals/P/day	1.8

Avg ft2/Perp = 75
 Bldg Floor Area = #REF!
 No. of People = #REF!

Hours SWH Use = 6.80
 Gallons per Day = #REF!
 Gallons per Hour = #REF!
 Gallons per Min = #REF!

Figure 11.3.2 (HVAC Systems Map) and Table 11.3.2 (Budget System Description) Pages 74-75 ASHRAE Std 90.1-2004 Budget Stem Type Air Cooled Condenser, Fossil Fuel Modeling Requirements for Calculating Design Energy Cost and Energy Cost Budget Method **System-4 : Packaged VAVS +RH**

Occupancy Based Ventilation (CO2 Sensors) Schedule =			AHU	Sched	% OA	AHU	Sched	% OA	AHU	Sched	% OA	AHU	Sched	% OA
% System Design Outdoor Air * Occupancy Schedule of Zone			B	1A	0.566	L	1A	0.848	C	1A	0.771	AUD	2A	0.545
Percent Outdoor by System (from Baseline Report SV-A)			F	4A	0.305	R	1A	0.848	GYM	2A	0.770	CMM	2A	0.499
Create 5 Outdoor Air Ventilation Schedules for "MIN-AIR-SCH ="			OA Ventil Schedule Number and System			3V : 0.52 % OA and Sched 2A			Auditor & Community					
			1V : 0.56 % OA and Sched 1A			4V : 0.77 % OA and Sched 2A			Gymnasium					
			2V : 0.85 % OA and Sched 1A			5V : 0.3 % OA and Sched 4A			Block - F					

Schd	Occupancy Profiles		No. of People									Gross Building Area (ft2) =		#REF!					
No.	ZONE	Hour From	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
		# of People	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	
1	Cafeteria	218	60	30	30	30	30	60	60	40	30	30	60	50	30	20	10	10	
			131	65	65	65	65	131	131	87	65	65	131	109	65	44	22	22	
	Lobby & Lounge	218	60	30	30	30	30	60	60	40	30	30	60	50	30	20	10	10	
			131	65	65	65	65	131	131	87	65	65	131	109	65	44	22	22	
	Circul + Lockers	#####	60	30	30	30	30	60	60	40	30	30	60	50	30	20	10	10	
696			348	348	348	348	696	696	464	348	348	696	580	348	232	116	116		
Toilets	108	60	30	30	30	30	60	60	40	30	30	60	50	30	20	10	10		
		65	32	32	32	32	65	65	43	32	32	65	54	32	22	11	11		
Library	312	60	30	30	30	30	60	60	40	30	30	60	50	30	20	10	10		
		187	94	94	94	94	187	187	125	94	94	187	156	94	62	31	31		
2	Auditor-Assmb	270	30	50	50	50	50	30	30	50	50	50	50	60	20	10	10	0	
			81	135	135	135	135	81	81	135	135	135	135	162	54	27	27	0	
3	Gym-Basketball	473	30	60	50	50	50	50	40	50	50	50	60	70	70	70	40	10	
			142	284	236	236	236	236	189	236	236	236	284	331	331	331	189	47	
4	Community Cntr	144	10	20	30	30	40	40	40	40	40	40	40	80	80	80	50	10	
			14	29	43	43	58	58	58	58	58	58	58	58	115	115	115	72	14
5	Administration	104	30	70	80	80	80	50	50	70	80	80	60	50	50	30	0	0	
			31	73	83	83	83	52	52	73	83	83	62	52	52	31	0	0	
6	Science Labs	144	10	50	50	50	50	30	30	40	50	50	50	20	10	10	0	0	
			14	72	72	72	72	43	43	58	72	72	72	29	14	14	0	0	
	Classrooms	1,309	10	50	50	50	50	30	30	40	50	50	30	20	10	10	0	0	
131			655	655	655	655	393	393	524	655	655	393	262	131	131	0	0		
Computer Lab	236	10	50	50	50	50	30	30	40	50	50	50	20	10	10	0	0		
		24	118	118	118	118	71	71	95	118	118	118	47	24	24	0	0		
7	Security - BMS	24	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	
			17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	
TOTALS	4,721	35	42	42	42	42	46	45	42	42	42	50	43	28	23	11	6		
		1,664	1,987	1,964	1,964	1,979	2,160	2,113	2,001	1,979	1,979	2,348	2,023	1,343	1,093	507	280		

Building Occupancy Profile (with Zone diversity)

