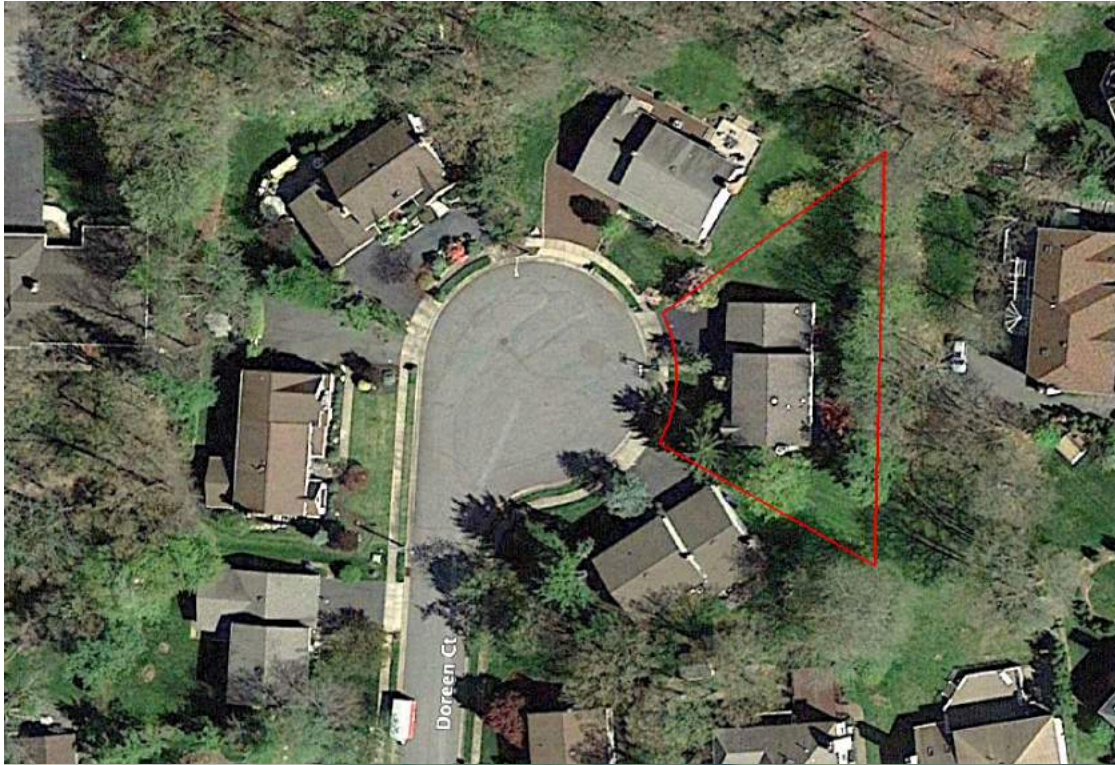


Tong Family House  
8 Doreen Ct, Edison NJ



# Property Overview





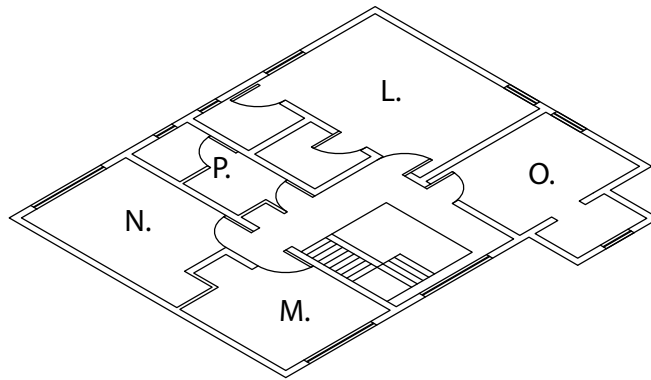
# Chapter 1:

## 8 Doreen Ct, Edison NJ

Stories: 3

Total rooms: 17

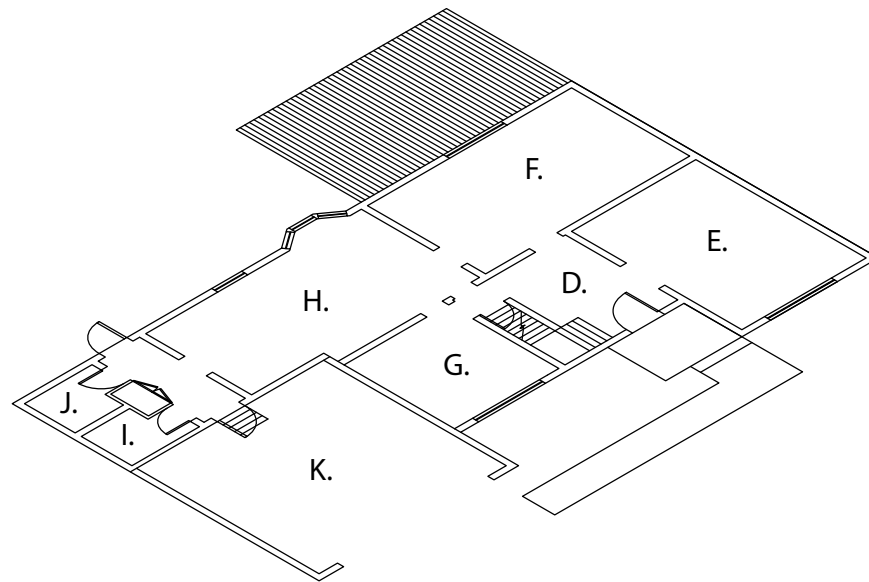
Total area:



### -1F

**944.31 sqft.**

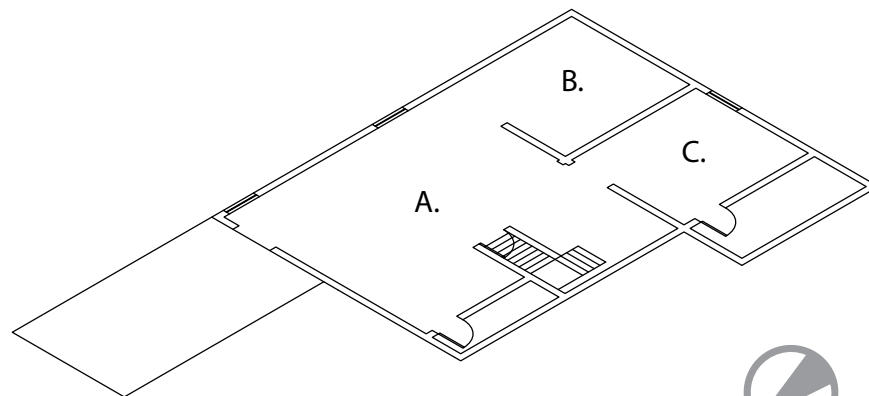
A	Play room	(606.25 sqft.)
B	Storage room	(173.25 sqft.)
C	Toy room	(164.81 sqft.)



### 1F

**1885.7 sqft.**

D	Atrium	(149.55 sqft.)
E	Living Room	(249.75 sqft.)
F	Family Room	(284.47 sqft.)
G	Dining Room	(135.52 sqft.)
H	Kitchen	(290 sqft.)
I	Laundry Room	(36 sqft.)
J	Bathroom 1	(36 sqft.)
K	Garage	(403.26 sqft.)
	Patio	(301.15 sqft.)



### 2F

**799.82 sqft.**

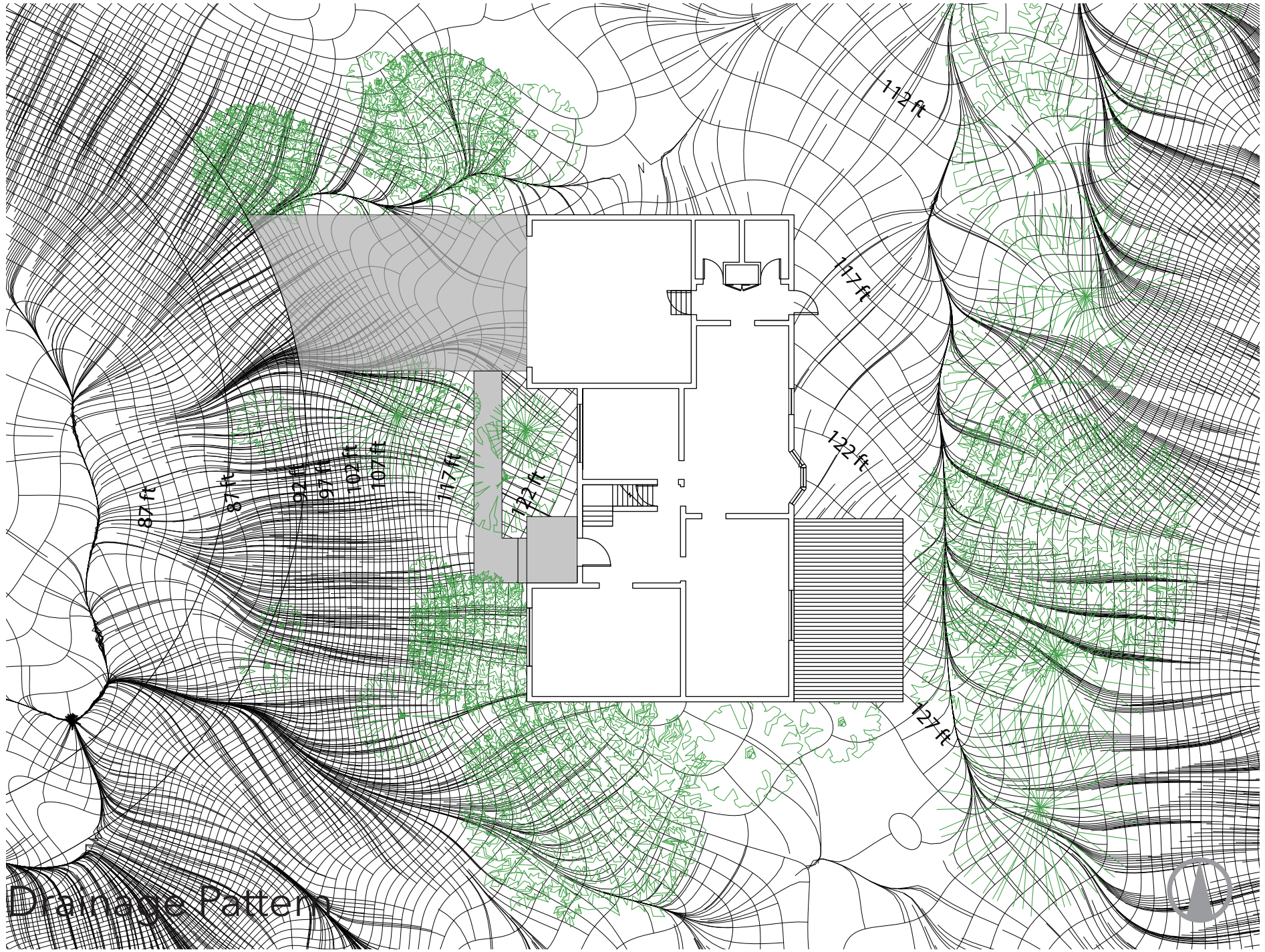
L	Master Suite	(312.72 sqft.)
M	Guest Bedroom	(128.44 sqft.)
N	Bedroom 3	(157.25 sqft.)
O	Bedroom 4	(132.16 sqft.)
P	Bathroom 2	(69.25 sqft.)

### 3F

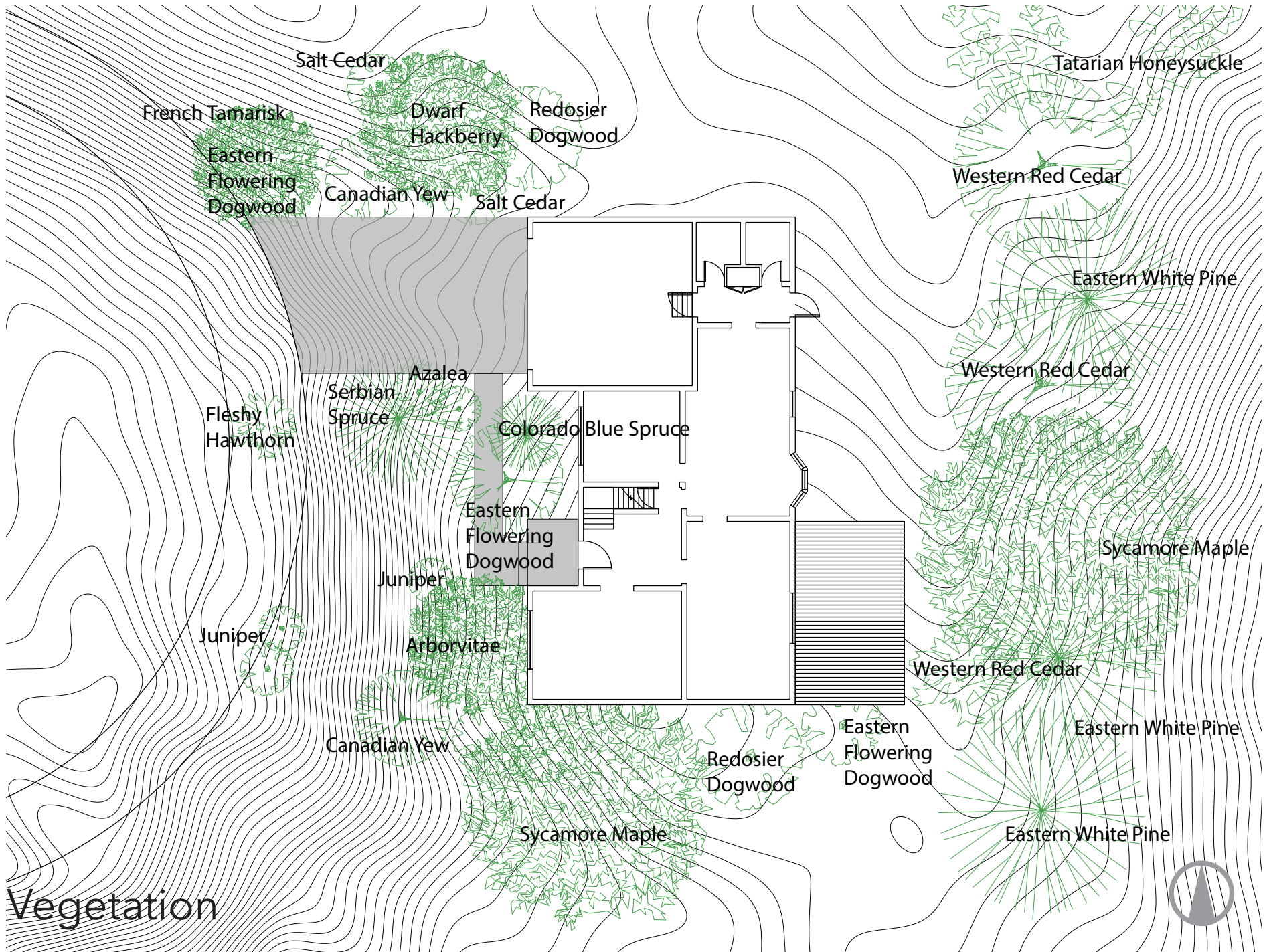
**758.37 sqft.**

Q	Attic	(758.37 sqft.)
---	-------	----------------





Drainage Pattern



# Vegetation

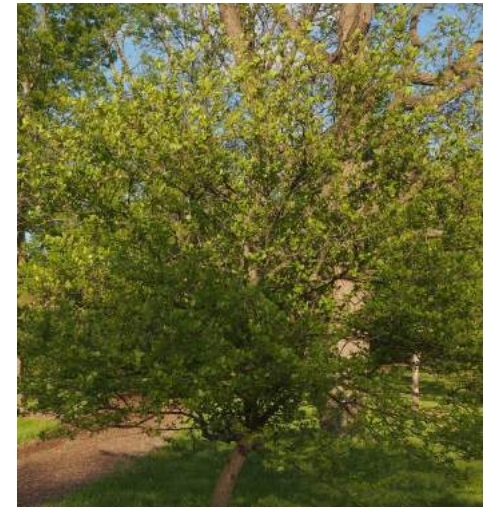




Arborvitae



Dwarf Hackberry



Fleshy Hawthorn



Azalea



Eastern Flowering Dogwood



French Tamarisk



Blue Spruce



Eastern White Pine



Juniper





Red Osier Dogwood



Salt Cedar



Serbian Spruce



Sycamore Maple



Tatarian Honeysuckle



Western Red Cedar



Canadian Yew

Species	Type	Height	Branching	Soil
Tatarian Honeysuckle	Deciduous	<10'	5' - 10'	Moist
Western Red Cedar	Evergreen	50' - 60'	15' - 20'	Moist, acid to alkaline
Eastern White Pine	Evergreen	50' - 80'	20' - 40'	Moist, acid
Sycamore Maple	Deciduous	80' - 115'	40' - 60'	Well-drained, acid to alkaline
Eastern Flowering Dogwood	Deciduous	20' - 30'	25' - 30'	Well-drained, acid to slightly alkaline
Red Osier Dogwood	Deciduous	8' - 12'	10' - 15'	Damp
Salt Cedar	Deciduous	13' - 26'	10' - 30'	Saline
Dwarf Hackberry	Deciduous	6' - 25'	10' - 15'	Dry
Canadian Yew	Evergreen	1' - 5'	7'	Part shade, moist
French Tamarisk	Evergreen	10' - 15'	15' - 20'	Moist, saline
Flesh Hawthorn	Deciduous	12' - 36'	15' - 20'	Moist, sandy
Serbian Spruce	Evergreen	50' - 60'	20' - 25'	Moist, acidic, sandy
Blue Spruce	Evergreen	30' - 50'	10' - 20'	Moist, sunny
Juniper	Evergreen	5'	10'	Dry, sunny
Arborvitae	Evergreen	50' - 60'	12' 20'	Well-drained, slightly acidic
Azalea	Deciduous	3' - 5'	3' - 5'	Moist, slightly acidic

