GREEN ARCHITECTS' LOUNGE

presents

Sprout Follies

www.GreenBuildingAdvisor.com

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KAPLAN THOMPSON ARCHITECTS
424 FORE ST. PORTLAND, MAINE
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phil@kaplanthompson.com

YOU MAY BE NEW AT THIS.


EVERYBODY HAS A GREEN
BROCHURE


Smaller Cap = Less Plastic
Did you notice this bottle has an Eco-Slim cap? This is part of our ongoing effort to reduce our impact on the environment. This bottle and cap contain an average of 20% less plastic than our original 500 mL Eco-Shape® bottle and cap. Be Green.
WARNING: Cap is a small part and poses a CHOKING HAZARD, particularly for children.
WE CAN ALL MAKE A DIFFERENCE
PLEASE RECYCLE

Everybody.

…and I mean, everybody.

…seriously, everybody.

WASHET & SPONGEM ARCHITECTS

HOME | ABOUT US | SERVICES | GALLERY | GREEN | CONTACT US

DESIGN EXCELLENCE

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam neque nisi, interdum ac porta non, condimentum eu tellus. Nunc rhoncus sem quis metus cursus sagittis....

1

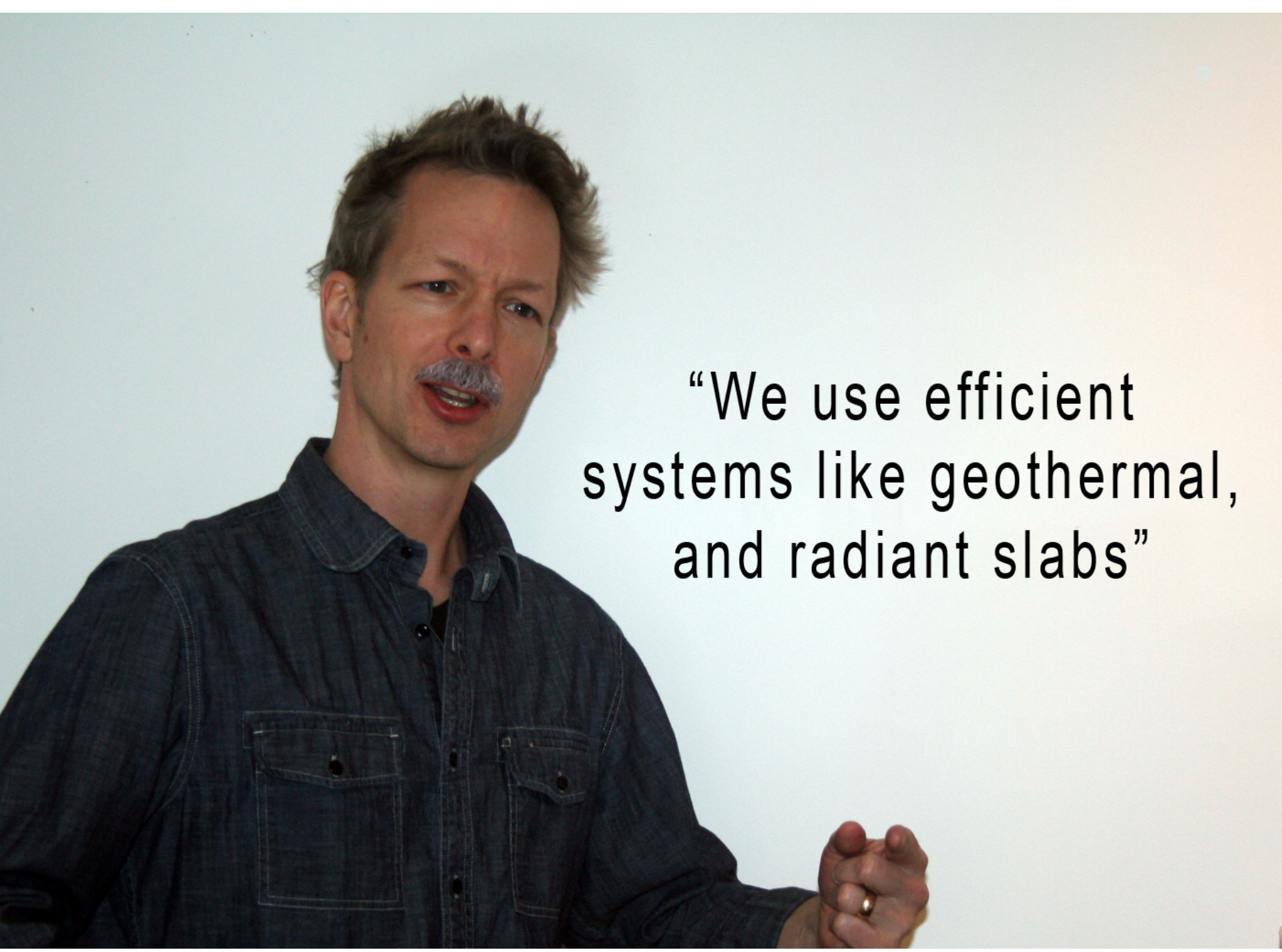
PELLENTESQUE A EST FELIS
MODERN

MORBI SIT AMET TELLUS
COMMERCIAL

FUSCE NULLA NISL
RESIDENTIAL


“Our houses breathe
naturally”

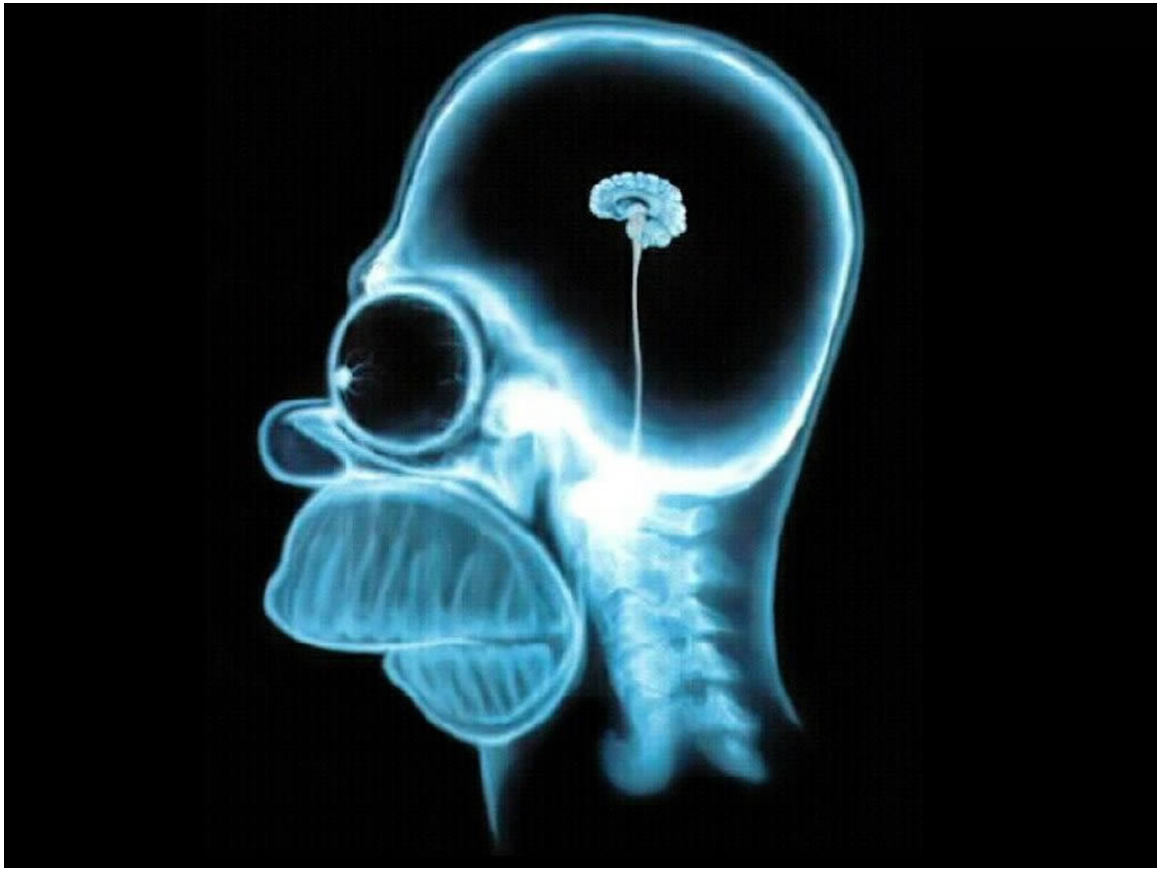

“We’re green experts. We use the LEEDS system”


“We use efficient
systems like geothermal,
and radiant slabs”


“We use SIP panels for our walls and roofs, and spray foam for those tricky spots”

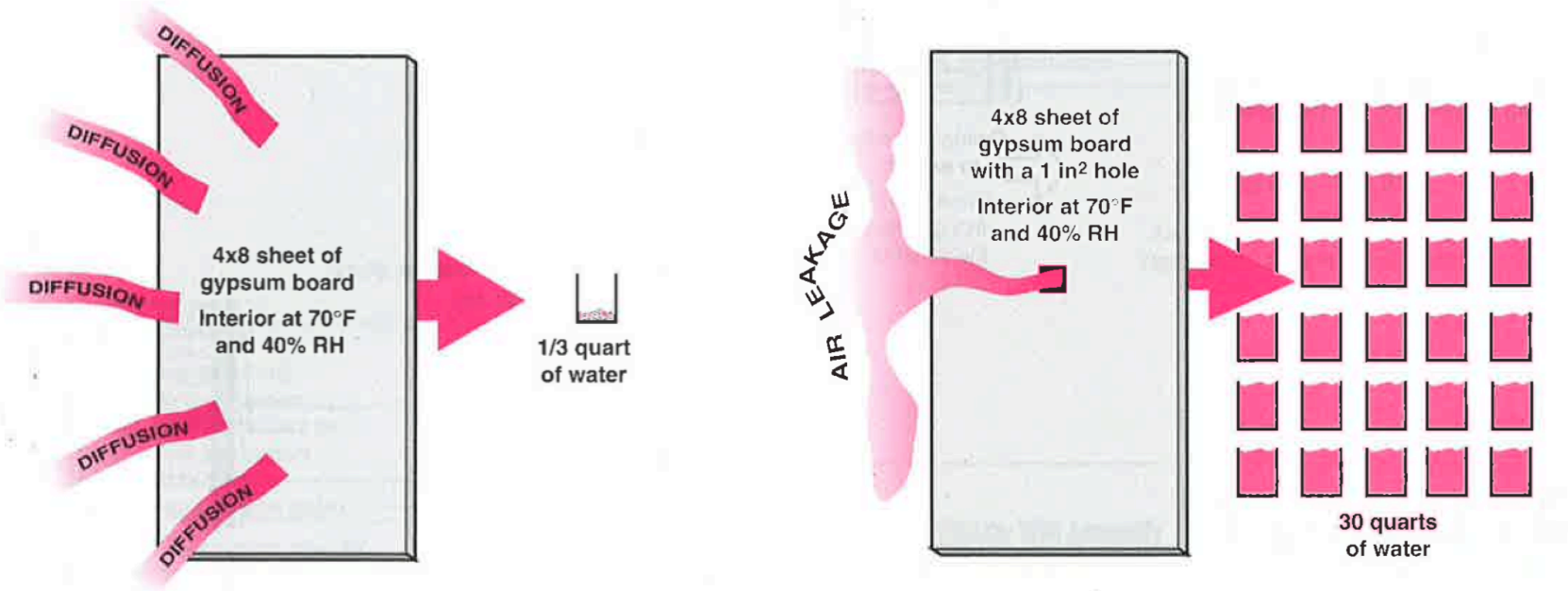

“We use the highest
quality low-e windows,
like Marvin and Pella”


“We advocate for solar panels for all of our houses.”



FIX THE “MOUTH TO BRAIN” RATIO.
SEEK KNOWLEDGE, SEEK ADVICE, EXERCISE THAT BRAIN!