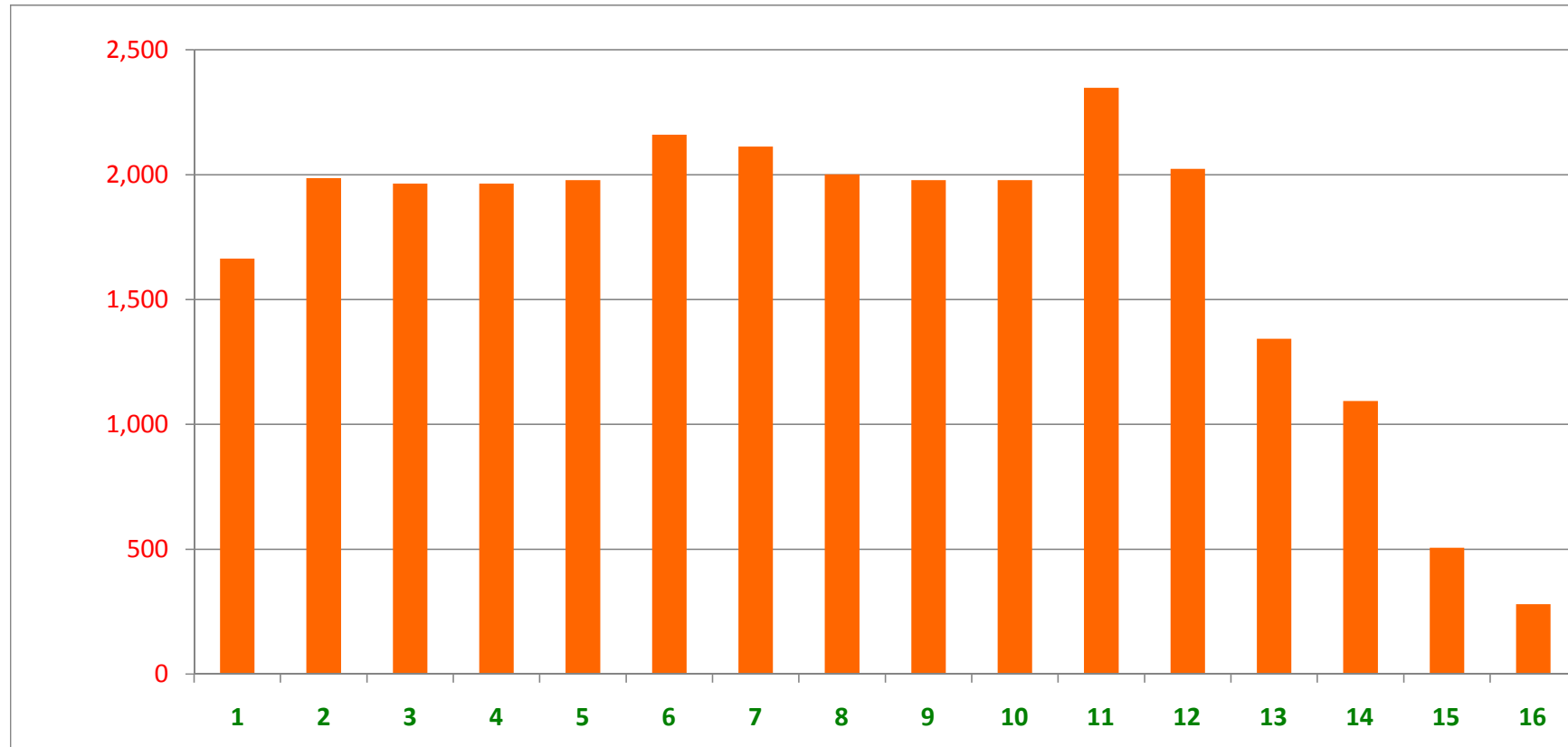
Max # of People

1,987

Bldg ft2/Person

#REF!

People	1,664	1,987	1,964	1,964	1,979	2,160	2,113	2,001	1,979	1,979	2,348	2,023	1,343	1,093	507	280
% Design	35	42	42	42	42	46	45	42	42	42	50	43	28	23	11	6
Hour	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22



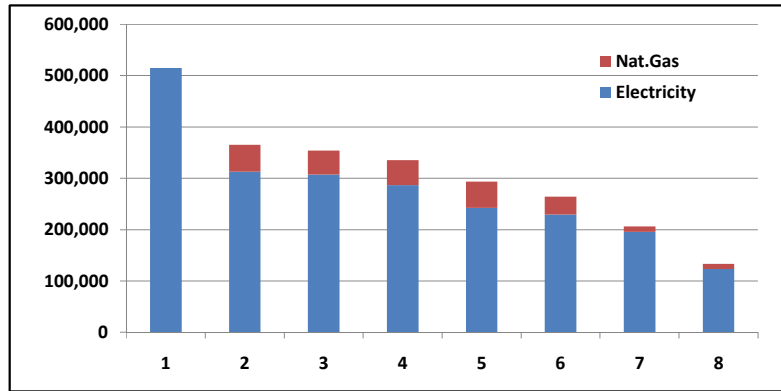
Hour	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
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Middle School & Community Center Energy Study