# Climate Design Priorities

## 1 Insulate to protect from winter temperature

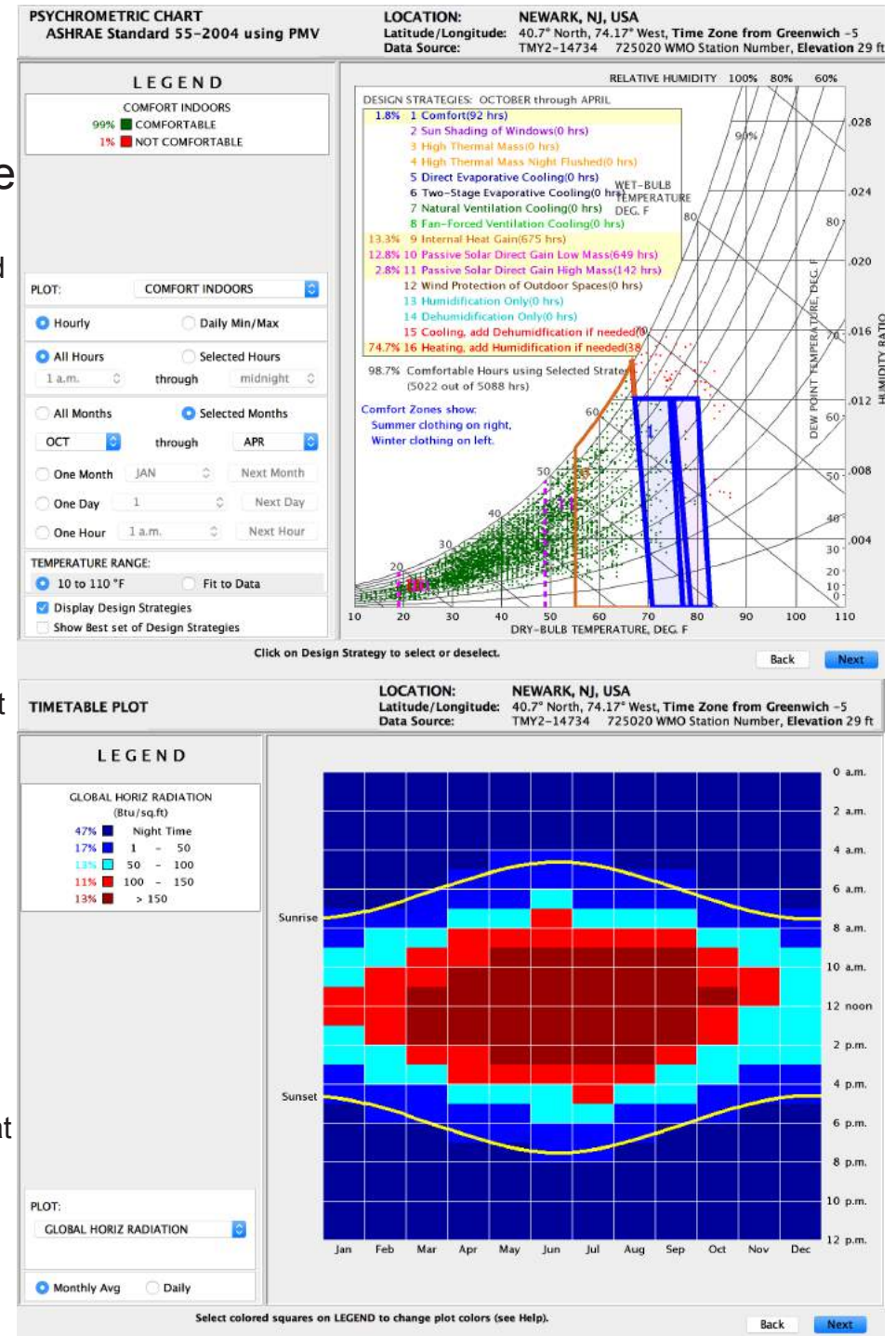
A long winter and often below freezing temperature requires better insulation from buildings to reduce heating load and increase thermal comfort inside buildings. Retaining internal heat gain results in 24.7% more hours of comfort.

## 2 Install operable sun screening device: Make use of winter sun

Pittsburgh winters have a decent amount of sunlight that could be used towards passive solar heating. Operable sun screening device allows the usage of winter sun and ensures protection from the summer sun.

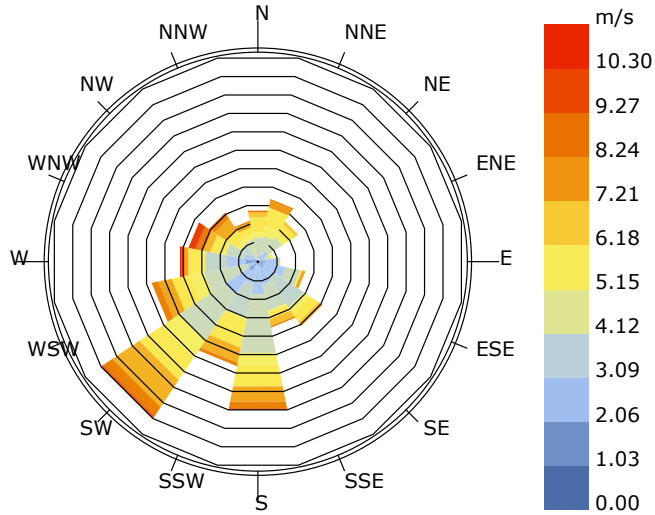
## 3 Install operable sun screening device: Shield from summer sun

Summer sun in Pittsburgh results in excessive solar heat gain, increasing building temperature and increasing cooling loads. Installing operable sun screening device helps shield from summer sun while allowing for view and usage of winter sun.



# 4 Reduce relative humidity

A high relative humidity reduces the efficiency of evaporative cooling and the effects of natural ventilation. By reducing the relative humidity (by air dehumidifier or other methods), summer months without machine cooling have more number of hours of comfort.



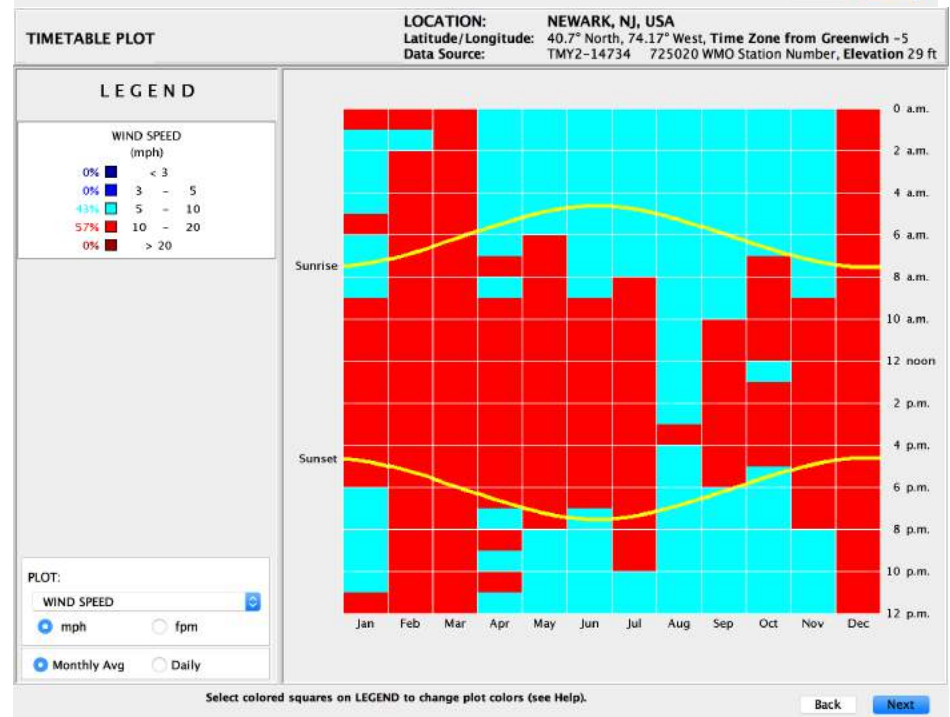
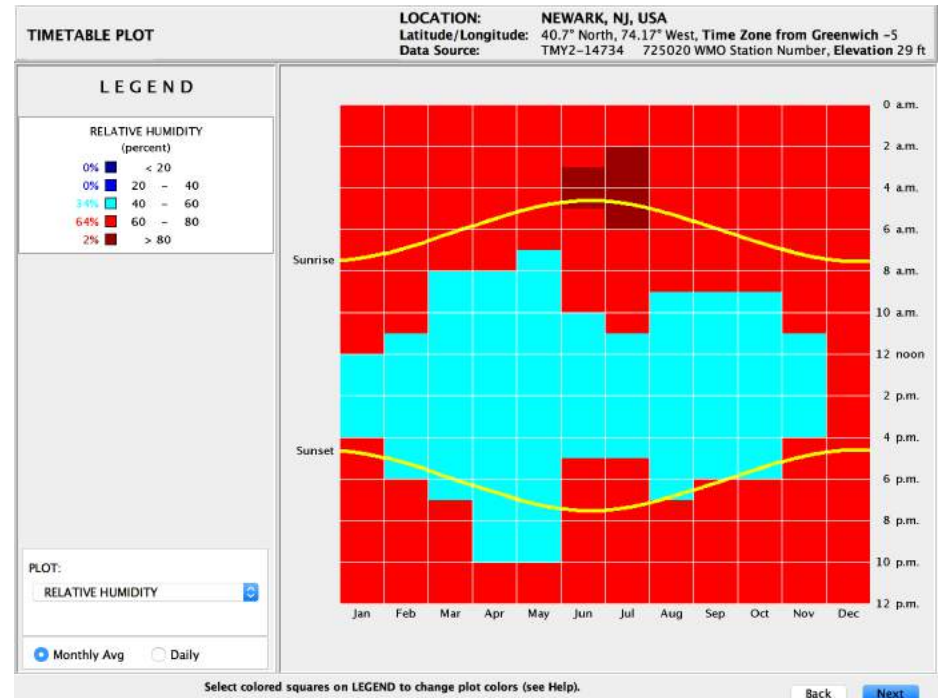
Wind-Rose  
NEWARK\_NJ\_USA  
1 JUN 1:00 - 30 JUN 24:00

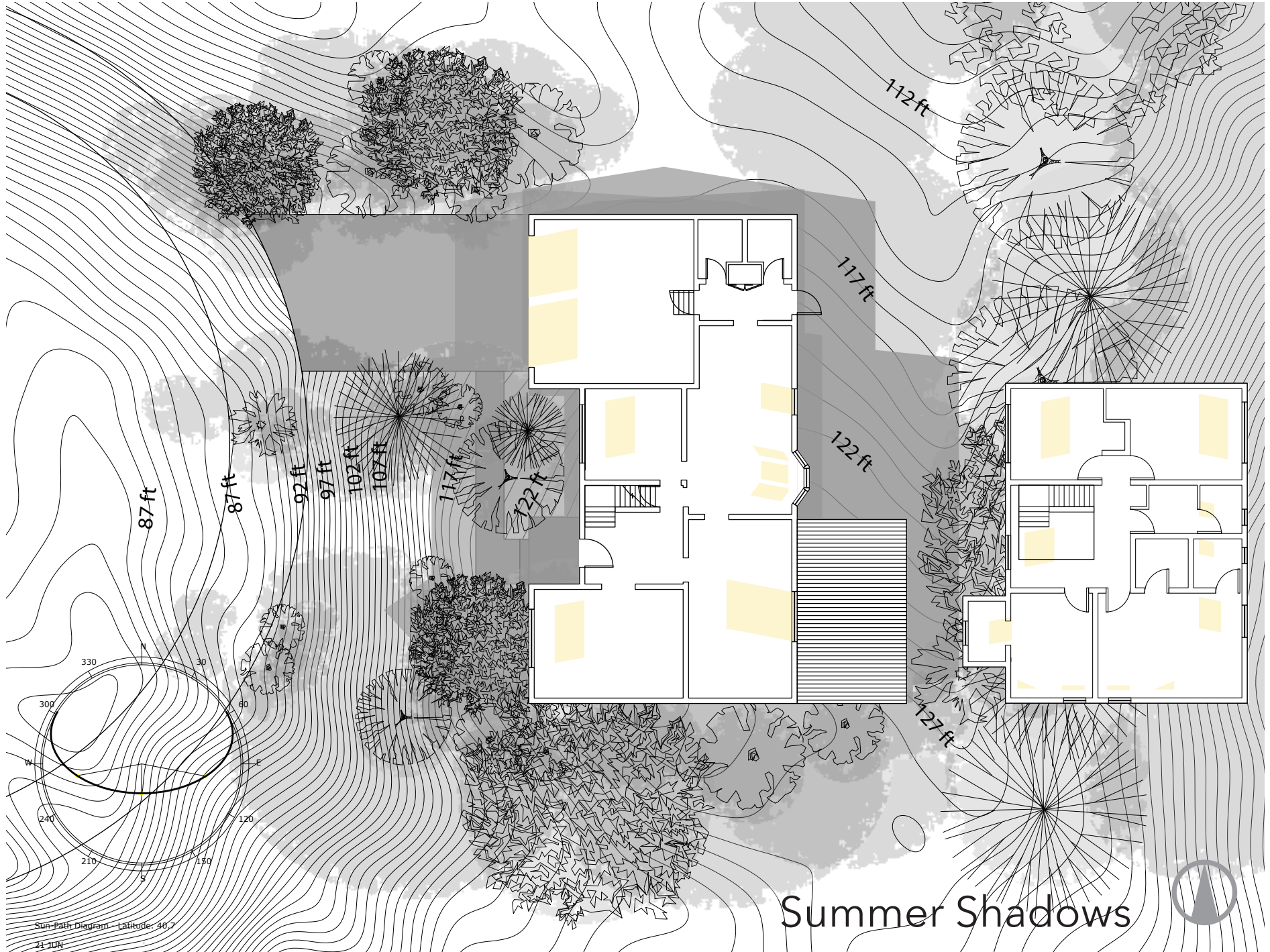
# 5 Natural Ventilation

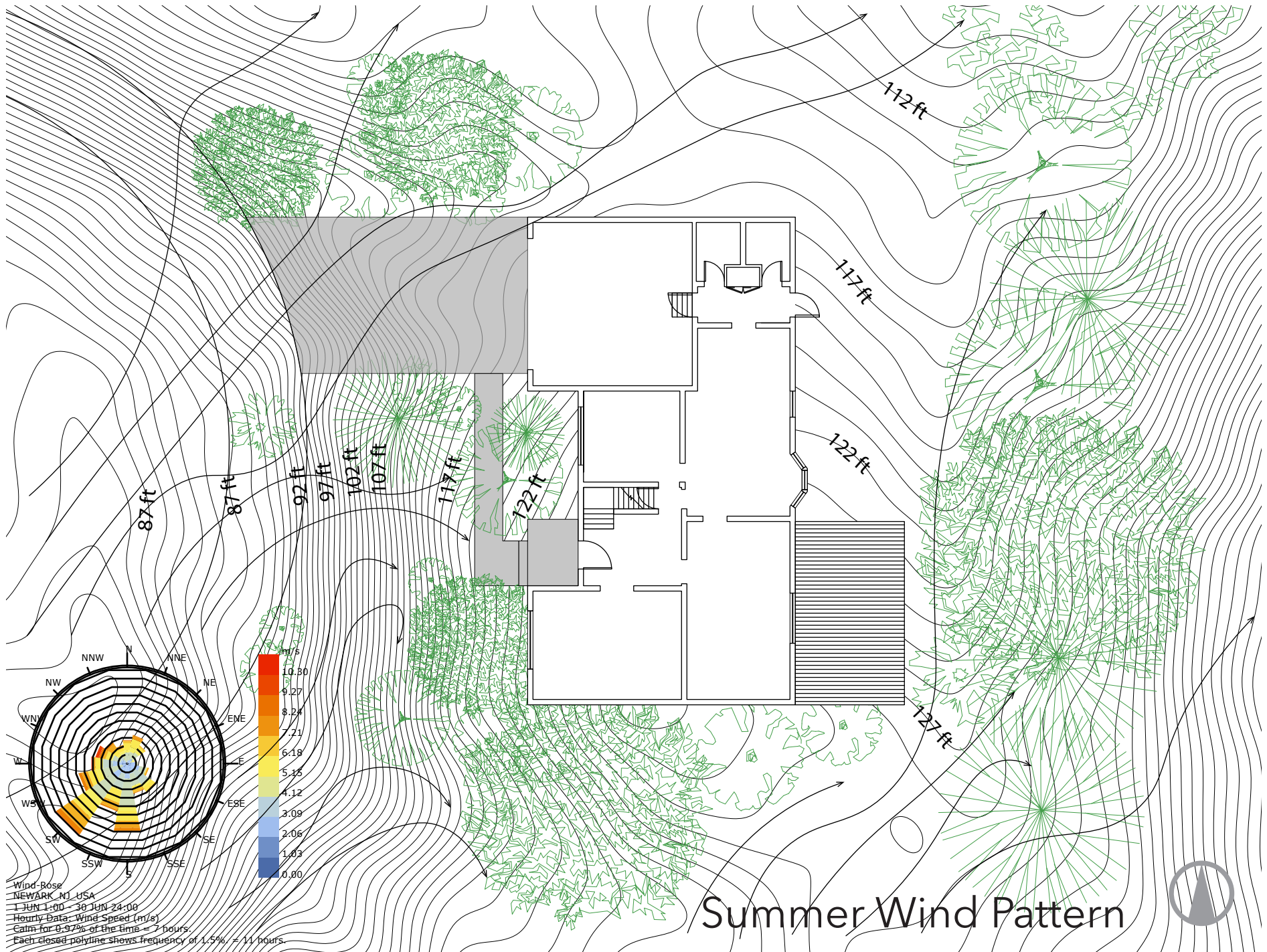
Natural ventilation and evaporative cooling is suitable in summer due to strong southwest winds. It encourages the usage of passive strategies for thermal comfort and provides a general orientation for built structures.

# 6 Protect against winter wind

Strong west winds propose a challenge in the winter months. The strongest wind coming from west and southwest direction, wind shielding becomes an essential part of reducing wind chill in the winter months.

