HouZe GT

By Zeroes

U.S. DEPARTMENT OF ENERGY RACE TO ZERO STUDENT DESIGN COMPETITION

Decision Making Process – WHAT IS THE MOST EFFICIENT, ROBUST, AND COST EFFECTIVE SOLUTION TO ACHIEVE NET ZERO?

Program – WHO ARE WE DESIGNING FOR?

VISITING FAMILY AND FRIENDS

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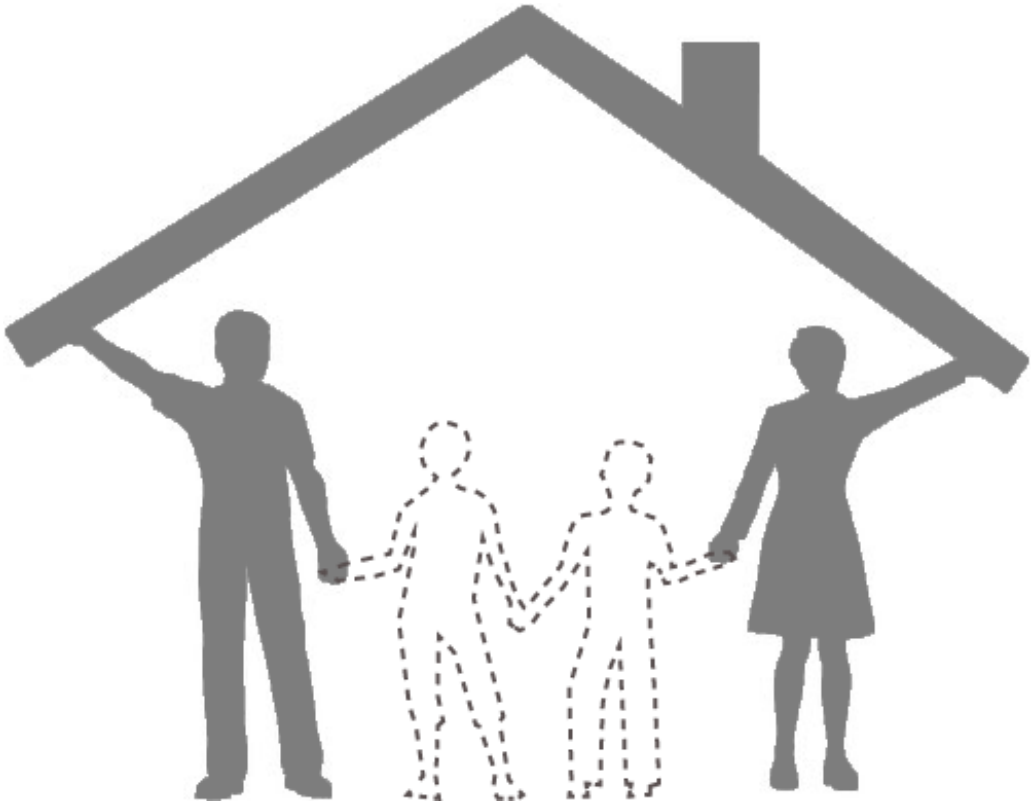
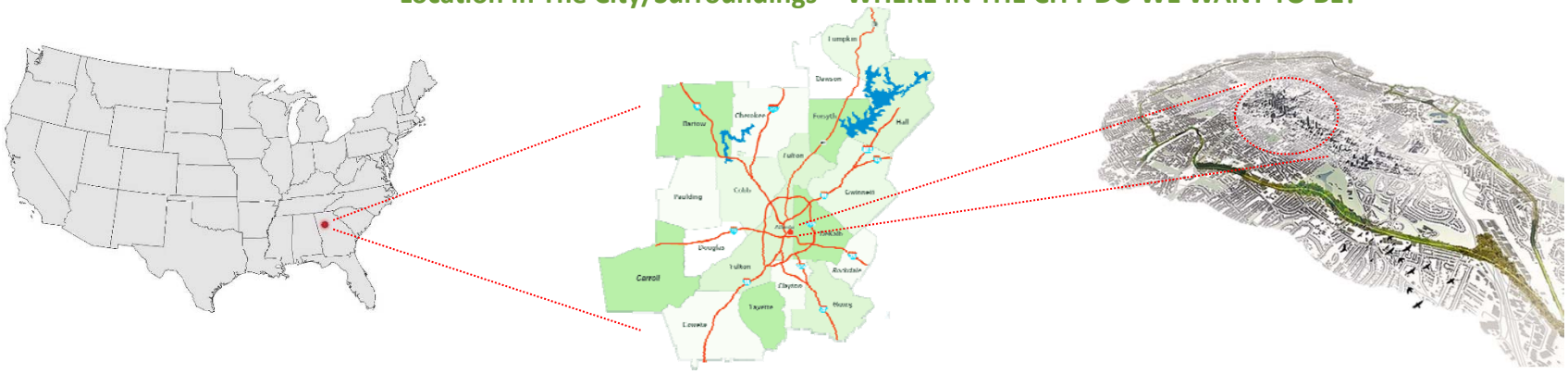
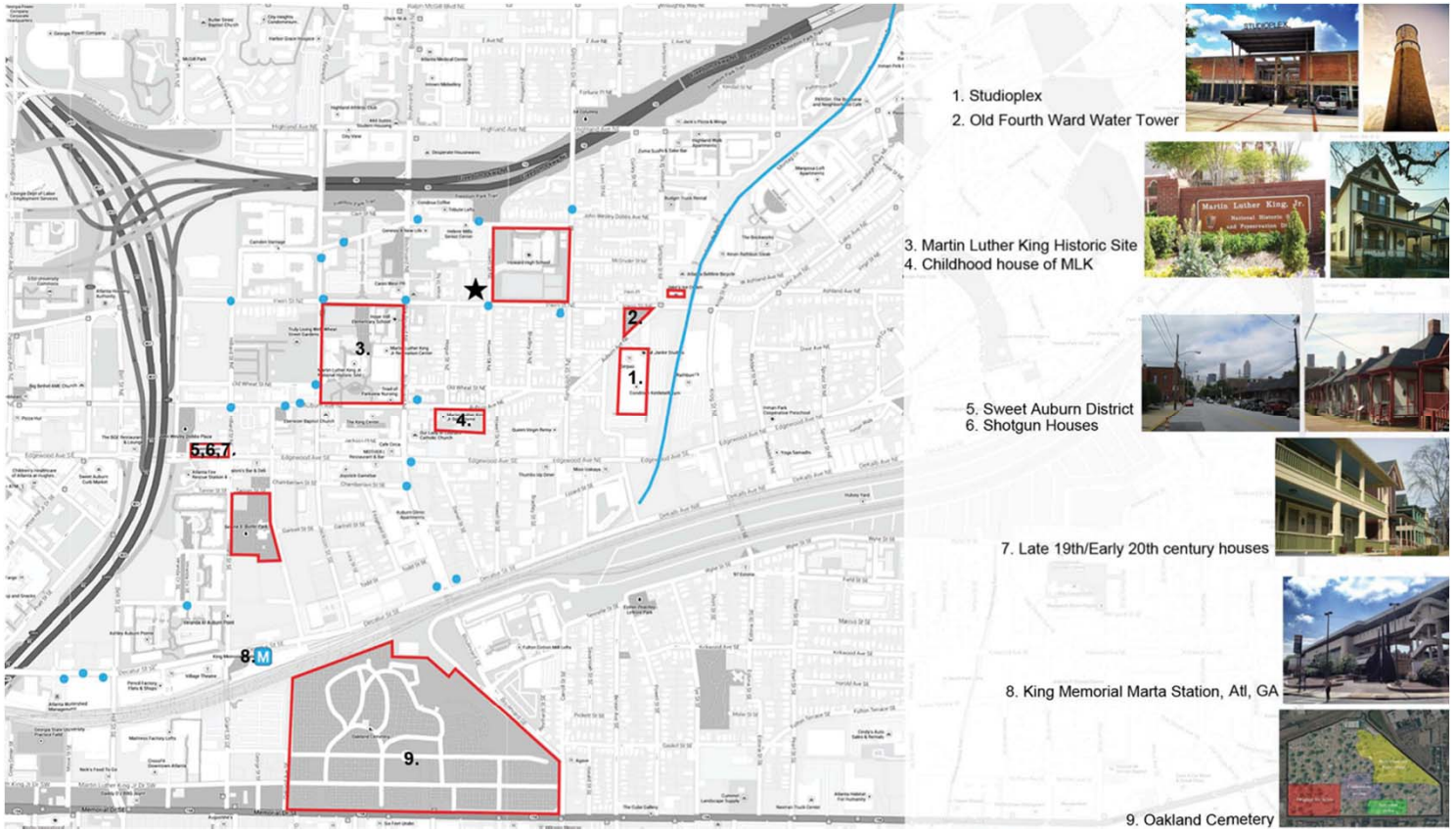


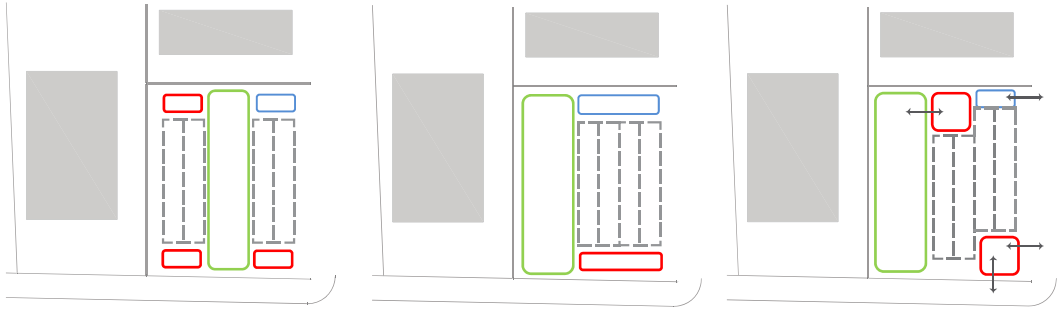
EXPANDING FAMILY

Location In The City/Surroundings – WHERE IN THE CITY DO WE WANT TO BE?





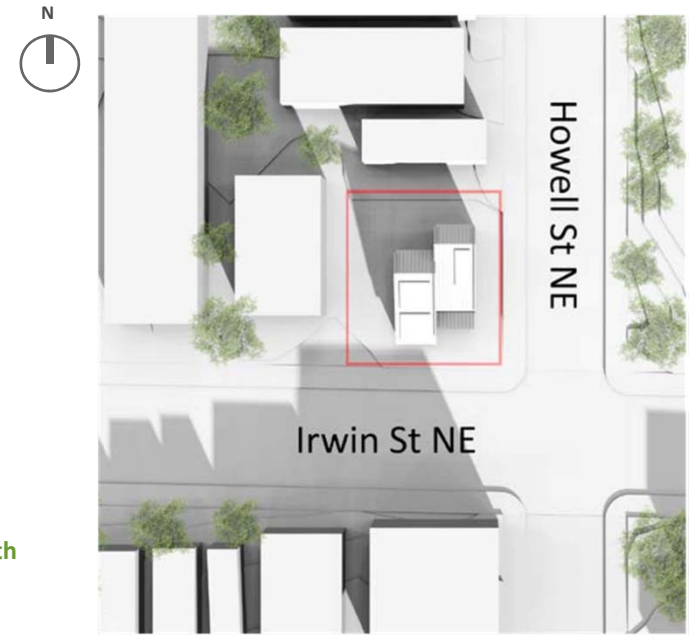
Site – WHAT IS THE EXISTING SITUATION?



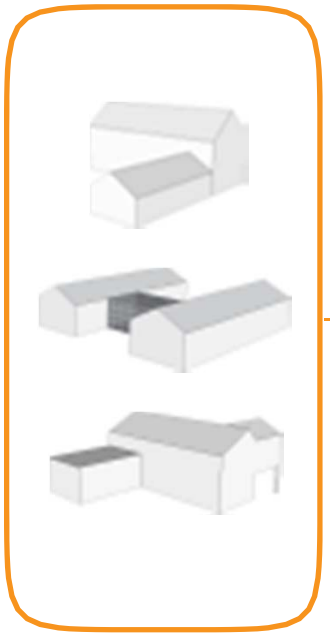
EXISTING FOOTPRINT
two volumes – large façade area

COMBINE VOLUMES
bad outdoor area allocation

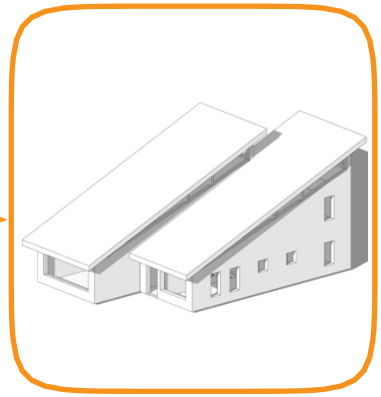
SHIFTED VOLUMES
optimized façade area with outdoor area allocation



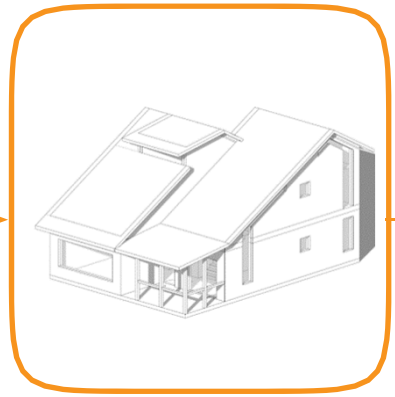
Performance Based Design – WHAT WAS THE APPROACH?