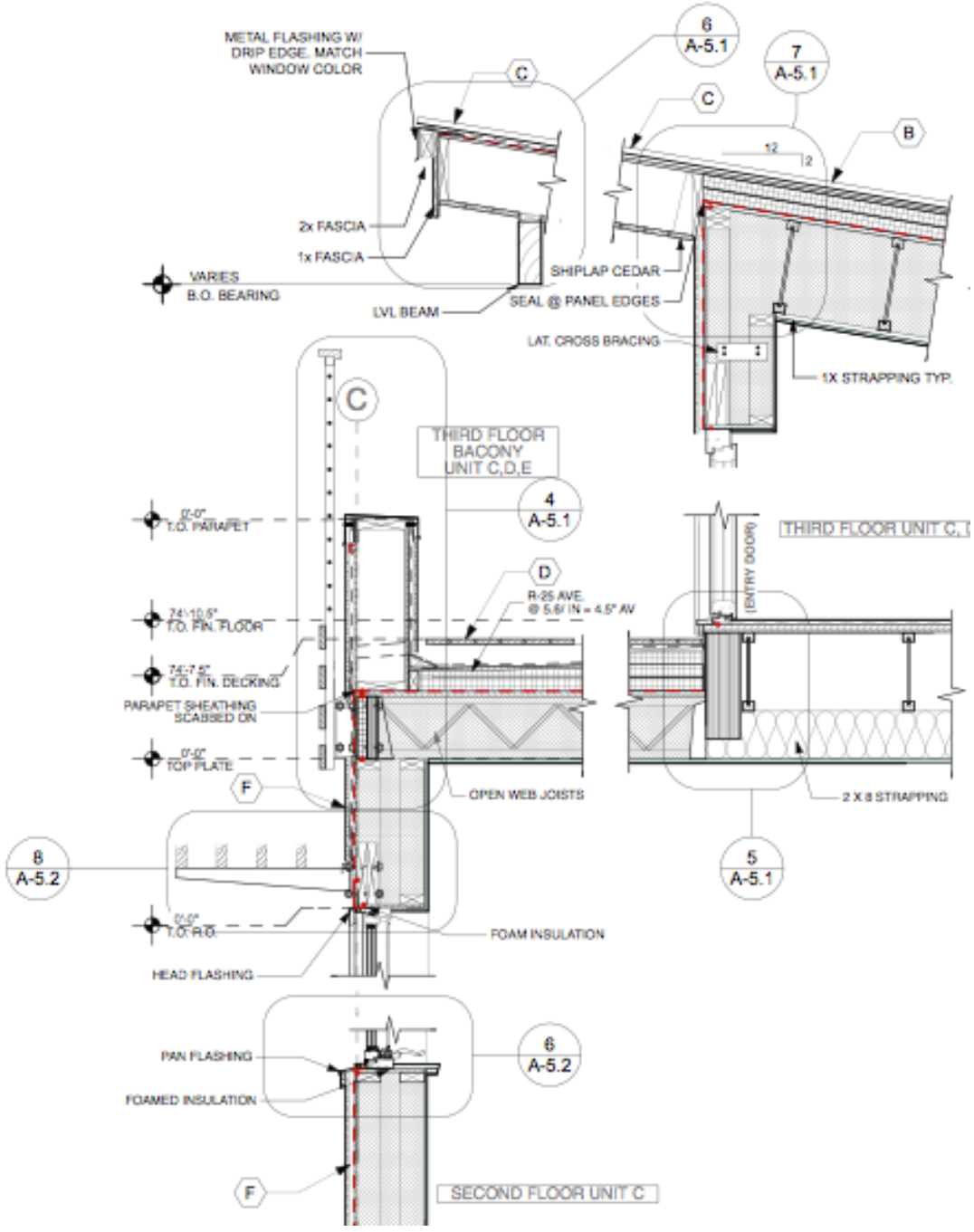
15 TOP TEN THINGS NOT TO BLOW

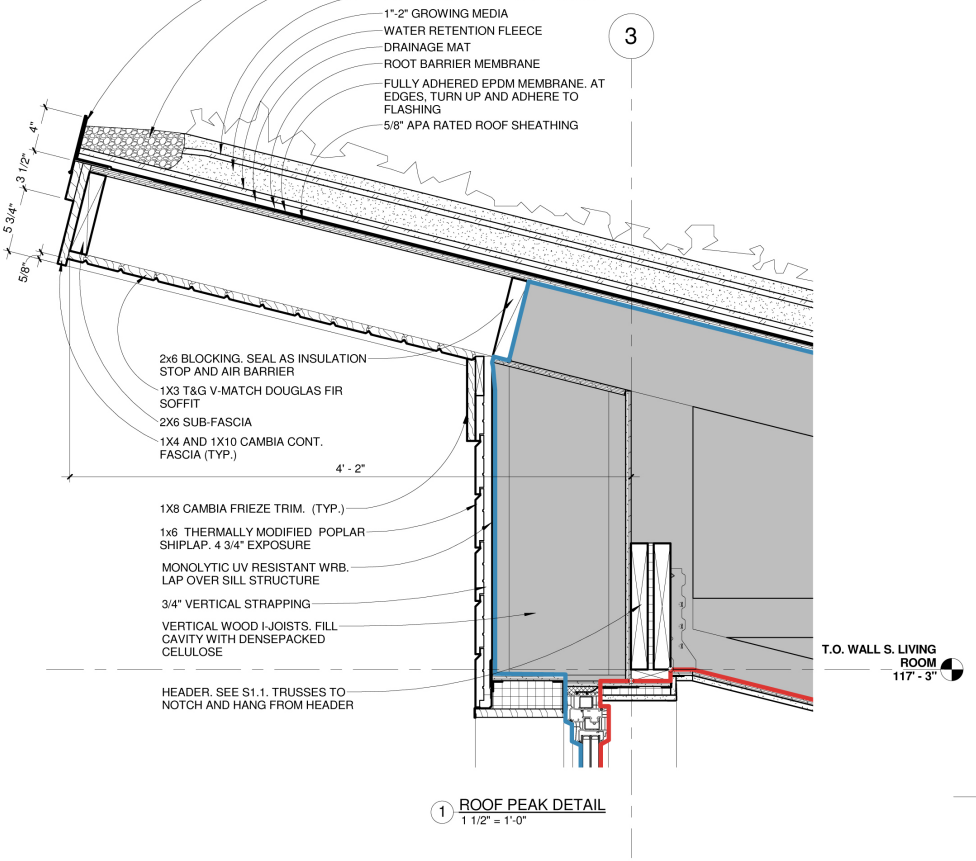


1. Don’t be an Airhole!

Image courtesy of Building Science Press

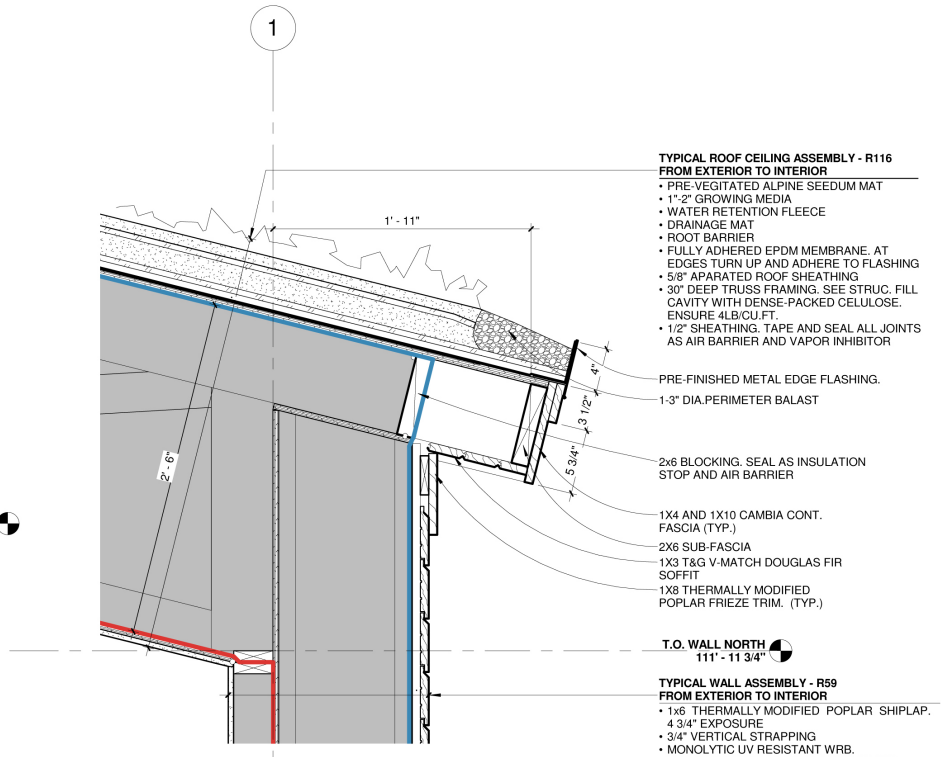

ROOF AND WALL


METAL FLASHING W/ DRIP EDGE, MATCH WINDOW COLOR
C
6
A-5.1
7
A-5.1
C
B
12
2
2x FASCIA
1x FASCIA
VARIES
B.O. BEARING
LVL BEAM
SHIPLAP CEDAR
SEAL @ PANEL EDGES
LAT. CROSS BRACING
1X STRAPPING TYP.
C
THIRD FLOOR
BACONY
UNIT C,D,E
4
A-5.1
0'-0"
T.O. PARAPET
D
R-25 AVE.
@ 5.6/ IN = 4.5" AV
74'-10.5"
T.O. FIN. FLOOR
74'-7.5"
T.O. FIN. DECKING
PARAPET SHEATHING
SCABBED ON
0'-0"
TOP PLATE
F
OPEN WEB JOISTS
THIRD FLOOR UNIT C, D
(ENTRY DOOR)
2 X 8 STRAPPING
8
A-5.2
5
A-5.1
0'-0"
T.O. R.O.
FOAM INSULATION
HEAD FLASHING
PAN FLASHING
FOAMED INSULATION
6
A-5.2
F
SECOND FLOOR UNIT C



1 ROOF PEAK DETAIL
1 1/2" = 1'-0"

VAPOR INFITRATION BARRIER
AIR INFILTRATION BARRIER



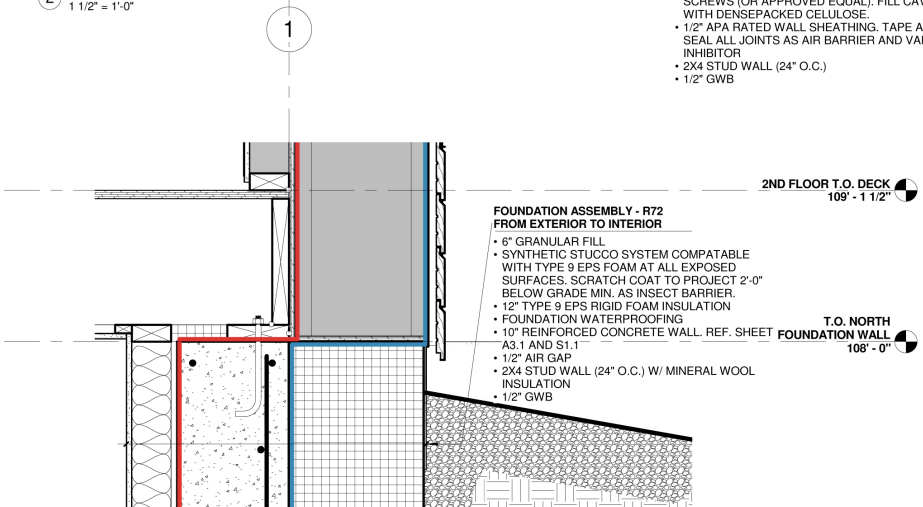
TYPICAL ROOF CEILING ASSEMBLY - R116
FROM EXTERIOR TO INTERIOR

- PRE-VEGITATED ALPINE SEEDUM MAT
- 1"-2" GROWING MEDIA
- WATER RETENTION FLEECE
- DRAINAGE MAT
- ROOT BARRIER
- FULLY ADHERED EPDM MEMBRANE. AT EDGES TURN UP AND ADHERE TO FLASHING
- 5/8" APARATED ROOF SHEATHING
- 30" DEEP TRUSS FRAMING. SEE STRUC. FILL CAVITY WITH DENSE-PACKED CELULOSE. ENSURE 4LB/CU.FT.
- 1/2" SHEATHING. TAPE AND SEAL ALL JOINTS AS AIR BARRIER AND VAPOR INHIBITOR

TYPICAL WALL ASSEMBLY - R59
FROM EXTERIOR TO INTERIOR

- 1x6 THERMALLY MODIFIED POPLAR SHIPLAP. 4 3/4" EXPOSURE
- 3/4" VERTICAL STRAPPING
- MONOLYTIC UV RESISTANT WRB.
- VERTICAL WOOD I-JOISTS. ALIGN W/ AND FASTEN TROUGH TO STUDS W/ 4" GRK RSS SCREWS (OR APPROVED EQUAL). FILL CAVITY WITH DENSEPACKED CELULOSE.
- 1/2" APA RATED WALL SHEATHING. TAPE AND SEAL ALL JOINTS AS AIR BARRIER AND VAPOR INHIBITOR
- 2X4 STUD WALL (24" O.C.)
- 1/2" GWB

2 ROOF EAVE DETAIL
1 1/2" = 1'-0"



FOUNDATION ASSEMBLY - R72
FROM EXTERIOR TO INTERIOR

- 6" GRANULAR FILL
- SYNTHETIC STUCCO SYSTEM COMPATABLE WITH TYPE 9 EPS FOAM AT ALL EXPOSED SURFACES. SCRATCH COAT TO PROJECT 2'-0" BELOW GRADE MIN. AS INSECT BARRIER.
- 12" TYPE 9 EPS RIGID FOAM INSULATION
- FOUNDATION WATERPROOFING
- 10" REINFORCED CONCRETE WALL. REF. SHEET A3.1 AND S1.1
- 1/2" AIR GAP
- 2X4 STUD WALL (24" O.C.) W/ MINERAL WOOL INSULATION
- 1/2" GWB

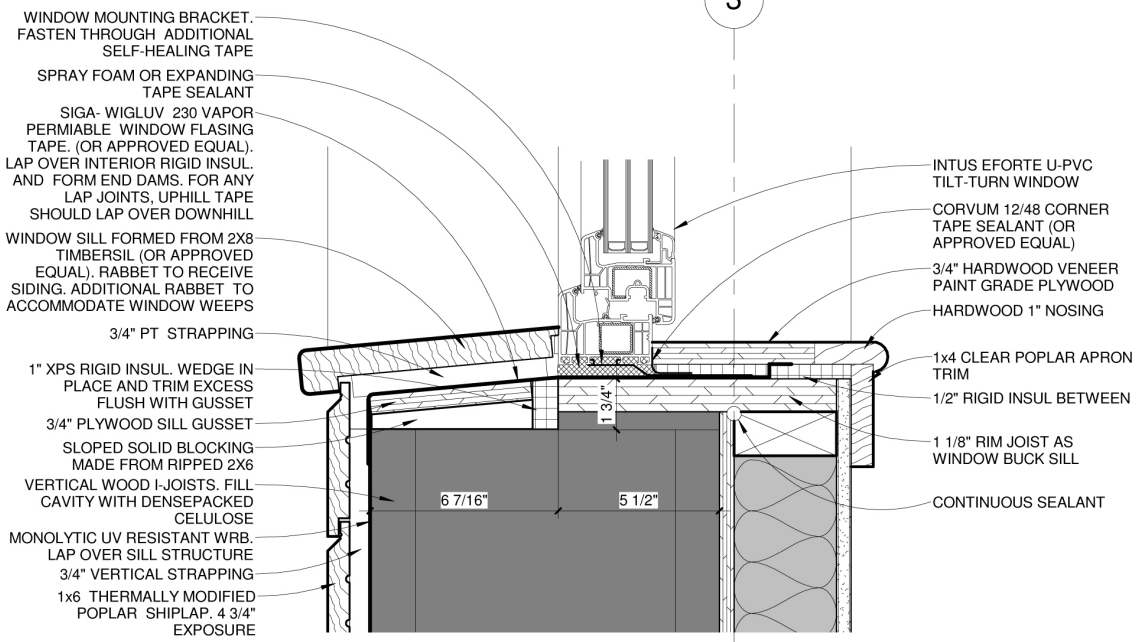
2. Raise your glass

	BIEBER PASSIVA	SCHMELLA TRIPPLE PANE	SCHMANDERSEN 400	
U-FACTOR- GLASS	0.106	0.171	0.30	(Btu/hr · ft^2 F°)
U-FACTOR- FRAME	0.13	0.35	?	(Btu/hr · ft^2 F°)
SHGC	0.62	0.55	0.48	
VT	0.73	0.69	0.54	