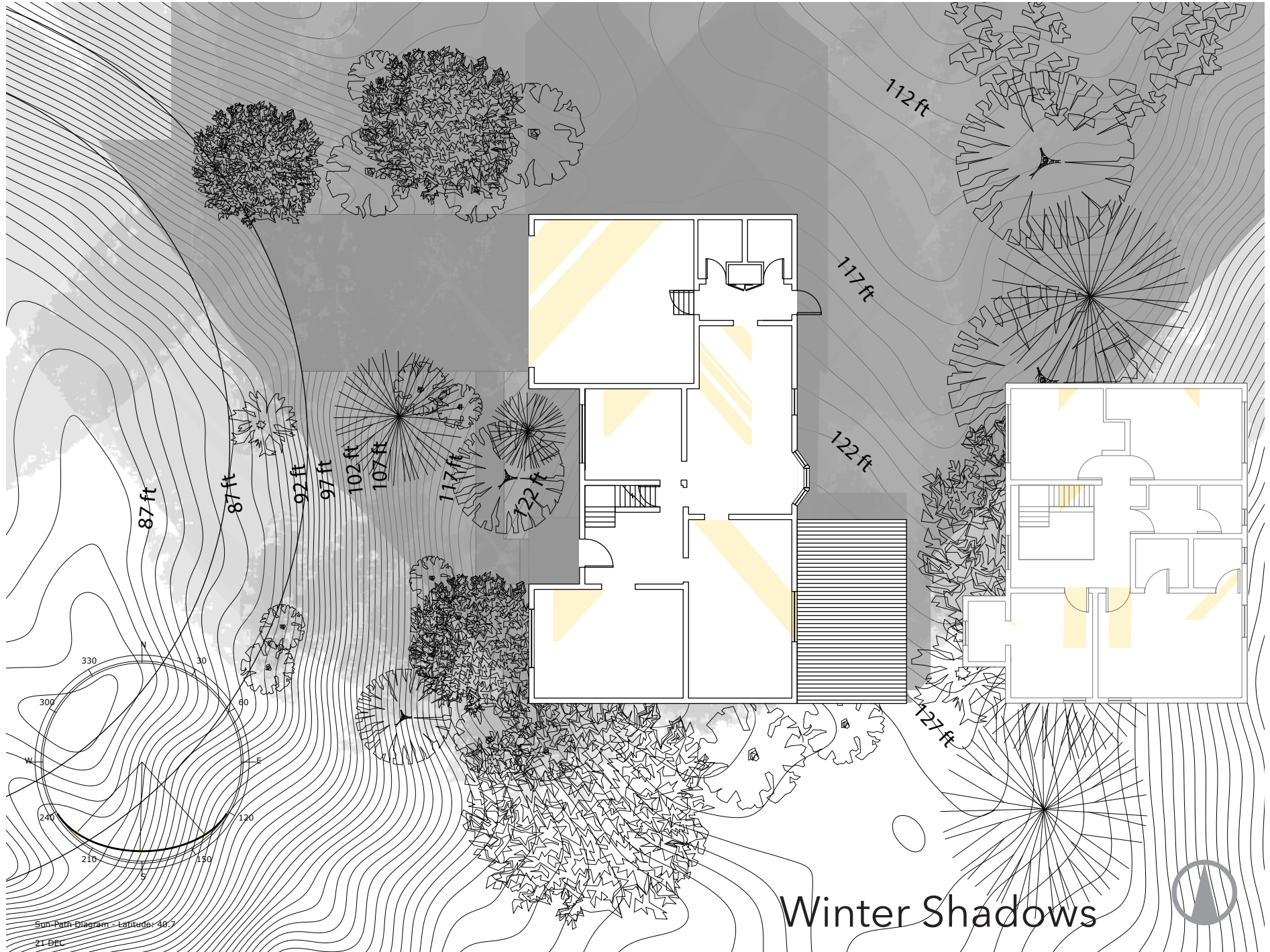


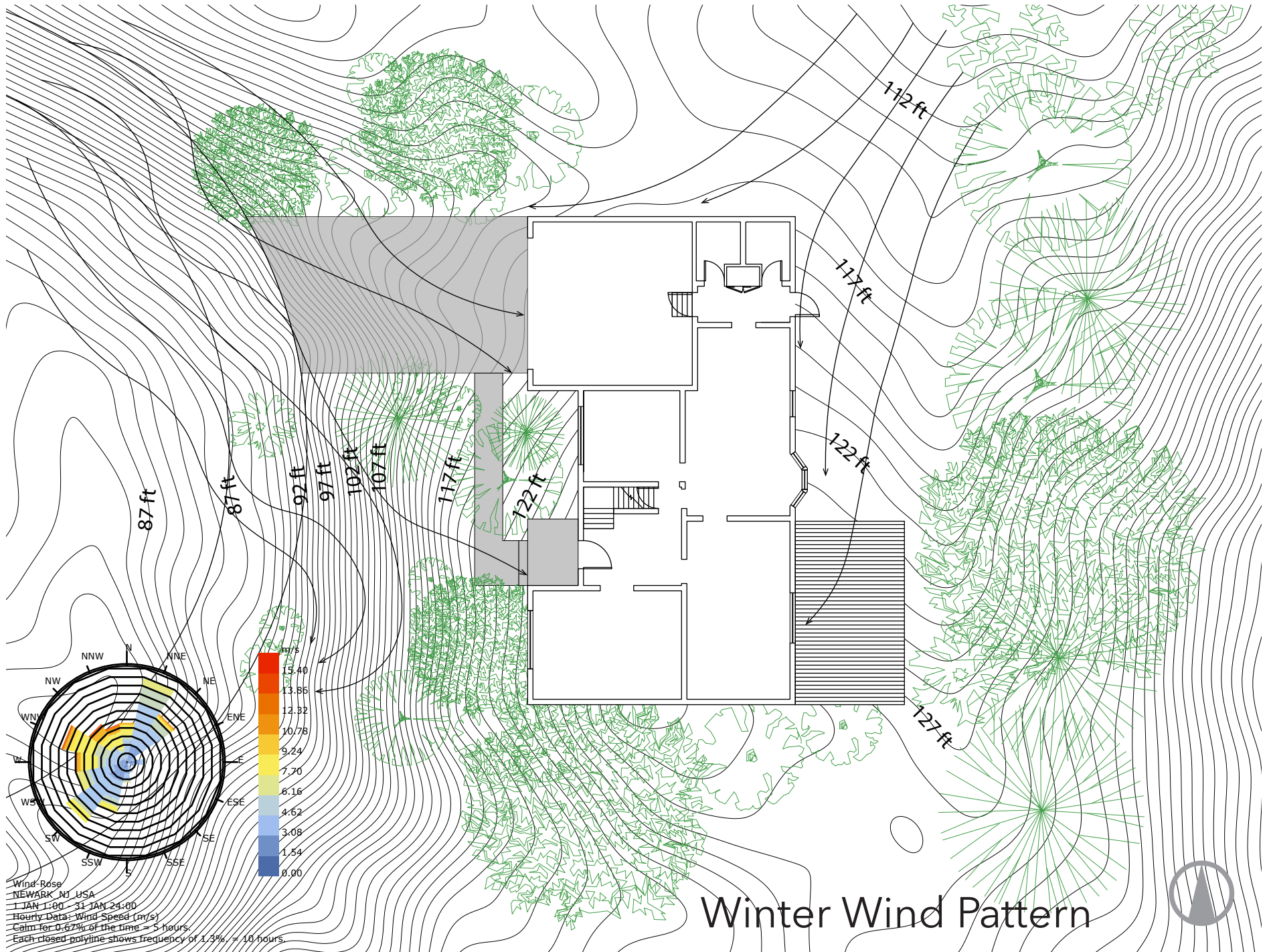




Summer Wind Pattern

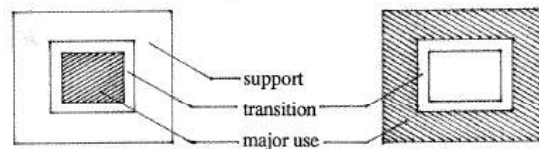
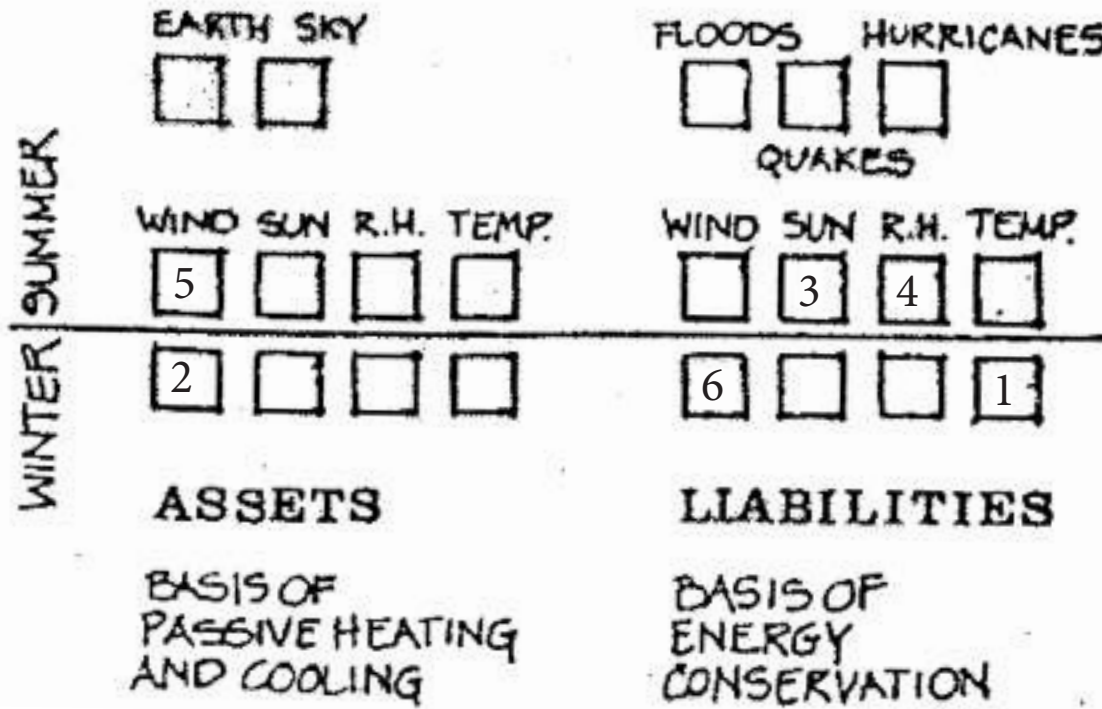






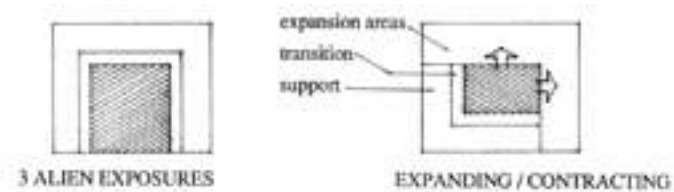
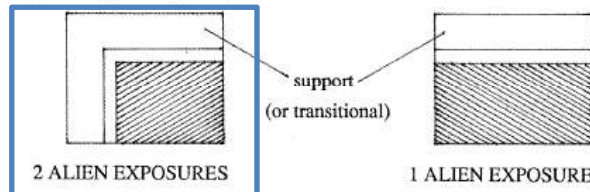


# CLIMATE & ARCHITECTURE

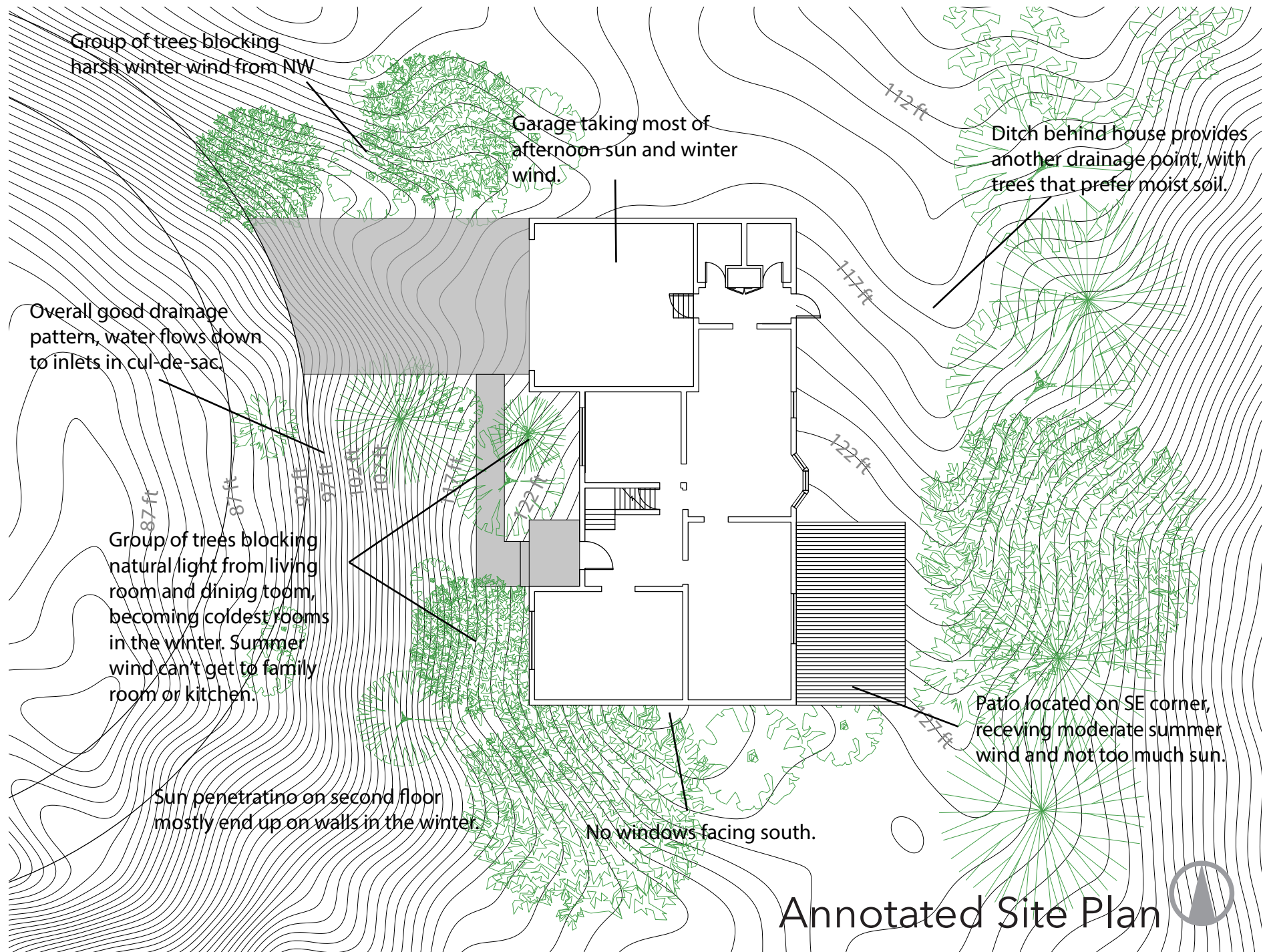


'ALIEN' CLIMATE  
(including Underground)

'FRIENDLY' CLIMATE



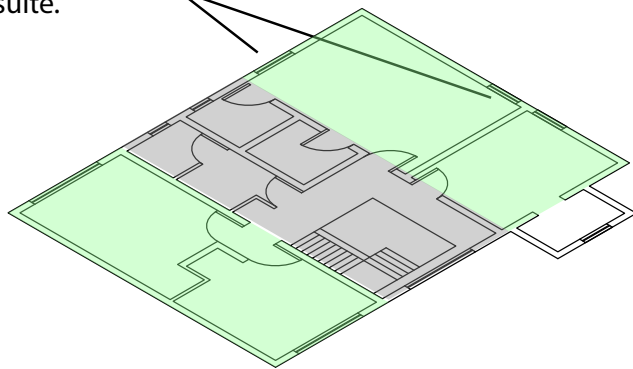




# Annotated Site Plan

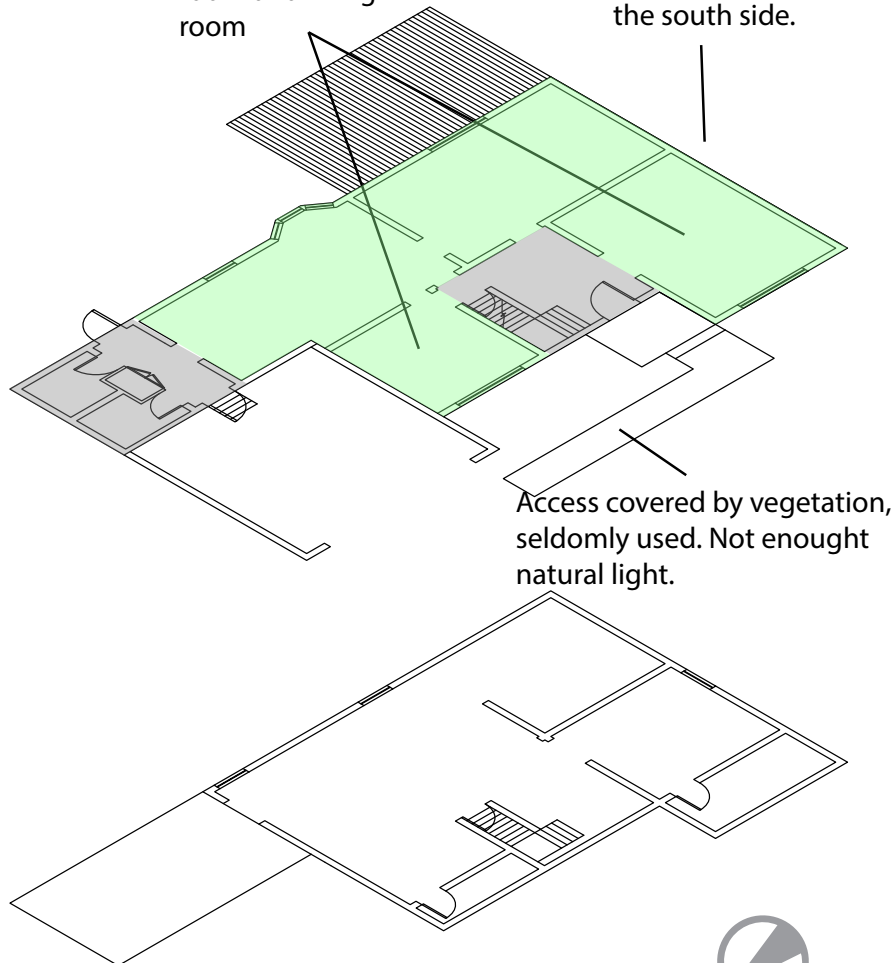


Only two small windows in master suite.



Under-used dining room and living room

No windows on the south side.



Access covered by vegetation, seldomly used. Not enough natural light.



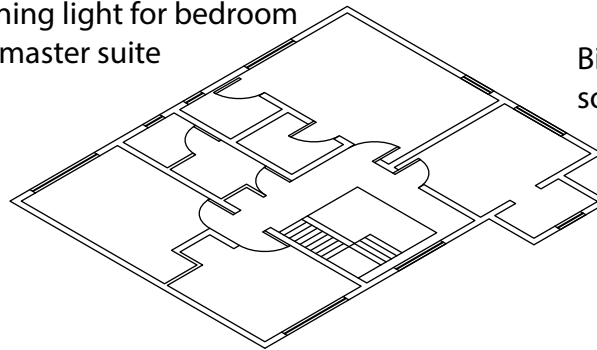
## Advantages:

1. Good drainage pattern, vegetation lining the ditch provides absorption of water as well as provide visual boundary and separation from the next house.
2. Garage and first floor support spaces shielding living spaces from winter weather, being on the north or northwest side.
3. Patio has southeastern exposure, and master suite is located on the south side.