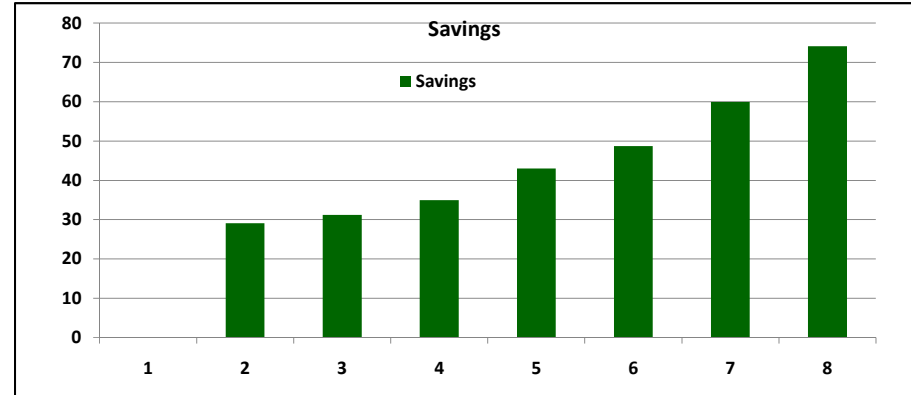
M-btuh to kwh = 293.1

ECO-#	Energy Conservation Option (ECO) Description	M-BTUH / Y		M-BTUH / Y		M-BTUH / Y			M-BTUH / Y			%	KWH	Site	Source	Dollars per Year			%																
		Electr	Electr	Electr	Gas	Electr	Electr	Electr	Electr	Gas	Electr					Gas	E + G	MBTUH		E + G	K-btu/	K-btu/	\$	\$	\$	\$									
ECO-1	ASHRAE Std 90.1 & 62-2004 PVAVS Fan SP = 5.0" Eff = 65%	2,539	950	3,656	0	2,371	379	568	1,096		11,558		11,558	0	3,387,767	68	204	514,881			514,881	0													
ECO-2	ECO-1 + Replace Electr (ComEd) Htg & DHW with Gas (Nicor)	2,540	950		5,758	2,371	379	568		1,180	6,807	6,938	13,745	-19	4,028,630	81	163	312,701	52,324		365,025	29													
ECO-3	ECO-2 + Proposed Roof, Walls and Windows + 3' Over-Hang	2,540	950		5,048	2,258	466	555		1,180	6,768	6,228	12,996	-12	3,809,069	76	158	306,942	47,130		354,072	31													
ECO-4	ECO-3 + Energy Efficient lights (15% off) & equipment (0% off).	2,175	950		5,193	2,211	430	533		1,180	6,299	6,373	12,672	-10	3,714,251	75	151	286,812	48,191		335,003	35													
ECO-5	ECO-4 + Daylighting Controls	1,346	950		5,568	2,073	374	486		1,180	5,229	6,748	11,977	-4	3,510,429	71	134	242,550	50,935		293,485	43													
ECO-6	ECO-5 + Economizer + Heat Recovery + Occup based Vent Cntrl	1,346	950		3,341	1,966	150	487		1,180	4,899	4,521	9,420	19	2,760,914	55	115	229,393	34,630		264,023	49													
ECO-7	ECO-6 + replace DX with GSHP. Standby Coolg-Twr & Boiler	1,346	950	9.3		0.4	755	1,710		1,180	4,771	1,180	5,951	49	1,744,121	35	92	195,947	10,186		206,133	60													
ECO-8	ECO-7 + Credit for Energy from PV panels (Mbtuh/yr)																	2,629	Avg ComEd Electric (\$/kwh)		0.16	Avg Nicor Gas (\$/therm)	0.75	2,142	1,180	3,321	71	973,490	20	60	123,301	10,186		133,487	74

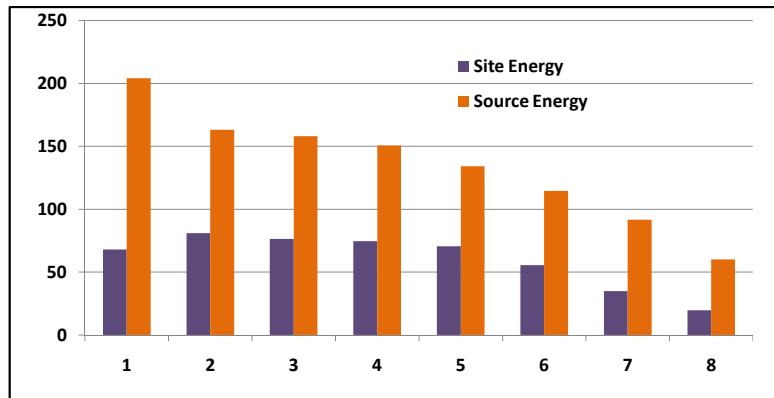
All ECOs (including ECO1 - electric heat) are based on ComEd Rate 6L (general large service) **ECO-1** (All-Electric) is **NOT** based on Commonwealth Edison (ComEd) Rider 25 (discount for winter space heating)