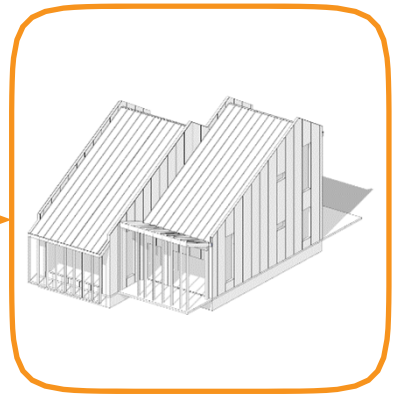
DIFFERENT FOOTPRINTS AND ORIENTATION



CHOSEN FOOTPRINT
Floor Area: 2002 ft^2
WWR: 19.4 %
Demand: 8,736 kWh/yr

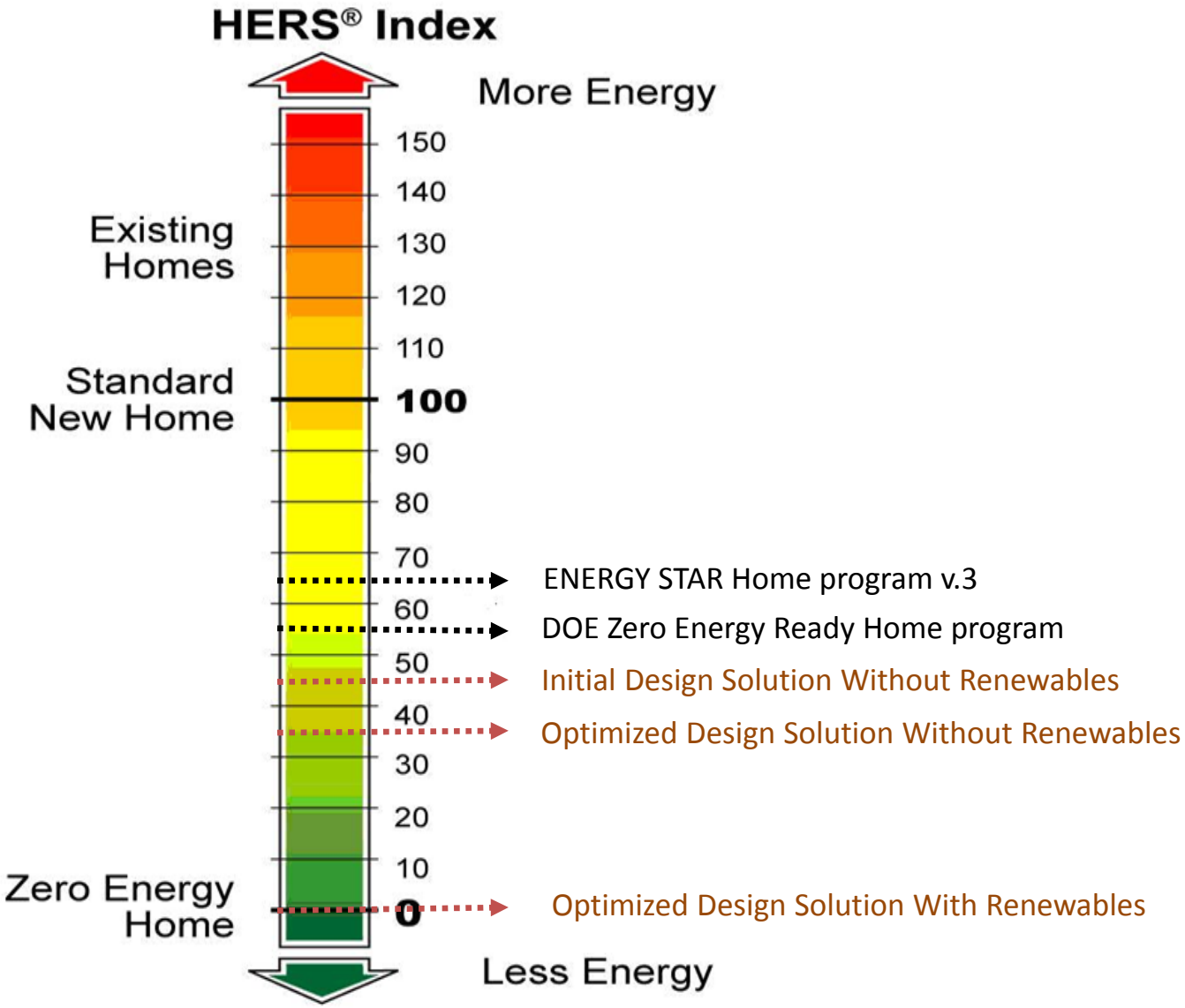


REDUCED VOLUME
Floor Area: 1776 ft^2
WWR: 19.5 %
Demand: 8,443 kWh/yr

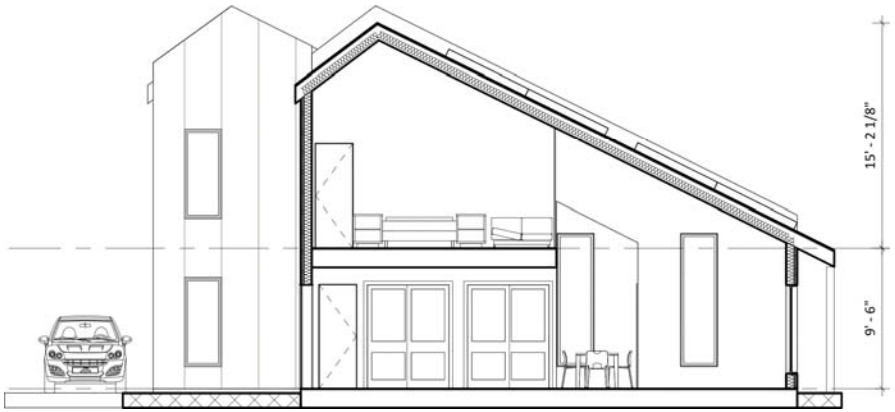


IMPROVED ROOF ANGLE
Floor Area: 1656 ft^2
WWR: 15.7 %
Demand: 8,265 kWh/yr

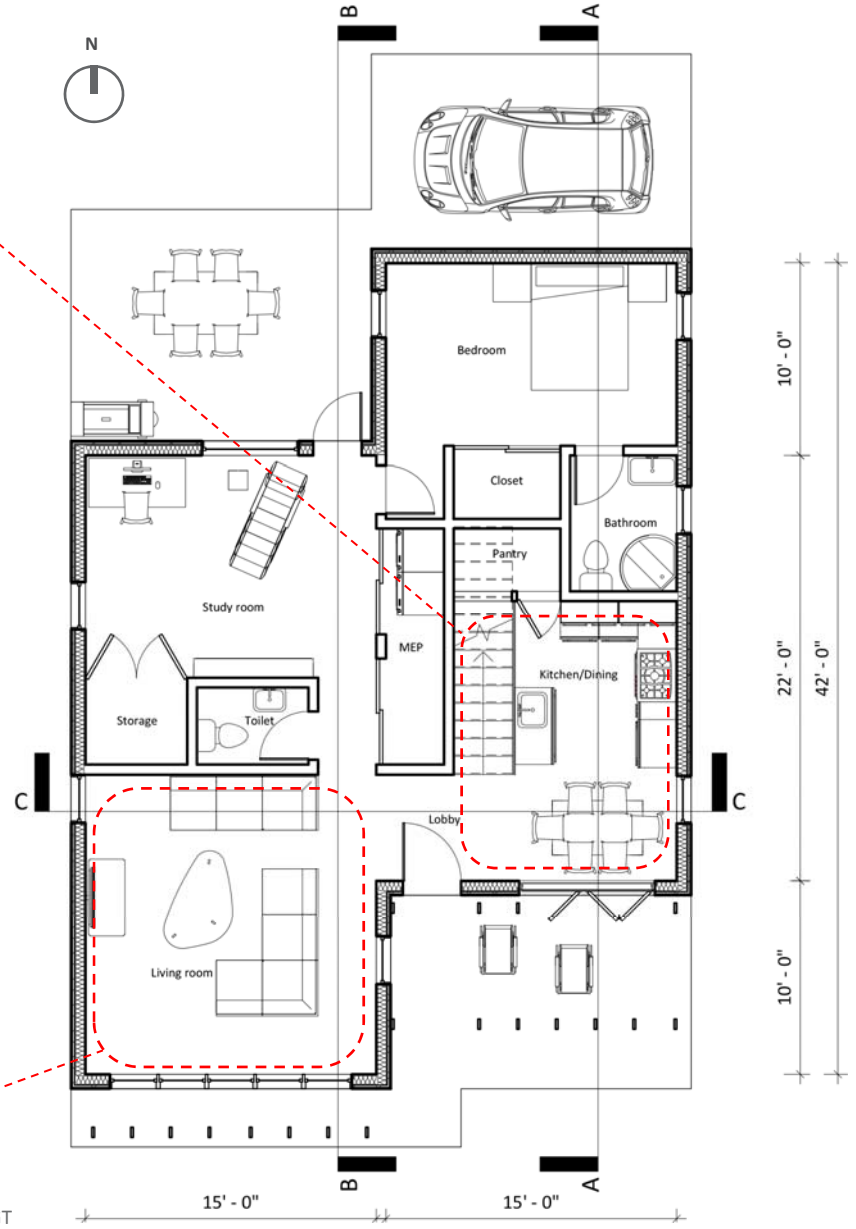
Energy Analysis – WHAT WAS THE TARGET?



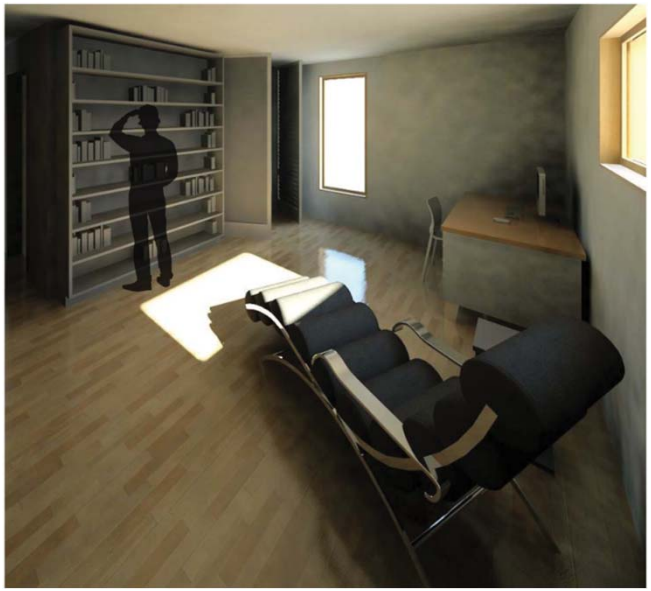
Orientation – HOW ARE WE MAKING THE BEST USE OF THE SITE?

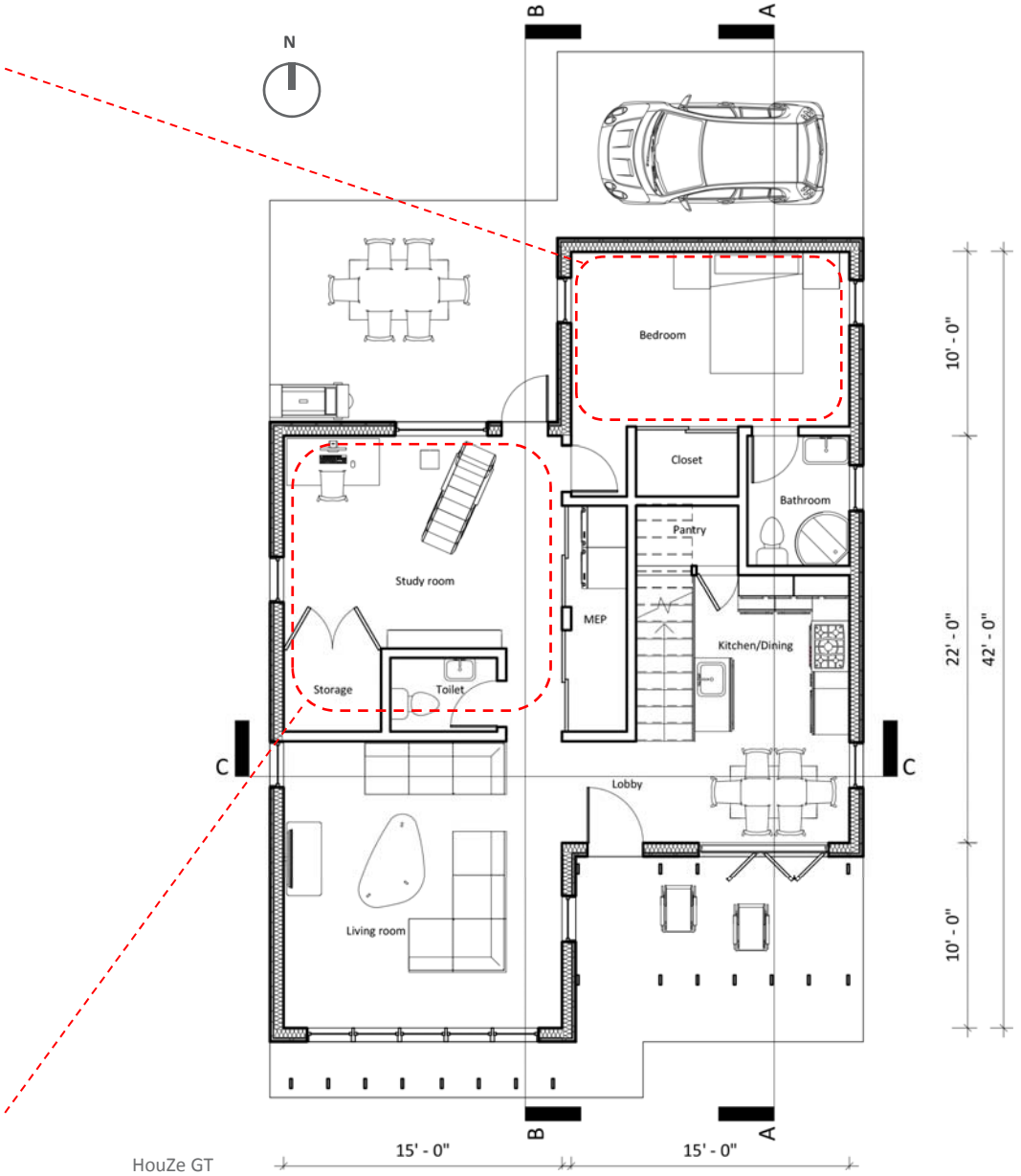


South-Facing Living Spaces – HOW ARE WE USING THE SOUTH DAYLIGHT TO OUR BENEFIT?

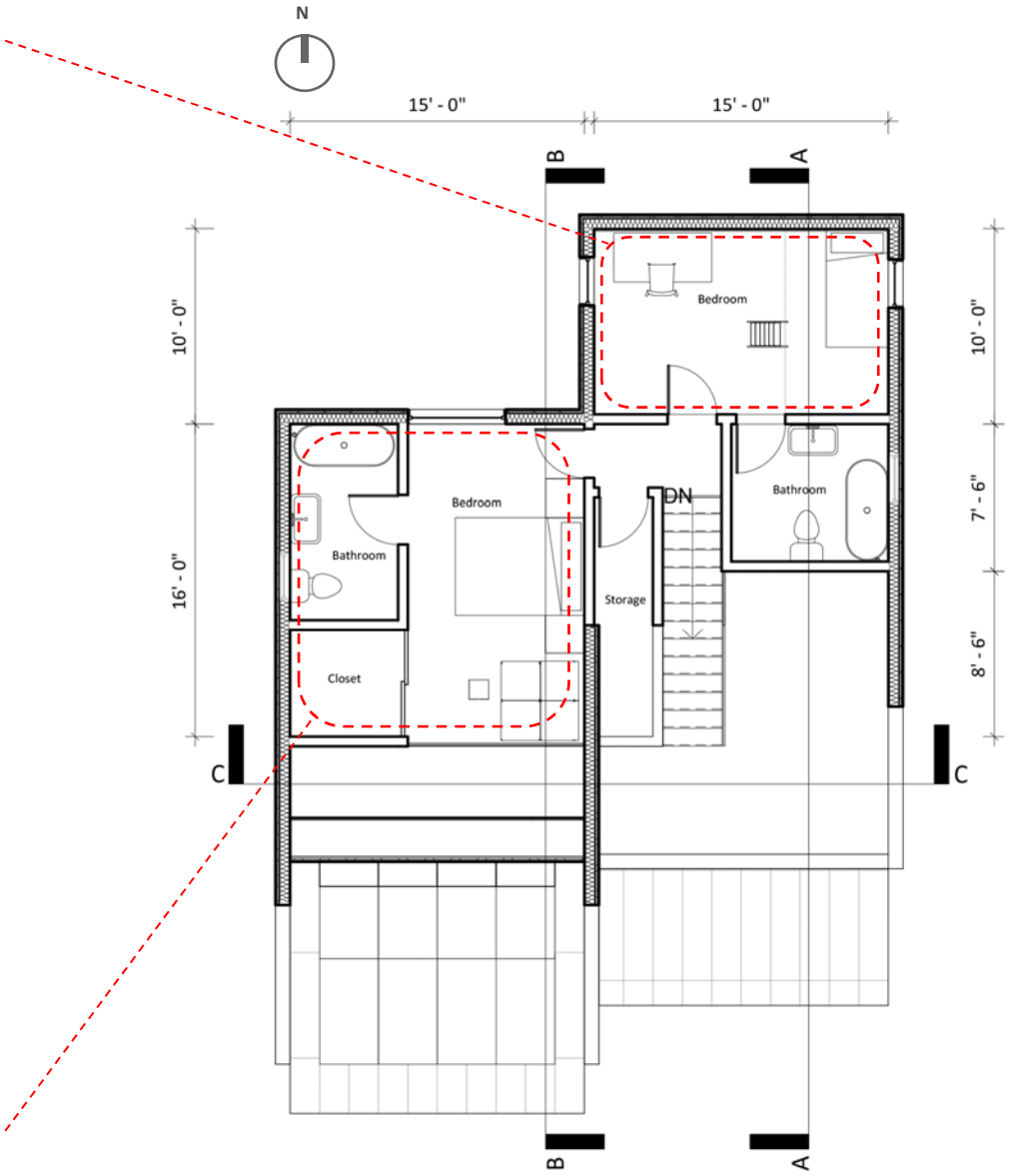


North-Facing Living Spaces – HOW ARE WE MINIMIZING NORTH FACING FENESTRATIONS?