## Disadvantages:

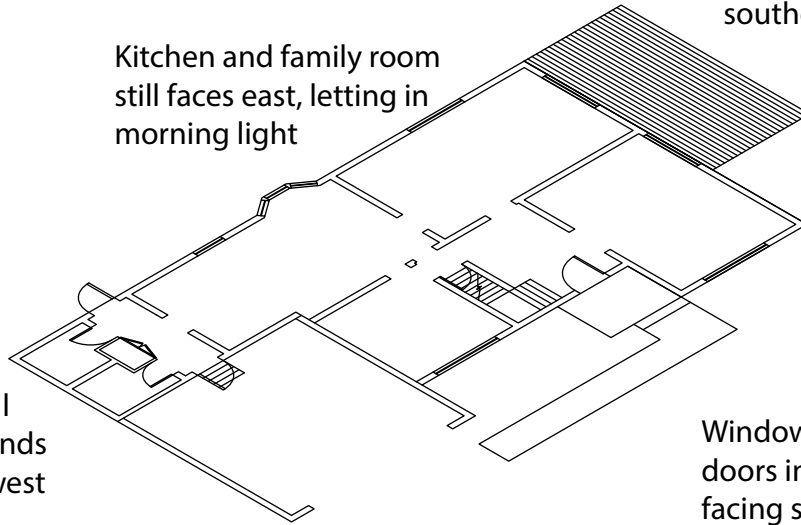
1. A number of living spaces being oriented to the west and covered by vegetation, resulting in the underusage of these spaces.
2. The south facade, although shaded by vegetation most times of the year, has no windows to allow natural light in, or to make use of solar energy in the winter when the sun is low.
3. The current main entrance is underused because the living spaces next to it are underused. This results in entering and exiting through the garage more often than the main door and waste of spaces.
4. Windows being only on the east and west facade means only half the house is of desirable solar exposure at a time, concentrating activity to mostly the east half of the house.

Morning light for bedroom and master suite



Bigger window facing southeast

Kitchen and family room still faces east, letting in morning light

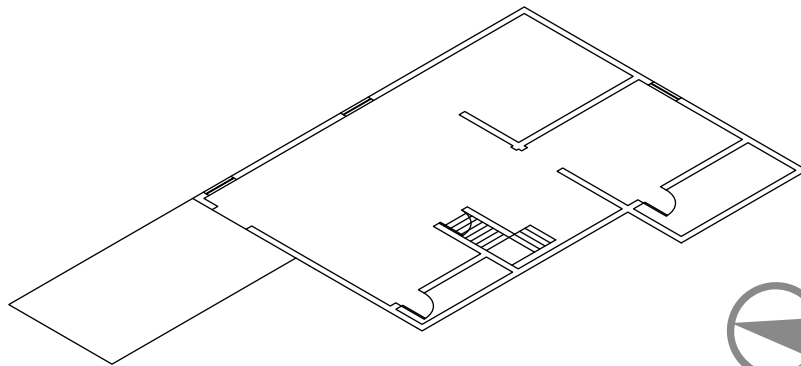


Patio relocated to southeast corner

Windows and glass doors in living room facing south/southeast

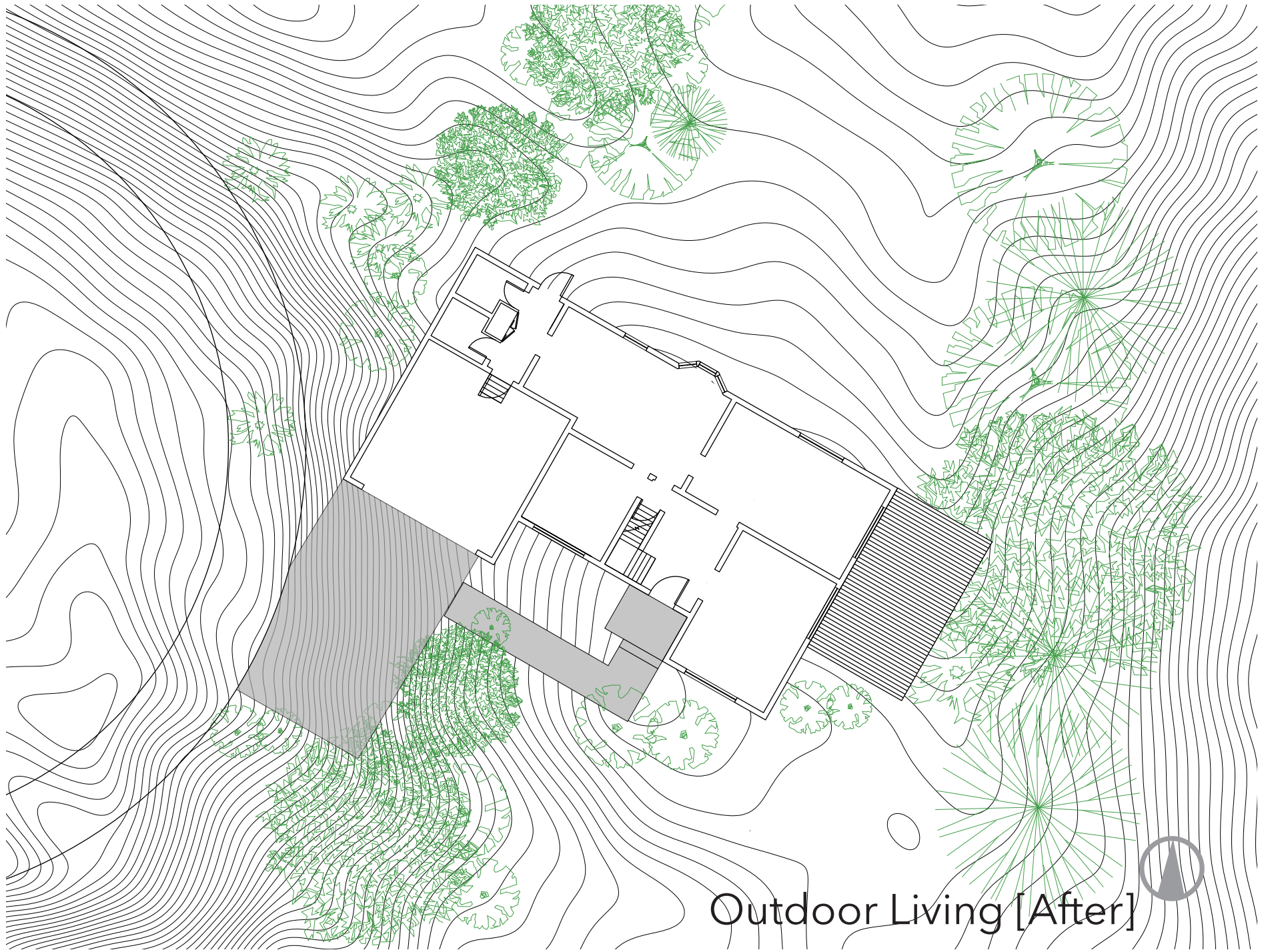
Support spaces still blocking winter winds from north/northwest

Windows and glass doors in living room facing south/southeast



## Recommendations:

1. Rotate house counterclockwise 60 degrees, so that there's more exposure to south/southeast
2. Open windows on the southeast to bring natural light into living room
3. Change planting strategy to block winds from northwest and let views through on the southeast
4. Move patio to the sunniest place outside, but have plants for summer shading.



Outdoor Living [After]



South and Southeast Axonometric



Axonometric [Before]



South and Southeast Axonometric

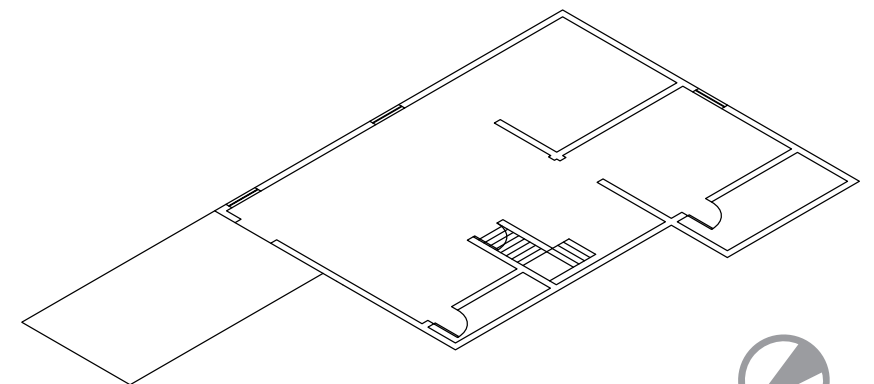
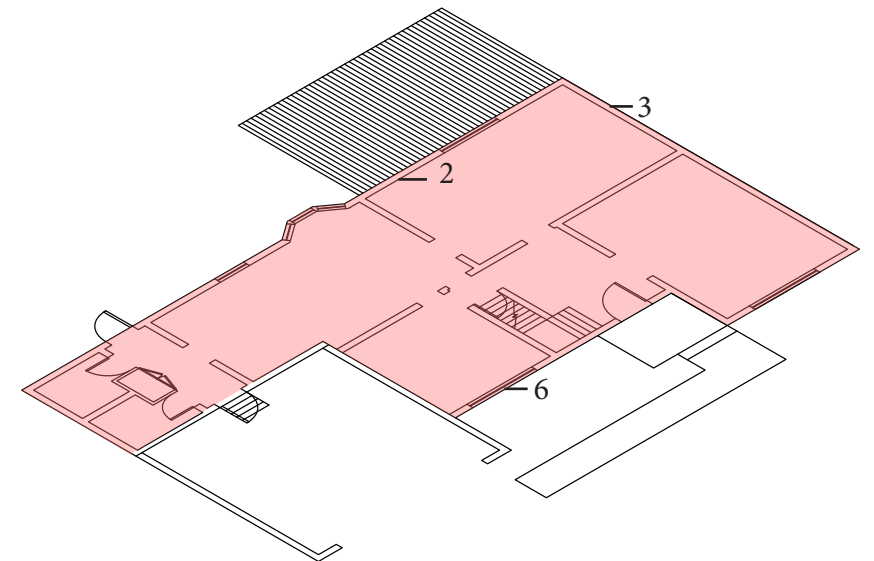
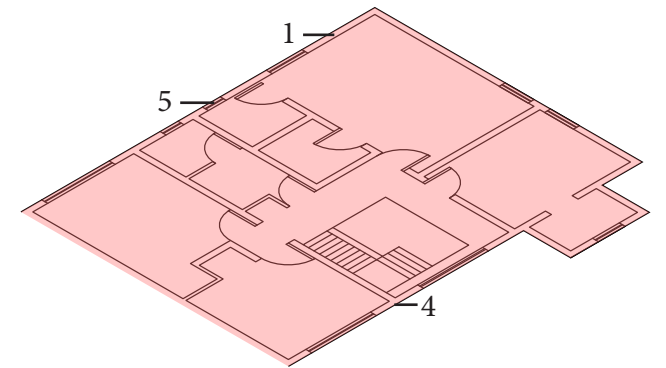


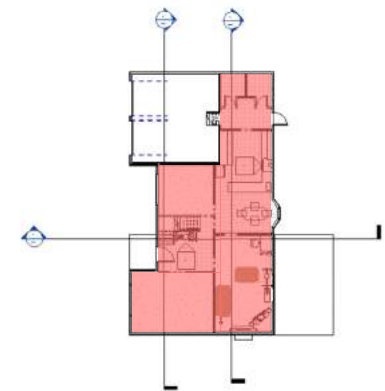
Axonometric [After]



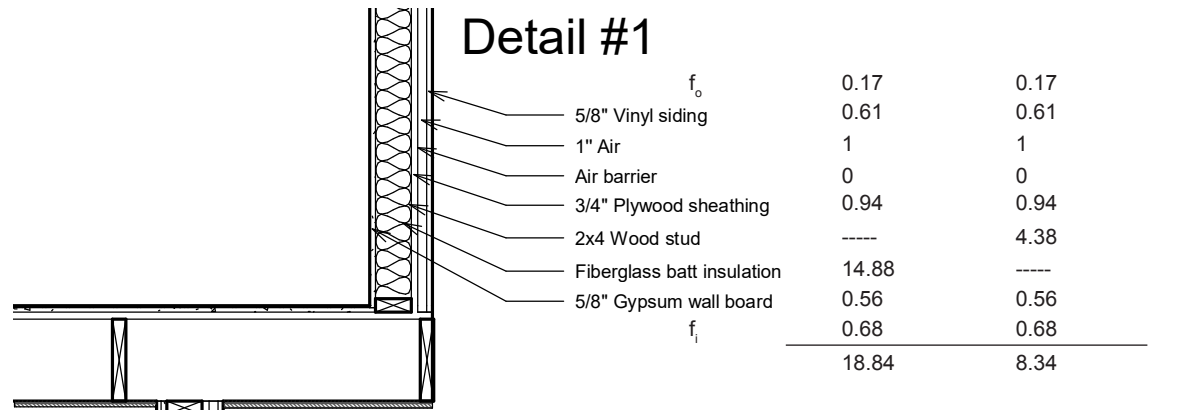


Chapter 2:



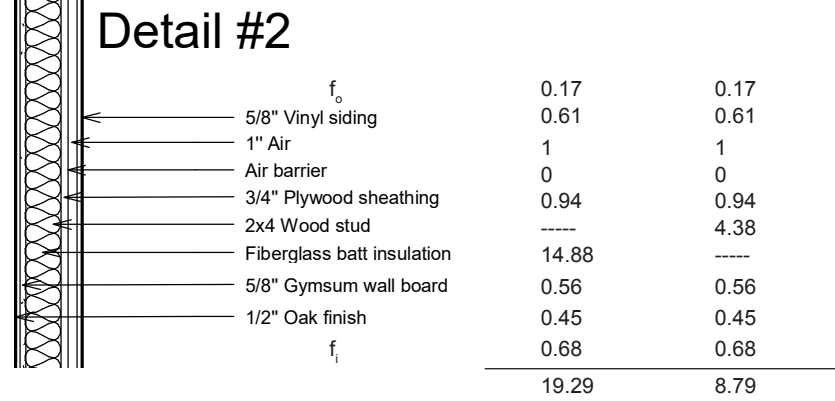


Conditioned Spaces



Average R = 85% x 18.84 + 15% x 8.34 = 17.26

U = 1/R = 0.058



Average R = 85% x 19.29 + 15% x 8.79 = 17.72

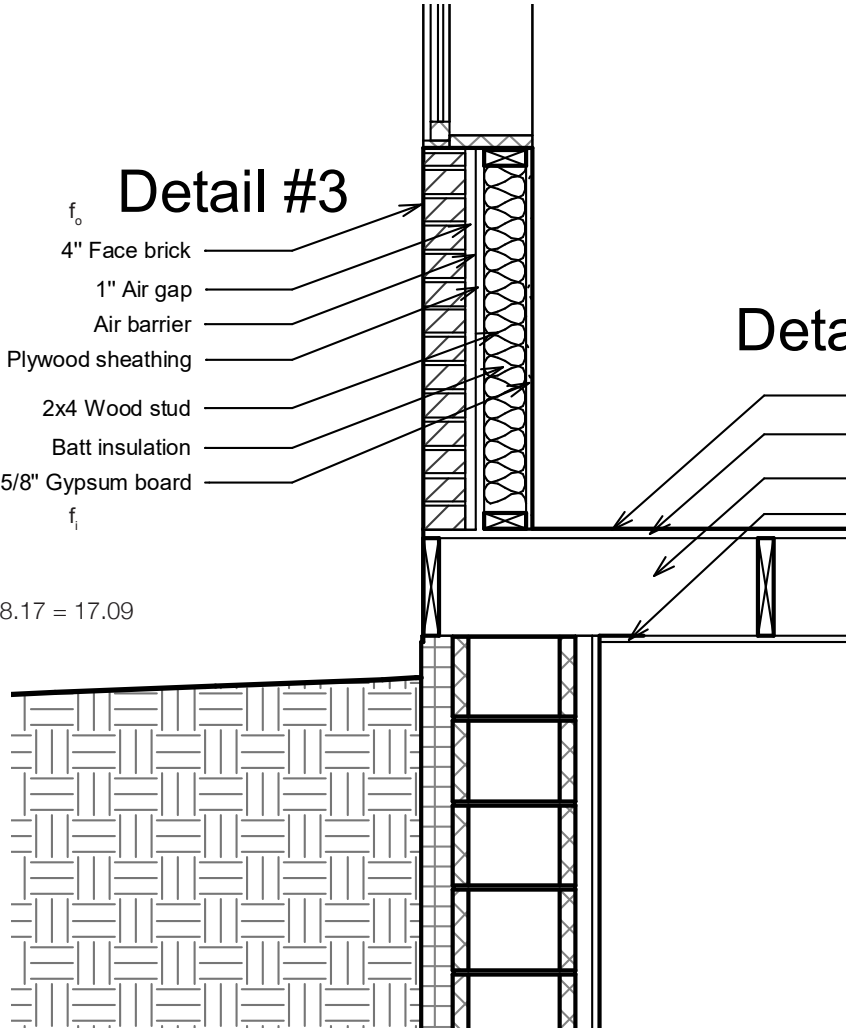
U = 1/R = 0.056

0.17	0.17
0.44	0.44
1	1
0	0
0.94	0.94
----	4.38
14.88	----
0.56	0.56
0.68	0.68
<hr/>	
18.67	8.17

Average R = 85% x 18.67 + 15% x 8.17 = 17.09  
 U = 1/R = 0.058

### Detail #3

- $f_o$
- 4" Face brick
- 1" Air gap
- Air barrier
- 3/4" Plywood sheathing
- 2x4 Wood stud
- Batt insulation
- 5/8" Gypsum board
- $f_i$

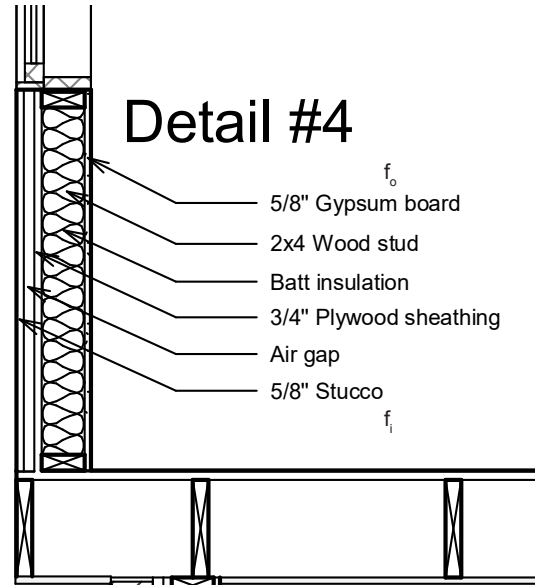


### Detail #10

$f_i$	0.17
1/8" Carpet finish	2.08
5/8" Plywood sheathing	0.77
10" Wood joist	12.35
5/8" Gypsum board	0.56
$f_o$	0.68
<hr/>	
	16.61