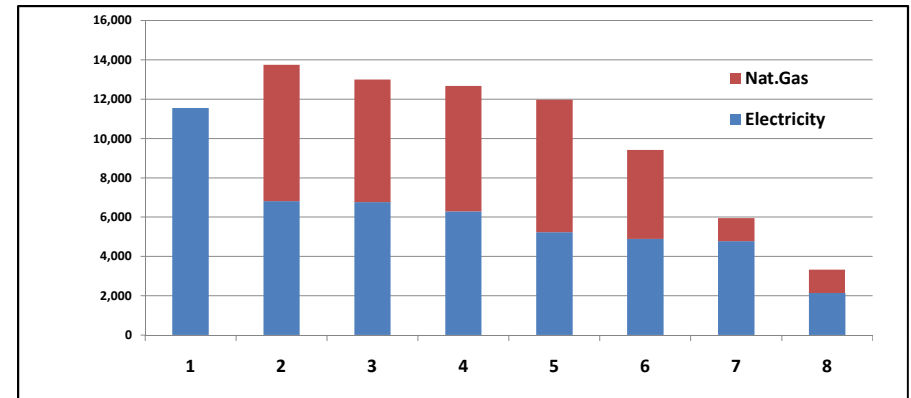
Building Energy Cost (\$ / year) and ECO



Building Energy Cost Savings (%) and ECO



Site & Source Energy Use (k-btu/sf/year) and ECO



Building Energy Use (M-btuh / year) and ECO

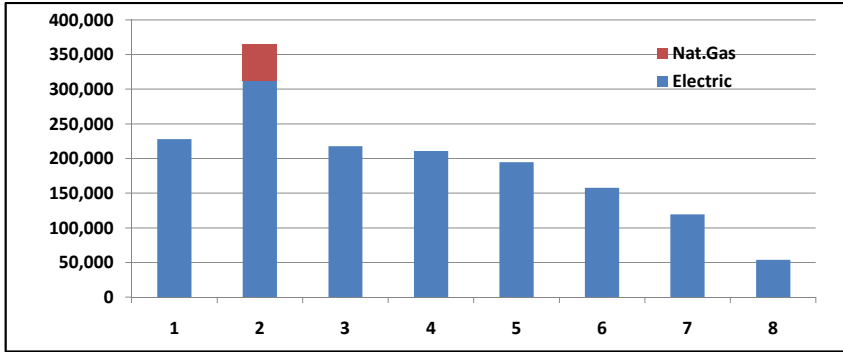
Middle School & Community Center Energy Study

M-btuh to kwh = 293.1

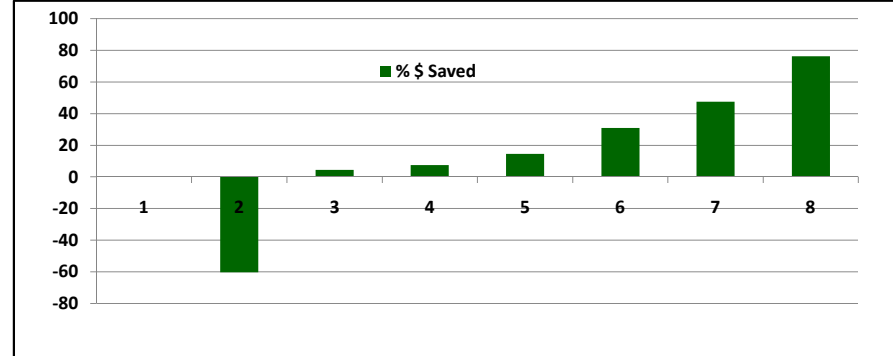
ECO-#	Energy Conservation Option (ECO) Description	M-BTUH / Y		M-BTUH / Y		M-BTUH / Y			M-BTUH / Y			M-BTUH / Y			%	KWH	Site	Source	Dollars per Year			%
		Electr	Electr	Electr	Gas	Electr	Electr	Electr	Electr	Gas	Electr	Gas	E + G	MBTUH					E + G	K-btu/	K-btu/	
ECO-1	ASHRAE Std 90.1 & 62-2004 PVAVS Fan SP = 5.0" Eff = 65%	2,539	950	3,656	0	2,371	379	568	1,096		11,558		11,558	0	3,387,767	68	204		227,839		227,839	0
ECO-2	ECO-1 + Replace Electr (ComEd) Htg & DHW with Gas (Nicolr)	2,540	950		5,758	2,371	379	568		1,180	6,807	6,938	13,745	-19	4,028,630	81	163		312,701	52,324	365,025	-60
ECO-3	ECO-1 + Proposed Roof, Walls and Windows + 3' Over-Hang	2,540	950	3,167		2,258	466	555	1,096		11,031		11,031	5	3,233,098	65	195		217,853		217,853	4
ECO-4	ECO-3 + Energy Efficient lights (15% off) & equipment (0% off)	2,175	950	3,260		2,211	430	533	1,096		10,655		10,655	8	3,122,922	63	188		210,588		210,588	8
ECO-5	ECO-4 + Daylighting Controls	1,346	950	3,501		2,073	374	486	1,096		9,826		9,826	15	2,880,030	58	174		194,498		194,498	15
ECO-6	ECO-5 + Economizer + Heat Recovery + Occup based Vent Cnt	1,346	950	1,853		1,966	150	487	1,096		7,848		7,848	32	2,300,190	46	139		157,545		157,545	31
ECO-7	ECO-6 + replace DX with GSHP. Standby Coolg-Twr & Boiler	1,346	950	9.3		0.4	755	1,710	1,096		5,867		5,867	49	1,719,530	35	104		119,432		119,432	48
ECO-8	ECO-7 + Credit for Energy from PV panels (Mbtuh/yr) 2,629	Avg ComEd Electric (\$/kwh)		0.07	Avg Nicolr Gas (\$/therm)		0.75	3,237		3,237	72	948,899	19	58	53,944		53,944		53,944		53,944	76