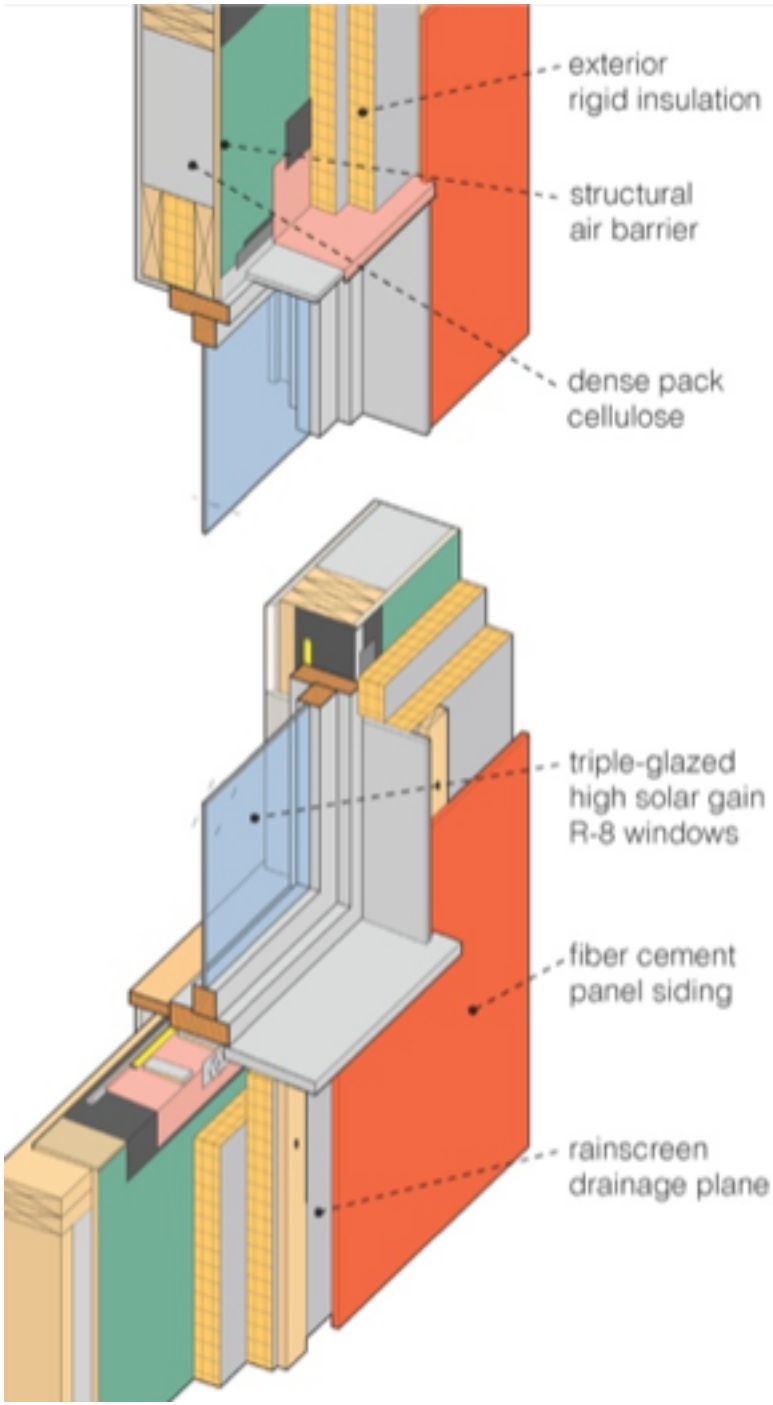
CARDINAL
Glass Industries

3. Don’t cross that bridge when you come to it

3



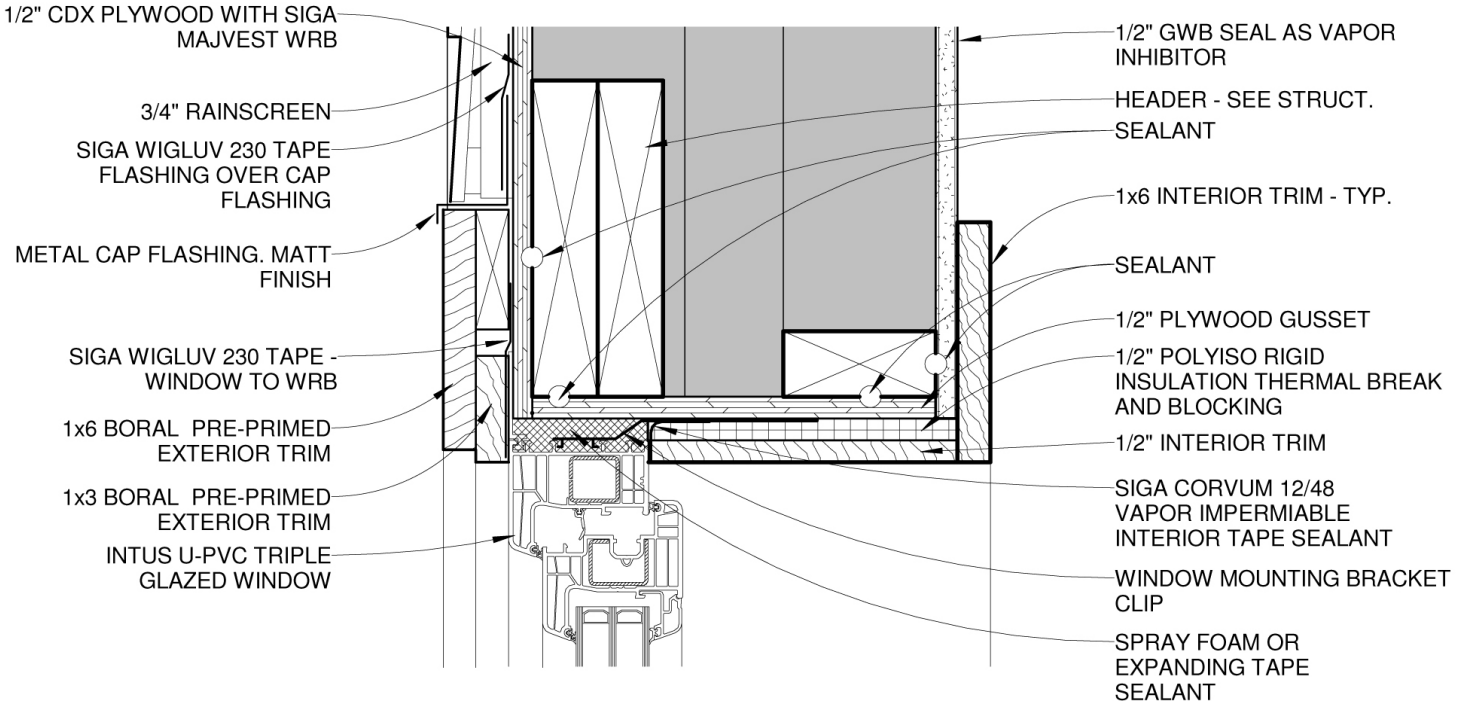
1 TYPICAL WINDOW SILL DETAIL
3" = 1'-0"


exterior
rigid insulation
structural
air barrier
dense pack
cellulose
triple-glazed
high solar gain
R-8 windows
fiber cement
panel siding
rainscreen
drainage plane

4. Belt, suspenders and clean underwear

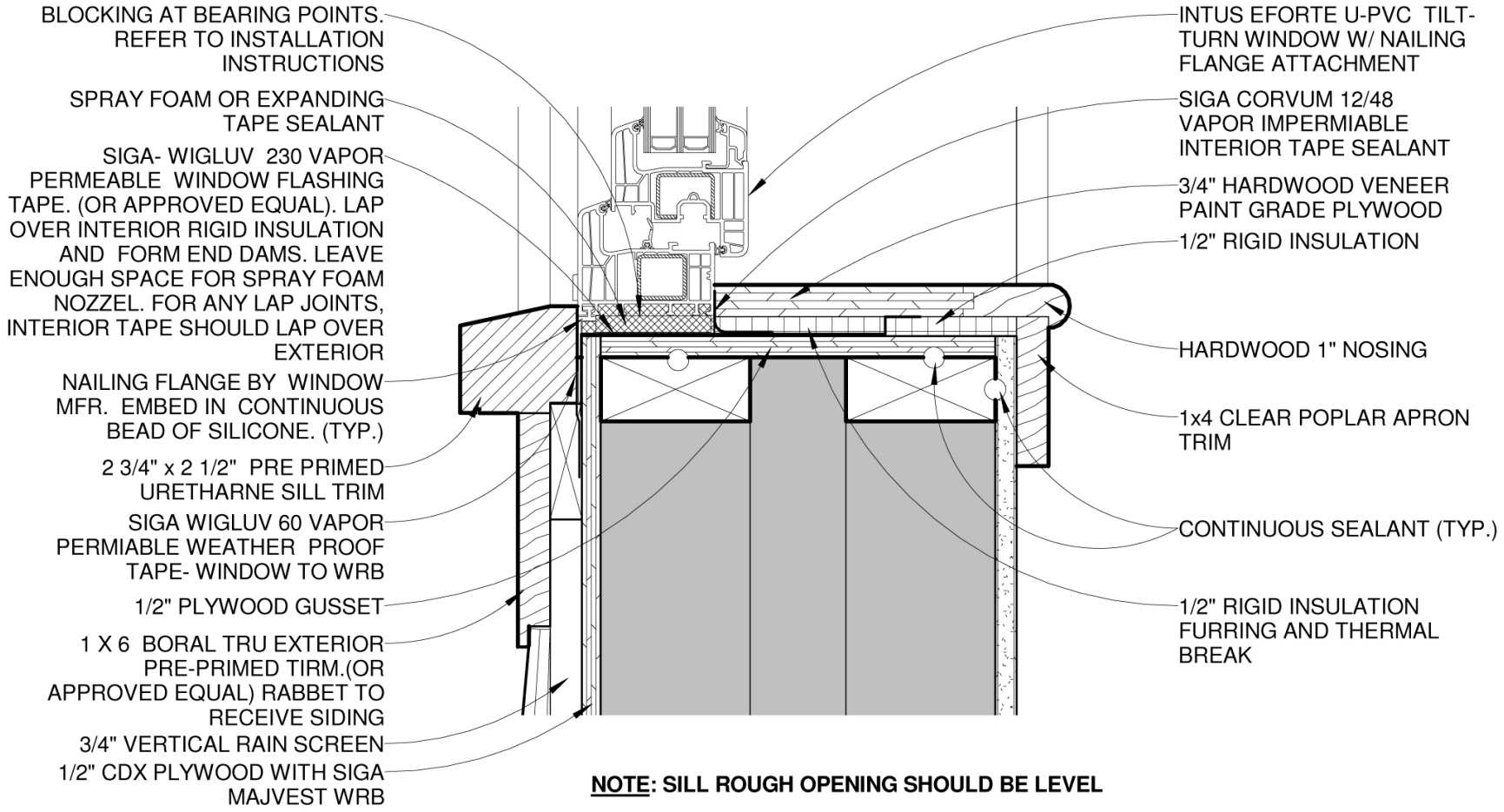
(a.k.a. redundancy and redundancy)


StraightFlash



1 MGBS WINDOW HEAD DETAIL

3" = 1'-0"

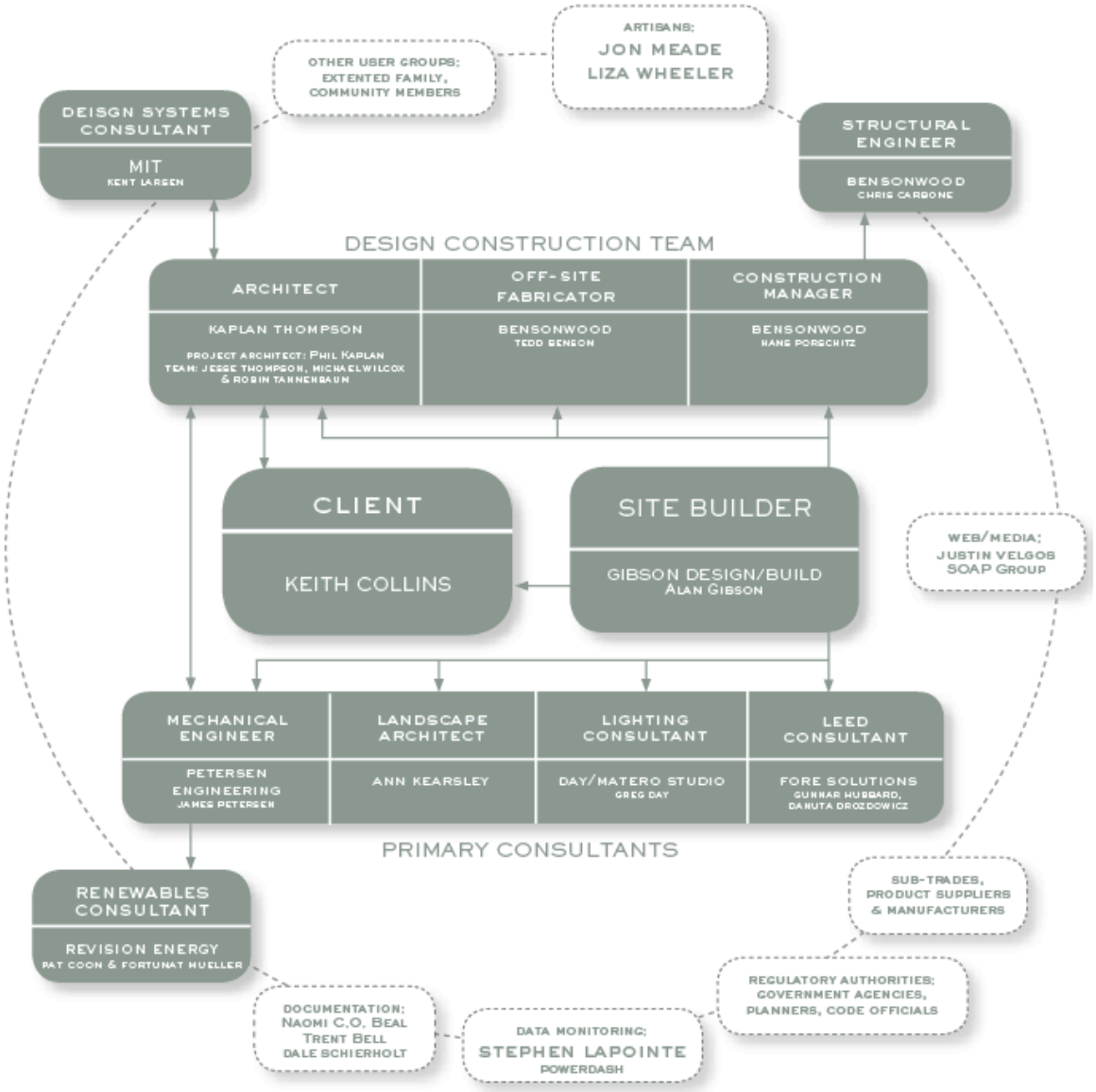


NOTE: SILL ROUGH OPENING SHOULD BE LEVEL

1 MGBS WINDOW SILL DETAIL
3" = 1'-0"

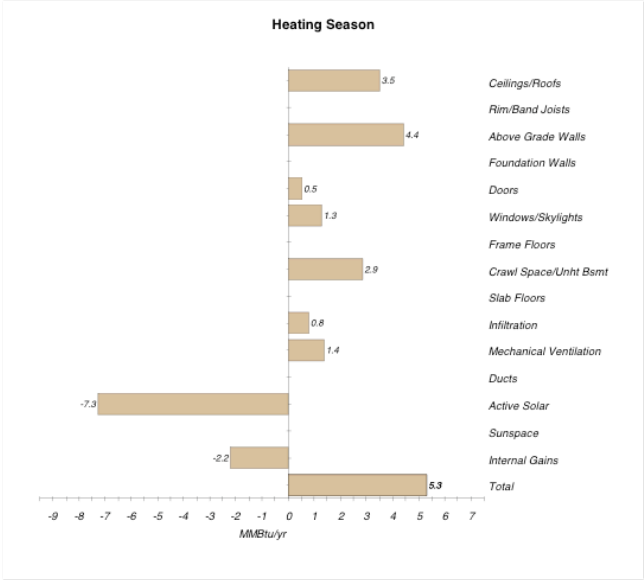
5. Group hug!

(a.k.a. Don’t wait to integrate)


ARTISANS:
JON MEADE
LIZA WHEELER
OTHER USER GROUPS:
EXTENTED FAMILY,
COMMUNITY MEMBERS
DEISGN SYSTEMS CONSULTANT
MIT
KENT LARSEN
STRUCTURAL ENGINEER
BENSONWOOD
CHRIS CARBONE
DESIGN CONSTRUCTION TEAM
ARCHITECT
KAPLAN THOMPSON
PROJECT ARCHITECT: PHIL KAPLAN
TEAM: JESSE THOMPSON, MICHAEL WILCOX & ROBIN TANNENBAUN
OFF-SITE FABRICATOR
BENSONWOOD
TEDD BENSON
CONSTRUCTION MANAGER
BENSONWOOD
HANS PORSCHITZ
CLIENT
KEITH COLLINS
SITE BUILDER
GIBSON DESIGN/BUILD
ALAN GIBSON
WEB/MEDIA:
JUSTIN VELGOS
SOAP GROUP
MECHANICAL ENGINEER
PETERSEN ENGINEERING
JAMES PETERSEN
LANDSCAPE ARCHITECT
ANN KEARSLEY
LIGHTING CONSULTANT
DAY/MATERO STUDIO
GREG DAY
LEED CONSULTANT
FORE SOLUTIONS
GUNNAR HUBBARD,
DANUTA DROZDOWICZ
PRIMARY CONSULTANTS
RENEWABLES CONSULTANT
REVISION ENERGY
PAT COON & FORTUNAT MUELLER
SUB-TRADES,
PRODUCT SUPPLIERS
& MANUFACTURERS
REGULATORY AUTHORITIES:
GOVERNMENT AGENCIES,
PLANNERS, CODE OFFICIALS
DOCUMENTATION:
NAOMI C.O. BEAL
TRENT BELL
DALE SCHIERHOLT
DATA MONITORING:
STEPHEN LAPOINTE
POWERDASH

COMPONENT LOAD SUMMARY

Date:	December 29, 2008	Rating No.:	
Building Name:	AS BUILT	Rating Org.:	HORIZON-RES
Owner's Name:	KEITH COLLINS	Phone No.:	207-221-3221
Property:	181 MILL ST	Rater's Name:	DAVID MILLIKEN
Address:	ROCKPORT, ME 04563	Rater's No.:	HRES-04
Builder's Name:	BENSONWOOD/GIBSON		
Weather Site:	Bangor, ME	Rating Type:	Based On Plans
File Name:	BRIGHTBUILT-03-P.blg	Rating Date:	02/21/2008



REM/Rate - Residential Energy Analysis and Rating Software v12.6

6. Do your modeling <u>before</u> the runway

Passive House Verification

Photo or Drawing

Building:	Normand Residence
Location and Climate:	PHI/NASA Saco Maine
Street:	18 Edgewater Lane
Postcode/City:	Saco, Maine
Country:	
Building Type:	
Home Owner(s) / Client(s):	Roger & Lynn Normand
Street:	18 Edgewater Lane
Postcode/City:	Saco, Maine
Architect:	Green Design Studio
Street:	
Postcode/City:	
Mechanical System:	
Street:	
Postcode/City:	
Year of Construction:	2012
Number of Dwelling Units:	1
Enclosed Volume V_e:	1622.0 m³
Number of Occupants:	9.3
Interior Temperature:	20.0 °C
Internal Heat Gains:	2.1 W/m²

no standard climate

Calculation Electricity / Internal Heat Gains

Building Type: Residential Building

Internal Heat Gains

Utilization Pattern: Residential building

Type of Values Used: Standard

Planned Number of Occupants:

7 Verification

Verification: Monthly method

Specific Space Heating Demand, Annual Method	15.4
Specific Space Heating Demand, Monthly Method	14.7

Specific Demands with Reference to the Treated Floor Area

Treated Floor Area: 326.9 m²

	Applied:	Monthly method	PH Certificate:	Fulfilled?
Specific Space Heating Demand:	15	kWh/(m²a)	15 kWh/(m²a)	Yes
Heating Load:	12	W/m²	10 W/m²	
Pressurization Test Result:	0.6	h⁻¹	0.6 h⁻¹	Yes
Specific Primary Energy Demand (DHW, Heating, Cooling, Auxiliary and Household Electricity):	76	kWh/(m²a)	120 kWh/(m²a)	Yes
Specific Primary Energy Demand (DHW, Heating and Auxiliary Electricity):	30	kWh/(m²a)		
Specific Primary Energy Reduction through Solar Electricity:		kWh/(m²a)		
Frequency of Overheating:		%	over 25 °C	
Specific Useful Cooling Energy Demand:	3	kWh/(m²a)	15 kWh/(m²a)	Yes
Cooling Load:	6	W/m²		

We confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The calculations with PHPP are attached to this application.