R = 16.61

U = 1/R = 0.060



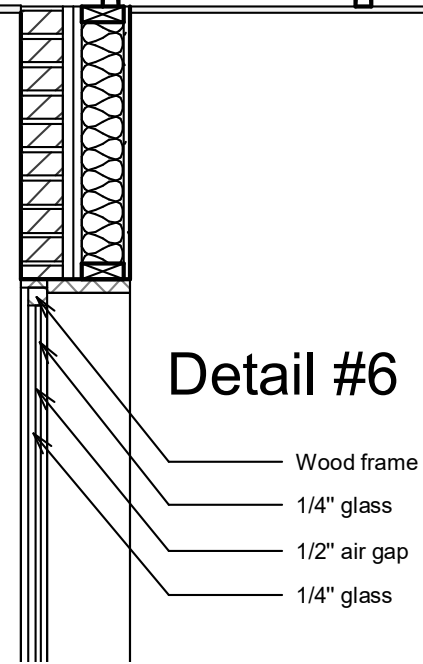
### Detail #4

- $f_o$
- 5/8" Gypsum board
- 2x4 Wood stud
- Batt insulation
- 3/4" Plywood sheathing
- Air gap
- 5/8" Stucco
- $f_i$

	0.17	0.17
	0.56	0.56
	----	4.38
	14.88	----
	0.94	0.94
	0	0
	0.13	0.13
	0.68	0.68
	<hr/>	<hr/>
	17.36	6.86

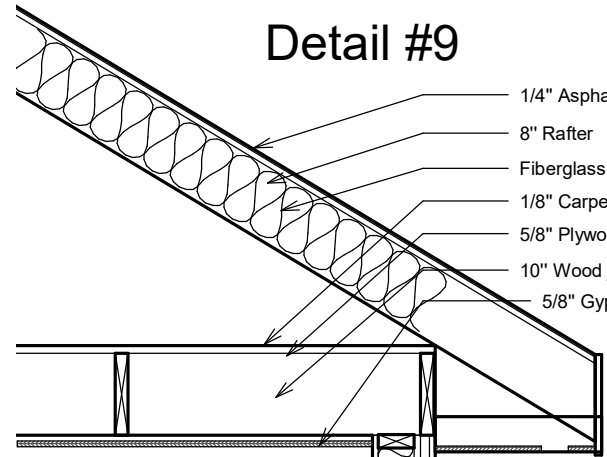
Average R = 85% x 17.36 + 15% x 6.86 = 15.77

U = 1/R = 0.063



### Detail #6

- Wood frame
- 1/4" glass
- 1/2" air gap
- 1/4" glass



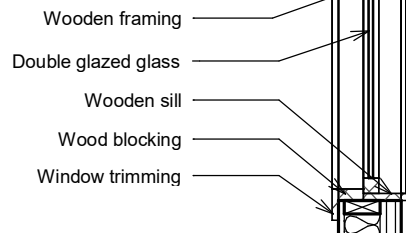
**Detail #9**

$f_o$	0.17	0.17
1/4" Asphalt Shingles	0.44	0.44
8" Rafter	-----	9.88
Fiberglass batt insulation	14.88	-----
1/8" Carpet finish	2.08	2.08
5/8" Plywood sheathing	0.77	0.77
10" Wood joist	12.35	12.35
5/8" Gypsum board	0.56	0.56
$f_i$	0.68	0.68
	<hr/>	<hr/>
	31.93	26.93

Average R = 85% x 31.93 + 15% x 26.93 = 31.18

U = 1/R = 0.032

**Detail #5**



**TABLE A: PEAK AND ANNUAL LOADS  
SIMPLIFIED CALCULATION OF BUILDING HEAT LOSS COEFFICIENTS**

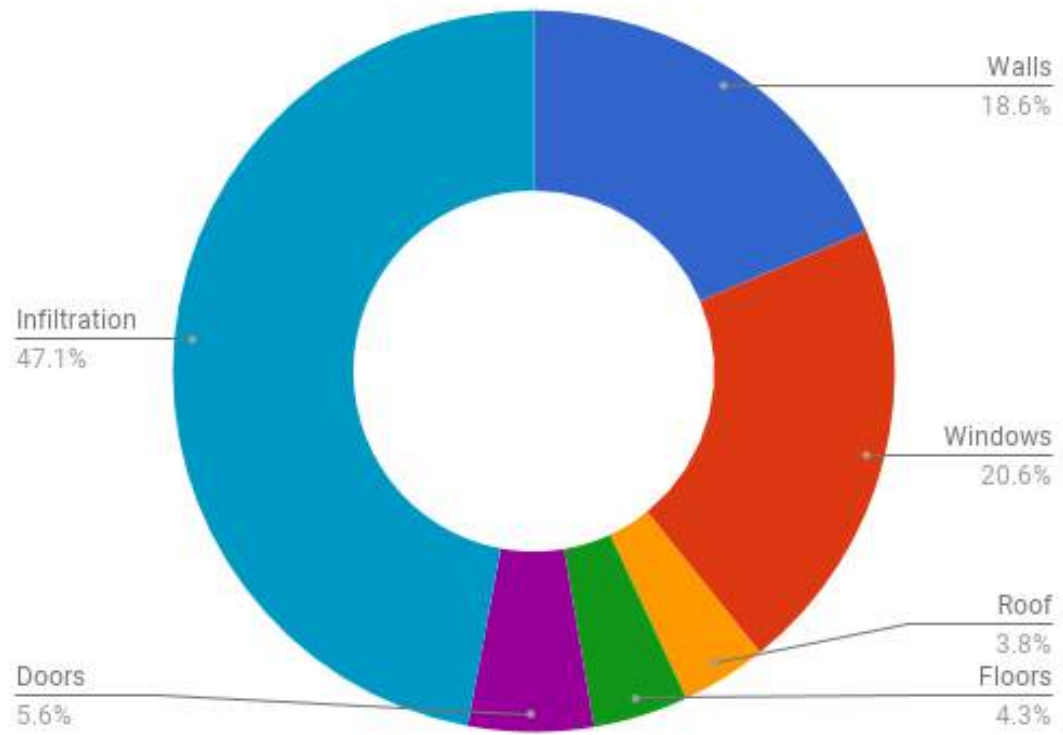
	detail #	U-value Btu/hrft <sup>2</sup> °F	total area ft <sup>2</sup>	Heat loss Coefficient UA=Btu/hr°F
WALLS	1	0.058	2655.96	154.05
	2	0.056	170.70	9.56
	3	0.058	173.88	10.09
	4	0.063	111.38	7.02
WINDOWS	5 (double hung)	0.5	156	78
	6 (casement)	0.5	243	121.5
DOORS	7 (single flush)	0.5	66.5	33.25
	8 (glass)	0.5	42.22	21.11
ROOFS (ceilings)	9	0.032	1160.21	37.13
FLOORS	(above grade, over vented crawl spaces U, over unheated spaces 1/2U)			
	10	0.060 x 1/2	1373.18	41.35
FLOOR	slab on grade	F-value	perimeter ft.	
	N/A			
BELOW GRADE FLOORS		modified U	ft <sup>2</sup>	
	N/A			
BELOW GRADE WALLS		total F	perimeter ft.	
	N/A			

INFILTRATION (heated volume of the building x number of air changes x the heat capacity of air .018 Btu ft <sup>3</sup> °F  #A.C. x .018 x volume cu.ft. = heat loss coefficient <u>1</u> x <u>0.018</u> x <u>25333.9</u> = <u>456.01</u>		
<b>TOTAL HEAT LOSS COEFFICIENT (total UA) Btu/hr°F</b>	100%	969.07

HEAT LOSS SOURCE	%	HEAT LOSS Btu/hr°F
Transmission Losses:		
Walls .....	18.65	180.72
Windows .....	20.59	199.5
Doors .....	5.61	54.36
Ceilings .....	3.83	37.13
Floors .....	4.27	41.35
Infiltration Losses .....	47.06	456.01
<b>PEAK HEAT LOSS</b> = total UA x T (design indoor°F - design outdoor°F) <u>44577.22</u> = <u>969.07</u> x <u>60 - 14</u>		
<b>ANNUAL HEAT LOSS</b> = total UA x 24hrs x annual degree days <u>81239076.24</u> = <u>969.07</u> x <u>24</u> x <u>3493</u>		

**ANNUAL BUILDING ENERGY PERFORMANCE BTU/sq.ft/year** 32067.34





# HEATING

Heating: Building Load Coefficient

1. UA total for house (BTU/h °F) 969.07 x 24 = 23257.68 building load coefficient (BTU/day °F)

(could vary per month if storm windows, night insulation, or zoning is used)

2. DD base 60 °F. Look up monthly DD at that base or calculate (new DD base– ave temp/month) x days month

Heating fuel type 1 electric (choose: gas, oil, electric, other)

3B. heating system efficiency 90 %

4. \$ 9.94 /mmbtu

(total mmbtu from the bills divided by the \$ charged); total costs in 4. may be less than bills if gas is used for DHW, cooking, and drying.

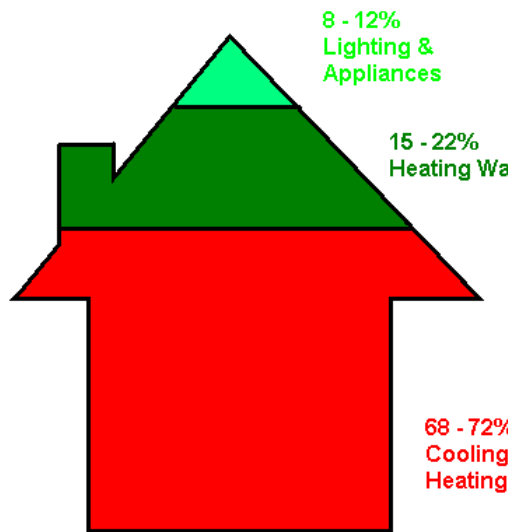
10therm or 10ccf gas = mcf = mmbtu  
 gal oil = 140,000 BTU = .14mmbtu  
 cord of wood = 20 mmbtu  
 1 kWh = 3413 btu (mmbtu = btu x 10<sup>6</sup>)

use these values to understand your bills

	1. BLC = 24 UA		2. mo. HDD (base 60°)		3. Htg. Load BTU x 10 <sup>6</sup> (1. X 2.)	divide by sys- tem effc. (eg. .85 = 85%)	3B. Htg. System Demand (BTU x 10 <sup>6</sup> )		4. cost/ mmbtu		Total Heating Cost
Jan	23257.68	x	727	=	16.91	0.9	18.79	x	8.72	=	182.20
Feb	23257.68	x	528	=	12.28	0.9	13.64	x	8.51	=	134.05
Mar	23257.68	x	621	=	14.44	0.9	16.05	x	8.67	=	157.41
Apr	23257.68	x	193	=	4.49	0.9	4.99	x	8.86	=	62.87
May	23257.68	x	105	=	2.44	0.9	2.71	x	9.37	=	45.18
June	23257.68	x	20	=	0.47	0.9	0.52	x	10.64	=	27.93
July	23257.68	x	0	=	0.00	0.9	0.00	x	11.33	=	23.88
Aug	23257.68	x	4	=	0.09	0.9	0.10	x	13.04	=	28.84
Sept	23257.68	x	22	=	0.51	0.9	0.57	x	11.74	=	31.42
Oct	23257.68	x	96	=	2.23	0.9	2.48	x	10.25	=	47.04
Nov	23257.68	x	442	=	10.28	0.9	11.42	x	9.37	=	126.78
Dec	23257.68	x	735	=	17.09	0.9	18.99	x	8.75	=	184.64
			3493		81.24		90.27				1,052.24
			Total HDD		Heating Load (mmbtu)		System Demand (mmbtu)				Heating Cost \$

your heating bills  
will include system  
inefficiency

**Where Your Energy Dollar Goes:**



What is the heating Btu/ SqFt? \_\_\_\_\_

32067.34  
btu/sqft

What is the heating Btu/ SqFt-HDD value? \_\_\_\_\_

9.18  
btu/sqft-hdd

Check the box to show the energy use of your home:

Passive house = 1 watt house (per sqmeter and hdd metric) = 0.8 Btu/sqft/hdd

Best new homes: 2 Btu/SqFt-HDD

ENERGY STAR® homes: 5 Btu/SqFt-HDD

low usage existing homes: 7 Btu/SqFt-HDD

medium usage existing homes: 11 Btu/ SqFt-HDD

high usage existing homes: 15 Btu/ SqFt-HDD

# DOMESTIC HOT WATER (DHW)

**General Information**

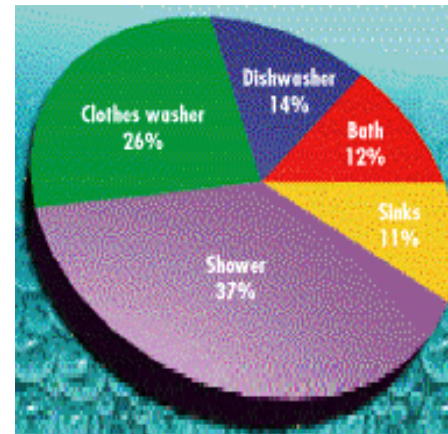
Gallons of hot water \_\_\_ 2108 \_\_\_/month (can be variable) (total activity chart)

DHW Fuel type \_\_\_gas\_\_\_ (gas, electric, other)

5. mmbtu/mo = total gallons x .001 mmbtu/gallon

6. cost/mmbtu= \$\_\_9.94\_\_\_. (same as gas heating cost)

	5. DHW Load in BTU x 10 <sup>6</sup> or Kwh	6. \$/ mmbtu or \$/kwh	Total Domestic Hot Water Cost
Jan	2.108	8.72	18.38
Feb	2.108	8.51	17.94
Mar	2.108	8.67	18.28
Apr	2.108	8.86	18.68
May	2.108	9.37	19.75
June	2.108	10.64	22.43
July	2.108	11.33	23.88
Aug	2.108	13.04	27.49
Sept	2.108	11.74	24.75
Oct	2.108	10.25	21.61
Nov	2.108	9.37	19.75
Dec	2.108	8.75	18.45
Total?	25.296 DHW load		251.38 DHW cost



**Average Hot Water Use**

### Water use in the home



Activity	Gallons per use		# of times per month		TOTAL
Clothes Washing	32	x	4	=	128
Showering	20	x	60	=	1200
Hand Dishwashing	15	x	30	=	450
Face/Hand washing	1	x	180	=	180
Preparing Food	5	x	30	=	150
					2108

US average DHW use: totals

1 person = 35 gallons/day

Family 4 = 75-90 gallons/day

Family 6 = 105-121 gallons/day

Average household = 65 gallons/day

Average Africa Family = 5 gallons/day

# COOLING

## General Information

7. Monthly CDD or cooling hours/month (variable by month)

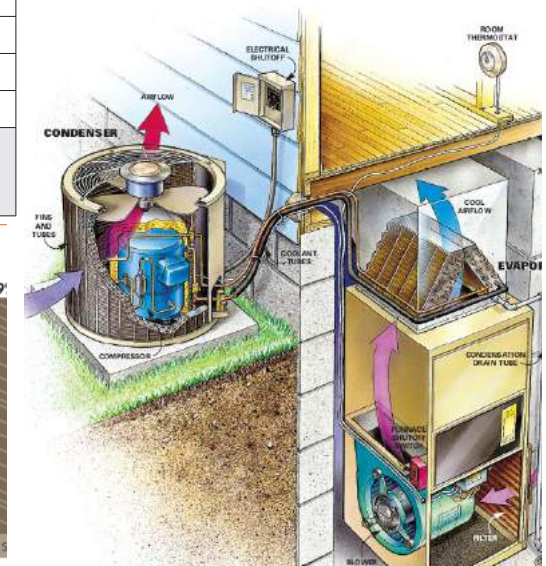
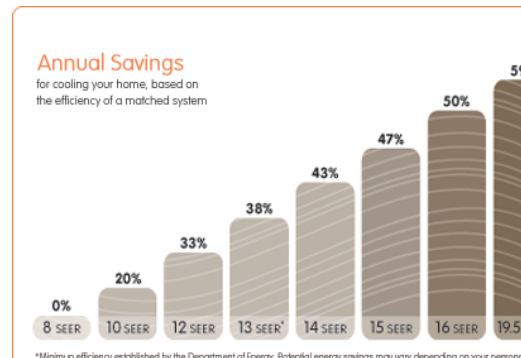
Equipment SEER rating 14 BTU/wh (find SEER and capacity on equipment)

Unit Capacity 38000 BTUh (note: 1 ton = 12,000 BTU/hrs) (if window units add all together)

8. Monthly cooling system demand in kwh/CDD 2.71 = unit capacity in BTU/hr divided by (SEER in BTU/wh x 1000 wh/kwh)

9. Electricity cost \$ 0.1145 /kwh (from bills)

	7. Monthly CDD (75 deg. base)		8. Cooling System Demand factor (kwh/CDD)		Monthly Cooling System Demand (kwh)	9. Electricity cost per kwh		Total Cooling Cost per month
Jan	0	x	2.71	=	0	0.1145	=	0.00
Feb	3	x	2.71	=	8.14	0.1145	=	0.93
Mar	0	x	2.71	=	0	0.1145	=	0.00
Apr	16	x	2.71	=	43.43	0.1145	=	4.97
May	38	x	2.71	=	103.14	0.1145	=	11.81
June	112	x	2.71	=	304	0.1145	=	34.81
July	138	x	2.71	=	374.57	0.1145	=	42.90
Aug	61	x	2.71	=	165.57	0.1145	=	18.96
Sept	39	x	2.71	=	105.86	0.1145	=	12.12
Oct	15	x	2.71	=	40.71	0.1145	=	4.66
Nov	2	x	2.71	=	5.43	0.1145	=	0.62
Dec	0	x	2.71	=	0	0.1145	=	0.00
<b>Total</b>	<b>424</b>				<b>1150.86</b>			<b>131.80</b>
					<b>Total Cooling Load</b>			<b>Total Cooling Cost</b>



# LIGHTING

## Lighting energy use

	Quantity in the House		Average Lamp Wattage (w)		Average Hours On per Month (h/mo)		Total (wh/mo)
Incandescent lamps	32	x	60	x	30.0	=	57600
Compact Fluorescent (CFL) lamps	0	x	0	x	0	=	0
Fluorescent Tubes	0	x	0	x	/	=	/
LED lamps	0	x	0	x	/	=	/
Halogen Lamps	0	x	0	x	/	=	/
Other:	0	x	0	x	/	=	/
						=	57600