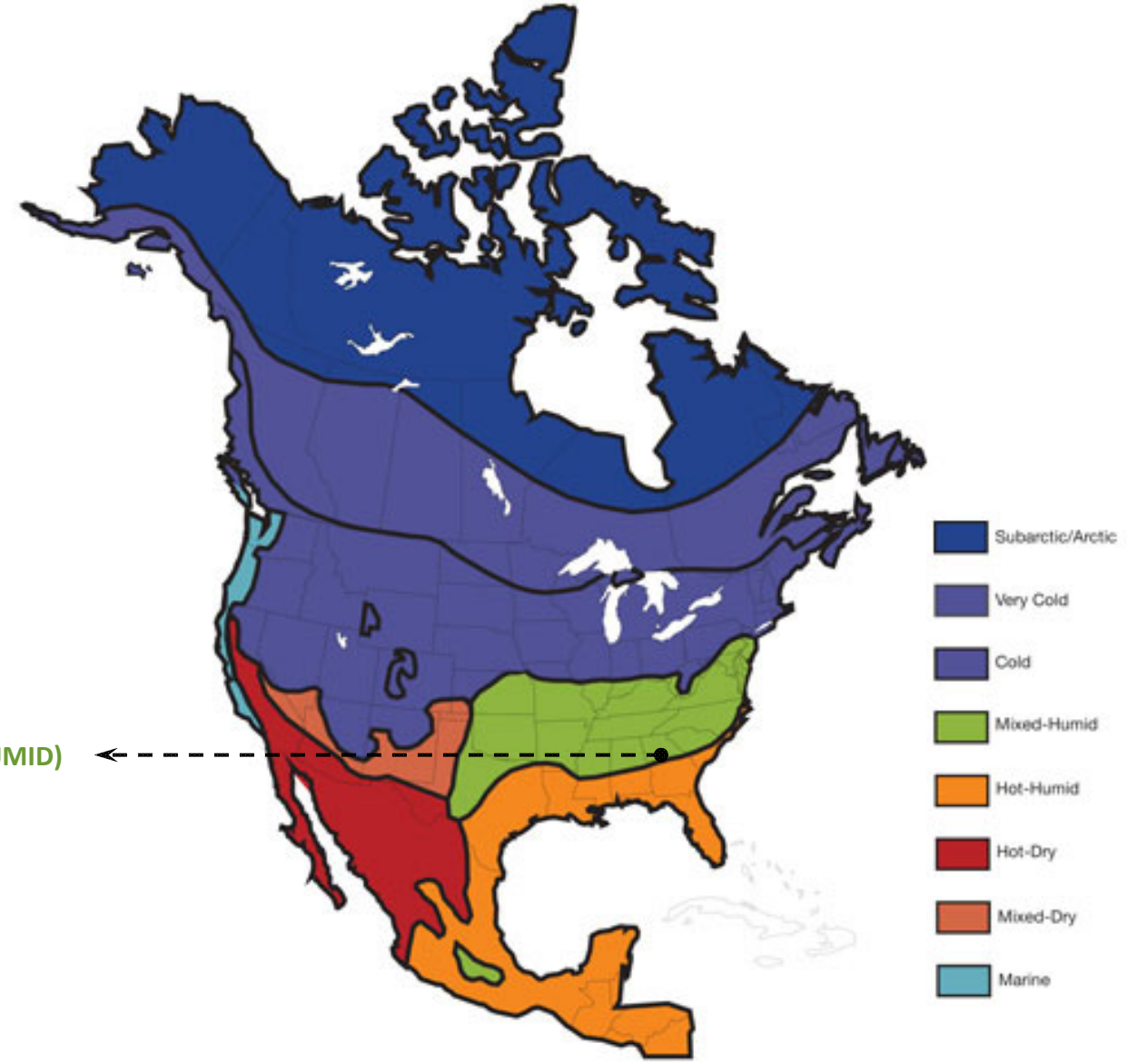




Second Floor Spaces – HOW ARE WE MAXIMIZING THE SPACE/VOLUME?



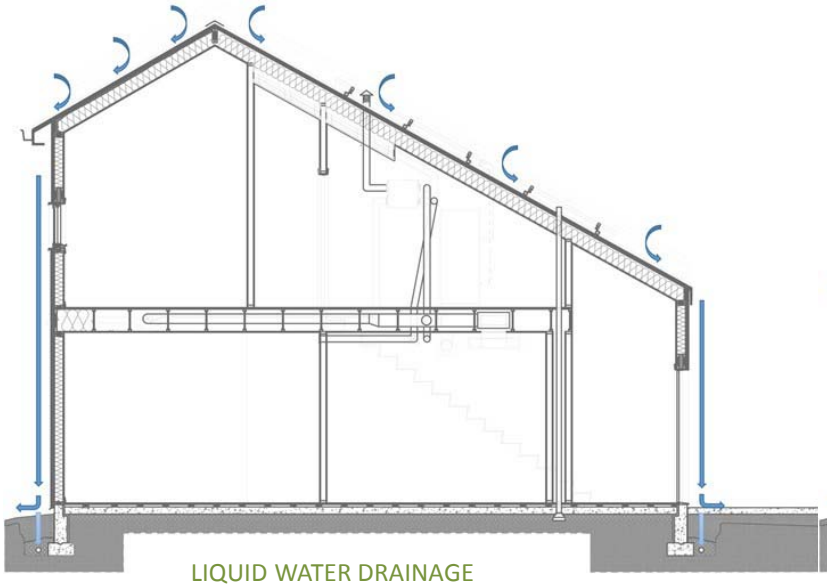
Climate – WHAT IS OUR CLIMATE?



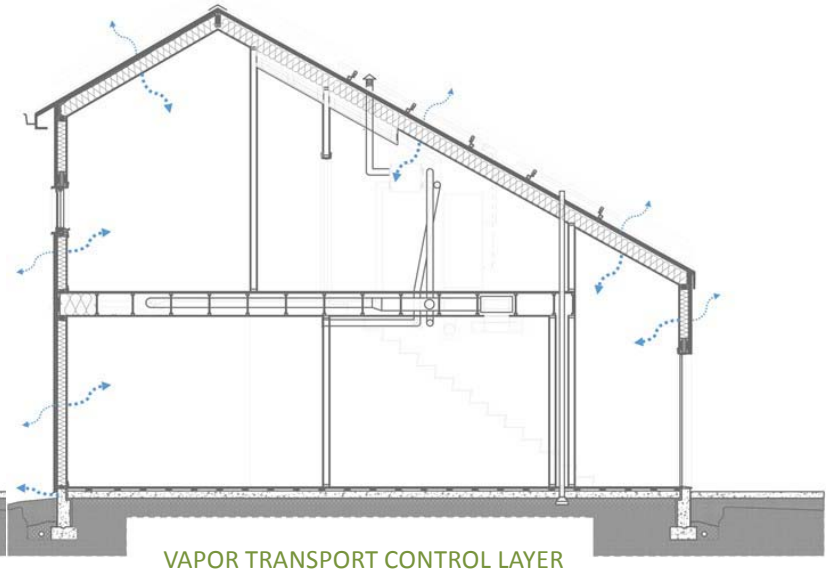
ATLANTA, GA (MIXED HUMID)

*Source: Building Science Corporation

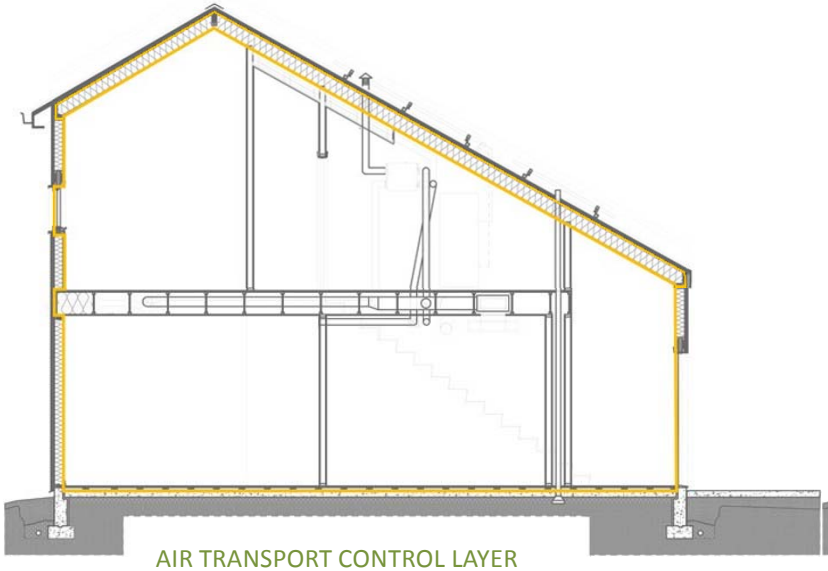
Envelope Durability – HOW IT WAS APPROACHED?