Issued on:

signed:

BUILDING ELEMENTS

VENTILATION

EXHAUST ONLY

x HRV OR ERV — 83% % EFFICIENT

AIR TIGHTNESS

0.60 ACH50:

R- VALUES

52	WALLS	TYPE: Wall: Double Stud 12"
101	ROOF	TYPE: Roof: TRUSS w cellulose
0	SUSPENDED FLOORS	TYPE:
0	BASEMENT WALLS	TYPE:
36	SLABS	TYPE: Slab on Grade, 4" XPS

WINDOWS & DOORS

WINDOWS

	SHGC:	0.56
GLASS 7.69	U-VALUE:	0.13
FRAME 6.69	U-VALUE:	0.15
TOTAL 5.87	**U-VALUE:**	**0.17**

SOLID DOORS

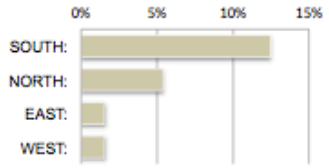
9.00 U-VALUE: 0.11

GLAZED DOORS

GLASS	SHGC:	0.56
GLASS 7.69	U-VALUE:	0.13
FRAME 6.69	U-VALUE:	0.15
TOTAL 5.87	**U-VALUE:**	**0.17**

GLAZING % OF TFA

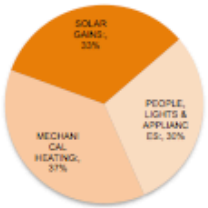
12%	SOUTH:
5%	NORTH:
2%	EAST:
2%	WEST:



PEAK LOAD	***21,120***	BTU / HOUR	(EQUIP SIZING)
PEAK LOAD PER UNIT	**2,347**		
PRIMARY ENERGY	***31.24***	kBTU / SF / YEAR	(TOTAL DAMAGE)
SITE ENERGY	***4.56***	kBTU / SF / YEAR	(LOCAL DAMAGE)
PV TO BE NET-ZERO	***19.42***	KW	
PV PANELS NEEDED	84	1,055 SF OF PV	
ANNUAL HEATING	***4.73***	kBTU / SF / YEAR	(TOTAL HEATING)
ANNUAL COOLING		kBTU / SF / YEAR	(TOTAL COOLING)
WINDOW ENERGY	***488***	KBTU / YEAR	(ENERGY + OR -)

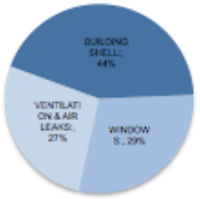
HEAT GAINS

SOLAR GAINS:	***33%***
PEOPLE, LIGHTS & APPLIANCES:	***30%***
MECHANICAL HEATING:	***37%***



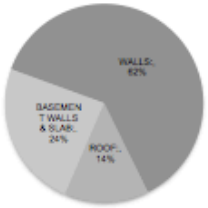
HEAT LOSS

BUILDING SHELL:	***44%***
WINDOWS:	***29%***
VENTILATION & AIR LEAKS:	***27%***



SHELL LOSSES

WALLS:	***62%***
ROOF:	***14%***
BASEMENT WALLS & SLAB:	***24%***



Thomaston Sail Lofts

SCHEME A: PASSIVHAUS

CLIMATE LOCATION: *THOMASTON, ME*

TFA: *5,670*

US SF: *6,480*

Wesolowski Residence
Summarry of energy model and system options:
29-Aug-12

GREEN DESIGN STUDIO

	1. Ductless min-split system	2. Ductless mini-split w/ Propane DHW	3. Ductless mini-split w/ HP DHW	4. Ductless mini-split w/ HP DHW. And PV Solar	5. Ductless mini-split w/ HP DHW. And PV Solar And Solar Hot Water	6. Ductless mini-split. And Solar Hot Water
	(2) Mitsubishi Hyper Heat Ductless Split Heat Pumps. COP= 2.5-3.0. .94 EF. Marathon HW tank	(2) Mitsubishi Hyper Heat Ductless Split Heat Pumps. COP= 2.5-3.0. - Rinnai Continuum Propane thru-wall	(2) Mitsubishi Hyper Heat Ductless Split Heat Pumps. COP= 2.5-3.0. - 2.4 EF. Voltex Heat Pump, 60 gal,	(2) Mitsubishi Hyper Heat Ductless Split Heat Pumps. COP= 2.5-3.0. - 2.4 EF. Voltex Heat Pump, 60 gal, - 2.88 KW Solar system	(2) Mitsubishi Hyper Heat Ductless Split Heat Pumps. COP= 2.5-3.0. - 2.4 EF. Voltex Heat Pump, 60 gal, - 2.88 KW Solar system - (2) Wagner Solar HW Flat Plate Collectors	(2) Mitsubishi Hyper Heat Ductless Split Heat Pumps. COP= 2.5-3.0. - 2.4 EF. Voltex Heat Pump, 60 gal, - 2.88 KW Solar system - (2) Wagner Solar HW Flat Plate Collectors
Demand:						
Component Load - Heating (MMBtu/yr.)	19.4	19.4	19.4	19.4	19.4	19.4
Component Load - Hot Water (MMBtu/yr.)	14.6	14.6	14.6	14.6	14.6	14.6
Design Day Load Heating (kBtu/hr)	15.2	15.2	15.2	15.2	15.2	15.2
Design Day Load Cooling (kBtu/hr)	109	109	109	109	109	109
Consumption						
Component Consumption Heating (MMBtu/yr.)	11.6	11.6	11.6	11.6	11.6	11.6
Component Consumption - Hot Water (MMBtu/yr.)	14.9	14.9	14.9	14.9	14.9	14.9
Heating Consumption (kWh)	3,139	3,139	3,139	3,139	3,139	3,139
Cooling Consumption (kWh)	673	673	673	673	673	673
Domestic Hot Water Consumption (kWh)	4,360	0	**1,668**	1,668	**0**	**0**
Domestic Hot Water Consumption (gal)		**163**				
Lighting & Appliances (kWh)	5,896	5,896	5,896	5,896	5,896	5,896
Capacity of Heat system BTU/hr	18,000	18,000	18,000	18,000	18,000	18,000
Estimated Renewable (MMBtu/yr)	0	0	0	0	12.6	12.6
Estimated Renewable (Kw/hr)	0	0	0	3,839	3,839	3,839
Estimated HERS Rating (lower is better) Standard ASHREA house =100 Energy Star = 80	43	35	36	?	?	?
Combustion Free	YES	NO	YES	YES	YES	YES
Annual Operating Cost						
Total Estimated Annual Energy Cost for Heating, DHW, L&A: Propane @ 3.25/gal and Elec. @ $0.15/kwh	**$ 2,009**	**$ 1,926**	**$ 1,605**	**$ 1,030**	**$ 779**	**$ 1,355**
Total Estimated Annual Energy Cost for Cooling: Propane @ 3.25/gal and Elec. @ $0.15/kwh	$ 101	$ 101	$ 101	$ 101	$ 101	$ 101
System Installation Cost						
Heat Sorce System:	$ 9,446	$ 9,446	$ 9,446	$ 9,446	$ 9,446	$ 9,446
Hot Water system	$ 1,200	$ 2,600	$ 2,350	$ 2,350		
Distribution	$ -	$ -	$ -	$ -	$ -	$ -
ERV	$ 3,200	$ 3,200	$ 3,200	$ 3,200	$ 3,200	$ 3,200
Supplemental (towel warmers)	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100
Solar PV	$ -	$ -	$ -	$ 10,931	$ 10,931	
Solar DHW	$ -	$ -	$ -	$ -	$ 10,565	$ 10,565
Total:	**$ 14,946**	**$ 16,346**	**$ 16,096**	**$ 27,027**	**$ 35,242**	**$ 24,311**
Tax Credits Rebates available						
30% Fed Tax Credit for Solar	$ -	$ -	$ -	$ 3,279	$ 6,449	$ 3,170
Additional 25% Efficiency Maine	$ -	$ -	$ -	$ 1,913	$ 2,000	$ 1,849
Total Savings	**$ -**	**$ -**	**$ -**	**$ 5,192**	**$ 8,449**	**$ 5,018**

Total net cost of system:	**$ 14,946**	**$ 16,346**	**$ 16,096**	**$ 21,835**	**$ 26,793**	**$ 19,293**

Wesolowski - Solar PV and Solar Hot Water Comparison

12 Panel Solar PV and Voltex Heat Pump Hot Water Heater						
	Heating - kWh	Cooling - kWh	Hot Water - kWh	Lights and Appliances - kWh **	PV Solar Offset - kWh	Total
Annual Load / Demand	3396	440	1668	5896	-3839	**7561**
Annual Cost at $0.135 / kWh*	$458.46	$59.40	$225.18	$795.96	-$518.27	**$1,020.74**

12 Panel Solar PV and Solar Hot Water System						
	Heating - kWh	Cooling - kWh	Hot Water - kWh	Lights and Appliances - kWh **	PV Solar Offset - kWh	Total
Annual Load / Demand	3396	440	703	5896	-3839	**6596**
Annual Cost at $0.135 / kWh*	$458.46	$59.40	$94.91	$795.96	-$518.27	**$890.46**

Additional PV pannels	3	<--Add panels to see affect on installation cost and annual savings
Additional install cost	$1,914	<--

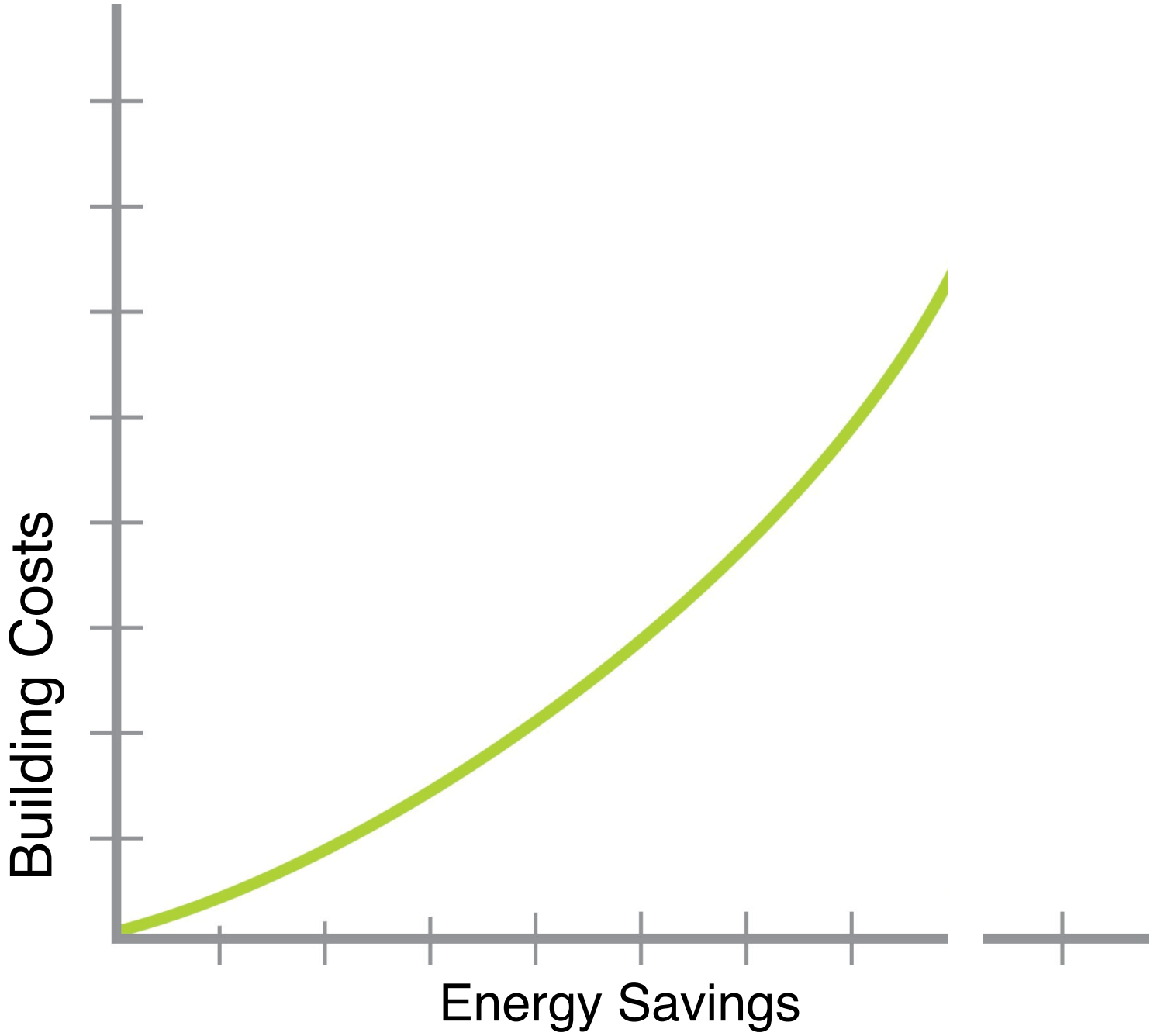
12 Panel Solar PV and Voltex Heat Pump Hot Water Heater						
	Heating - kWh	Cooling - kWh	Hot Water - kWh	Lights and Appliances - kWh **	PV Solar Offset - kWh	Total
Annual Load / Demand	3396	440	1668	5896	-4784	**6616**
Annual Cost at $0.135 / kWh*	$458.46	$59.40	$225.18	$795.96	-$645.84	**$893.16**