\*(With dimmers reduce the lamp wattage)

10. (total wh/mo)/1000 = 57.6 total kwh/mo

11. Electricity cost \$ 0.1145/kwh (from bills)

	10. Monthly Lighting Load KWh		11. Electricity cost \$/kwh		Monthly Lighting Cost
Jan	57.6	x	0.1145	=	6.5952
Feb	57.6	x	0.1145	=	6.5952
Mar	57.6	x	0.1145	=	6.5952
Apr	57.6	x	0.1145	=	6.5952
May	57.6	x	0.1145	=	6.5952
June	57.6	x	0.1145	=	6.5952
July	57.6	x	0.1145	=	6.5952
Aug	57.6	x	0.1145	=	6.5952
Sept	57.6	x	0.1145	=	6.5952
Oct	57.6	x	0.1145	=	6.5952
Nov	57.6	x	0.1145	=	6.5952
Dec	57.6	x	0.1145	=	6.5952
<b>Total</b>	<b>691.2</b>				<b>79.1424</b>
	Lighting Load				Total Lighting Cost

60 watt Incandescent	14 watt CFL	12 watt LED
		
	<b>\$58 Lifetime Savings</b> over an incandescent with the same brightness	<b>\$200 Lifetime Savings</b> over an incandescent with the same brightness
Yearly Operating Cost - <b>\$12.92</b>	Yearly Operating Cost - <b>\$3.01</b>	Yearly Operating Cost - <b>\$2.58</b>
Energy Usage - <b>60w</b>	Energy Usage - <b>14w</b>	Energy Usage - <b>12w</b>
Brightness(Lumens) - <b>800</b>	Brightness(Lumens) - <b>800</b>	Brightness(Lumens) - <b>800</b>
Bulb Lifetime- <b>750 Hours</b>	Bulb Lifetime - <b>10,000 Hours</b>	Bulb Lifetime- <b>50,000 Hours+</b>
		

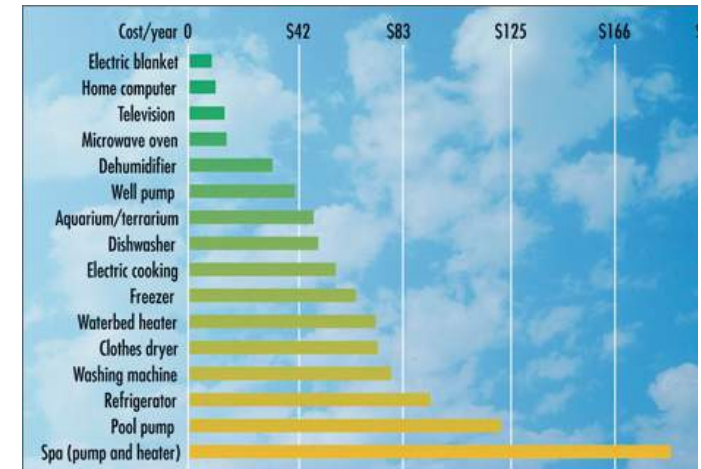
# APPLIANCES

## Appliance energy use

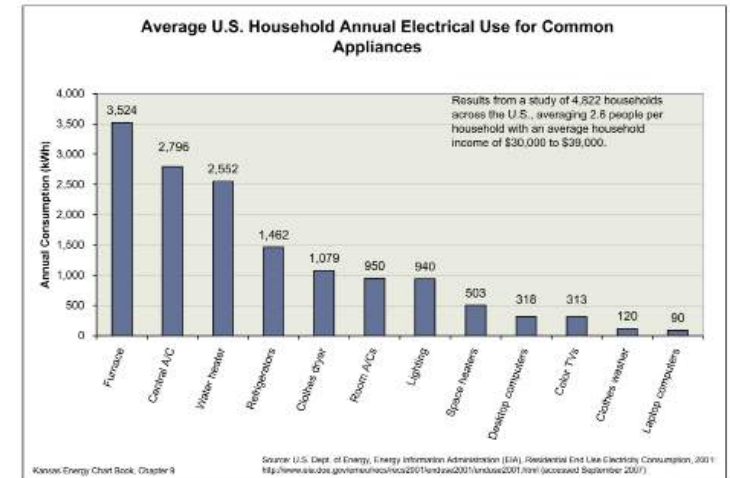
	quantity in house		average wattage in use****		average hours on/mo	=	Total (wh/mo)
Refrigerator/Freezer	1	x	450	x	720	=	324000
Dryer	1	x	5400	x	25	=	135000
Washer	1	x	1800	x	15	=	27000
Oven/Stove	0	x	0	x	0	=	0
Computer	3	x	100	x	70	=	21000
Printer	2	x	50	x	3	=	300
TV	1	x	220	x	5	=	1100
Other (small appliances)	6	x	877	x	18.875	=	16553.375
Other (large, eg. spa)	2	x	850	x	13.5	=	11475
					total	=	537375 wh/mo
					12. divide 1000	=	537.375 kwh/mo

12. (total wh/mo)/1000 = 537.375 total kwh/mo

13. Electricity cost \$ 0.1145 /kwh



	12. Monthly Appliance Load (KWh)		13 Electricity cost \$/kwh	=	Monthly Appliance Cost
Jan	537.375	x	0.1145	=	61.53
Feb	537.375	x	0.1145	=	61.53
Mar	537.375	x	0.1145	=	61.53
Apr	537.375	x	0.1145	=	61.53
May	537.375	x	0.1145	=	61.53
June	537.375	x	0.1145	=	61.53
July	537.375	x	0.1145	=	61.53
Aug	537.375	x	0.1145	=	61.53
Sept	537.375	x	0.1145	=	61.53
Oct	537.375	x	0.1145	=	61.53
Nov	537.375	x	0.1145	=	61.53
Dec	537.375	x	0.1145	=	61.53
<b>Total</b>	<b>6448.5</b>		<b>0.1145</b>		<b>738.35</b>
	<b>Appliance Load</b>				<b>Total Appliance Cost</b>





# CARS

## Auto energy use

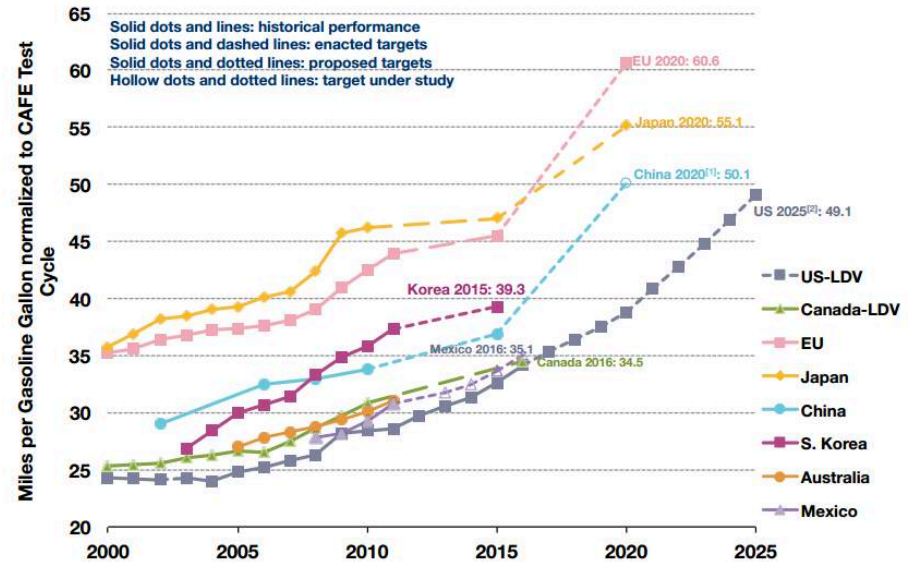
Car 1 13000 miles/year / 26 mpg = 500 gallons X 0.125 mmbtu/gallon = 62.5 mmbtu  
 Car 2 6800 miles/year / 17 mpg = 400 gallons X 0.125 mmbtu/gallon = 50 mmbtu  
 Car 3 4200 miles/year / 21 mpg = 200 gallons X 0.125 mmbtu/gallon = 25 mmbtu  
1100 Total gallons 137.5 Total mmbtu

14. Total mmbtu 137.5 / 12 months

15. Average \$/gallon 2.512 / 0.125 mmbtu/gallon = 20.096 \$/mmbtu



	14. Monthly Cars MMBTU		15. \$/mmbtu		
Jan	11.46	x	20.096	=	230.67
Feb	11.46	x	20.096	=	230.67
Mar	11.46	x	20.096	=	230.67
Apr	11.46	x	20.096	=	230.67
May	11.46	x	20.096	=	230.67
June	11.46	x	20.096	=	230.67
July	11.46	x	20.096	=	230.67
Aug	11.46	x	20.096	=	230.67
Sept	11.46	x	20.096	=	230.67
Oct	11.46	x	20.096	=	230.67
Nov	11.46	x	20.096	=	230.67
Dec	11.46	x	20.096	=	230.67
	137.5				2763.2
	Car Load				Total Car Cost



[1] China's target reflects gasoline vehicles only. The target may be higher after new energy vehicles are considered.  
 [2] US, Canada, and Mexico light-duty vehicles include light-commercial vehicles.

## TOTAL MONTHLY GAS & ELECTRIC USE (EXCLUDING CARS) (attach bills)

<b>GAS</b>	\$ Heating	\$ Domestic Hot Water*	\$ Appliance*	Estimated Total \$ Gas		Actual Gas Bills
Jan	163.82	18.38	0	182.20		174.16
Feb	116.11	17.94	0	134.05		192.79
Mar	139.13	18.28	0	157.41		182.59
Apr	44.19	18.68	0	62.87		138.21
May	25.42	19.75	0	45.18		121.97
June	5.50	22.43	0	27.93		61.47
July	0.00	23.88	0	23.88		0.00
Aug	1.35	27.49	0	28.84		0.00
Sept	6.67	24.75	0	31.42		0.00
Oct	25.43	21.61	0	47.04		0.00
Nov	107.03	19.75	0	126.78		33.86
Dec	166.20	18.45	0	184.64		102.38
<b>Total</b>	<b>800.86</b>	<b>251.38</b>	<b>0</b>	<b>1,052.24</b>		<b>1,007.43</b>

\* If applicable

**These should match**

<b>Estimated GAS Annual Total</b>	<b>1,052.24</b>	<b>Actual GAS Annual Total</b>	<b>1,007.43</b>
-----------------------------------	-----------------	--------------------------------	-----------------

<b>ELEC-TRIC</b>	\$ Cooling	\$ Domestic Hot Water*	\$ Lighting	\$ Appliance	\$ Estimated Total		Actual Electric Bills
Jan	0.00	0	6.60	61.53	68.12		56.5
Feb	0.93	0	6.60	61.53	69.06		55
Mar	0.00	0	6.60	61.53	68.12		49.58
Apr	4.97	0	6.60	61.53	73.10		47.72
May	11.81	0	6.60	61.53	79.93		41.39
June	34.81	0	6.60	61.53	102.93		41.17
July	42.89	0	6.60	61.53	111.01		62.92
Aug	18.96	0	6.60	61.53	87.08		144.84
Sept	12.12	0	6.60	61.53	80.25		186.21
Oct	4.66	0	6.60	61.53	72.79		111.23
Nov	0.62	0	6.60	61.53	68.75		38.61
Dec	0.00	0	6.60	61.53	68.12		35.35
<b>Total</b>	<b>131.77</b>	<b>0</b>	<b>79.14</b>	<b>738.35</b>	<b>949.27</b>		<b>870.52</b>

\* If applicable

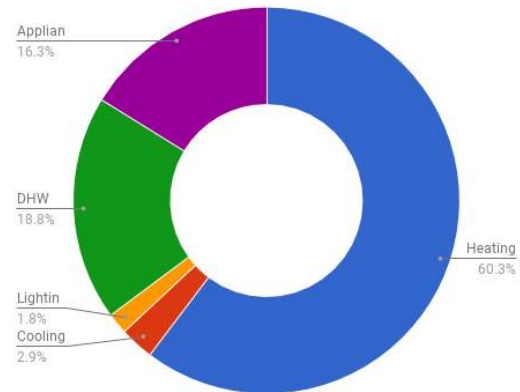
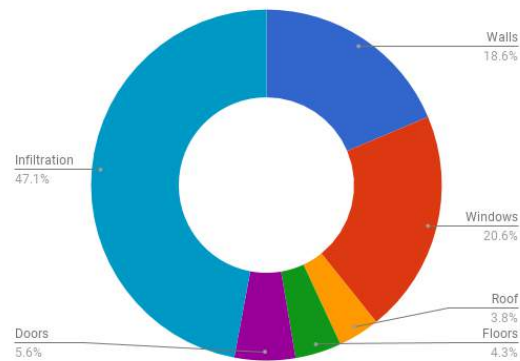
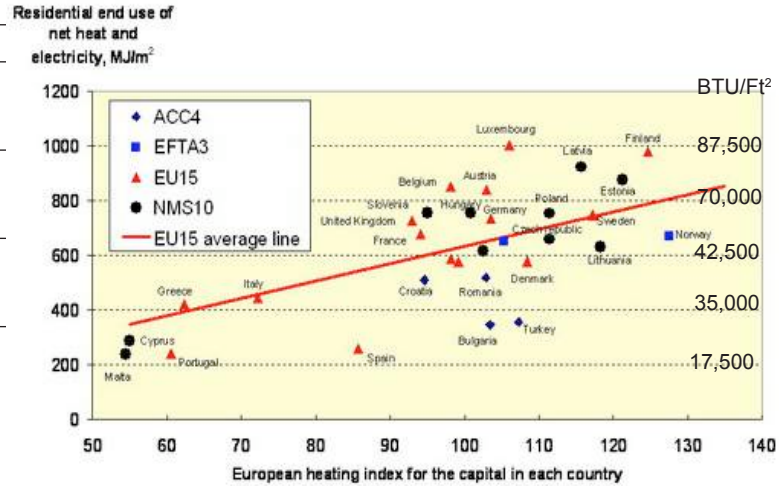
**These should match**

<b>Estimated ELECTRIC Annual Total</b>	<b>949.27</b>	<b>Actual ELECTRIC Annual Total</b>	<b>870.52</b>
--	---------------	-------------------------------------	---------------

	Heating	Cooling	Lighting	DHW	Appliance	Totals
Annual ELEC in mmbtu equivalent		3.92	2.36		21.99	28.27
Annual GAS IN mmbtu	81.24			25.30		106.54
Percentage of Total Energy (%)	60.26	2.91	1.75	18.77	16.31	100%

How does your house compare to US and International energy standards?

EUI for all fuels Annual BTU/ft <sup>2</sup>	53213
--	-------



## Retrofit Measures

1. Insulate ceiling below attic and floor above basement
2. Caulking and weatherstripping window and door frames
3. Use masterslave for appliances
4. Zoning the house
5. Install night insulation for windows
6. Use dual setback thermostat
7. Replace shower heads
8. Replacing furnace for energy efficiency



**For service at**

8 DOREEN CT  
EDISON TWP NJ  
08820-3746

**1 800 436-PSEG (7734)**

**Emergencies 24 hours/7days**

Customer service  
7 AM - 8 PM Mon- Fri  
7 AM - 5 PM Sat - Sun

Visit our website  
www.pseg.com

Inquiries by mail  
PSE&G  
PO Box 14444  
New Brunswick NJ 08906-4444

**Important Dates**

Your payment  
is due September 06, 2017.

Your meter(s) are scheduled to be  
read on or about September 19.

To make a payment from a credit  
card Log in to **My Account** at  
pseg.com or call 1 888-575-6273

If you'll be away on your meter  
reading day, Log In to **My  
Account** at pseg.com or call 1  
800 622-0197 before the  
scheduled date, to submit your  
reading.

**Monthly Statement  
AUGUST 2017**

Account number: 65 079 649 05

042895 000038509  
XIAOHONG ZHU  
GANG PONG  
8 DOREEN CT  
EDISON NJ 08820-3746

**Account Summary**

PSE&G balance from last bill	\$141.30
Payment received Aug 4 - Thank You!	-141.30
Current PSE&G - Electric	180.30
<b>Total Amount Due On Sep 6, 2017</b>	<b>\$180.30</b>

**Need help understanding your energy bill?** Read the enclosed "Working For You" bill newsletter for information about understanding your energy bill, including an explanation of itemized charges and information about payment assistance programs.

**Summer can bring severe storms with possible power outages. If there is loss of power:** keep refrigerator and freezer doors closed, use caution with candles, and turn off lights and appliances to avoid overloading circuits once power is restored.

**Hot weather can lead to more electricity usage.** Visit pseg.com/saveenergy for energy saving tips and other ways to manage your energy costs.

6507964905 0000180300 00000000004

XIAOHONG ZHU  
GANG PONG  
8 DOREEN CT  
EDISON NJ 08820-3746

65 079 649 05

**Total Amount Due On Sep 6, 2017** **\$180.30**

PSE&G CO  
PO BOX 14444  
NEW BRUNSWICK NJ 08906-4444

\$

Amount enclosed

THIS BILL PRINTED ON RECYCLED PAPER



August 2017  
Account number: 65 079 649 05  
Visit our website: www.pseg.com

**PSE&G Electric**

Usage	Meter	50255193
Estimated reading Aug 18		22143
Estimated reading Jul 20		21113
<b>Total kWh</b>		<b>1030</b>

<b>Charges</b>	PoD ID: PE000008526560128255	Rate - RS
<b>Delivery</b>		
Service charge		\$2.43
Distribution charges		
kWh charges	600 kWh @ \$0.049716667	29.83
	Next 430 kWh @ \$0.053790698	23.13
<b>Sub-Total Delivery</b>		<b>\$55.39</b>

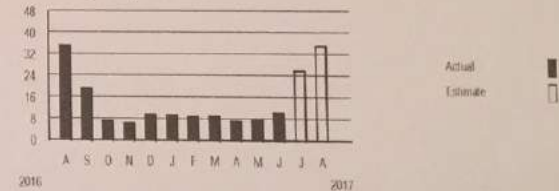
**Supply\***

BGS Energy		
Charges	228 kWh @ \$0.121754386	27.76
	Next 162 kWh @ \$0.131481481	21.30
	Next 372 kWh @ \$0.114435484	42.57
	Next 268 kWh @ \$0.124179104	33.28
<b>Sub-Total Supply</b>		<b>\$124.91</b>

**Total electric charges** **\$180.30**

\*The total supply amount (\$124.91, or an average of \$0.121272 per kWh) is your Price to Compare for this month should you consider another electric supplier for these services. Your Price to Compare varies each month depending upon your usage pattern.

kWh Average daily electric use



**Energy Use Comparison**

This chart represents your energy use for the billing months shown in the current year compared to last year.