All ECOS (except ECO2 - gas heat) based on Commonwealth Edison (ComEd) Rider 25 (discount for winter space heating)

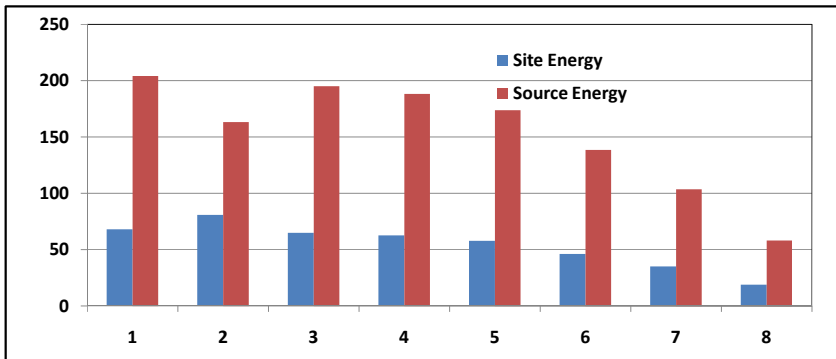
ECO-2 electricity is based on ComEd Rate 6L (large general service) and Nicolr Gas rates



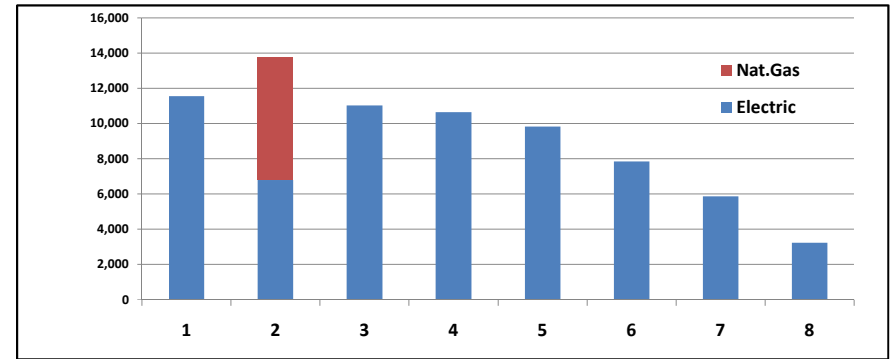
Building Energy Cost (\$ / year) and ECO



Building Energy Cost Savings (%) and ECO



Site & Source Energy Use (k-btu/sf/year) and ECO



Building Energy Use (M-btuh / year) and ECO

CHICAGO: Electric and Natural Gas Rates - Non Residential

										8/9/2007	
ComEd Electric Rates		Rate GL Large General Service				Summer Months: June to September			Peak Hours: 9 AM to 9 PM		
Electricity Rate:		Summer Demand:				Winter Demand:					
Minimum Charge / Month (\$):		524.61	First KW	10,000	\$/KW	16.41	First KW	10,000	\$/KW	12.85	
Fuel Adjustment Charge (%):			Next KW	9,999,999	\$/KW	6.51	Next KW	9,999,999	\$/KW	5.03	
Summer and Winter Energy Charge (Peak Hours):				Summer and Winter Energy Charge (Off-Peak Hours):							
First Kwh		9,999,999	\$/Kwh	0.05022	First Kwh		9,999,999	\$/Kwh	0.02123		
Next Kwh			\$/Kwh		Next Kwh			\$/Kwh			
Commonwealth Edison											
ComEd Electric Rates		Rider 25 Electric Space Heating				Summer Months: June to September			Peak Hours: 24 Hours		
Electricity Rate:		Summer Demand:				Winter Demand: Not Applicable (NA)					
Minimum Charge / Month (\$):		524.61	First KW	10,000	\$/KW	NA	First KW	NA	\$/KW	NA	
Fuel Adjustment Charge (%):			Next KW	9,999,999	\$/KW	NA	Next KW	NA	\$/KW	NA	
Summer Energy Charge (24 Hours): Energy Charge is Higher				Winter Energy Charge (24 Hours): Energy Charge is Higher							
First Kwh		30,000	\$/Kwh	0.07146	First Kwh		30,000	\$/Kwh	0.06568		
Next Kwh		9,999,999	\$/Kwh	0.06891	Next Kwh		9,999,999	\$/Kwh	0.06331		
Commonwealth Edison											