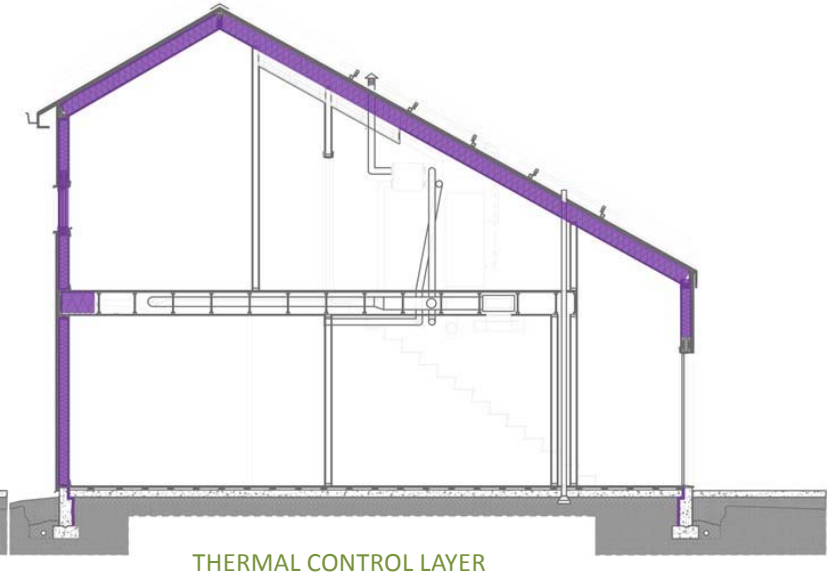
LIQUID WATER DRAINAGE



VAPOR TRANSPORT CONTROL LAYER

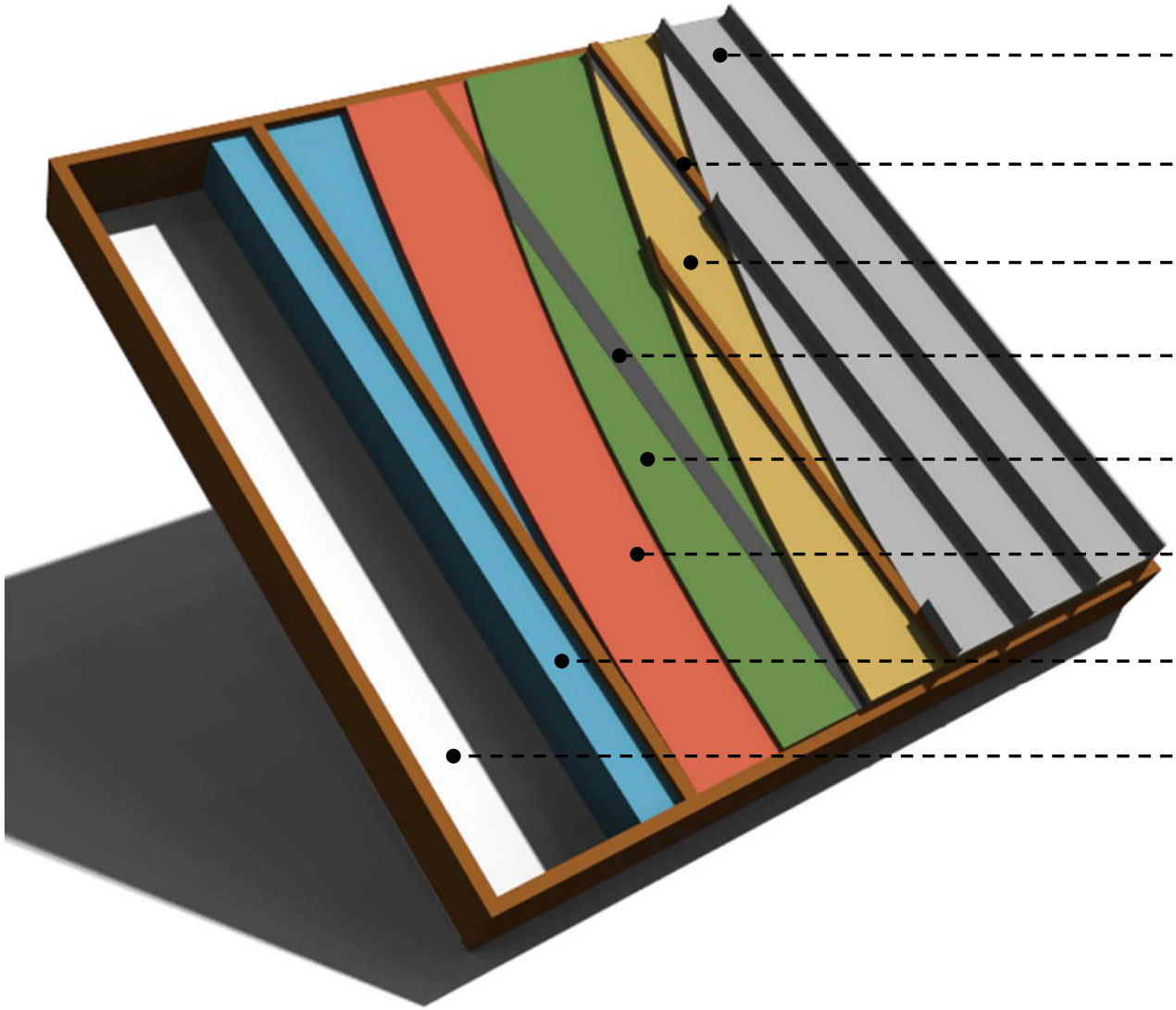


AIR TRANSPORT CONTROL LAYER



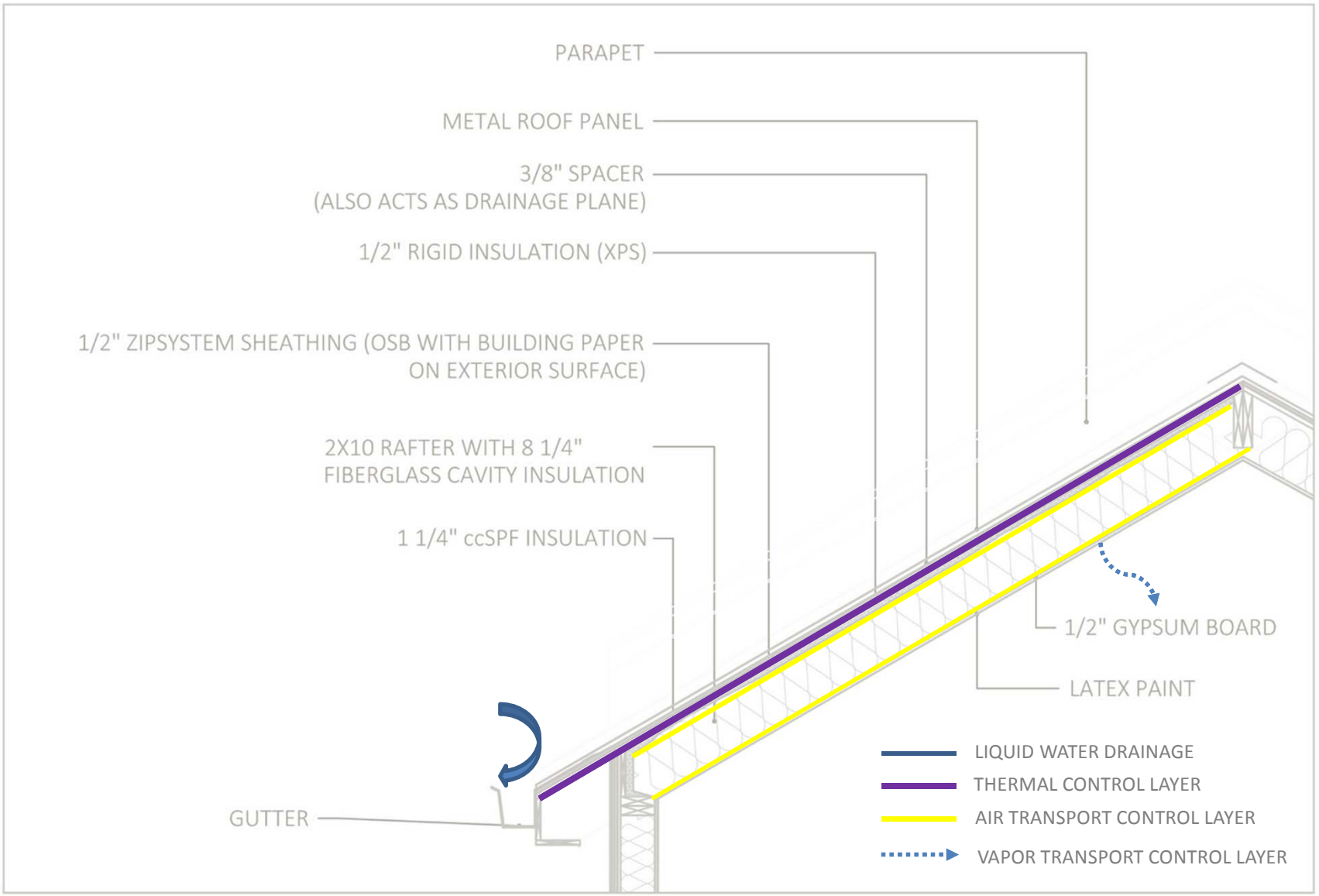
THERMAL CONTROL LAYER

Roof Envelope – WHAT IS THE CONSTRUCTION?

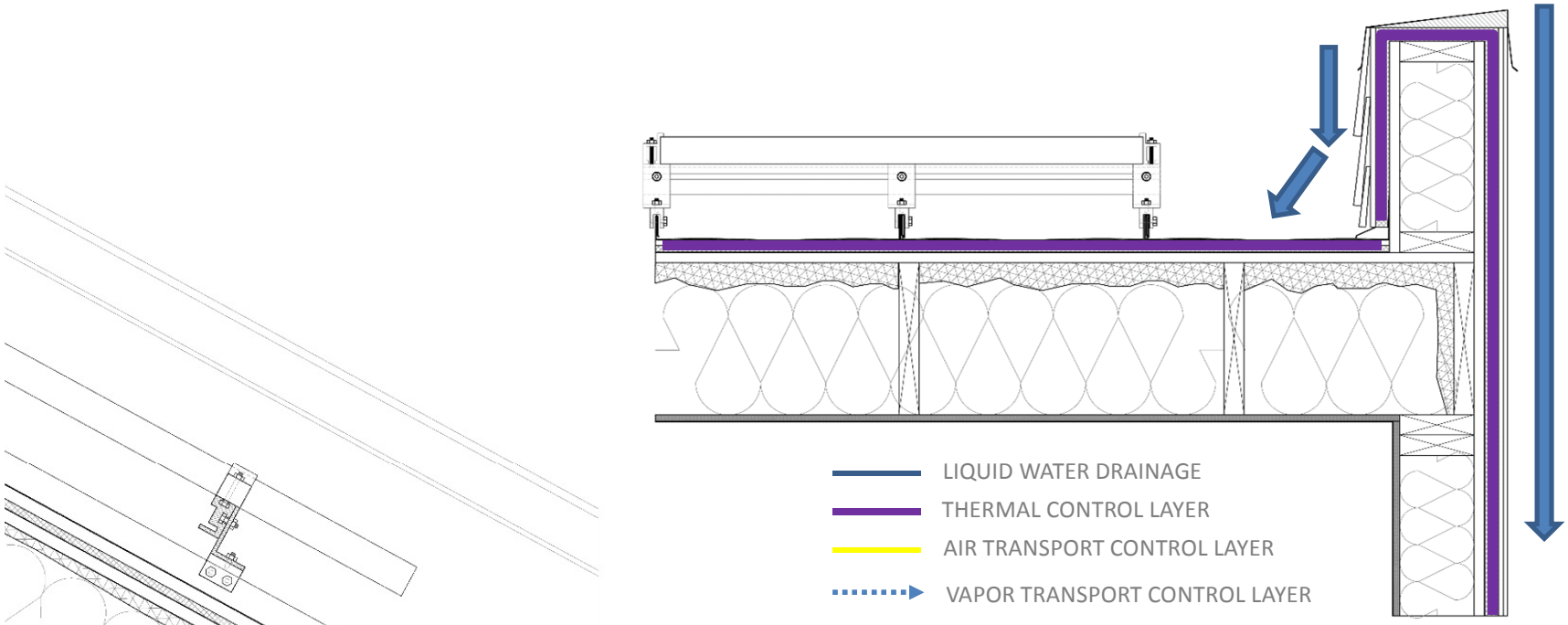


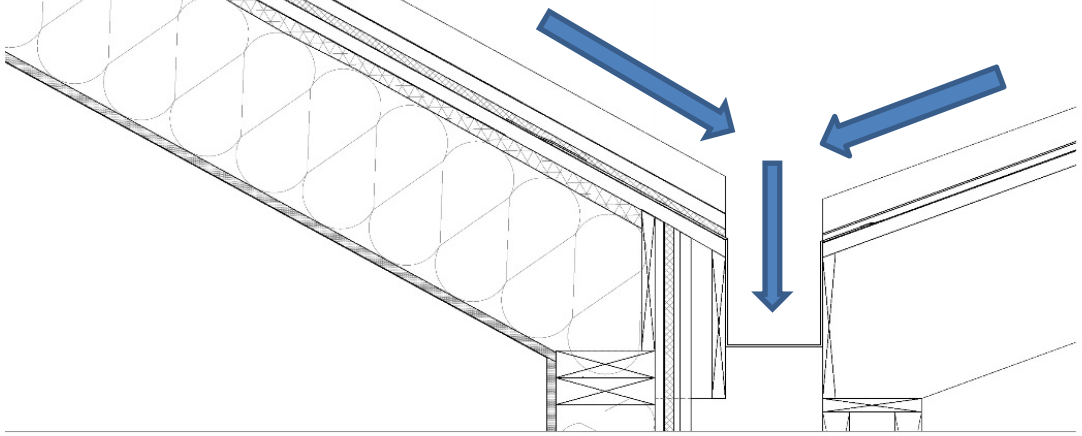
- METAL ROOF
- FURRING STRIPS
- INSULATION BOARD (XPS)
- ZIP-SYSTEM TAPE
- ZIP-SYSTEM EXTERIOR SHEATHING WITH BUILDING PAPER
- CLOSED CELL SPRAY FOAM INSULATION
- CAVITY INSULATION
- GYPSUM BOARD

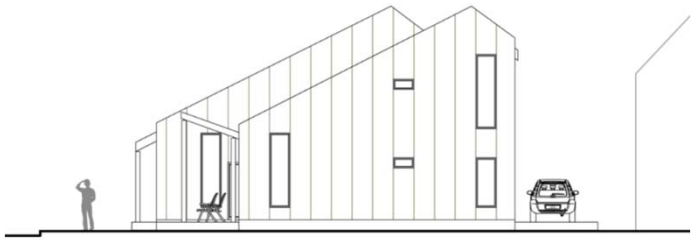
Roof – HOW DO THE ROOF LAYERS PERFORM?



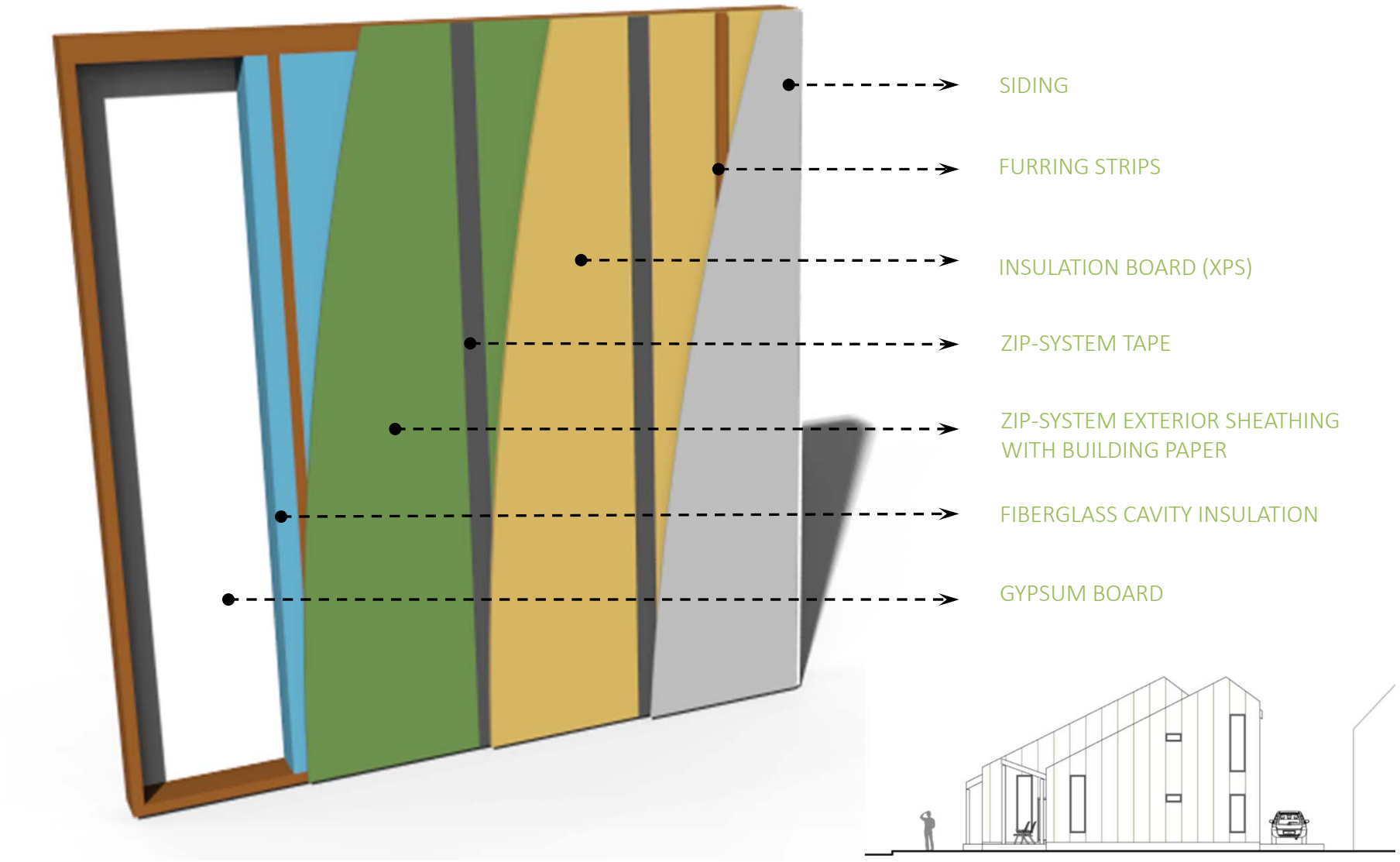
Parapet and Porch – HOW DO THE LAYERS PERFORM?