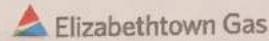
\* = Bill period greater  
or less than 1 month  
E = Estimated

	Avg. temp		Electric - kWh	
	2016	2017	2016	2017
AUG	82	75	1030	1030 E
JUL	78	78	785	785 E
JUN	73	68	519	348

THIS BILL PRINTED ON RECYCLED PAPER

THIS BILL PRINTED ON RECYCLED PAPER

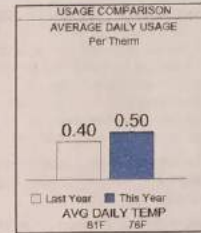
Gang Tong  
Zhu Xiaohong  
8 Doreen Ct  
Edison NJ 08820



P.O. BOX 4569  
Location 6250  
Atlanta, GA 30302-4569

Billing Date Aug 23, 2017	Account Number 4947911091	Next Reading Date Sep 21, 2017	Billing Type ET-RDS Utility Residential Heat
------------------------------	------------------------------	-----------------------------------	---

Payment Received 07/24/2017 - Thank you!  
Total Current Charges - Utility **\$21.53**  
Total Account Balance **\$18.13**



**Detailed Current Charges - Utility**  
ETG - Residential Delivery Service  
Charges 07/19/2017 - 08/20/2017

Service Charge \$8.50  
Energy Charge: 16.50 Therms @ \$0.3967 \$6.55  
The Elizabethtown Gas Price To Compare is \$0.3757 per therm.  
Basic Gas: 16.50 Therms @ \$0.3757 \$6.20  
CAC: 16.50 Therms @ 0.017000 \$0.28  
Total Current Charges - Utility **\$21.53**

Billing Inquiries? Call: 1-800-242-5830

Please Pay This Amount  
By Sep 11, 2017  
**\$18.13**

Know what's below and call 811 before you dig! Learn more at elizabethtowngas.com/safety.

Billing Period and Meter Readings

Meter Number	Type of Reading	Billing Period	Days	Reading		Gas Used (CCF)	Multiplier	Therm Factor	Therms Billed
				Old	New				
2541777	Actual	07/19 - 08/21	33	4386	4402	16	X 1.0000	X 1.03125	= 16.5

Your tax-deductible donation to Warm Neighbors will help a needy local family stay warm this winter. You can help by adding \$1, \$2, \$5, \$10, \$15, or \$20 to your gas bill payment.

To Report a Gas Leak (24hr.) call 1-800-492-4009 [elizabethtowngas.com](http://elizabethtowngas.com)

If paying by mail, return the portion below with your check or money order payable to Elizabethtown Gas.

Elizabethtown Gas P.O. BOX 4569 - Loc 6250  
Atlanta, GA 30302-4569

PREVIOUS BALANCE	\$3.40CR
Total Current Charges	\$21.53
<b>Total Account Balance</b>	<b>\$18.13</b> Please Pay By 09/11/17
Account No. 4947911091	Amount Enclosed

000215300000000100494791109100018134

AV 01 006693 33416B 26 A\*\*5DGT

Gang Tong  
Zhu Xiaohong  
8 Doreen Ct  
Edison NJ 08820-3746

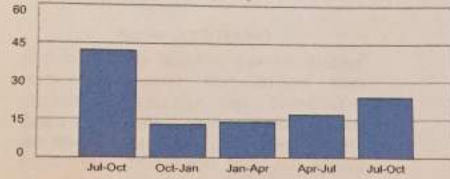
ELIZABETHTOWN GAS  
PO BOX 5412  
CAROL STREAM IL 60197-5412



**Middlesex Water Company**  
**Customer Service Center**  
 1500 Ronson Road Iselin, New Jersey 08830-3049  
 Telephone: 1-800-549-3802

**USAGE HISTORY**

Quarterly usage in hundred cubic feet



Next meter reading date: on or about 01/08/18

<b>Billing Date:</b>	10/12/17
<b>Account Number:</b>	4438500000
Previous Balance	\$116.28
Payment/Credit by 10/12/17 <small>THANK YOU</small>	\$116.28
Balance Forward	\$0.00
Current Charges	\$145.52
<b>DUE 10/27/2017</b>	<b>\$145.52</b>

*\*Past Due Balance may be subject to collection and/or termination.*

Service To: **GANG TONG**

Service Address: **8 DOREEN CT EDISON NJ**

Meter Number	Service		Days of Service	Meter Reading		Usage	Unit of Measure	Reading Type	Rate
	From	To		Previous	Present				
73048142	07/13/17	10/10/17	90	672	696	24	CCF	REGULAR	GSQ
						EQUIVALENT TO		17,952 GALLONS	
FACILITIES CHARGE \$45.30				\$45.30	PAYMENT		\$116.28 CR		
PURCHASED WTR ADJ CHRGR \$0.0458				\$0.11	TOTAL CREDITS		\$116.28 CR		
WTR CHRGR (\$4.17121 PER 100 CF)				\$100.11					
<b>TOTAL CURRENT CHARGES</b>				<b>\$145.52</b>					

SEE REVERSE SIDE FOR IMPORTANT ACCOUNT INFORMATION

**IMPORTANT MESSAGES**

Starting 5/1/2017, you can view Middlesex Water Company's water quality report online at: [HTTP://WATERQUALITY.MIDDLESEXWATER.COM](http://waterquality.middlesexwater.com)  
 The report contains information about the quality of your drinking water. Please call 800-549-3802 if you prefer a paper report sent to your home.  
 The Board of Public Utilities has approved a Purchased Water Adjustment Clause increase effective for service provided on or after 11/01/16.  
 The increase represents a pass through of higher costs for water purchased by the Company from other water purveyors. For more information, please visit our website at [www.middlesexwater.com](http://www.middlesexwater.com) or call 1-800-549-3802.  
 Now you can pay online at [www.middlesexwater.com](http://www.middlesexwater.com) or pay by phone at 1-877-386-6729  
 Approximately 13.5% or \$19.65 of your current period charges reflects the average Gross Receipts and Franchise Taxes which are paid to the State of New Jersey and distributed to New Jersey municipalities.  
**BE INFORMED:** Check out the Winter 2017 Customer Update on the Customer Care Section of our website.

PLEASE DETACH HERE AND RETURN THE BOTTOM PORTION WITH YOUR PAYMENT IN THE RETURN ENVELOPE PROVIDED

Middlesex Water Company  
 Customer Service Center  
 1500 Ronson Road  
 Iselin, New Jersey 08830-3049

Forwarding Service Requested

Service Address: **8 DOREEN CT  
 EDISON NJ**

Please check this box if you have made any information changes on the reverse side.

000447

AUTO\*\*SCH 5-DIGIT 08820 447 T2:5 447 1 AV 0.370  
**GANG TONG**  
**8 DOREEN CT**  
**EDISON NJ 08820-3746**



<b>Account Number:</b>	4438500000
Balance Forward	\$0.00
Current Charges	\$145.52
<b>DUE 10/27/2017</b>	<b>\$145.52</b>
<i>Please make payable to: Middlesex Water Company</i>	
<b>Payment Amount Enclosed</b>	\$ _____

MIDDLESEX WATER COMPANY  
 PO BOX 826538  
 PHILADELPHIA PA 19182-6538

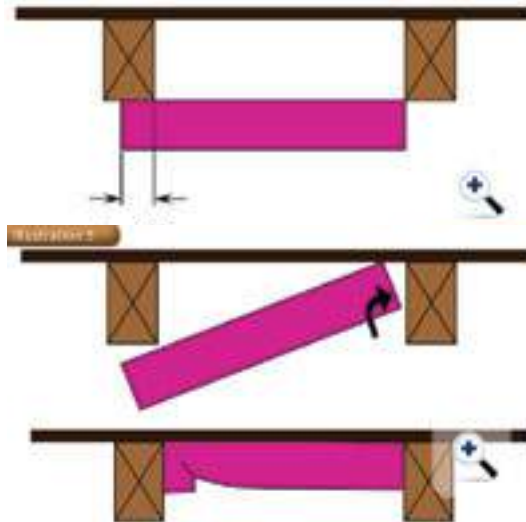
1004438500000200000000001455283

## Owens Corning R-30 Unfaced Insulation Continuous Roll 15 in. x 25 ft. (31.25 SqFt)

- Soft to the touch, easy to cut, split and install
- GREENGUARD GOLD certified and verified to be Formaldehyde free

### Attic:

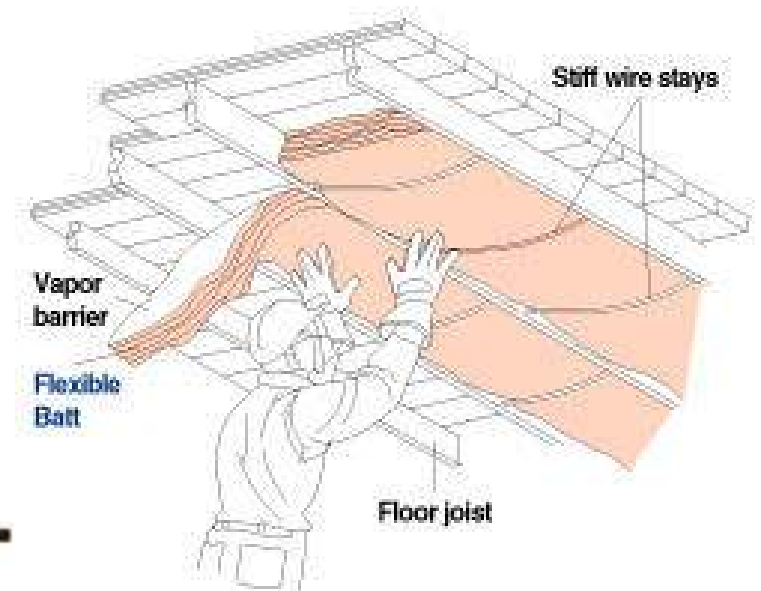
1. Plan ahead – install in the early morning hours before the attic heats up.
2. Use plywood to make a temporary walkway (rest a sheet across ceiling joists).
3. Install rafter vents between ceiling joists and adjacent to soffit vents.
4. Unroll the insulation, and cut it to the length of each run. Place insulation into the cavities between ceiling joists, and make sure the vapor retarder is facing the conditioned interior space.
5. Run the insulation to cover the tops of exterior walls, but not the soffit vents.
6. Tuck small pieces of unfaced insulation into small spaces and gaps as needed.



### Floor:

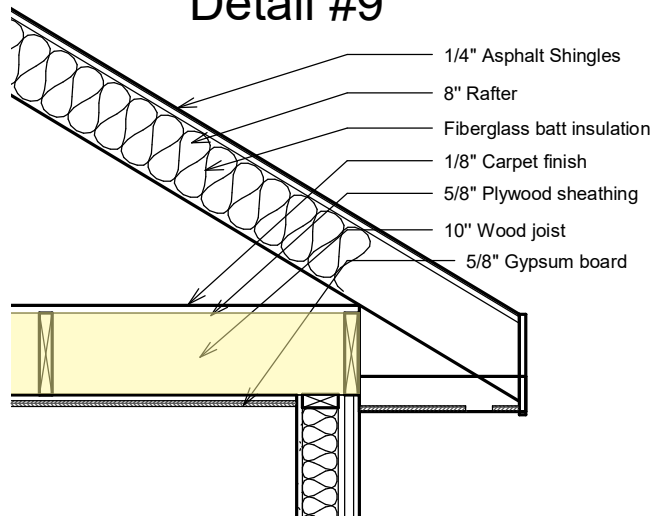
1. Cut the batts to the full length of the floor joists and slit to fit around wiring and plumbing.
2. Install the batts flush against the subfloor to eliminate all gaps.
3. Insulate the band joist area between the air ducts and floor, using wire staves spaced every 12-18 inches to hold the insulation in place (without compressing more than an inch).

## Retrofit Strategies 1: Insulate Floor and Ceiling Detail #9 & #10

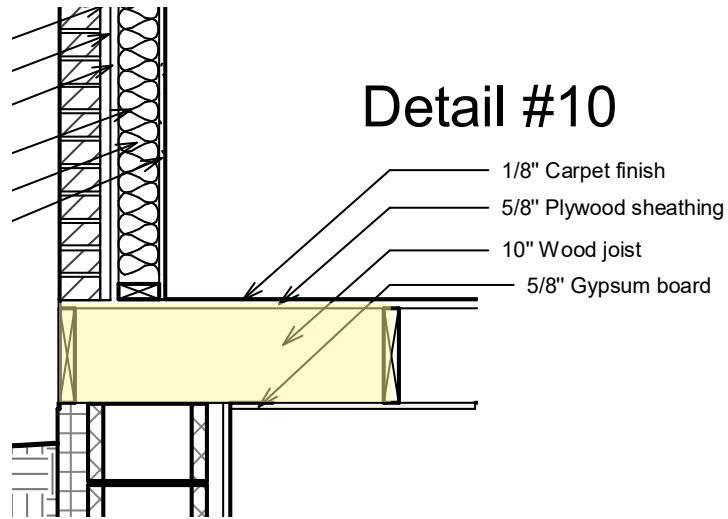


Layer fiberglass roll insulation perpendicular to the joists.

**Detail #9**



**Detail #10**



<b>GAS</b>	<b>\$ Heating</b>	<b>\$ Domestic Hot Water*</b>	<b>\$ Appliance*</b>	<b>Estimated Total \$ Gas</b>
Jan	155.99	18.38	0	174.37
Feb	110.56	17.94	0	128.50
Mar	132.48	18.28	0	150.76
Apr	42.08	18.68	0	60.75
May	24.21	19.75	0	43.96
June	5.24	22.43	0	27.67
July	0.00	23.88	0	23.88
Aug	1.28	27.49	0	28.77
Sept	6.36	24.75	0	31.10
Oct	24.21	21.61	0	45.82
Nov	101.91	19.75	0	121.66
Dec	158.25	18.45	0	176.69
<b>Total</b>	<b>762.57</b>	<b>251.38</b>	<b>0</b>	<b>1,013.95</b>

Attic:

Average R = 85% x 49.58 + 15% x 26.93 = 46.18

U = 1/R = 0.021

Area = 1160.21

UA = 24.36

Floor:

Average R = 85% x 34.26 + 15% x 16.61 = 31.61

Modified U = 1/R x 1/2 = 0.016

Area = 1373.18

UA = 21.97

Heating Savings = \$800.86 - \$762.57 = \$38.29 /yr

Cost of Roll = \$13.64 x 82 rolls = \$1118.48

Payback = Total cost / Savings per year

= \$1118.48 / \$38.29

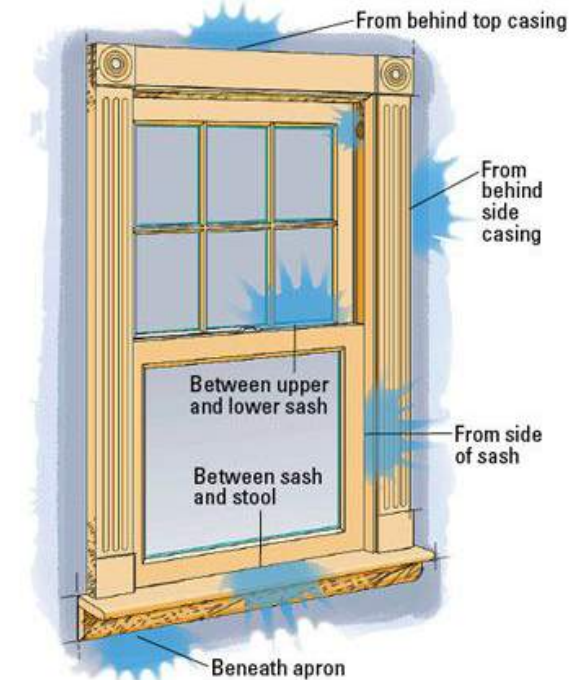
= 29.2 yrs



## Frost King EPDM Rubber Weatherseal

- Resists sub-freezing conditions
- Apply to cracks between doors/windows
- Cost: \$3.99/17 ft roll

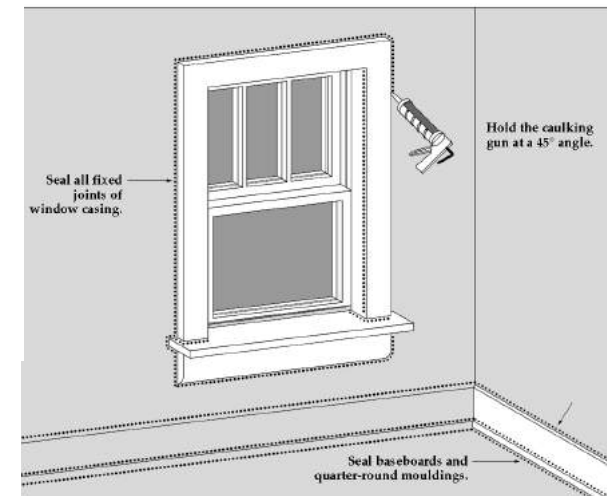
1. Install when temperature is between 40 and 90 degrees Fahrenheit. Surface should be clean, dry, and grease-free.
2. Unwind 12 to 18 inches of tape.
3. Starting at one edge or corner, press the adhesive side of tape firmly in place (leave backing paper on to prevent stretching).
4. Continue to apply, cutting off at required lengths with scissors or razor blade.
5. Remove backing paper.
6. On windows, apply to top of upper window, bottom of lower window, across lock rail, and along sides of frame.
7. On doors, apply to door stop moulding across top and down latch side. On hinge side, apply to door frame next to moulding.



## Liquid Nails All Purpose Adhesive Caulk

Cost: \$3.82/10.1oz bottle (covers 30 ft. per tube)

1. Inspect doorframes for gaps and holes. If there are any holes or cracks on the exterior side of the door around the frame, use caulk rated for outdoor use.
2. Insert the caulk tube into a caulking gun, cut off the end with a utility knife at an angle and push the gun's plunger against the bottom of the tube. Pull the trigger to release the caulk and pull the gun across the area you want sealed.