Northern Illinois Gas Co. (Nicor)				Distribution	cents/therm
Rate-1 Residential		Monthly	\$8.40	1st 20 therms	14.73
1-Jan-07		Add Rider 6 Gas Supply cost		Next 30 therms	5.79
				Over 50 therms	5.19

Northern Illinois Gas Co. NICOR Gas Co.					1-Jan-07
Rate-4 General Service			Cubic Feet Gas x 1.025 = Therms		
Monthly		\$	Distribution	cents/therm	
	less than 1,000 cfh	15.87	1st 150 therms	12.29	
	1,000 to 10,000 cfh	55.32	Next 4,850 therms	6.82	
	greater than 10,000 cfh	101.06	Over 5,000 therms	4.82	
			Add Rider 6 Gas Supply cost		
Rate-5 Seasonal Use			Cubic Feet Gas x 1.025 = Therms		
Monthly		\$	Distribution	cents/therm	
	less than 1,000 cfh	18.00	January - April	3.39	
	1,000 to 10,000 cfh	57.50	May - December	2.85	
	greater than 10,000 cfh	130.50	Add Rider 6 Gas Supply cost		
Rate-4	\$101.06 / Month	Rider 6 Gas Supply Cos		cents/therm	
Jan-Dec	75 cents/therm	Commodity Charge		65.89	
Rate-5	\$130.50 / Month	Non Commodity Charge		4.11	
Jan-Apr	73.39 cents/therm	Total Gas Supply Cost		70.00	
May-Dec	72.85 cents/therm				

Gas Rates from Peoples Gas: 1996								General Service No. 2	1996
Gas usage not to exceed an average per month of 41,000 therms									
(1) Gas (Commodity / Consumption) Charge:					Cubic Feet Gas x 1.025 = Therms				
Mon-Yr	Jan-99	Feb-99	Mar-99	Apr-99	May-99	Jun-99			
\$ / therm	0.2660	0.2725	0.2559	0.2386	0.2592	0.2797			
	Jul-99	Aug-99	Sep-99	Oct-99	Nov-98	Dec-98			
	0.3060	0.3045	0.3448	0.3705	0.2642	0.2757			
(2) Customer Monthly Charges for Annual Consumption of:									
(1) Less than 4,000,000 therms per year					(3) Distribution Monthly Charge				
(2) Equal to or greater than 4,000,000 therms per year					Consumption		\$ / therm		
Meter Class	(1)		(2)		First 100 therms		0.34107		
Up to 700 cubic feet per hour (\$)	19.50	352.50		Next 4900 therms		0.13180			
Over 700 cubic feet per hour (\$)	26.50	359.50		Over 5000 therms		0.07338			

Middle School & Community Center Energy Study
CHICAGO, ILLINOIS Std90-2004 Climate Zone 5A

Energy Summary by End Use
 From DOE2.1E Report PSE **293.1**

Notes: No Cooling Tower (Heat Rejection) for PVAVS Proposed DHW is GAS shown in KWH & KW

End Use	Energy Type	Proposed Building - A		Budget Building		Energy Savings [%]
		Energy [KWH]	Peak [KW]	Energy [KWH]	Peak [KW]	
Space Cooling	Electricity	127	15	694,682	812	
PhotoVoltaic KWH Credit		-770,631		0		
Space Heating	Electricity	2,716	226	1,071,227	1,630	
Domestic Hot Water	Gas/Electr	345,770	164	321,078	164	108%
Ventilation and Fans	Electricity	500,902	116	166,379	100	301%
Pumps & Auxiliary	Electricity	221,304	48	110,995	258	199%
Miscellaneous Equipment	Electricity	278,363	108	278,363	108	100%
Area Lighting	Electricity	394,450	192	744,154	224	53%
TOTAL BUILDING CONSUMPTION		973,001	870	3,386,878	3,296	29%
Percent Savings = (ECB' KWH -DEC'' KWH)/ECB' KWH =						71%

Energy and Cost Summary by Fuel Type ComED Electricity Cost \$/kwh for Chicago (LEED Ref 2 0.16

Type	DEC Use [KWH]	DEC Cost [\$]	ECB Use [KWH]	ECB Cost [\$]	DEC'' / ECB' Energy %	DEC'' / ECB' Cost %
Electricity	973,001	\$ 155,680	3,386,878	541,900	29%	29%
Natural Gas	-	\$ -	-	\$ -	-	-
Other	-	\$ -	-	\$ -	-	-
Total Nonrenewable	973,001	\$ 155,680	3,386,878	\$ 541,900	29%	29%
Renewable	-	\$ -	-	\$ -	-	-
Total including Renewable	973,001	\$ 155,680		\$ 541,900		
Percent Savings = (ECB' \$ -DEC'' \$)/ECB' \$ =						71%