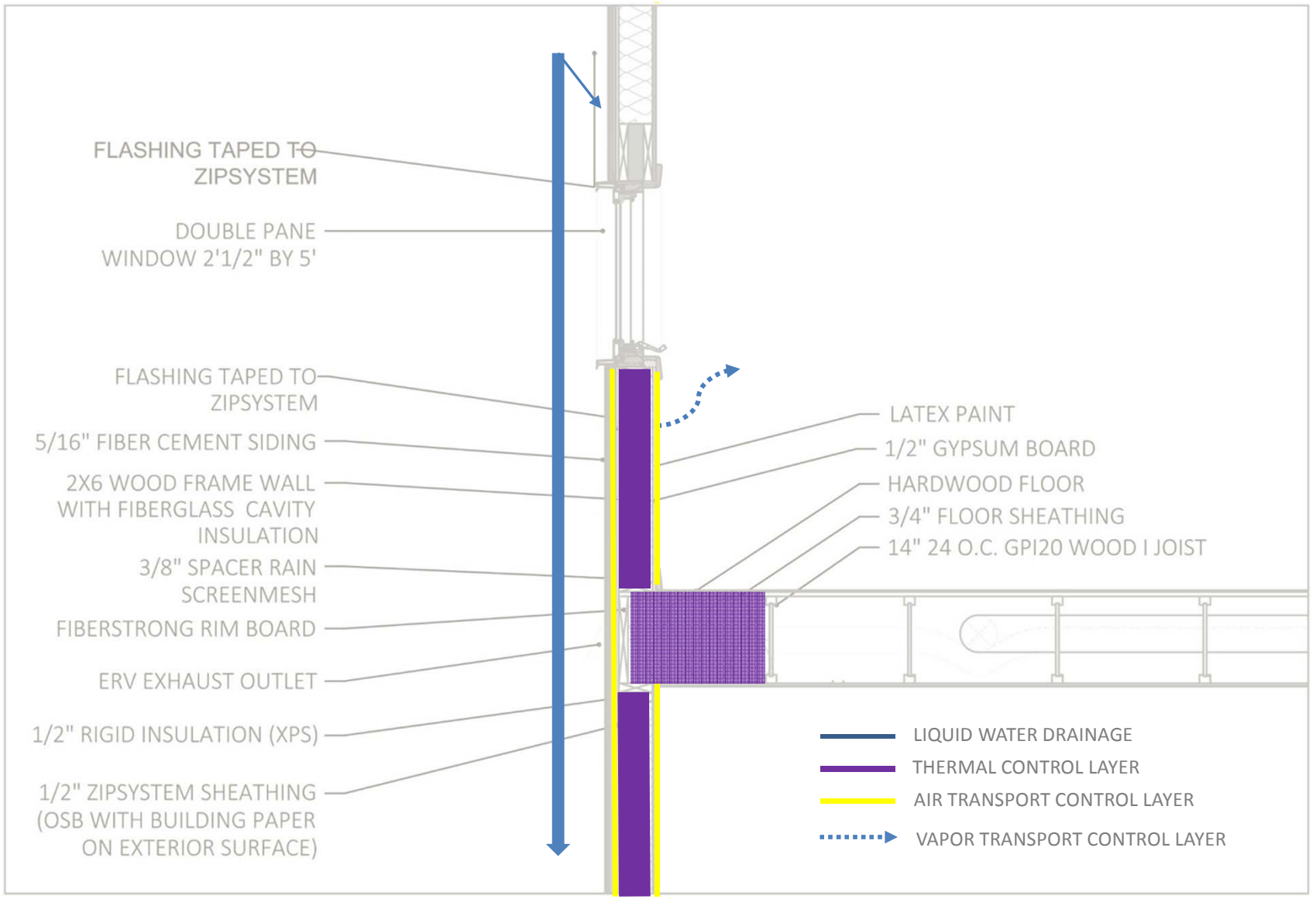




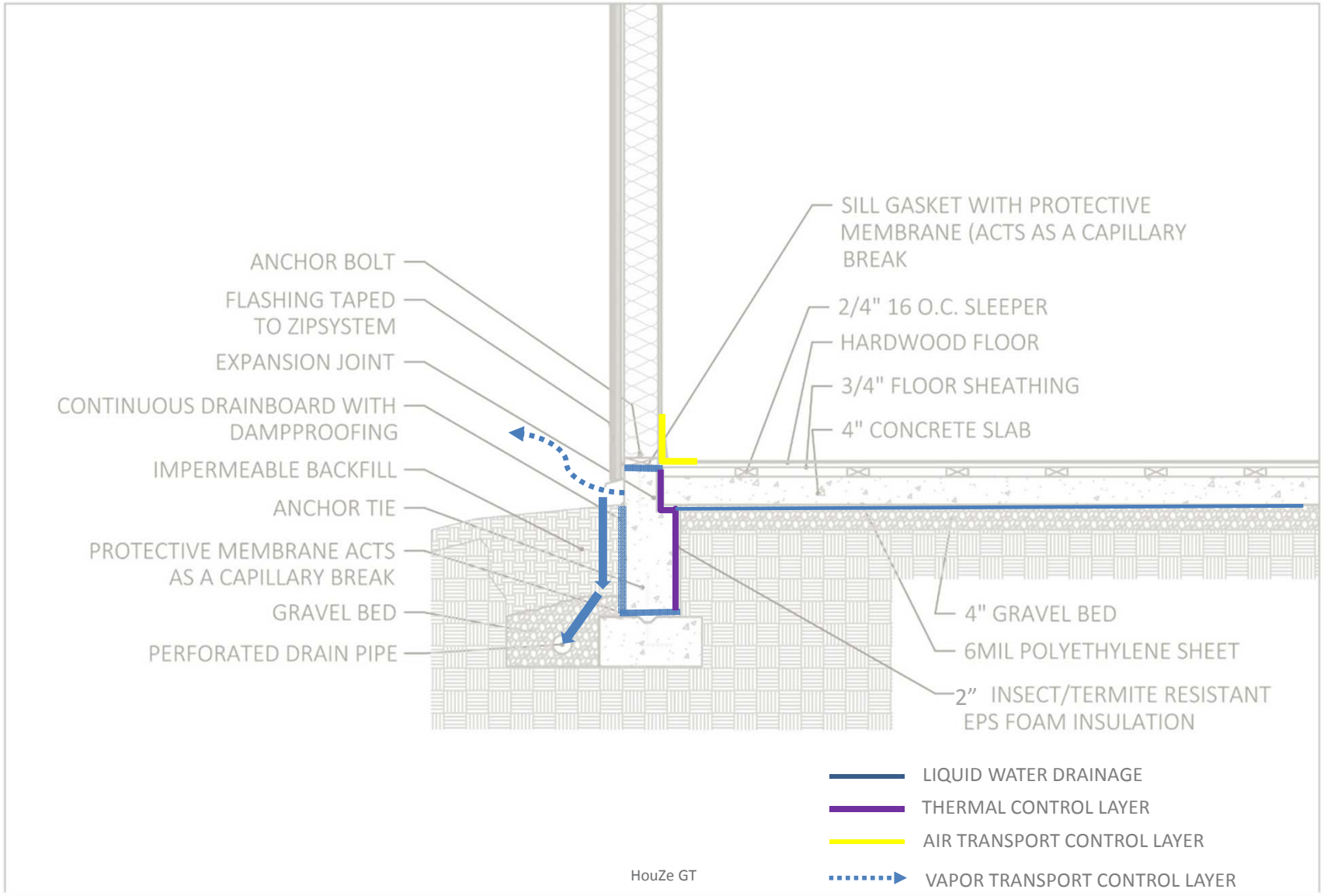
Wall Envelope – WHAT IS THE WALL CONSTRUCTION?



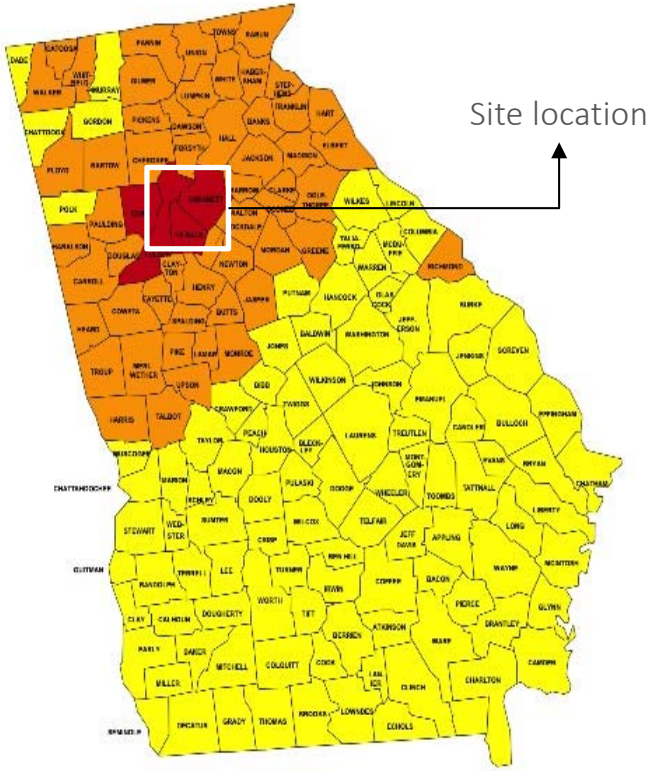
Wall – HOW DO THE LAYERS PERFORM?



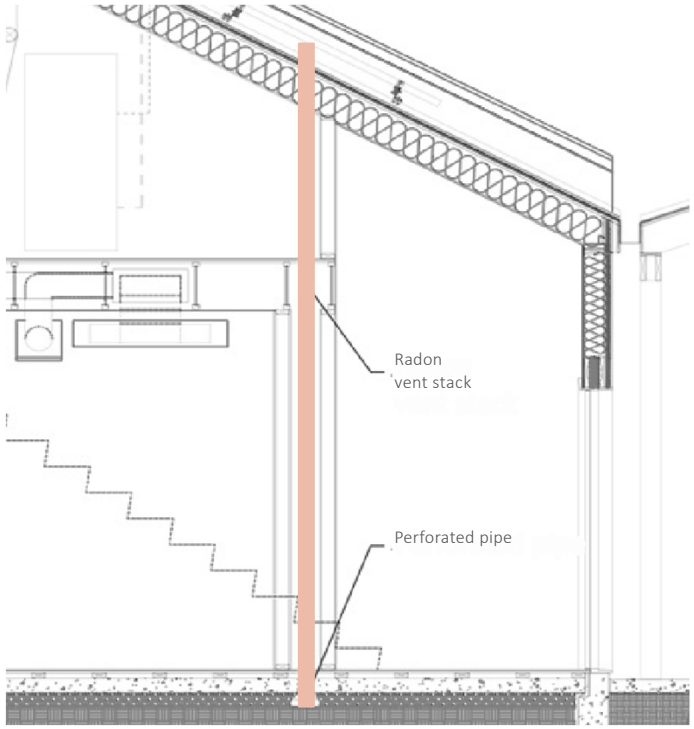
Foundation – HOW DO THE LAYERS PERFORM?



Radon Control – HOW DO WE REMOVE RADON GAS?

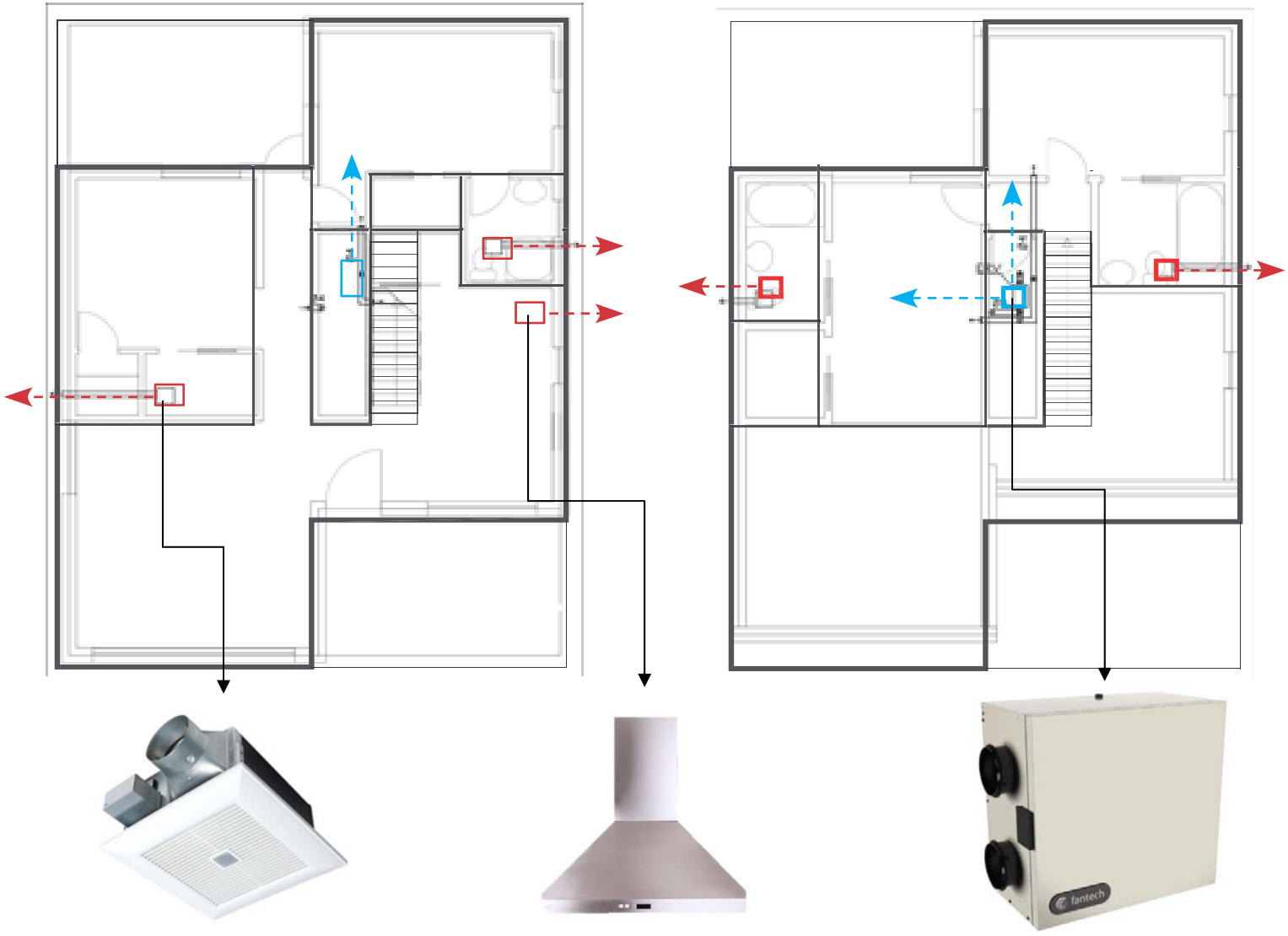


GEORGIA - MAP OF RADON ZONES



SUB-SLAB DEPRESSURIZATION RADON CONTROL

Ventilation Strategy – HOW DO WE PROVIDE FRESH AIR CIRCULATION?