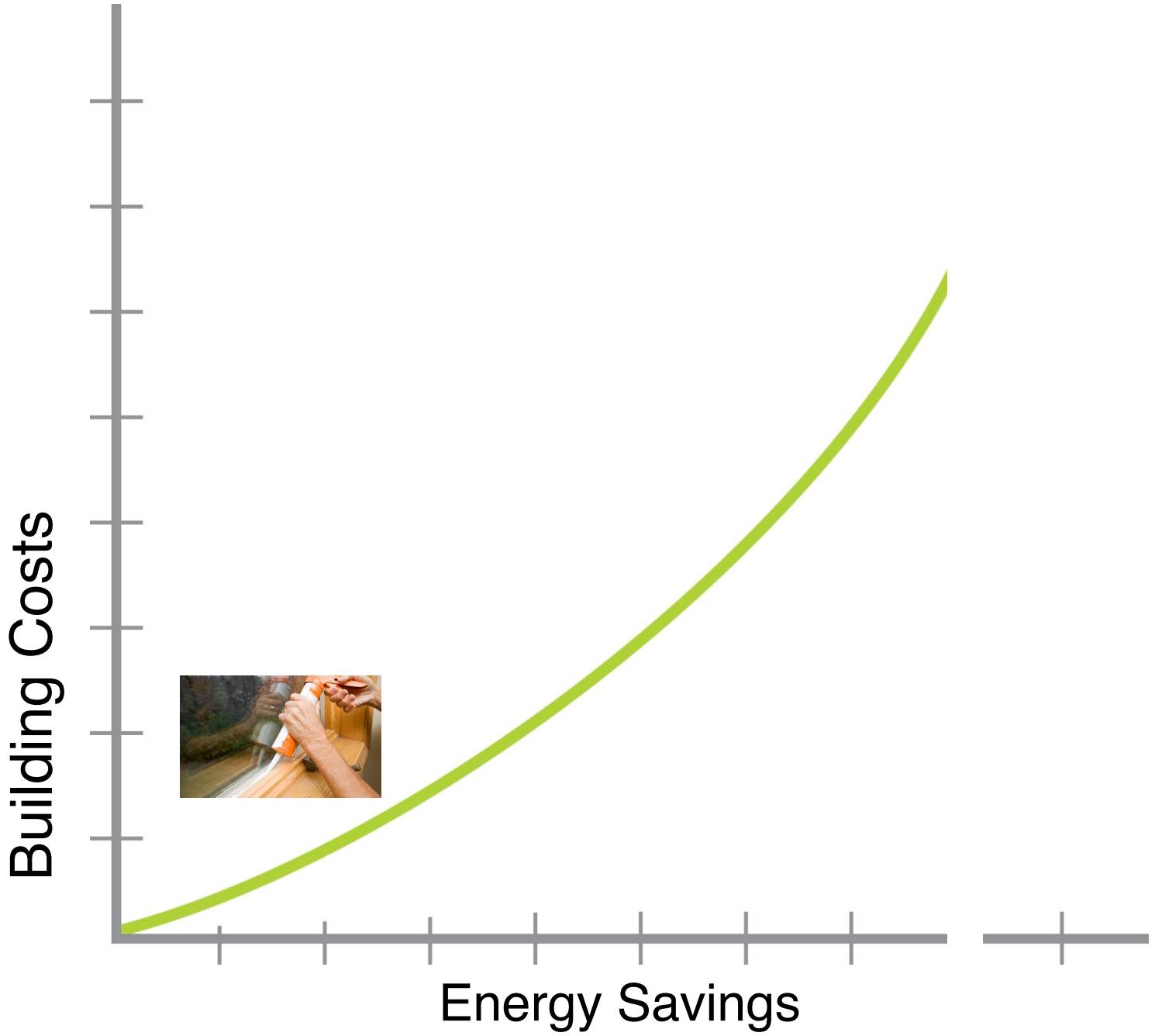
* Estimated cost in Freeport, Maine
** Rem Rate's estimate based on house size

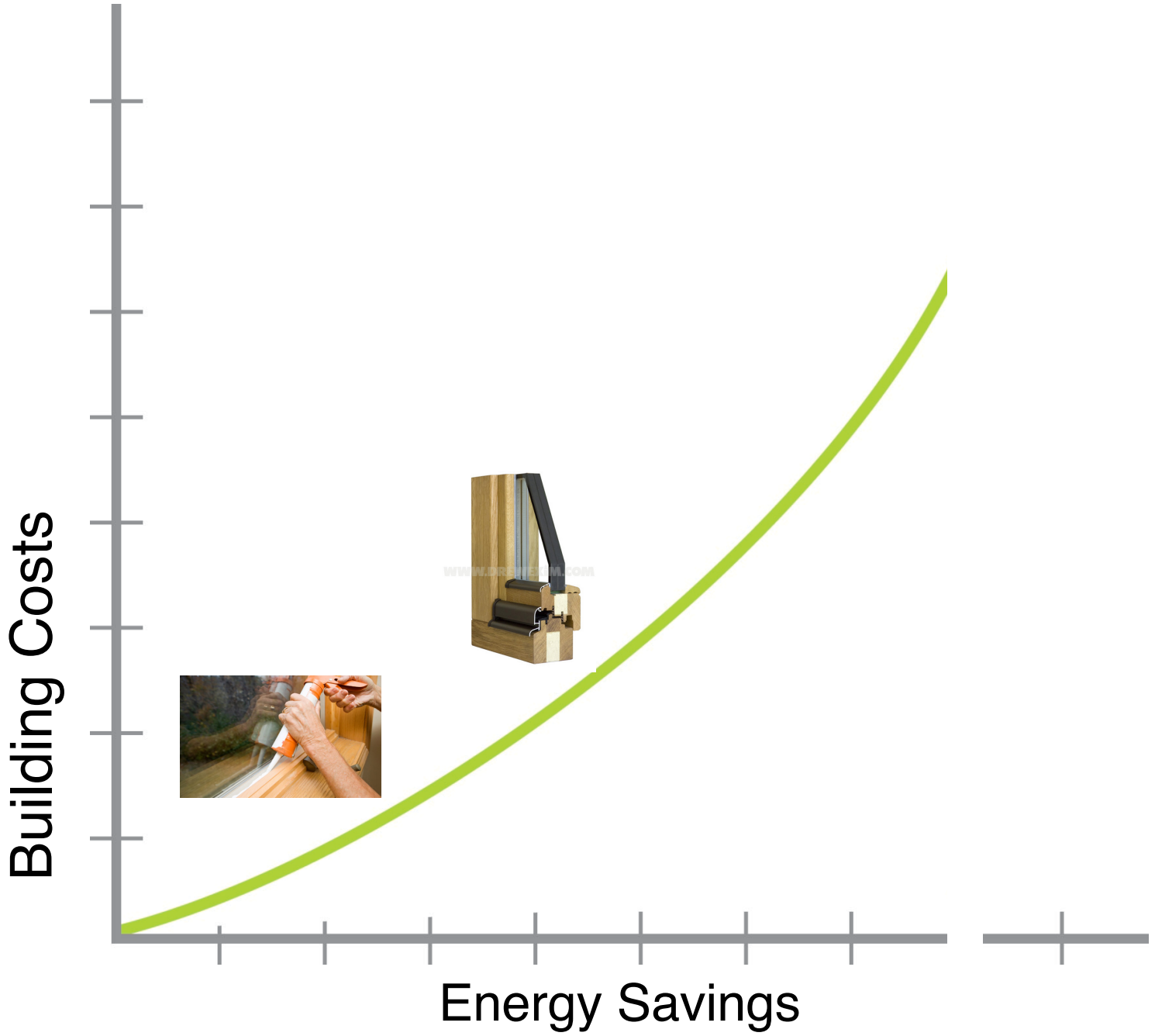
kWH vs. kW
heat pump COP
U-value & SHGC
achNAT vs ach50
kBTU/sf/year

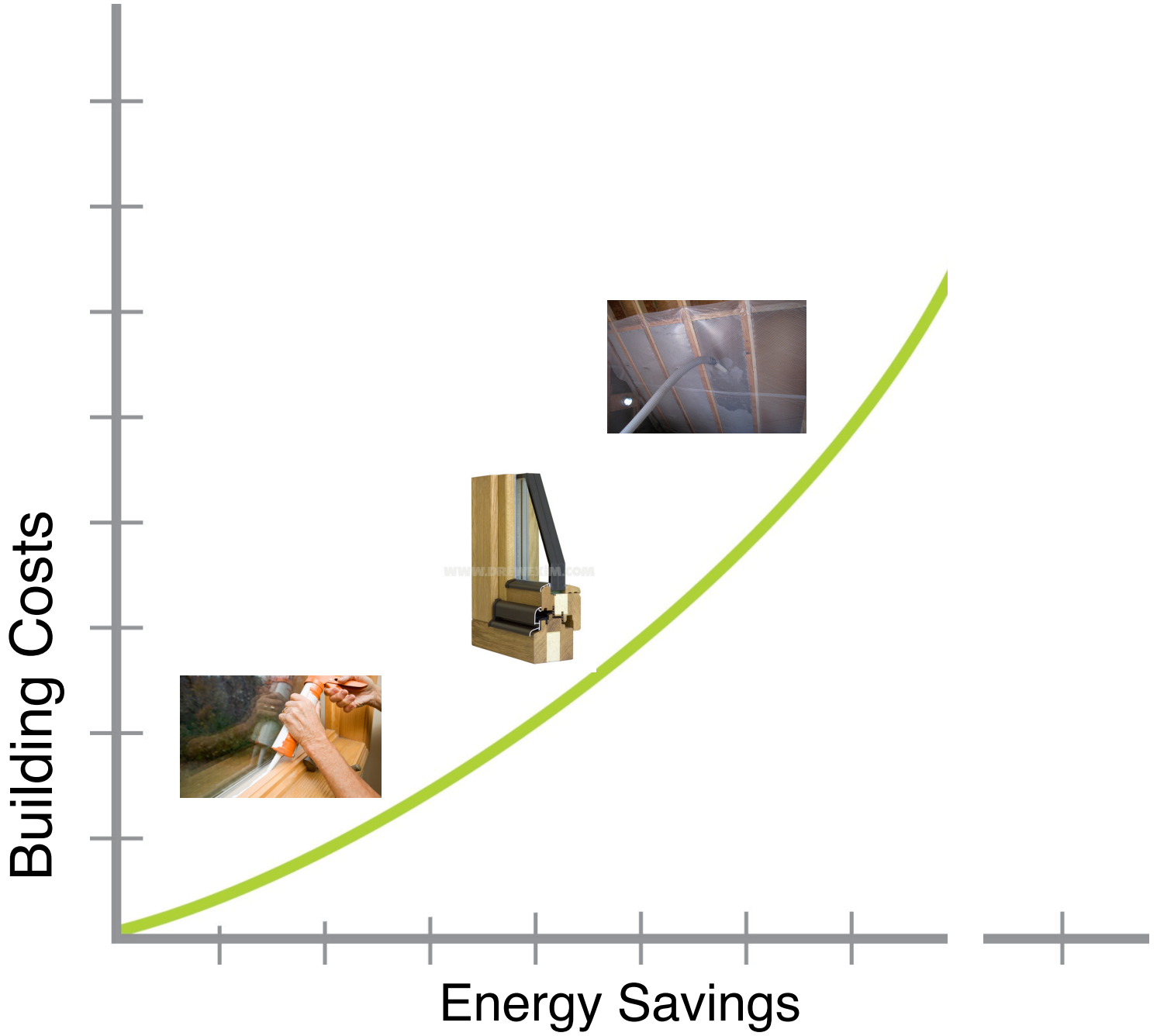
7. Bigger isn’t better

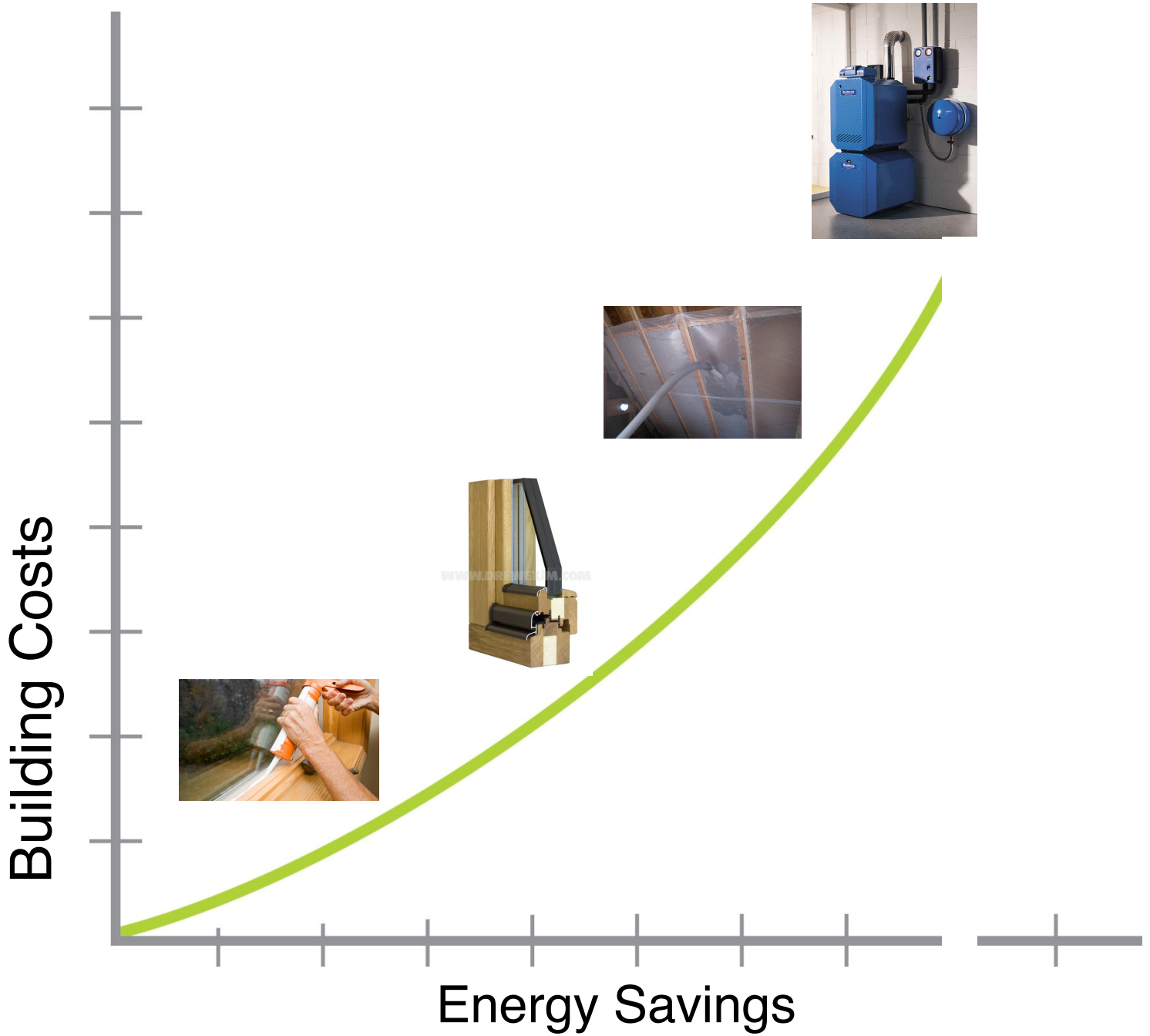
(a.k.a. Toe-dipping will leave you all wet)