ECO-1 Baseline : Monthly Energy End Use (KWH) and Demand (KW)												DOE2.1E Report PSE	Results used in LEED Analysis	Mbtuh to KWH =	293.1
ELECTRIC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL		
AREA LIGHTS	51246	69508	76901	76965	63089	32947	35464	50794	73931	78418	72414	62477	744154		
MAX KW	224.2	224.2	224.2	224.2	224.2	126.3	126.3	224.2	224.2	224.2	224.2	224.2	224.2		
MISC EQUIPMT	19487	27081	29961	30018	24360	12104	13142	18522	26722	28288	26215	22462	278363		
MAX KW	107.8	107.8	107.8	107.8	107.8	56.8	56.8	107.8	107.8	107.8	107.8	107.8	107.8		
SPACE HEAT	286798	211435	143334	47544	9505	0	0	1490	5224	19696	96955	249245	1071227		
MAX KW	1629.8	1397.4	1164.1	629.7	279.2	0	0	32.4	132.9	483.8	971.8	1337.4	1629.8		
SPACE COOL	4711	5649	11071	38822	78472	101124	118617	132558	108544	63245	23864	8006	694682		
MAX KW	64.1	200.5	200.5	270.6	677.8	544	605.3	811.7	753.2	343.4	205.3	200.5	811.7		
PUMPS & MISC	22115	8664	16186	14144	8112	0	0	552	2062	8913	11717	18531	110995		
MAX KW	233.1	155.7	193.1	225.7	234.5	0	0	91.5	195.9	242.5	258.4	237.1	258.4		
VENT FANS	10626	10673	12288	14786	15720	12939	14106	17254	19177	15734	12138	10938	166379		
MAX KW	30.3	37.3	45.6	66.6	74.6	47.9	49.3	100	90.6	64.7	49.5	34.3	100		
DOMHOT WATER	24680	33922	37646	37069	28467	14256	14298	18712	26275	29185	29062	27504	321078		
MAX KW	157.1	163.5	164	161	148.8	87	80.4	119.7	119.1	124.5	134.7	146.4	164		
TOTAL KWH	419663	366933	327387	259348	227725	173370	195627	239881	261935	243480	272364	399163	3386878		

ECO-7 Proposed : Monthly Energy End Use (KWH) and Demand (KW)												DOE2.1E Report PSE	Results used in LEED Analysis
ELECTRIC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
AREA LIGHTS	30594	38454	39651	37544	29309	15688	16506	24537	36729	41915	42765	40758	394450
MAX KW	189	180.8	165.2	158.5	122.1	88.4	82.8	170.2	183	188.6	192	192	192
MISC EQUIPMT	19487	27081	29961	30018	24360	12104	13142	18522	26722	28288	26215	22462	278363
MAX KW	107.8	107.8	107.8	107.8	107.8	56.8	56.8	107.8	107.8	107.8	107.8	107.8	107.8
SPACE HEAT	2716	0	0	0	0	0	0	0	0	0	0	0	2716
MAX KW	226.1	0	0	0	0	0	0	0	0	0	0	0	226.1
SPACE COOL	127	0	0	0	0	0	0	0	0	0	0	0	127
MAX KW	14.9	0	0	0	0	0	0	0	0	0	0	0	14.9
PUMPS & MISC	16997	18543	20522	20184	19122	14486	15935	17529	19798	20715	19605	17867	221304
MAX KW	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3
VENT FANS	38705	44685	49456	48642	42384	25604	28161	35730	47711	49922	47245	42659	500902
MAX KW	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4
TOTAL KWH	108627	128763	139591	136388	115175	67882	73744	96317	130959	140839	135830	123746	1397862

GAS - MBTUH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
DOMHOT WATER	91.6	121.5	134.8	132.6	104.2	56.5	56.9	71.6	96.6	106.6	105.9	101	1179.7
MAX MBTU	0.537	0.558	0.56	0.55	0.509	0.303	0.281	0.412	0.41	0.428	0.462	0.501	0.56

GAS - KWH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
DOMHOT WATER	26848	35612	39510	38865	30541	16560	16677	20986	28313	31244	31039	29603	345770
MAX KW	157	164	164	161	149	89	82	121	120	125	135	147	164