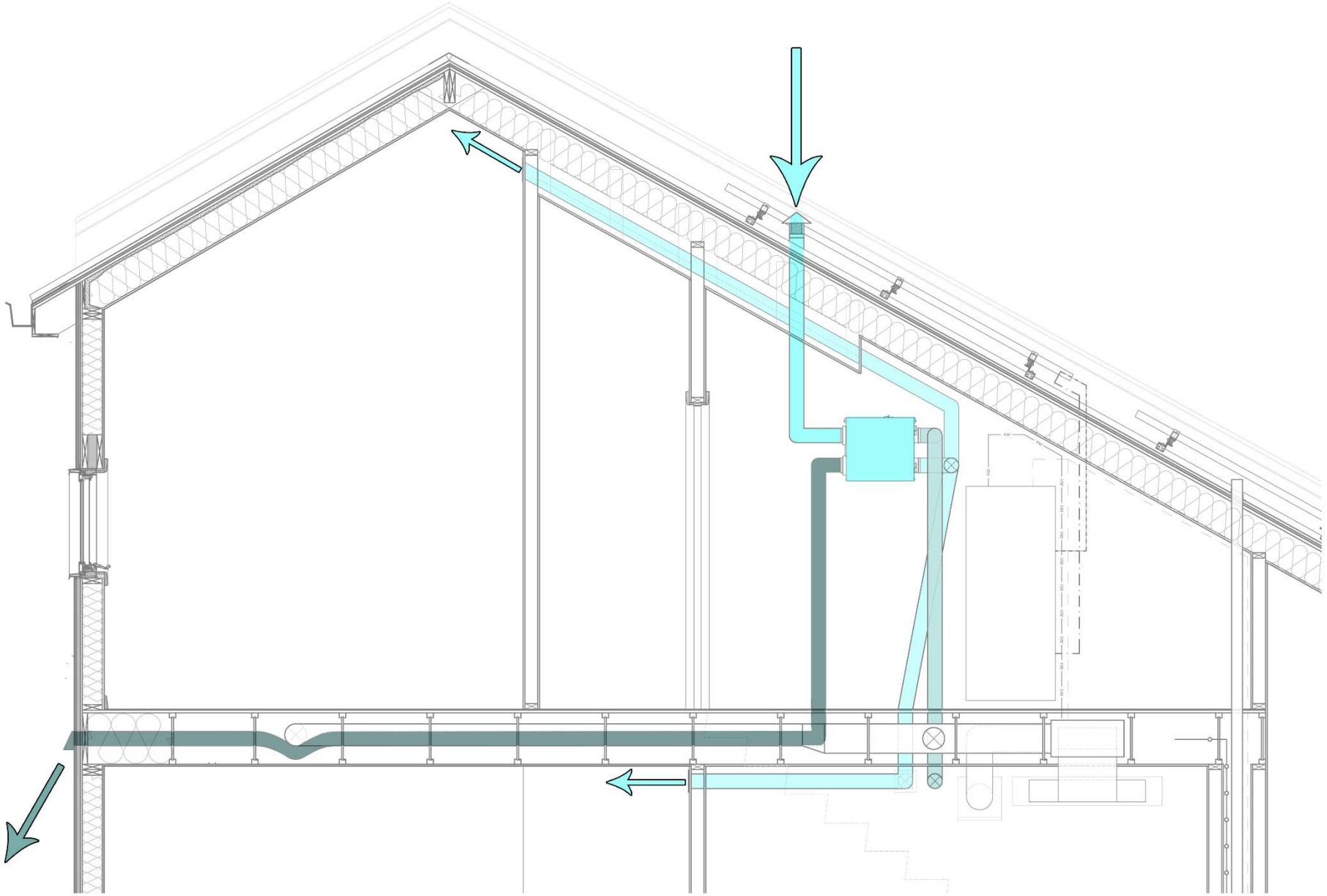


EXHAUST FAN

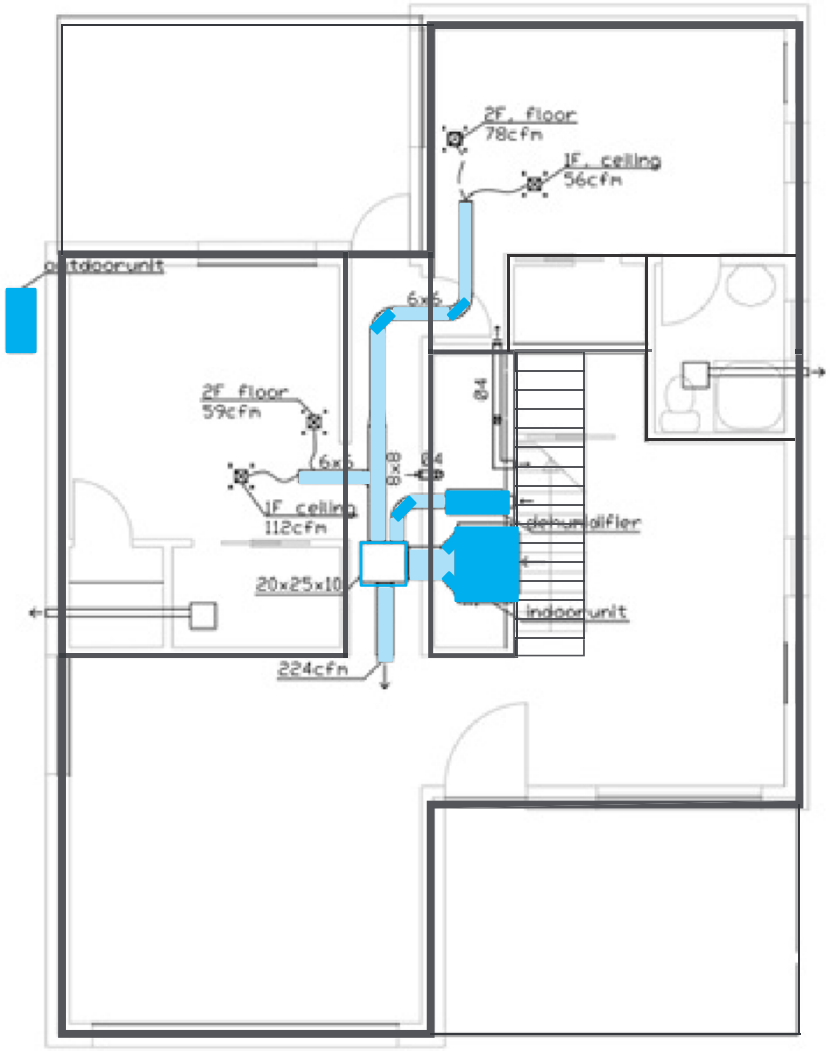
RANGE HOOD

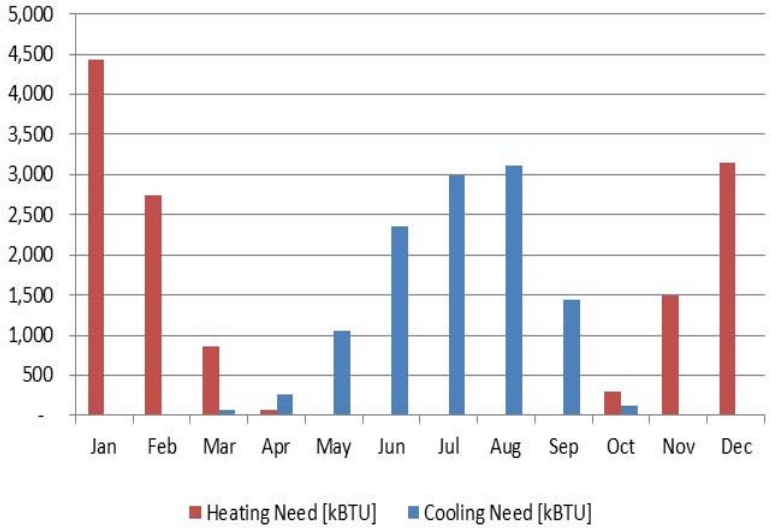
ERV

ERV Distribution – HOW DO WE VENTILATE FRESH AIR?

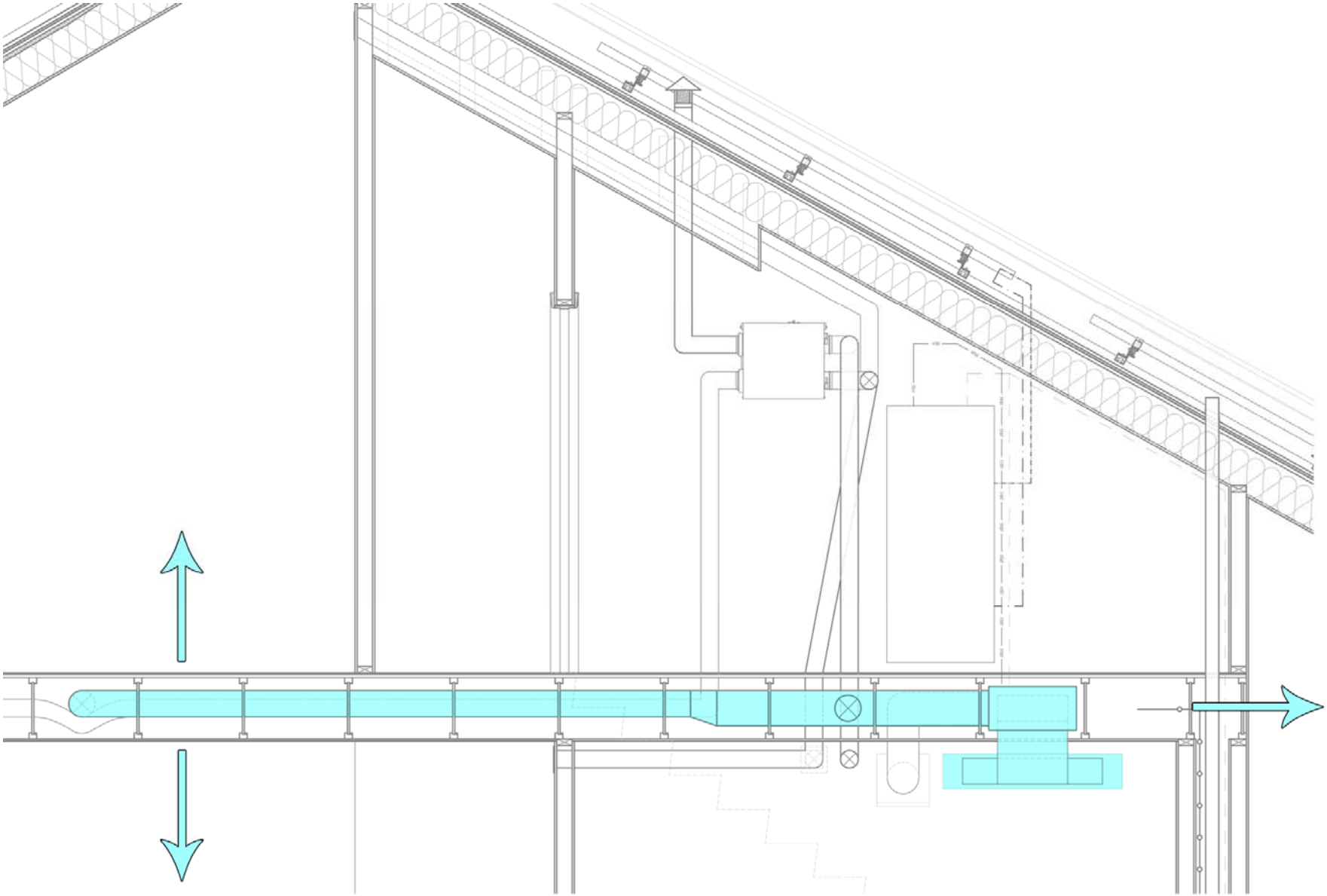


Space Conditioning – HOW ARE WE CONDITIONING?

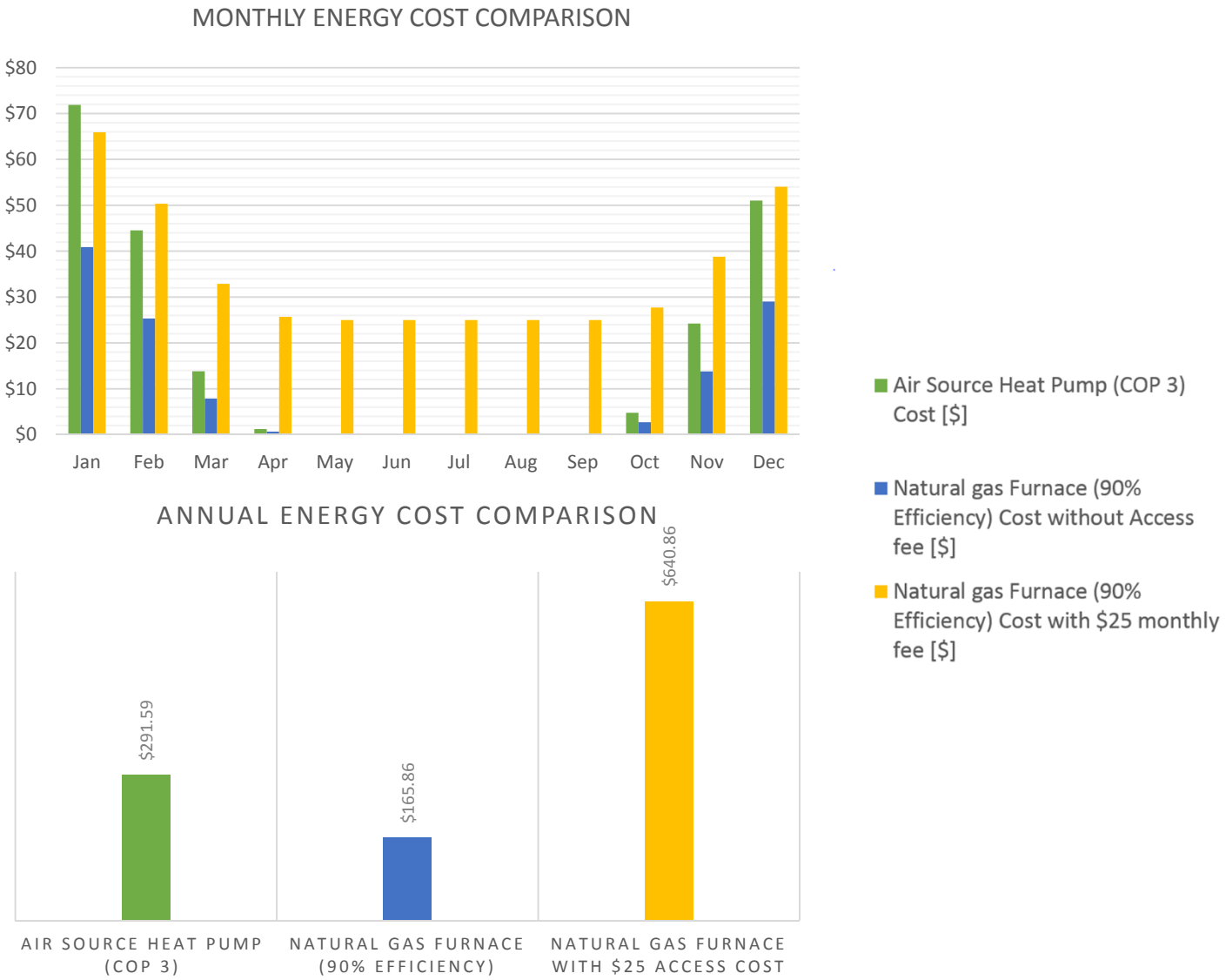




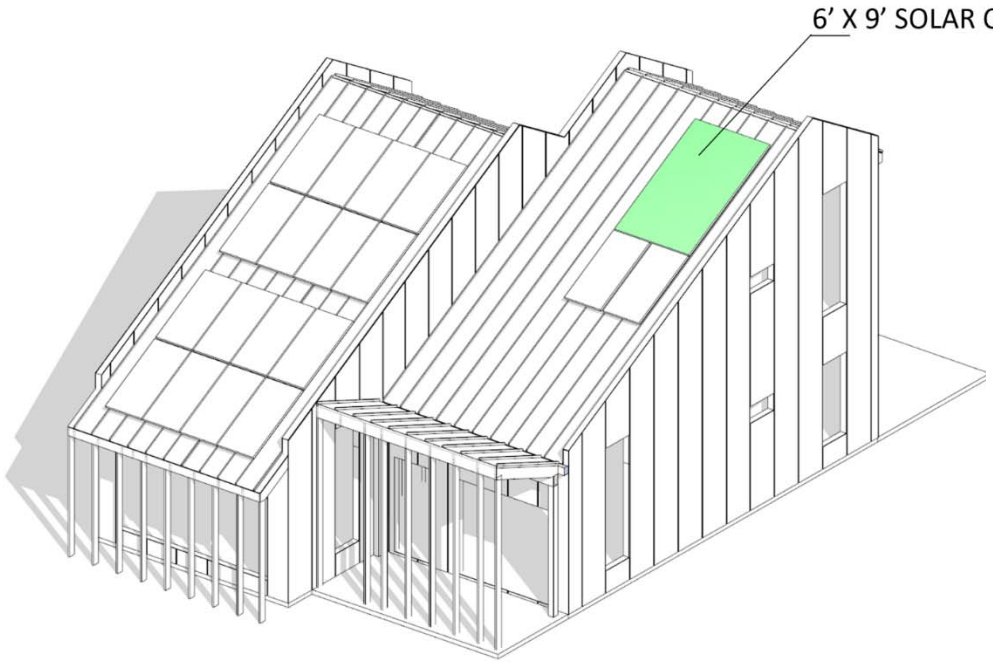
Space Conditioning – HOW DO WE DISTRIBUTE CONDITIONED AIR?