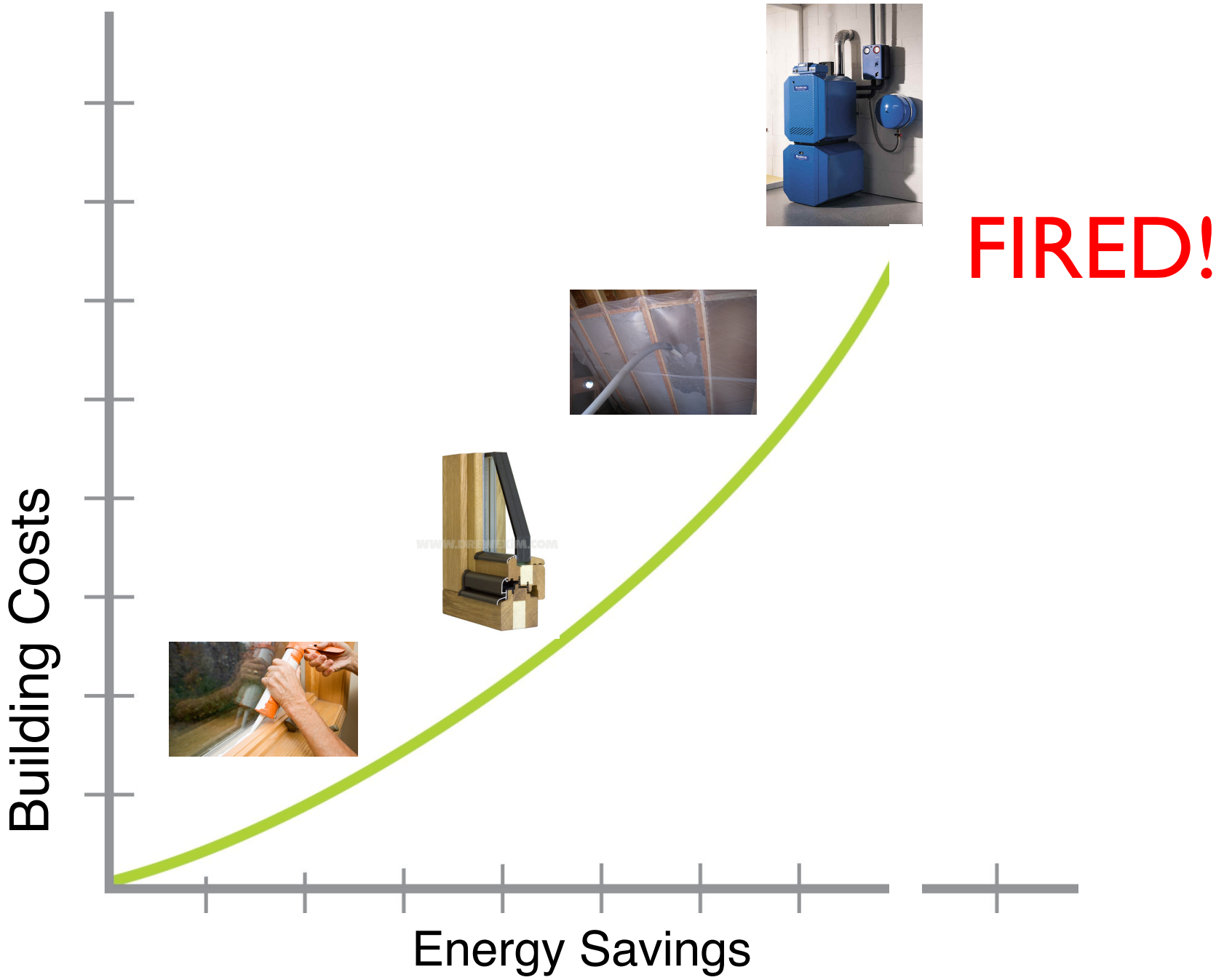

Building Costs
Energy Savings

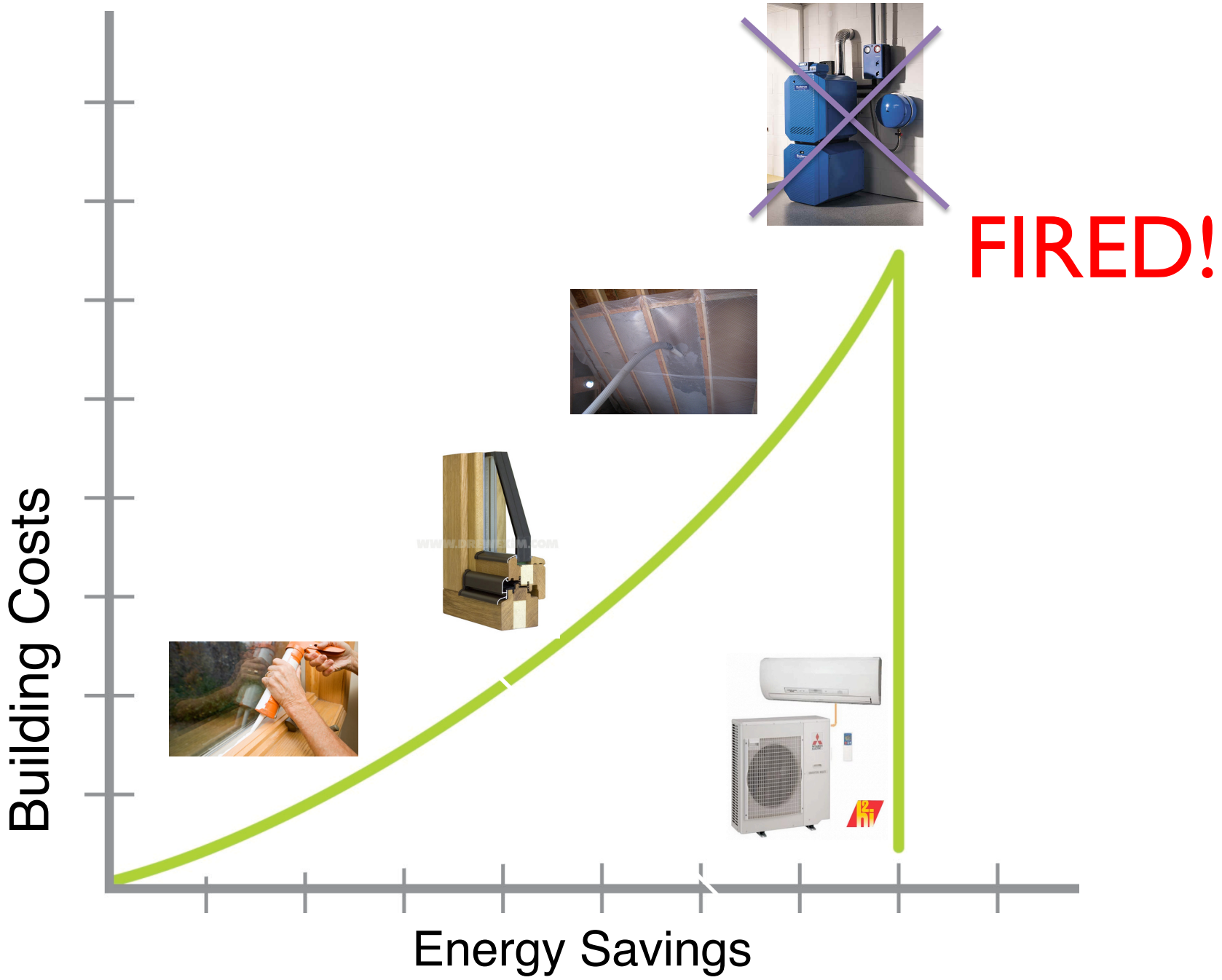

Building Costs
Energy Savings

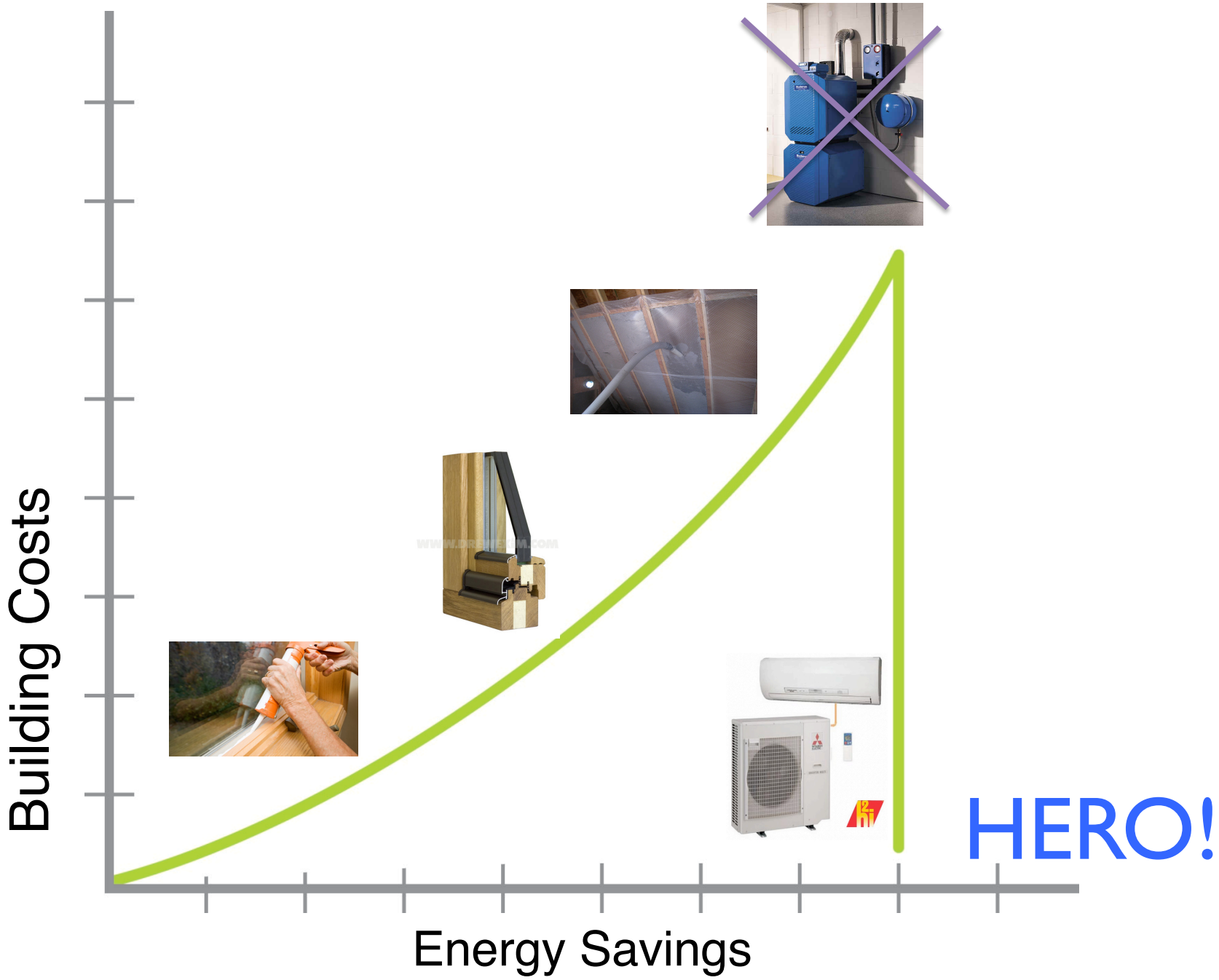

Building Costs
Energy Savings


Building Costs
Energy Savings


Building Costs
Energy Savings


Building Costs
Energy Savings
FIRED!


Building Costs
Energy Savings
FIRED!


Building Costs
Energy Savings
HERO!

8. Pump it real good

(a.k.a. don’t learn mechanical systems from a fossil)

$9,000 - $12,000
MINI-SPLIT SYSTEM + BATH FAN

30,000 BTU / HR MAX

- BATH FAN VENTILATION ($500)
- ELECTRIC RESISTANCE HOT WATER ($1,500)
- 2 - 3 HEAD WALL-MOUNTED MINI-SPLIT ($8,000 - $10,000)

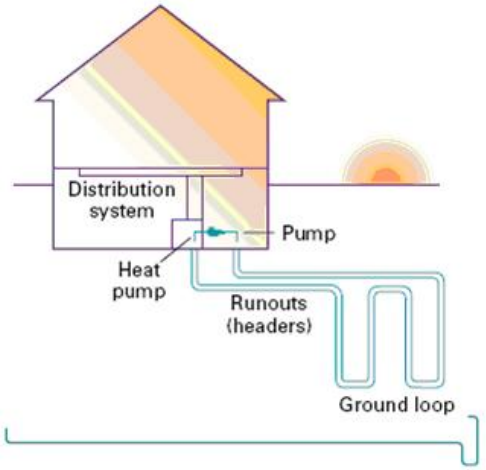
BATH FANS

DHW

HEAT PUMP

PRO	CON
COOLING INCLUDED	EXPENSIVE VENTILATION HEAT LOSSES
MINIMAL PLUMBING	EXPENSIVE HOT WATER COSTS, HIGH SOURCE ENERGY
NO SOURCE ENERGY PENALTY FOR ELECTRIC HEATING	EXPOSED WALL MOUNTED HEATING & COOLING

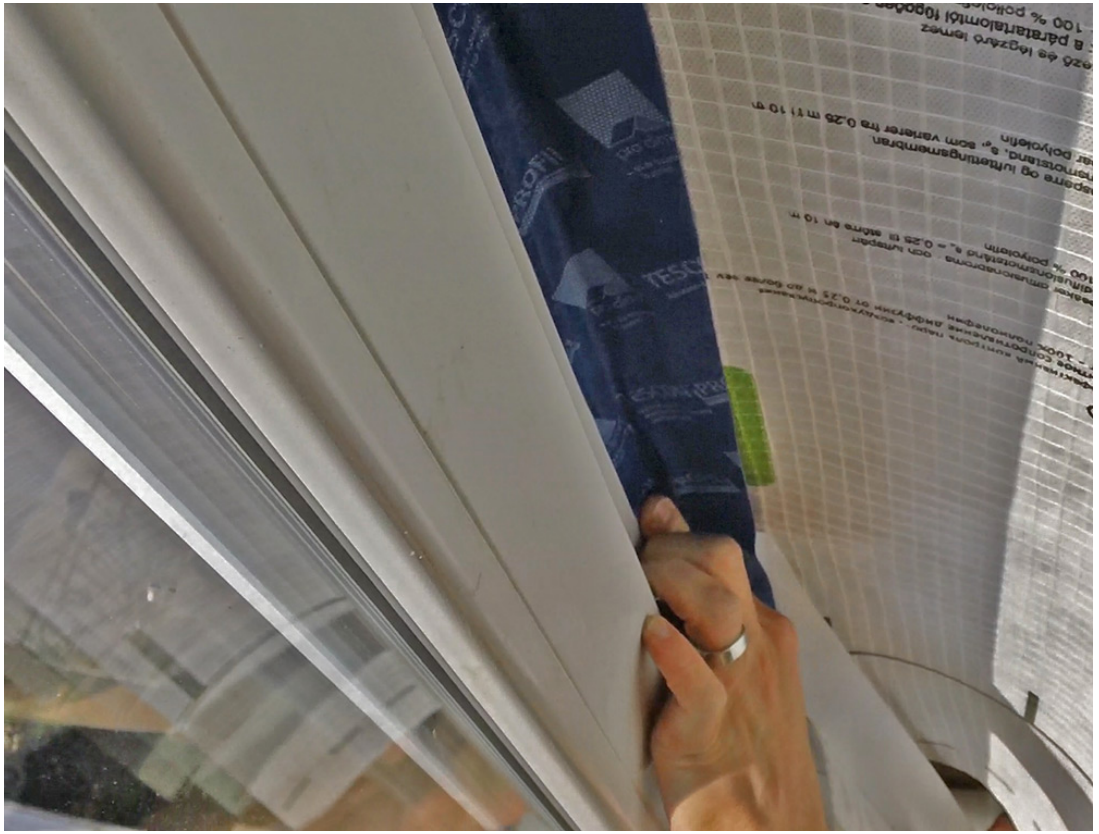
Saying
“geothermal”
makes you sound
like a dink.

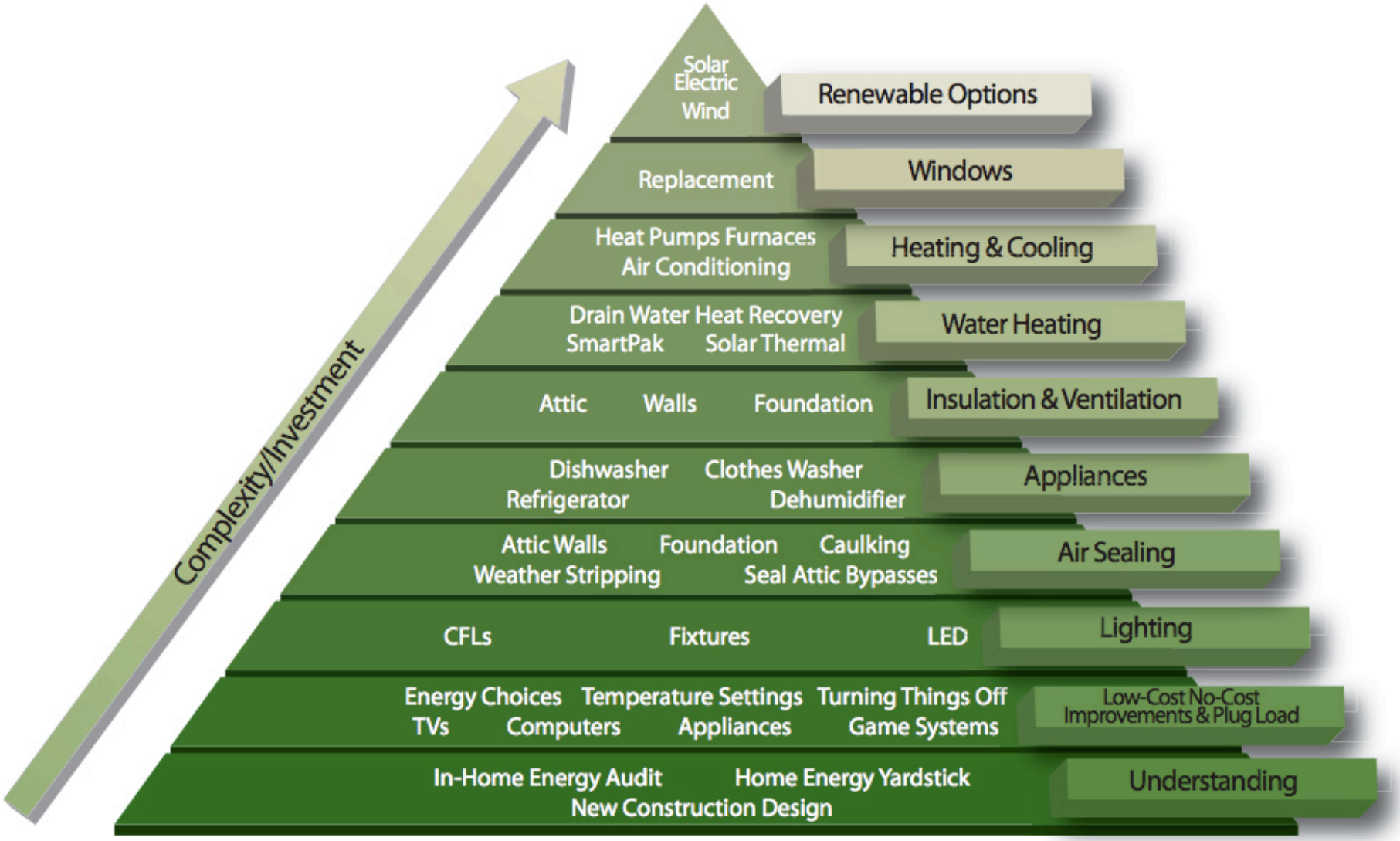


9. Keep it clean
(a.k.a. tonic, not toxic)

“Gee, this looks healthy to have in my house!”