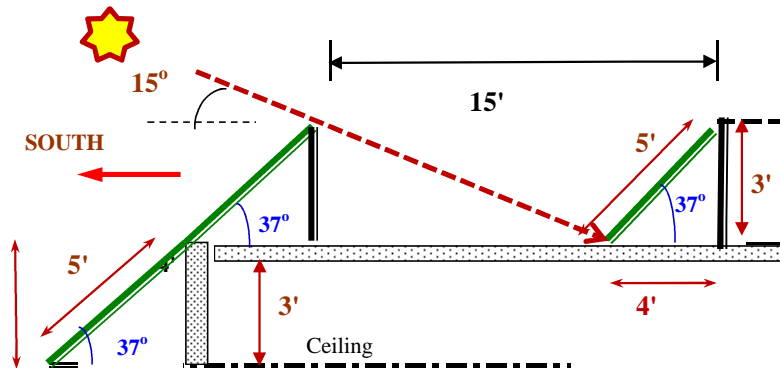
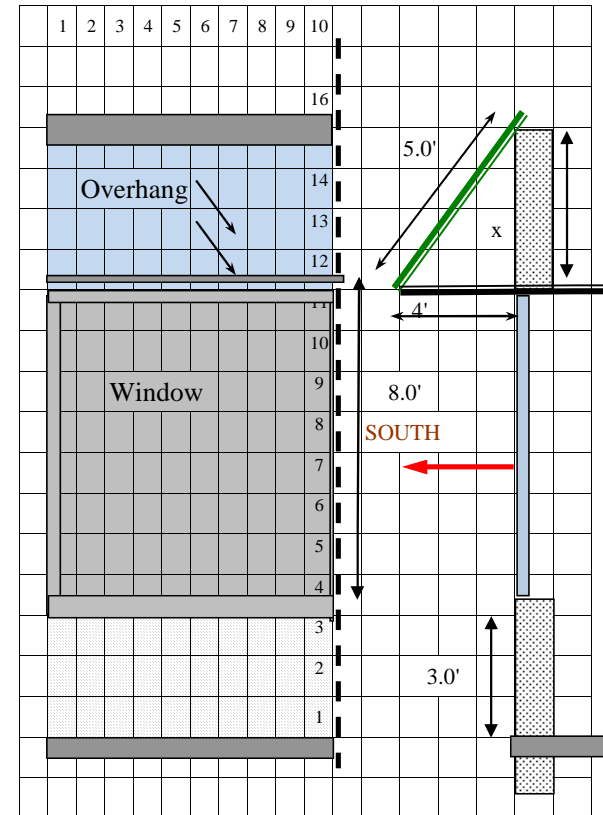
Middle School and Community Center

Solar (includes Cloud Cover) Analysis to Determine Optimum PV Tilt Angle

Based on Chicago (42° latitude) & Weather (CC)

From DOE2.1E Run "PV-Chi42.inp" Total PV Surface Area = **51,000**

TILT Angle	Solar Rad.	M-btuh/ft2 for 8,760 Hou			10% of SUM	M-btuh ft2 / Yr	KW / ft2/Yr	Total kwh/Yr	Total Mbtuh/Yr
		MAX	AVG	SUM					
15°	Total	325.4	56.2	491,925	49,193	0.049	14.4	735,293	2,509
	Direct	267.5	34.0	297,878	29,788	0.030	8.7	445,245	1,519
30°	Total	333.6	58.9	516,044	51,604	0.052	15.1	771,343	2,632
	Direct	276.9	36.1	315,875	31,587	0.032	9.3	472,146	1,611
45°	Total	337.9	58.5	512,382	51,238	0.051	15.0	765,870	2,613
	Direct	275.4	35.7	312,507	31,251	0.031	9.2	467,112	1,594
60°	Total	330.7	54.9	481,217	48,122	0.048	14.1	719,287	2,454
	Direct	271.4	32.9	287,940	28,794	0.029	8.4	430,391	1,468
75°	Total	311.5	48.6	425,678	42,568	0.043	12.5	636,271	2,171
	Direct	260.2	27.9	244,699	24,470	0.024	7.2	365,758	1,248



Optimum Tilt Angle for PV-Panel facing South = between 30 and 45 degrees
The optimum Tilt Angle is based on Solar Radiation adjusted for Cloud Cover

PV Length = E-W Width *
 # of PV Panels = Block N-S Length / 10 = Y / 10
 PV Area = PV-Length * 5 * (# % Net Area = 75%)
 PV-Eff (light to 110V) = 15%

Middle School and Community Center

Chicago, Latitude = 42°N WALL Azimuth = 180° (SOUTH) PV- Area (ft2) = 0

Solar (includes Cloud Cover) Analysis to Determine Optimum PV Tilt Angle

BTU/HR/SQFT

Hours	TILT Angle = 15°		TILT Angle = 30°		TILT Angle = 45°		TILT Angle = 60°		TILT Angle = 75°	
	Total	Direct	Total	Direct	Total	Direct	Total	Direct	Total	Direct
8,760										
MAX	325.4	267.5	333.6	276.9	337.9	275.4	330.7	271.4	311.5	260.2
AVG	56.2	34.0	58.9	36.1	58.5	35.7	54.9	32.9	48.6	27.9
SUM	491,925	297,878	516,044	315,875	512,382	312,507	481,217	287,940	425,678	244,699
10% Sum	49,193	29,788	51,604	31,587	51,238	31,251	48,122	28,794	42,568	24,470
mbtu/ft2	0.049	0.030	0.052	0.032	0.051	0.031	0.048	0.029	0.043	0.024
KW/ft2	14.4	8.7	15.1	9.3	15.0	9.2	14.1	8.4	12.5	7.2
*PV-Area	0	0	0	0	0	0	0	0	0	0