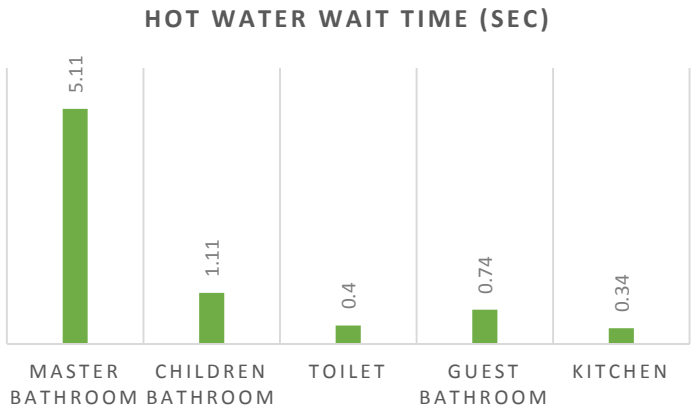


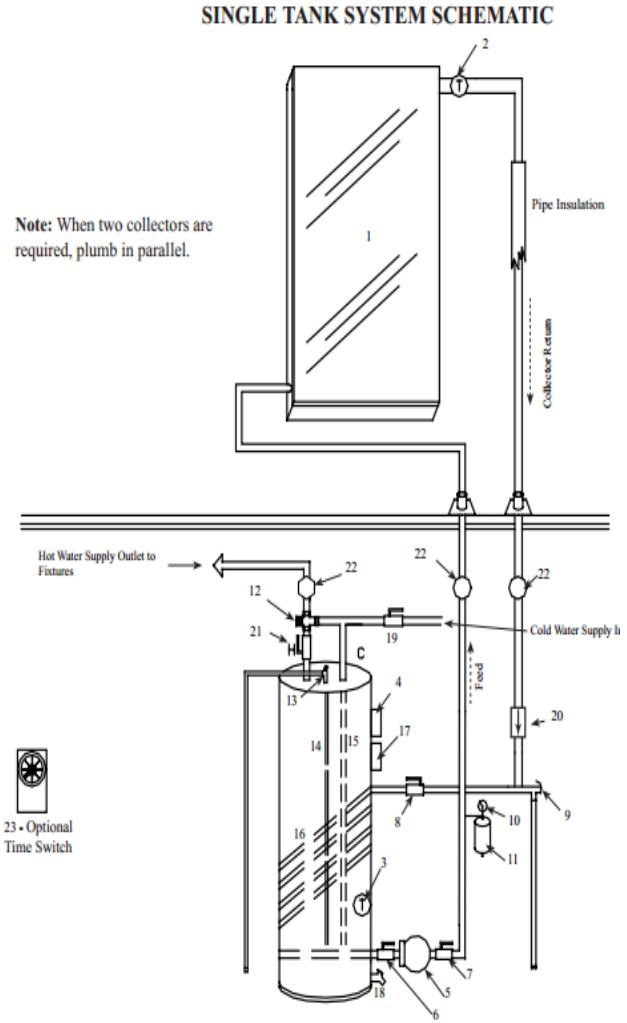
Space Conditioning – WHY AN AIR SOURCE HEAT PUMP VS NATURAL GAS?



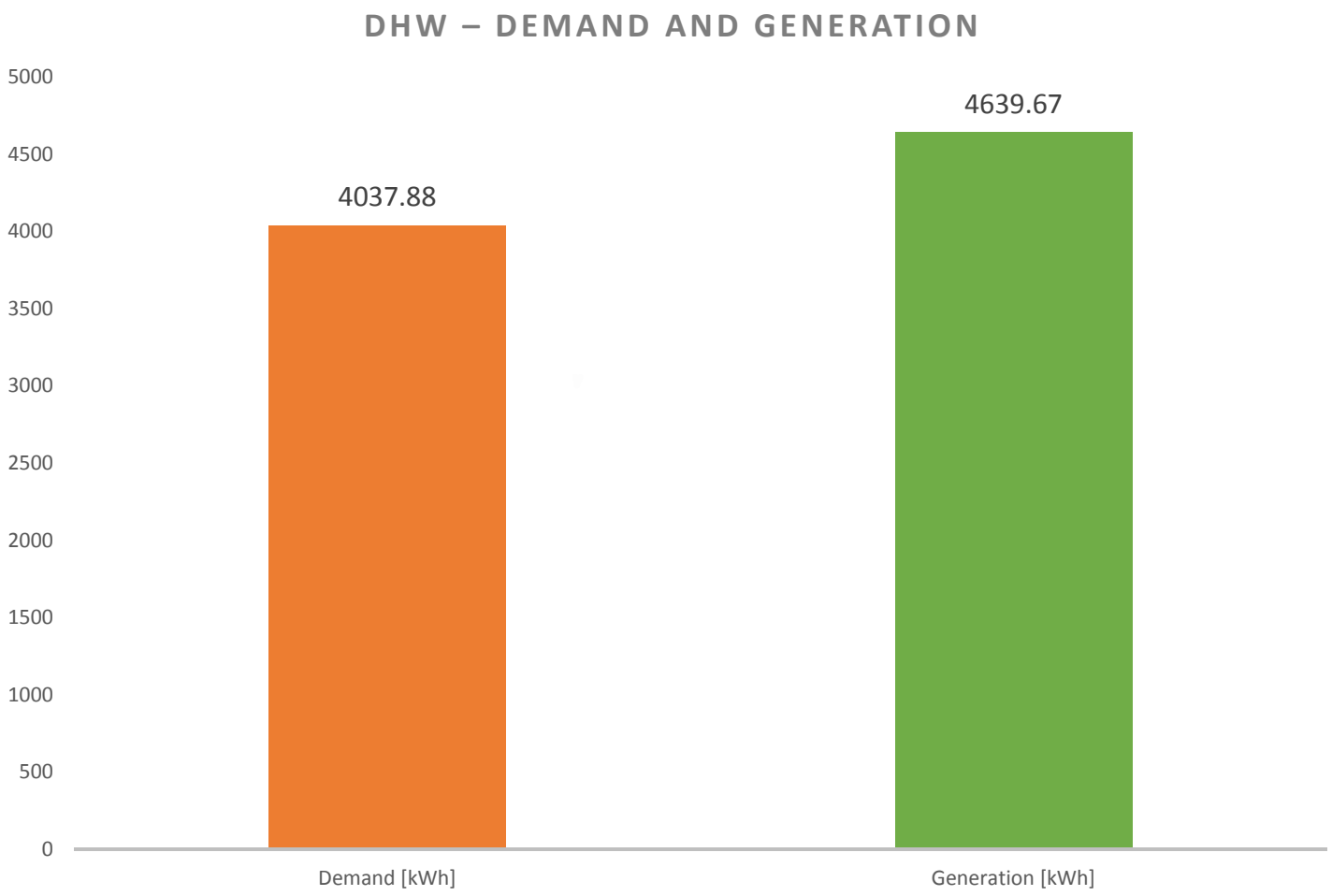
DHW Solar Thermal Collectors – HOW DO WE HEAT THE WATER?



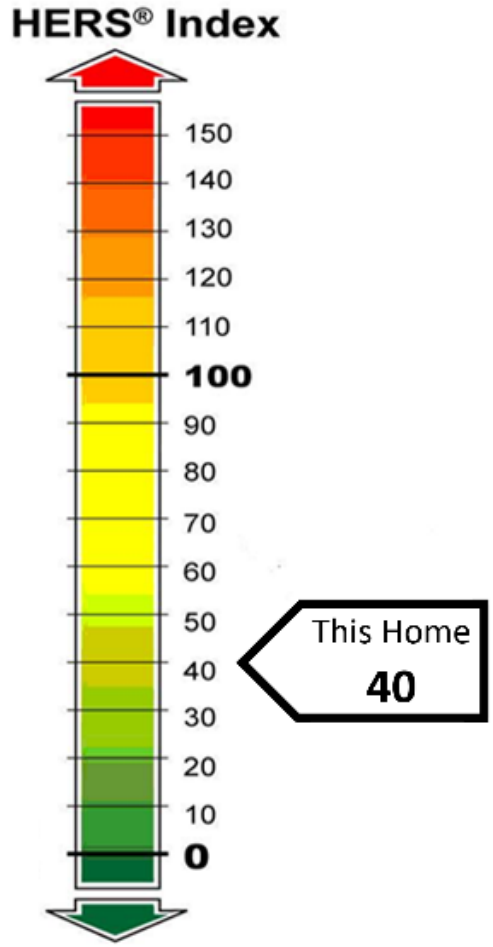




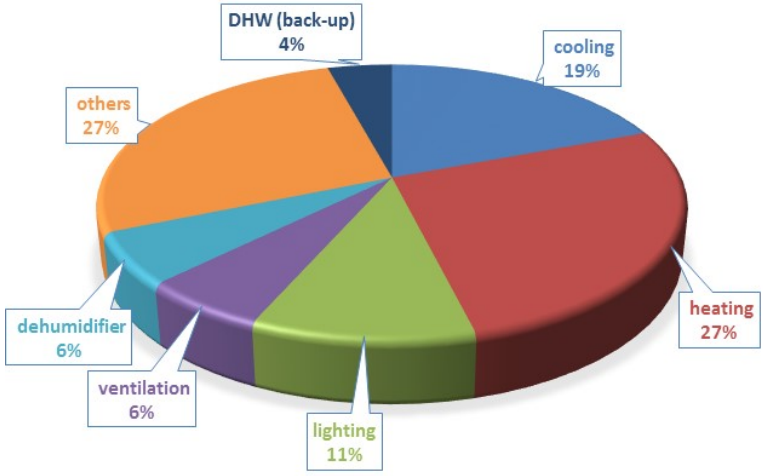
DHW Solar Thermal Collectors – HOW MUCH DO WE GENERATE?

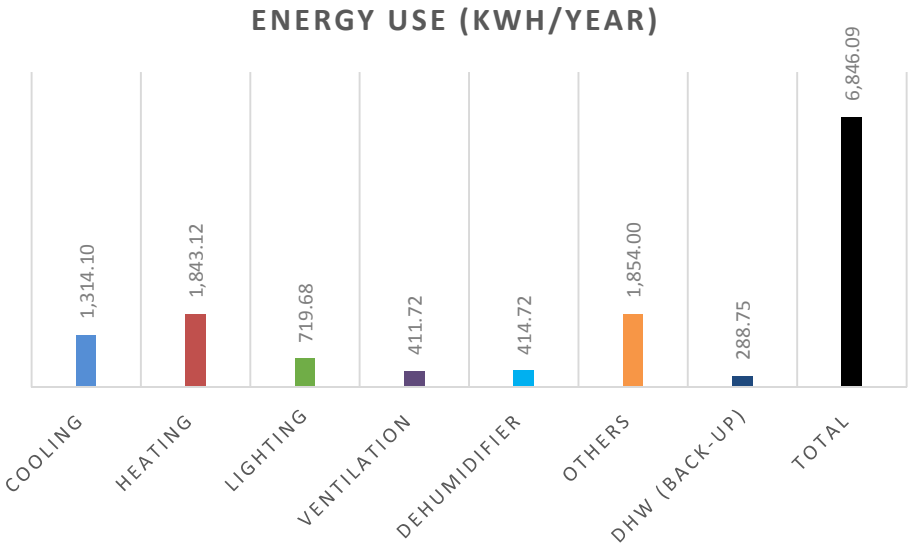


Annual Energy Consumption – HOW MUCH DO WE CONSUME?