Foam softly, and forever hold your tape.





10. Pushing solar first is shady

(a.k.a. grab your low hanging fruit)

11. Blower door me!

ACH50 =
(CFM50 x 60) /
building volume

What's good?

ACH50 = 0.6 - 1.5

How do you make this cost effective?

=

12. Touch the sweet spot!

Please send any comments or corrections to: info@kaplanthompson.com

June 24, 2011

NET-ZERO COST OPTIMIZATION

Kaplan Thompson Architects

BUILDING DATA						
Utility Electricity cost:	$0.16		**Fixed Cost per month to run your new house 100% on clean, renewable solar energy:**			
kWH Useage / Month:	500		**($450.59)**	**($202.97)**	**($142.93)**	**($134.58)**
			Cost per month to run your new house on toxic fossil fuel powered electricity :			
kWH / yr / kW in this location (from PVwatts):	1,285		**($426.63)**	**($175.73)**	**($114.90)**	**($106.45)**
PV Cost / kW (Before Tax Credits):	**$4,500**		**Gap:**			
House Model:	Custom		$23.96	$27.23	$28.03	$28.14
Description:	3BR, 3 story					
House Size (square feet):	1,973					
Constr Cost: ($/SF)	$175					
Estimated Base House Cost:	$345,275					
			Option A-1:	**Option A-2:**	**Option B:**	**Option C:**
Window Square Feet: (includes glass doors)	600		**CODE MIN (elect base)**	**CODE MIN (heat pump)**	**BUILDING SCIENCE**	**PASSIVHAUS**
Exterior Wall Linear Feet:	220		3.0 ACH50	3.0 ACH50	1.5 ACH50	.60 ACH50
Roof Square Feet:	1,580		R-10 Slab	R-10 Slab	R-10 Slab	R-10 Slab
Basement Square Feet:	1,180		R-18 Basement Walls	R-18 Basement Walls	R-20 Basement Walls	R-18 Basement Walls
Slab on Grade Square Feet:	1,180		R-18 Walls	R-18 Walls	R-40 Walls	R-32 Walls
			R-30 Roof	R-30 Roof	R-60 Roof	R-40 Roof
Location:	Rochester, NH		US Double Glazed	US Double Glazed	Canadian Triple Glazed	Canadian Triple Glazed
Peak Heat Load (kBTU / Hour) (system sizing only)			44,000	42,000	18,194	13,824
Annual Heat Load (kBTU / YR)			77,071	75,000	14,653	9,243
Annual Heat Load (kWH/YR)			22,587	21,980	4,294	2,709
kBTU / SF / YR (Passivhaus = 4.75 BTU/sf/yr TFA sf!))			39.06	38.01	7.43	4.68
Heating System Type:			**Electric Baseboard**	**Air Source Heat Pump**	**Air Source Heat Pump**	**Air Source Heat Pump**
Heating System $			**$4,400**	**$35,000**	**$10,000**	**$8,000**
Ventilation System Cost (exhaust only vs. HRV)			$500	$3,000	$5,000	$5,000
Heat Pump COP			0.9	3.5	2.5	2.5
Heating Demand (kWH / YR)			25,097	6,280	1,718	1,084
PV Size for Heating (kW)			19.5	4.9	1.3	0.8
PV Cost for Heating (before tax credits)			**$87,888**	**$21,993**	**$6,015**	**$3,795**
Lights & Appliances (kWH / YR)			6,000	6,000	6,000	6,000
PV Size for Lights & Apps (kW)			4.7	4.7	4.7	4.7
PV Cost for Lights & Appls (before tax credits)			**$21,012**	**$21,012**	**$21,012**	**$21,012**
Family Size			2	2	2	2
DHW demand (kWH / YR)			3,000	3,000	3,000	3,000
Percent of DHW from Solar:			70%	70%	70%	70%
Solar Thermal Cost (after tax credit):			**$5,500**	**$5,500**	**$5,500**	**$5,500**
DHW remainder from PV:			900	900	900	900
PV Size for Domestic HW (kW)			0.7	0.7	0.7	0.7
PV Cost for Domestic HW ($)			$3,152	$3,152	$3,152	$3,152
Total kWH / Year:			31,997	13,180	8,618	7,984
Total PV Size (kW)			24.9	10.3	6.7	6.2
Total PV Cost (before tax credits)			$112,052	$46,156	$30,179	$27,958
Total PV Cost After Tax Credits (-30%)			**$78,436**	**$32,309**	**$21,125**	**$19,571**
Base House Cost:			**$345,275**	**$345,275**	**$345,275**	**$345,275**
Mechanical System Cost:			$4,900	$38,000	$15,000	$13,000
Construction Cost Increase for Options:			$0	$0	$22,840	$20,070
Total House Cost:			**$350,175**	**$383,275**	**$383,115**	**$378,345**
Total Renewables Cost:			**$83,936**	**$37,809**	**$26,625**	**$25,071**
Total Building Cost:			**$434,111**	**$421,084**	**$409,740**	**$403,416**
Cost Savings:				**$13,027**	**$24,371**	**$30,696**
	Interest Rate	**Years**				
Monthly Payment for NET-ZERO Building:	5.0%	30	($2,330.40)	($2,260.47)	($2,199.57)	($2,165.62)
Cost Savings per Month:				**$70**	**$131**	**$165**
Renewables Only:						
Cost to Borrow for Solar Systems per Month	5.0%	30	**(450.59)**	**(202.97)**	**(142.93)**	**(134.58)**
Cost for power from Utility Company ($0.16 / kWH w/out inflation)			(426.63)	(175.73)	(114.90)	(106.45)
NET-ZERO Difference:			**$24**	**$27**	**$28**	**$28**
Standard Building / Month Total Cost:			($2,334.44)	($2,261.24)	($2,199.55)	($2,165.49)
Net-Zero Building / Month Total Cost:			($2,330.40)	($2,260.47)	($2,199.57)	($2,165.62)
Cost Difference:			**($4.04)**	**($0.77)**	**$0.03**	**$0.14**

Please send any comments or corrections to: info@kaplanthompson.com

June

NET-ZERO COST OPTIMIZATION

Kaplan Thompson Arc

BUILDING DATA	
Utility Electricity cost:	$0.16
kWH Useage / Month:	500
kWH / yr / kW in this location (from PVwatts):	1,285
PV Cost / kW (Before Tax Credits):	**$4,500**
House Model:	Custom
Description:	3BR, 3 story
House Size (square feet):	1,973
Constr Cost: ($/SF)	$175
Estimated Base House Cost:	$345,275
Window Square Feet: (includes glass doors)	600
Exterior Wall Linear Feet:	220
Roof Square Feet:	1,580
Basement Square Feet:	1,180
Slab on Grade Square Feet:	1,180
Location:	Rochester, NH

Fixed Cost per month to run your new house 100% on clean, renewable solar energy:

Option A-1:	Option A-2:	Option B:	Option C:
($450.59)	**($202.97)**	**($142.93)**	**($1**

Cost per month to run your new house on toxic fossil fuel powered electricity :

Option A-1:	Option A-2:	Option B:	Option C:
($426.63)	**($175.73)**	**($114.90)**	**($1**

Gap:	Option A-1:	Option A-2:	Option B:	Option C:
	CODE MIN (elect base)	CODE MIN (heat pump)	BUILDING SCIENCE	PASSIVHAUS
	3.0 ACH50	3.0 ACH50	1.5 ACH50	.60 ACH50
	R-10 Slab	R-10 Slab	R-10 Slab	R-10 Slab
	R-18 Basement Walls	R-18 Basement Walls	R-20 Basement Walls	R-18 Basement W
	R-18 Walls	R-18 Walls	R-40 Walls	R-32 Walls
	R-30 Roof	R-30 Roof	R-60 Roof	R-40 Roof
	US Double Glazed	US Double Glazed	Canadian Triple Glazed	Canadian Triple G
Peak Heat Load (kBTU / Hour) (system sizing only)	44,000	42,000	18,194	
Annual Heat Load (kBTU / YR)	77,071	75,000	14,653	
Annual Heat Load (kWH/YR)	22,587	21,980	4,294	
kBTU / SF / YR (Passivhaus = 4.75 BTU/sf/yr TFA sf!))	39.06	38.01	7.43	
Heating System Type:	**Electric Baseboard**	**Ground Source Heat Pump**	**Air Source Heat Pump**	**Air Source Heat**
Heating System $	**$4,400**	**$35,000**	**$10,000**	
Ventilation System Cost (exhaust only vs. HRV)	$500	$3,000	$5,000	
Heat Pump COP	0.9	3.5	2.5	
Heating Demand (kWH / YR)	25,097	6,280	1,718	
PV Size for Heating (kW)	19.5	4.9	1.3	
PV Cost for Heating (before tax credits)	**$87,888**	**$21,993**	**$6,015**	
Lights & Appliances (kWH / YR)	6,000	6,000	6,000	
PV Size for Lights & Apps (kW)	4.7	4.7	4.7	
PV Cost for Lights & Appls (before tax credits)	**$21,012**	**$21,012**	**$21,012**	
Family Size	2	2	2	
DHW demand (kWH / YR)	3,000	3,000	3,000	
Percent of DHW from Solar:	70%	70%	70%	
Solar Thermal Cost (after tax credit):	**$5,500**	**$5,500**	**$5,500**	
DHW remainder from PV:	900	900	900	
PV Size for Domestic HW (kW)	0.7	0.7	0.7	
PV Cost for Domestic HW ($)	$3,152	$3,152	$3,152	
Total kWH / Year:	31,997	13,180	8,618	
Total PV Size (kW)	24.9	10.3	6.7	
Total PV Cost (before tax credits)	$112,052	$46,156	$30,179	

ATION

Kaplan Thompson Architects

		Fixed Cost per month to run your new house 100% on clean, renewable solar energy:			
	$0.16	**($450.59)**	**($202.97)**	**($142.93)**	**($134.58)**
	500				
		Cost per month to run your new house on toxic fossil fuel powered electricity :			
watts):	1,285	**($426.63)**	**($175.73)**	**($114.90)**	**($106.45)**
	$4,500	**Gap:**			
	Custom	$23.96	$27.23	$28.03	$28.14
	3BR, 3 story				
	1,973				
	$175				
	$345,275				
		Option A-1:	**Option A-2:**	**Option B:**	**Option C:**
s)	600	**CODE MIN (elect base)**	**CODE MIN (heat pump)**	**BUILDING SCIENCE**	**PASSIVHAUS**
	220	3.0 ACH50	3.0 ACH50	1.5 ACH50	.60 ACH50
	1,580	R-10 Slab	R-10 Slab	R-10 Slab	R-10 Slab
	1,180	R-18 Basement Walls	R-18 Basement Walls	R-20 Basement Walls	R-18 Basement Walls
	1,180	R-18 Walls	R-18 Walls	R-40 Walls	R-32 Walls
		R-30 Roof	R-30 Roof	R-60 Roof	R-40 Roof
	Rochester, NH	US Double Glazed	US Double Glazed	Canadian Triple Glazed	Canadian Triple Glazed
nly)		44,000	42,000	18,194	13,824
		77,071	75,000	14,653	9,243
		22,587	21,980	4,294	2,709
yr TFA sf!))		39.06	38.01	7.43	4.68
		Electric Baseboard	**Ground Source Heat Pump**	**Air Source Heat Pump**	**Air Source Heat Pump**
		$4,400	**$35,000**	**$10,000**	**$8,000**
)		$500	$3,000	$5,000	$5,000
		0.9	3.5	2.5	2.5
		25,097	6,280	1,718	1,084
		19.5	4.9	1.3	0.8
		$87,888	**$21,993**	**$6,015**	**$3,795**
		6,000	6,000	6,000	6,000
		4.7	4.7	4.7	4.7
credits)		**$21,012**	**$21,012**	**$21,012**	**$21,012**
		2	2	2	2
		3,000	3,000	3,000	3,000
		70%	70%	70%	70%
		$5,500	**$5,500**	**$5,500**	**$5,500**
		900	900	900	900
		0.7	0.7	0.7	0.7
		$3,152	$3,152	$3,152	$3,152
		31,997	13,180	8,618	7,984
		24.9	10.3	6.7	6.2
		$112,052	$46,156	$30,179	$27,958
		$78,436	**$32,309**	**$21,125**	**$19,571**

Heating System Type:			Electric Baseboard	Ground Source Heat Pump	Air Source Heat Pump	Air Source Heat Pump
Heating System $			**$4,400**	**$35,000**	**$10,000**	**$8,000**
Ventilation System Cost (exhaust only vs. HRV)			$500	$3,000	$5,000	$5,000
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Lights & Appliances (kWH / YR)			6,000	6,000	6,000	6,000
PV Size for Lights & Apps (kW)			4.7	4.7	4.7	4.7
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Solar Thermal Cost (after tax credit):			**$5,500**	**$5,500**	**$5,500**	**$5,500**
DHW remainder from PV:			900	900	900	900
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Total PV Cost After Tax Credits (-30%)			**$78,436**	**$32,309**	**$21,125**	**$19,571**
Base House Cost:			**$345,275**	**$345,275**	**$345,275**	**$345,275**
Mechanical System Cost:			$4,900	$38,000	$15,000	$13,000
Construction Cost Increase for Options:			$0	$0	$22,840	$20,070
Total House Cost:			**$350,175**	**$383,275**	**$383,115**	**$378,345**
Total Renewables Cost:			**$83,936**	**$37,809**	**$26,625**	**$25,071**
Total Building Cost:			**$434,111**	**$421,084**	**$409,740**	**$403,416**
Cost Savings:				**$13,027**	**$24,371**	**$30,696**
	Interest Rate	**Years**				
Monthly Payment for NET-ZERO Building:	5.0%	30	($2,330.40)	($2,260.47)	($2,199.57)	($2,165.62)
Cost Savings per Month:				**$70**	**$131**	**$165**
Renewables Only:						
Cost to Borrow for Solar Systems per Month	5.0%	30	**(450.59)**	**(202.97)**	**(142.93)**	**(134.58)**
Cost for power from Utility Company ($0.16 / kWH w/out inflation)			(426.63)	(175.73)	(114.90)	(106.45)
NET-ZERO Difference:			**$24**	**$27**	**$28**	**$28**
Standard Building / Month Total Cost:			($2,334.44)	($2,261.24)	($2,199.55)	($2,165.49)
Net-Zero Building / Month Total Cost:			($2,330.40)	($2,260.47)	($2,199.57)	($2,165.62)
Cost Difference:			**($4.04)**	**($0.77)**	**$0.03**	**$0.14**

13. Sustainability <u>is</u> design, dummy.


F+ = FAIL!