## Retrofit Strategies 2: Caulking & Weatherstripping

INFILTRATION (heated volume of the building x number of air changes x the heat capacity of air .018 Btu ft <sup>3</sup> °F  #A.C. x .018 x volume cu.ft. = heat loss coefficient $\frac{1}{0.6} \times 0.018 \times 25333.9 = \frac{456.01}{273.6}$		
<b>TOTAL HEAT LOSS COEFFICIENT (total UA) Btu/hr°F</b>	100%	<del>969.07</del> <b>786.66</b>

Heating Savings = \$800.86 - \$650.11 = \$150.75 /yr

GAS	\$ Heating	\$ Domestic Hot Water*	\$ Appliance*	Estimated Total \$ Gas
Jan	132.99	18.38	0	151.37
Feb	94.26	17.94	0	112.20
Mar	112.94	18.28	0	131.22
Apr	35.87	18.68	0	54.55
May	20.64	19.75	0	40.39
June	4.46	22.43	0	26.89
July	0.00	23.88	0	23.88
Aug	1.09	27.49	0	28.58
Sept	5.42	24.75	0	30.17
Oct	20.64	21.61	0	42.25
Nov	86.88	19.75	0	106.63
Dec	134.91	18.45	0	153.36
Total	650.11	251.38	0	901.49

Cost of Weatherstrip = \$3.99 x 10 rolls = \$39.99

Cost of Caulk = \$3.82 x 6 tubes = \$22.92

Total cost = \$39.99 + \$22.92 = \$62.91

Payback = Total cost / Savings per year

= \$62.92 / \$150.75

= 0.42 yrs

## Belkin Conserve Socket with Energy Saving Outlet

- Saves energy automatically by turning off TV peripherals when you turn off your TV
- The Master Outlet detects when your TV is on or off and controls power to five Controlled outlets for DVD players, VCRs
- 2 Not-Controlled outlets for continuous power to cable/satellite boxes and DVRs
- 1080 Joules surge protection to protect sensitive electronics; \$100,000 connected equipment warranty

1. Simply plug a “master” device--most likely a television or stereo amplifier-- into the green Master Outlet. This master device will then control the five Master-Controlled Outlets, which are suitable for those devices, like DVD players VCRs and game consoles that do not require constant round-the-clock power.

2. Cable/Satellite boxes, and DVRs, which need 24-hour power, should be plugged into one of the two dark gray Not-Controlled Outlets.

3. Turn off master device when not in use.

Electricity Savings = 596 kWh x \$0.1145 = \$68.24

Cost of power strip = \$25 x 3 = \$75

Payback = Total cost / Savings per year  
 = \$75 / \$68.24  
 = 1.09 yrs

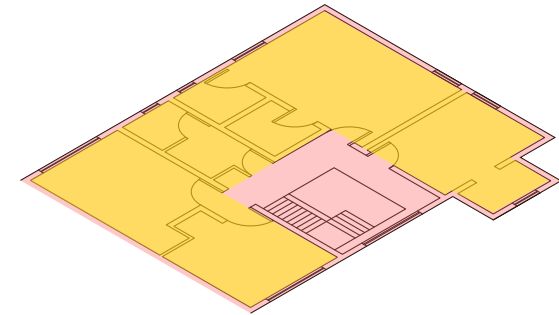


## Retrofit Strategies 3: Use Masterslave power strip

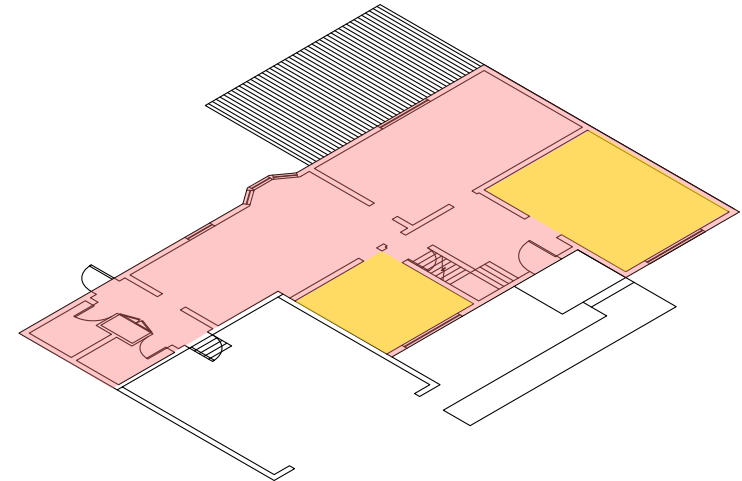
## Honeywell HZ322K Truezone Kit with Dats, Transformer and HZ322 Panel

- Variable-Speed Fan Control
- Up to 3 zone controls
- Ambient Temp Range -20 to 150
- Controls heating and cooling

DIY setup following LED instructions if using wireless thermostat, otherwise require professional installation



GAS	\$ Heating	\$ Domestic Hot Water*	\$ Appliance*	Estimated Total \$ Gas
Jan	150.08	18.38	0	168.46
Feb	105.56	17.94	0	123.50
Mar	126.59	18.28	0	144.86
Apr	35.72	18.68	0	54.39
May	17.92	19.75	0	37.67
June	3.85	22.43	0	26.28
July	0.00	23.88	0	23.88
Aug	0.34	27.49	0	27.83
Sept	4.55	24.75	0	29.30
Oct	19.34	21.61	0	40.94
Nov	94.19	19.75	0	113.94
Dec	152.40	18.45	0	170.85
Total	710.53	251.38	0	961.91

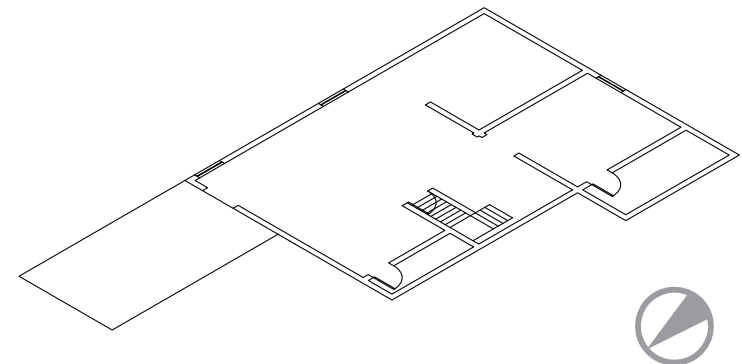


New DD base =  $55\% \times 55^\circ\text{F} + 45\% \times 60^\circ\text{F} = 58^\circ\text{F}$   
 Heating Savings =  $\$800.86 - \$710.53 = \$90.33$  /yr

Cost of truezone = \$169.5

Payback = Total cost / Savings per year =  $\$169.5 / \$90.33 = 1.88$  yrs

## Retrofit Strategies 4: Zoning the House



## Larson Low-E Exterior Storm Window

- Double weather stripping insulates against air infiltration, tubular frame adds strength and durability

**Easy Install**



1. Clean the surface
2. Caulk head and jams of existing window openings (do NOT caulk the bottom sill)
3. Position window into opening with top of window pushed snug to top of opening
4. Secure window with installation screws (provided)
5. Adjust bottom expander

<b>GAS</b>	\$ Heating	\$ Domestic Hot Water*	\$ Appliance*	Estimated Total \$ Gas
Jan	150.33	18.38	0	168.71
Feb	106.55	17.94	0	124.49
Mar	127.68	18.28	0	145.95
Apr	40.55	18.68	0	59.23
May	23.33	19.75	0	43.08
June	5.05	22.43	0	27.48
July	0.00	23.88	0	23.88
Aug	1.24	27.49	0	28.73
Sept	6.12	24.75	0	30.87
Oct	23.33	21.61	0	44.94
Nov	98.21	19.75	0	117.96
Dec	152.51	18.45	0	170.95
Total	734.91	251.38	0	986.29

Without storm window U value: 0.5

With storm window U values: 0.3

New UA = 889.27

Heating Savings = \$800.86 - \$734.91 = \$145.95 /yr

Cost of storm windows = \$85 x 16 = \$1360

Payback = Total cost / Savings per year  
 = \$1360 / \$145.95  
 = 9.32 yrs

## Retrofit Strategies 5: Install exterior storm windows

## Goodman TSTATG4271GT

- Digital, indoor and outdoor temp sensing,  
4 heating periods, 2 cooling periods, auto  
changeover, programmable fan

1. Turn off old unit and furnace AC breaker
2. Pop off cover and thermostat, label where wires are connected
3. Disconnect wires, remove mounting screws and plate
4. Attach new thermostat's plate and screw into place
5. Reconnect wires to new thermostat
6. Follow included instructions for specific unit set-up



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Mon	60°F								55°F								60°F							
Tue	60°F								55°F								60°F							
Wed	60°F								55°F								60°F							
Thu	60°F								55°F								60°F							
Fri	60°F								55°F								60°F							
Sat	60°F																							
Sun	60°F																							

Programmed heating periods  
(Oct - Mar)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Mon	75°F								78°F								75°F							
Tue	75°F								78°F								75°F							
Wed	75°F								78°F								75°F							
Thu	75°F								78°F								75°F							
Fri	75°F								78°F								75°F							
Sat	75°F																							
Sun	75°F																							

Programmed cooling periods  
(Apr - Sep)

## Retrofit Strategies 6: Use Dual-Setback Thermostat

Current HDD (60°F base) = 3493

Modified HDD = 3493 x 76% + 2578 x 24% = 3274

<b>GAS</b>	\$ Heating	\$ Domestic Hot Water*	\$ Appliance*	Estimated Total \$ Gas
Jan	155.66	18.38	0	174.04
Feb	89.94	17.94	0	107.88
Mar	108.44	18.28	0	126.72
Apr	24.96	18.68	0	43.63
May	9.93	19.75	0	29.68
June	1.92	22.43	0	24.35
July	0.00	23.88	0	23.88
Aug	0.00	27.49	0	27.49
Sept	2.43	24.75	0	27.17
Oct	12.71	21.61	0	34.32
Nov	76.03	19.75	0	95.78
Dec	131.60	18.45	0	150.04
Total	613.62	251.38	0	865.00

Heating Savings = \$800.86 - \$613.62 = \$187.24 /yr

Cooling Savings = \$131.77 - \$102.61 = \$29.16 /yr

Total Savings = \$187.24 + \$29.16 = \$216.4 /yr

Cost of thermostat = \$141.99

Current CDD (75°F base) = 424

Modified CDD = 3493 x 76% + 2578 x 24% = 3274

<b>ELEC-TRIC</b>	\$ Cooling	\$ Domestic Hot Water*	\$ Lighting	\$ Appliance	\$ Estimated Total
Jan	0.00	0	6.60	61.53	68.12
Feb	0.71	0	6.60	61.53	68.83
Mar	0.00	0	6.60	61.53	68.12
Apr	3.78	0	6.60	61.53	71.90
May	8.98	0	6.60	61.53	77.10
June	26.45	0	6.60	61.53	94.58
July	32.60	0	6.60	61.53	100.72
Aug	14.41	0	6.60	61.53	82.53
Sept	10.48	0	6.60	61.53	78.60
Oct	4.74	0	6.60	61.53	72.86
Nov	0.47	0	6.60	61.53	68.60
Dec	0.00	0	6.60	61.53	68.12
Total	102.61	0	79.14	738.35	920.10

Payback = Total cost / Savings per year

= \$141.99 / \$216.4

= 0.65 yrs

## High Sierra 1.5 GPM High Efficiency Low Flow Shower Head

- This showerhead is a Green Product, not only from the water and energy it saves, but also because of its compact design.
- Certifications: A112.18.1 and WaterSense.
- Patented nozzle delivers great strong, full spray of large drops



### Installation

1. Use an adjustable wrench to loosen and unscrew the old showerhead.
2. Clean off any rust or mineral deposits, old tape or leftover sealant on the shower arm threads.
3. Wrap Teflon tape in a clockwise direction two or three times around the threads of the shower arm.
4. Screw the new showerhead onto the shower arm in a clockwise direction and tighten.
5. Turn on the water and check for leaks. If leaks occur, wrap with Teflon tape and carefully tighten with an adjustable wrench until there are no leaks.

Current GPM = 2

New GPM = 1.5

Each 10 min shower saving =  $(2 - 1.5) \times 10 = 5$  Gallons

Each month saving =  $5 \times 60 = 300$

Monthly DHW usage =  $2108 - 300 = 1808$  Gallons

GAS	\$ Heating	\$ Domestic Hot Water*	\$ Appliance*	Estimated Total \$ Gas
Jan	163.82	15.76	0	182.20
Feb	116.11	15.38	0	134.05
Mar	139.13	15.67	0	157.41
Apr	44.19	16.01	0	62.87
May	25.42	16.94	0	45.18
June	5.50	19.23	0	27.93
July	0.00	20.48	0	23.88
Aug	1.35	23.57	0	28.84
Sept	6.67	21.22	0	31.42
Oct	25.43	18.53	0	47.04
Nov	107.03	16.94	0	126.78
Dec	166.20	15.82	0	184.64
Total	800.86	215.60	0	1,052.24

DHW Savings =  $\$251.38 - \$215.6 = \$35.78$  /yr

Cost of shower head = \$35.99

Payback = Total cost / Savings per year  
 =  $\$35.99 / \$35.78$   
 = 1 yr

## Retrofit Strategies 7: Replace Shower Heads



## AirQuest G9MAE0601714A Furnace

- The a97mv has an AFUE of up to 97%, meaning it converts a full 97% of fuel into usable heat
- Featuring a modulating heating system with a variable-speed fan

Professional installation needed.

Model Number	Capacity (MBtu/hr)	Energy Use:	Annual Gas Use (MMBtu)	Annual Energy Use (kWh)	Annual Cost (National Average)*	Lifetime Cost to Operate**	% Saving over Standard Furnace
		AFUE					
G9MAE0601714A	60	97	46.9	155	\$509	\$9,168	22%

Heating Savings = \$800.86 - \$509 = \$291.86 /yr

Cost of furnace = \$1536.95

Installation cost = ~\$2000

Total cost = \$3536.95

Payback = Total cost / Savings per year  
 = \$3536.95 / \$291.86  
 = 12.11 yrs



## Retrofit Strategies 8: Replace Furnace

$A_g$ (area of south glass area)	=	variable to be solved
$UA_h$ (total UA minus the south wall and south windows)	=	$969.07 - 182.41 - 79.8 - 32.15 - 63.93 = 610.78$
		(UA) (infiltration) (windows) (walls) (s-wall & windows) (UA <sub>h</sub> )
$U_g$ (U value of the south windows after retrofit measures)	=	0.3
$U_{sw}$ (U value of the south wall after retrofit)	=	0.058
$A_{tw}$ (area of south wall)	=	914.4
$T_i$ (desired indoor design temperature)	=	60°F
$T_o$ (12 noon average outdoor temperature in January)	=	32°F
$I_s$ (12 noon average hourly solar radiation in January)	=	154.65
	Latitude	= 40°
	12 noon total S	= 254
	half day total S	= 813
	Percentage	= $254/(2 \times 813) = 15.6\%$
	Global Incident Radiation	= 990

$$[UA_h + U_g A_g + U_{sw} (A_{tw} - A_g)] (t_i - t_o) = I_s A_g$$

$$[610.78 + 0.3A_g + 0.058 \times (914.4 - A_g)] \times (60 - 32) = 154.65A_g$$

$$A_g = 119.19 \text{ sq.ft.}$$

## Passive Solar Strategies: Suntempering

$A_g$  (area of south glass area) = variable to be solved

$UA_h$  (total UA minus the south wall and south windows) =  $969.07 - 182.41 - 79.8 - 32.15 - 63.93 = 610.78$   
(UA) (infiltration) (windows) (walls) (s-wall & windows) (UA<sub>s</sub>)

LCR (load collector ratio) = 30

Passive Solar System TWF3  
 Thermal Storage Capacity 30 BTU/ft<sup>2</sup>°F  
 Wall Thickness 12 in.  
 pck (density x specific heat x conductivity) 30  
 Number of glazings 2  
 Night Insulation No  
 SSF (solar savings fraction) 21%

$$LCR = 24UA_h / A_g$$

$$A_g = 488.63 \text{ sq.ft.}$$

Part C. Trombe Wall Systems: Unvented						
Designation	Thermal Storage Capacity (Btu/ft <sup>2</sup> °F)	Wall Thickness (in.)	pck <sup>d</sup> (Btu/h ft <sup>4</sup> °F <sup>2</sup> )	No. of Glazings	Wall Surface	Night Insulation
TW-F1	15	6	30	2	Normal	No
TW-F2	22.5	9	30	2	Normal	No
TW-F3 <sup>b</sup>	30	12	30	2	Normal	No
TW-F4	45	18	30	2	Normal	No
TW-G1	15	6	15	2	Normal	No
TW-G2	22.5	9	15	2	Normal	No
TW-G3	30	12	15	2	Normal	No
TW-G4	45	18	15	2	Normal	No
TW-H1	15	6	7.5	2	Normal	No
TW-H2	22.5	9	7.5	2	Normal	No
TW-H3	30	12	7.5	2	Normal	No
TW-H4	45	18	7.5	2	Normal	No
TW-I1	30	12	30	1	Normal	No
TW-I2	30	12	30	3	Normal	No
TW-I3	30	12	30	1	Normal	Yes
TW-I4	30	12	30	2	Normal	Yes
TW-I5	30	12	30	3	Normal	Yes
TW-J1	30	12	30	1	Selective	No
TW-J2 <sup>b</sup>	30	12	30	2	Selective	No
TW-J3	30	12	30	1	Selective	Yes
TW-J4	30	12	30	2	Selective	Yes

NEW YORK, NEW YORK SSF (%) - 4851 DD65								
Type	LCR = 100	70	50	40	30	25	20	15
WWA3	10	14	19	22	27	30	35	41
WWB4	13	21	29	35	44	50	57	67
WWC2	13	20	28	34	42	48	55	64
TWA1	13	15	17	18	21	22	24	27
TWA2	11	14	17	20	23	26	30	35
TWA3	10	14	17	20	25	28	32	38
TWA4	9	13	17	20	25	28	33	39
TWB3	9	13	16	19	23	26	30	36
TWD4	13	19	26	31	39	44	51	60
TWE2	14	20	26	32	39	44	51	60
TWF3	7	11	14	17	21	24	28	34
TWJ2	11	17	24	29	36	42	48	57
DGA1	6	8	10	11	12	13	14	14
DGA2	9	12	16	18	23	25	29	34
DGA3	12	17	22	27	33	38	44	52
DGB1	6	8	10	11	13	14	16	17
DGB2	9	12	16	19	23	27	31	37
DGB3	13	17	23	28	35	40	47	56
DGC1	8	11	13	15	18	20	23	26
DGC2	11	15	20	23	29	33	38	45
DGC3	15	20	26	31	39	45	53	63
SSA1	16	19	23	26	30	33	37	43
SSB1	13	16	19	22	26	28	32	37
SSB2	17	22	28	33	39	44	50	58
SSB3	12	14	17	20	23	25	28	32
SSC1	9	12	15	18	22	25	29	34
SSC2	11	16	22	27	33	37	43	52
SSE1	13	17	21	24	28	31	35	41
SSE2	17	23	30	35	43	48	54	62
SSE3	13	16	19	22	25	27	31	35

# Passive Solar Heating: Systems