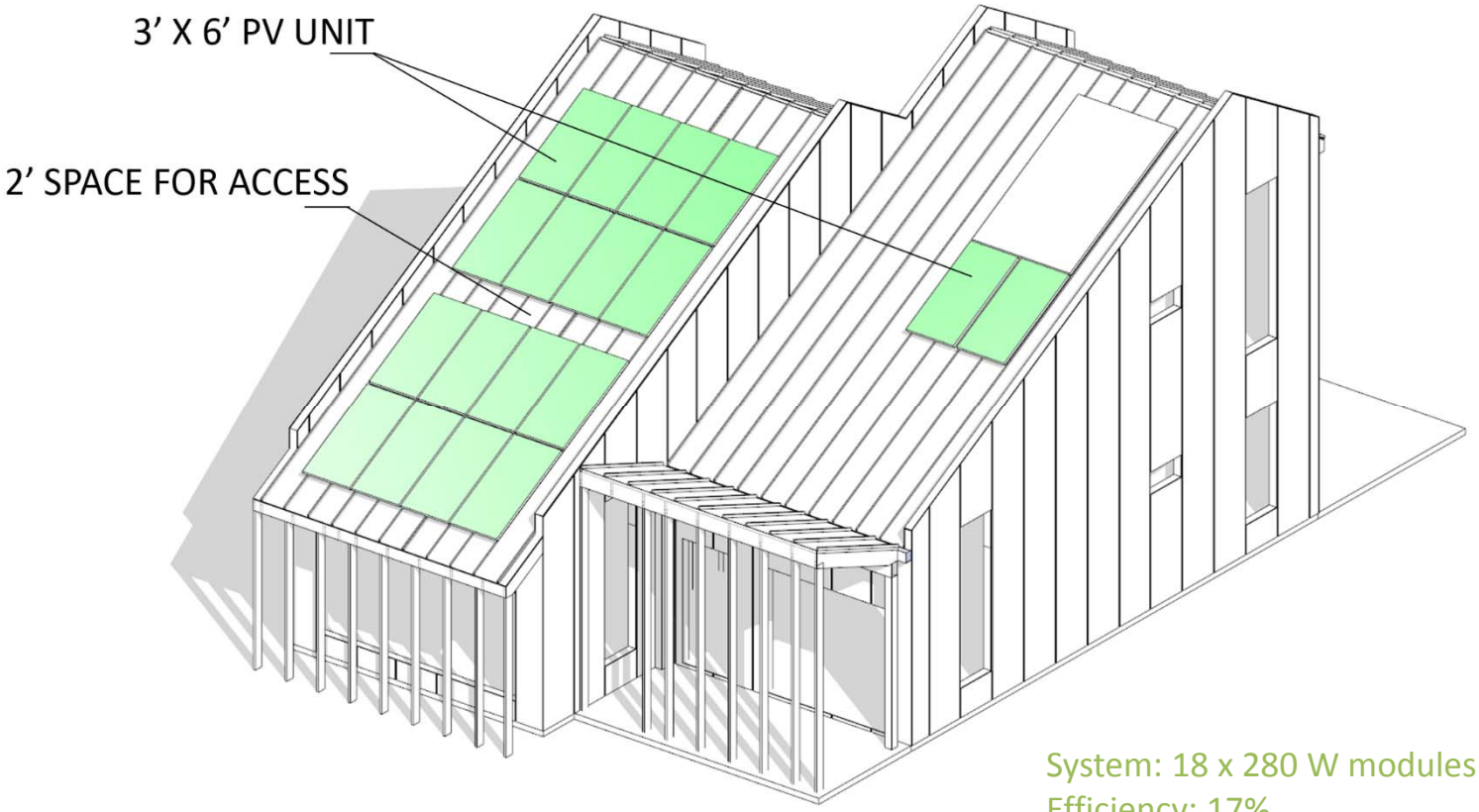


WITHOUT PV GENERATION



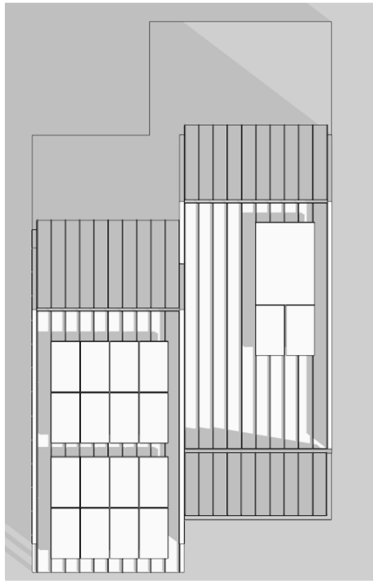


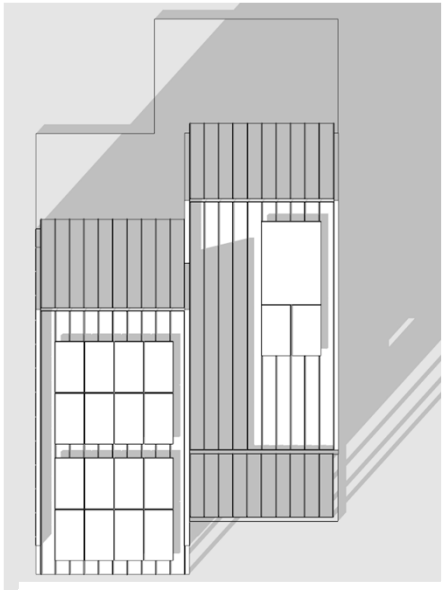
PV On-site Generation – HOW DO WE GENERATE ENERGY?



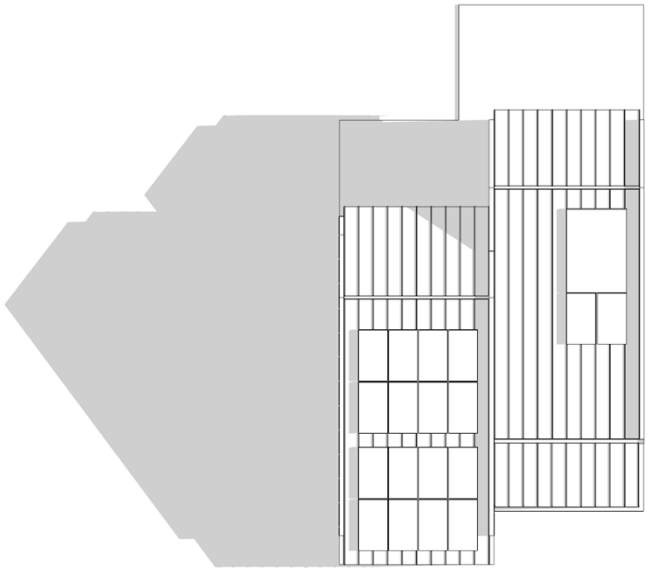
System: 18 x 280 W modules
Efficiency: 17%
Energy Generation: 5 kW

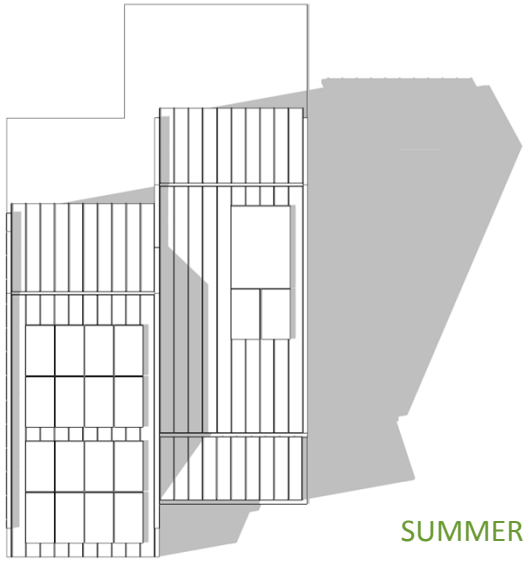
Shading – WHAT WAS THE OPTIMAL POSITION FOR THE SOLAR PANELS?





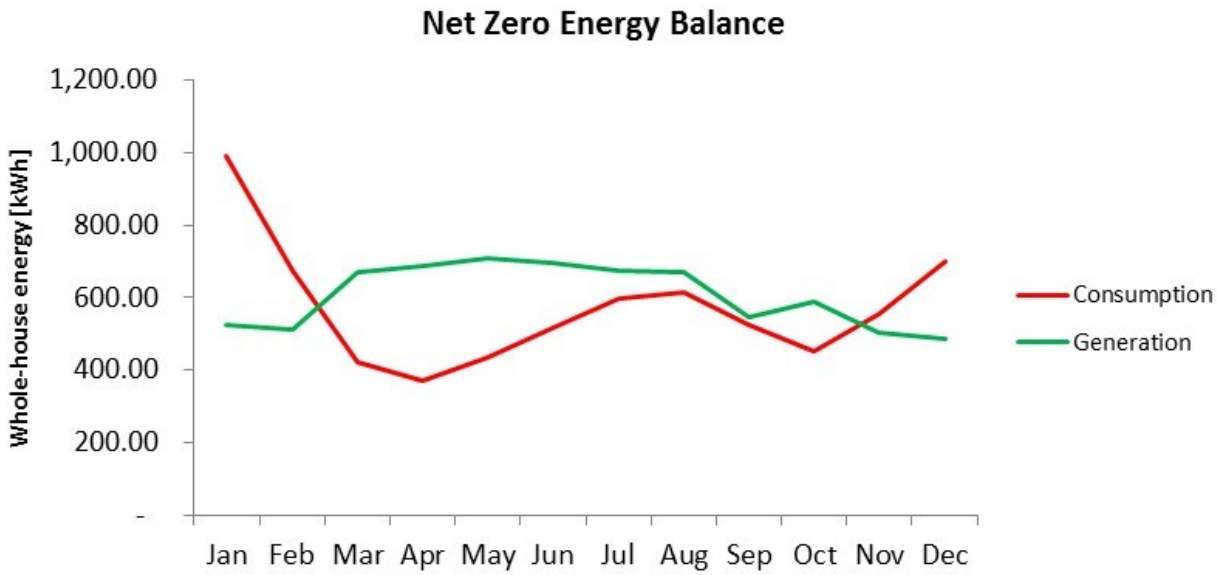
WINTER SHADING AT 10AM AND 5PM





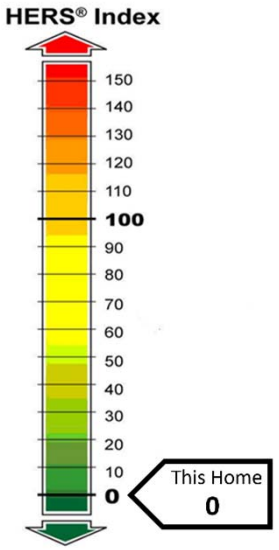
SUMMER SHADING AT 10AM AND 5PM

Solar Energy – WHAT IS THE CONSUMPTION AND GENERATION?



Month	PVWatts (kWh)	SAM (kWh)
Jan	487	525
Feb	529	511
Mar	648	670
Apr	734	688
May	725	709
Jun	679	694
Jul	688	672
Aug	687	668
Sep	600	547
Oct	664	590
Nov	525	503
Dec	471	487
Annual	7,438	7,267

ESTIMATED ONSITE PV GENERATION



WITH ONSITE PV GENERATION

Affordability – HOW MUCH DOES THE HOUSE COST?

FINANCING		
Inicial value	$337.263,00	
Down Payment	$67.452,54	20% of Value
Loan value	$269.810,18	
Period	30	Years
	360	No of payments
Interest	4.50%	APR
	0.38%	Monthtly interest
Payment	$1.367,09	
Principal	$355,30	
Interest	$1.011,79	
Financing Cost	$364.243,74	

FINANCIAL KEY POINTS	
Total cost	**$337.262,72**
Cost per sq ft	$203,66
Homeownership affordability	**35.45%**
Utilities	
Energy	$66,00
Water	$1.205,52

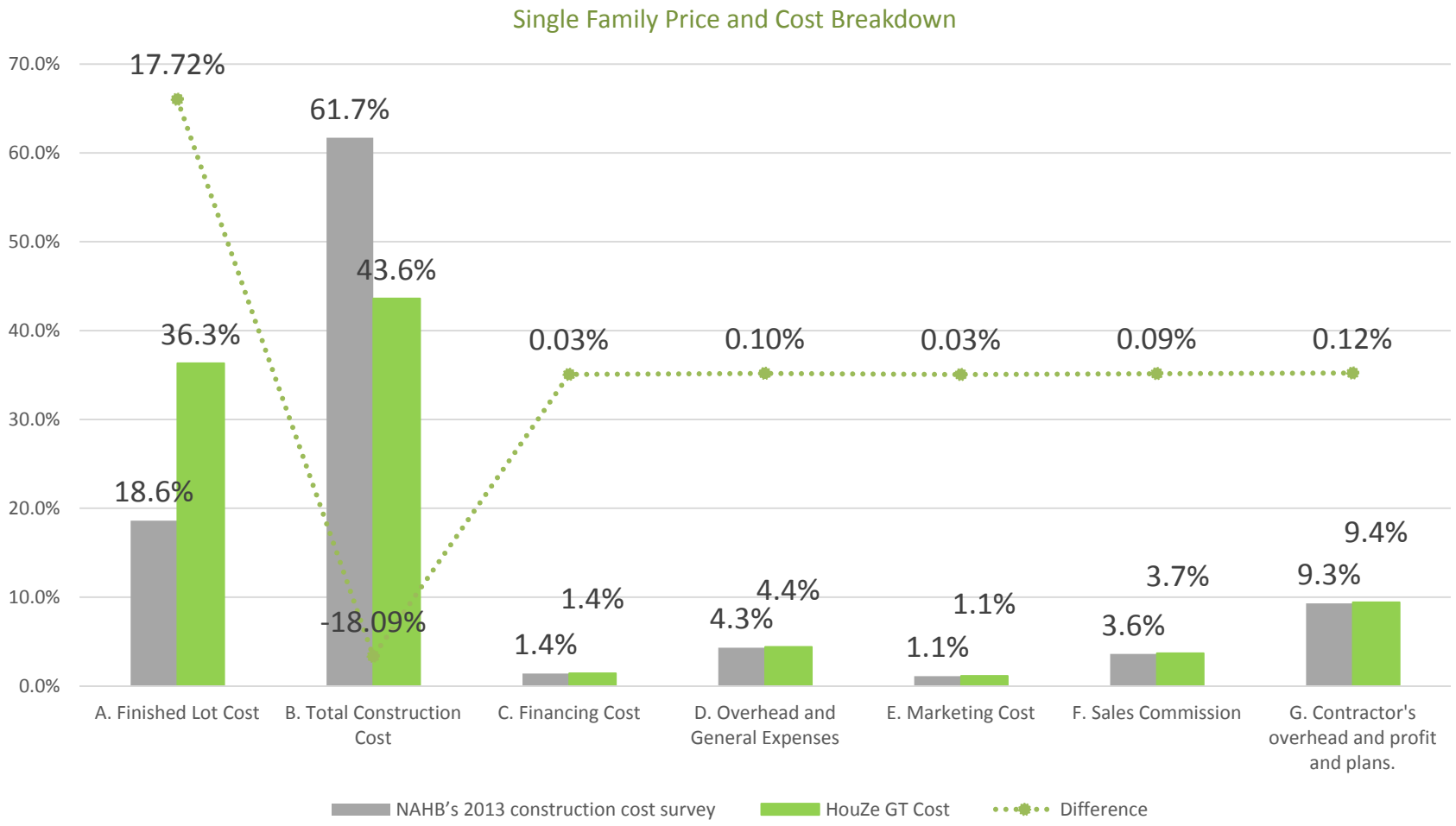
Bank of America
NMLS 399802

Loan details

Loan product	30 year fixed
Interest rate	3.875%
APR	3.932%
Payment (principal & interest)	$1,269
Loan amount	$269,810
Down payment	$67,453
Quote ID	ZQ-LDDDFKKX

SINGLE FAMILY PRICE AND COST BREAKDOWNS					
	NAHB's 2013 construction cost survey**		HouZe GT Cost		
	Average Lot Size:	14,359 sq ft	HouZe GT Lot Size:	4,209 sq ft	
	Average Finished Area:	**2,607 sq ft**	HouZe GT Finished Area:	**1,656 sq ft**	
I. Sale Price Breakdown	Average	Share of Price	GT Home	Share of Price	% Difference
A. Finished Lot Cost	**$74,509**	**18.60%**	**$122.500,00**	**36.32%**	**17.72%**
B. Total Construction Cost	**$246,453**	**61.70%**	**$147.074,34**	**43.61%**	**-18.09%**
C. Financing Cost	$5,479	1.40%	$4.834,38	1.43%	0.03%
D. Overhead and General Expenses	$17,340	4.30%	$14.848,00	4.40%	0.10%
E. Marketing Cost	$4,260	1.10%	$3.798,00	1.13%	0.03%
F. Sales Commission	$14,235	3.60%	$12.431,00	3.69%	0.09%
G. Contractor's overhead and profit and plans.	$37,255	9.30%	$31.777,00	9.42%	0.12%
Total Sales Price	**$399,532**	100%	**$337.262,72**	100%	

Single Family Price and Cost Breakdown – HOW DO WE COMPARE TO AN AVERAGE SINGLE FAMILY HOUSE?



* Source NAHB's 2013 construction cost survey

Market Research – WHAT IS THE COST PER SQFT IN OUR NEIGHBOURHOOD?

* Source www.zillow.com – Jan 23/2015

Year built	Cost per sqft
1920	$193,91
1920	$211,72
1997	$190,91
1920	$214,81
1920	$214,73
1920	$184,33
1920	$284,57
Average	**$213,57**
HouZe GT (2015)	**$203,66**

HouZe GT

By Zeroes

U.S. DEPARTMENT OF ENERGY RACE TO ZERO STUDENT DESIGN COMPETITION