14. Don’t LEED your clients down a dark alley.

15. Watch your language!

QUALITY
DURABILITY
COMFORT
SECURITY
INVESTMENT

Passive House Institute US

15. Watch your language!

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13. Sustainability <u>is</u> design, dummy.
12. Touch the sweet spot!

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11. Blower door me!

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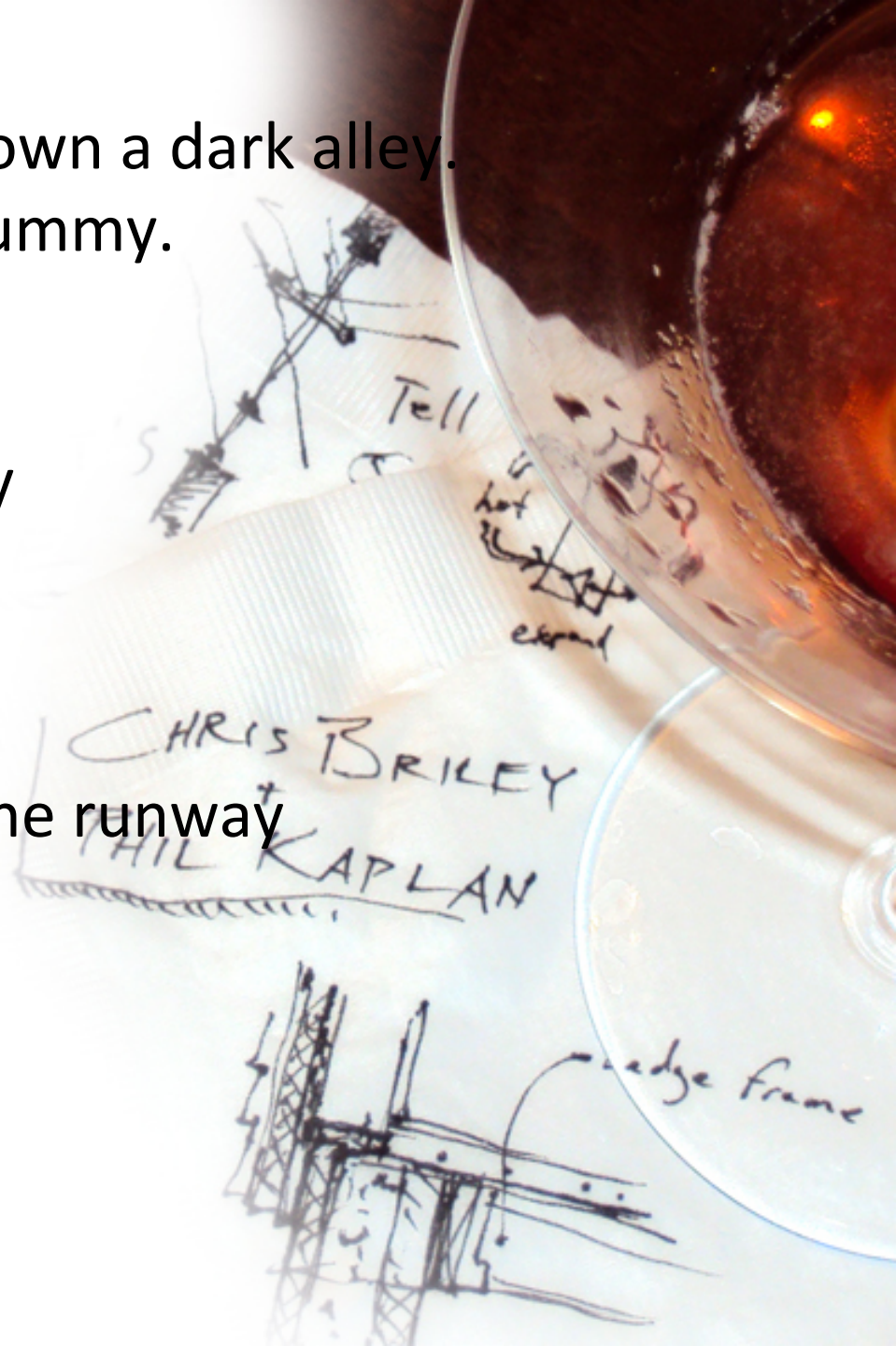
7. Bigger isn't better

15. Watch your language!
14. Don't LEED your clients down a dark alley.
13. Sustainability <u>is</u> design, dummy.
12. Touch the sweet spot!
11. Blower door me!
10. Pushing solar first is shady
9. Keep it clean
8. Pump it real good
7. Bigger isn't better
6. Do your modeling before the runway



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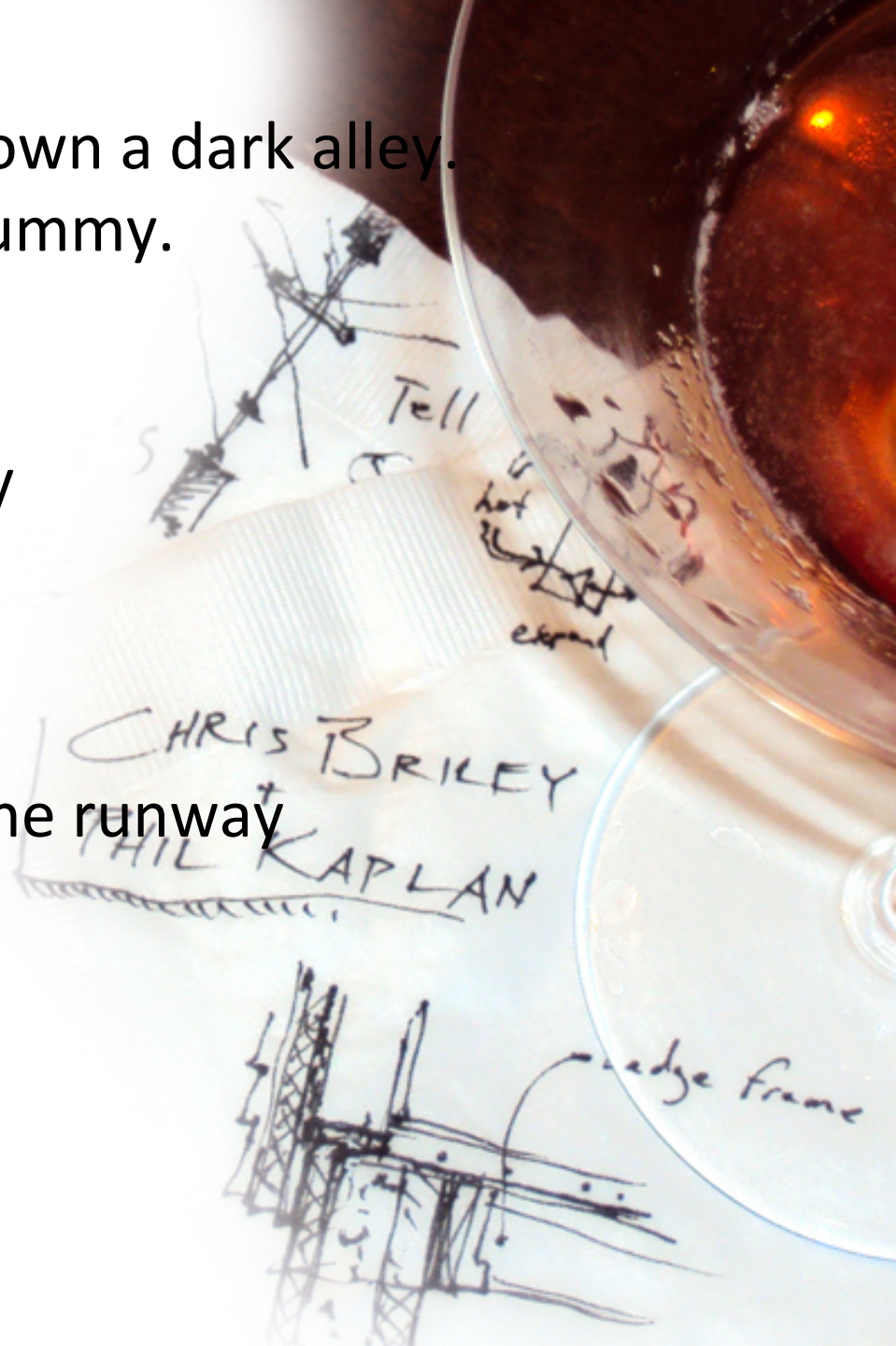
5. Don't wait to integrate



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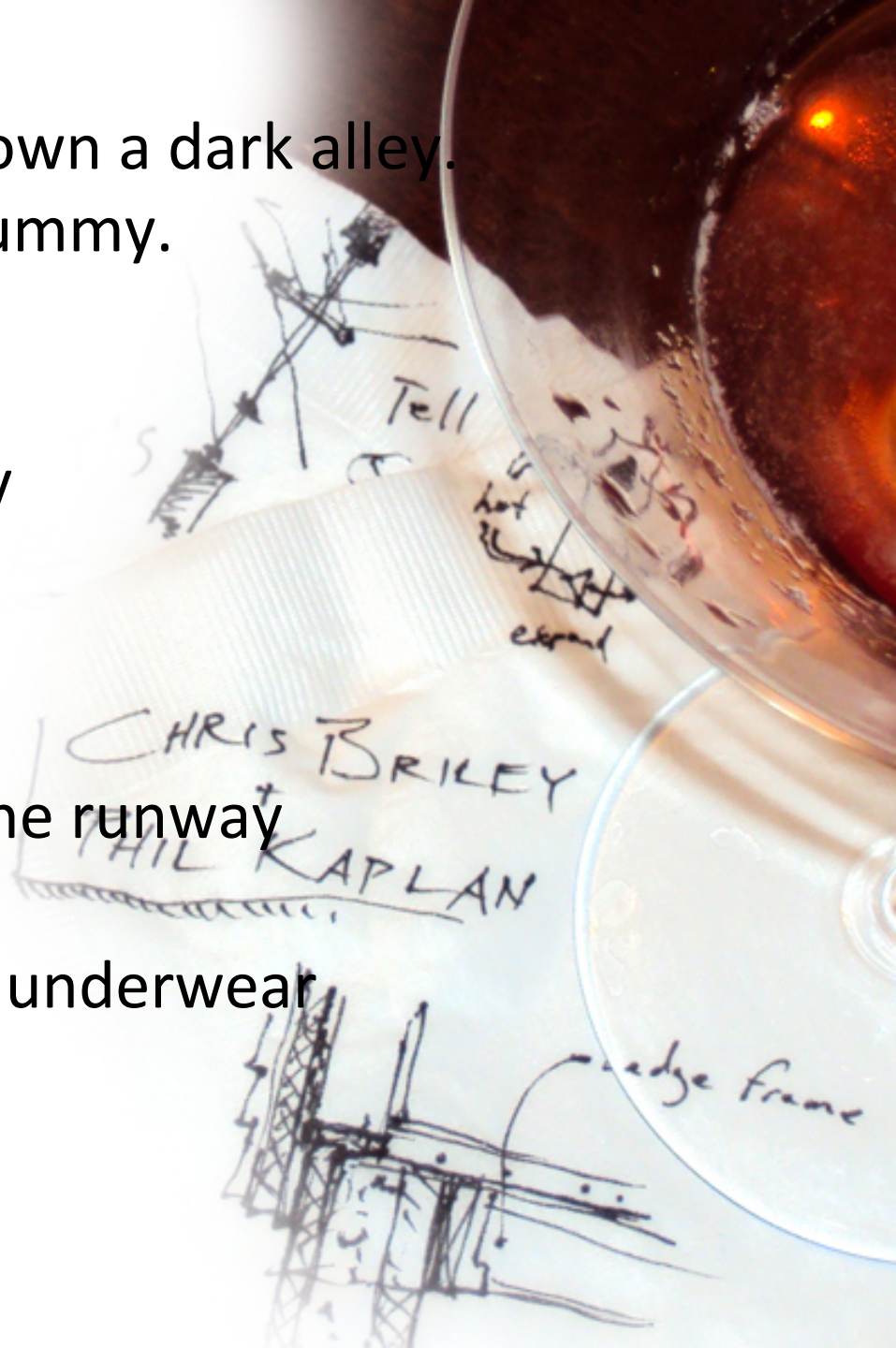
5. Don't wait to integrate
4. Belt, suspenders and clean underwear



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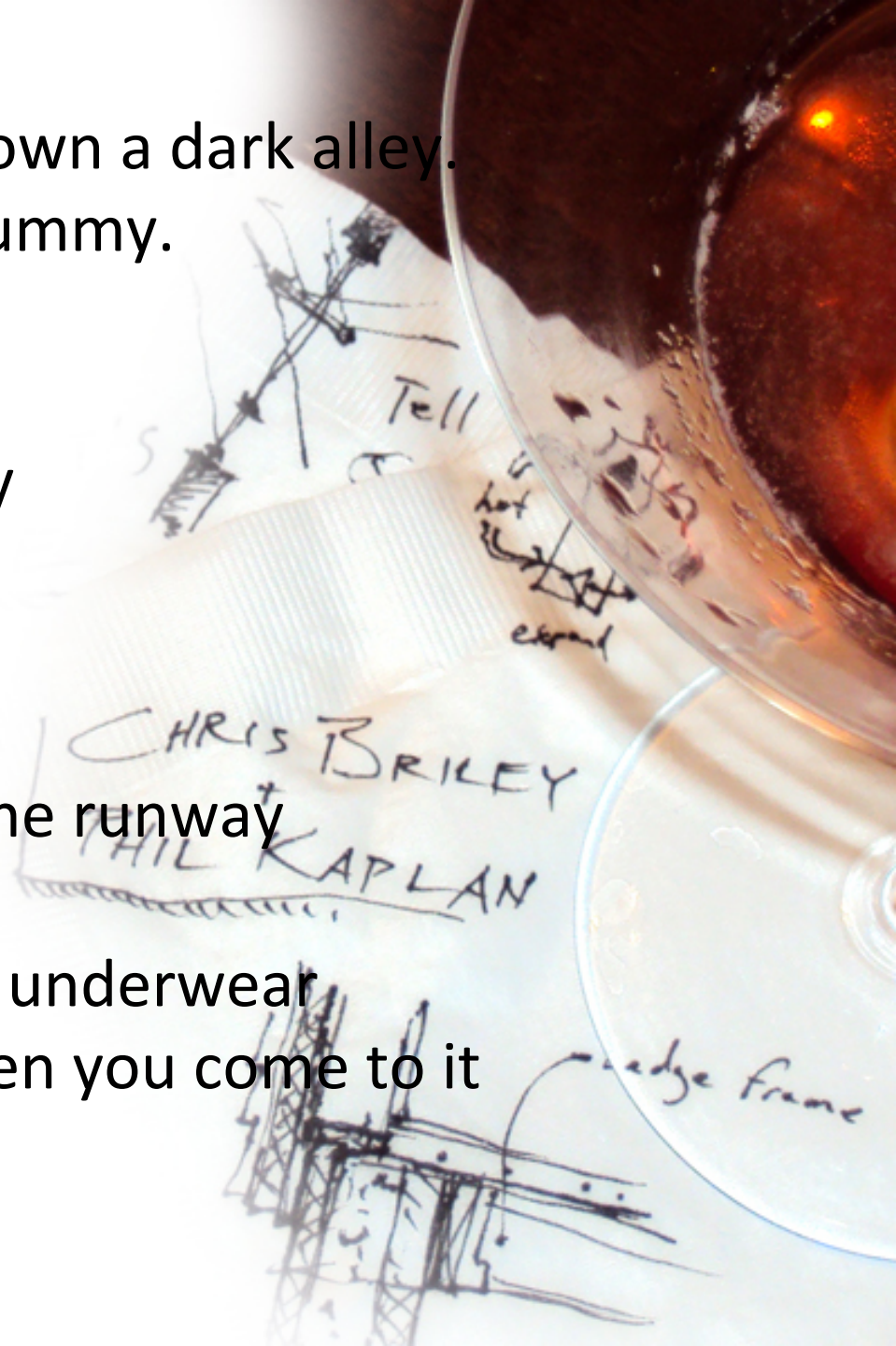
5. Don't wait to integrate
4. Belt, suspenders and clean underwear
3. Don't cross that bridge when you come to it



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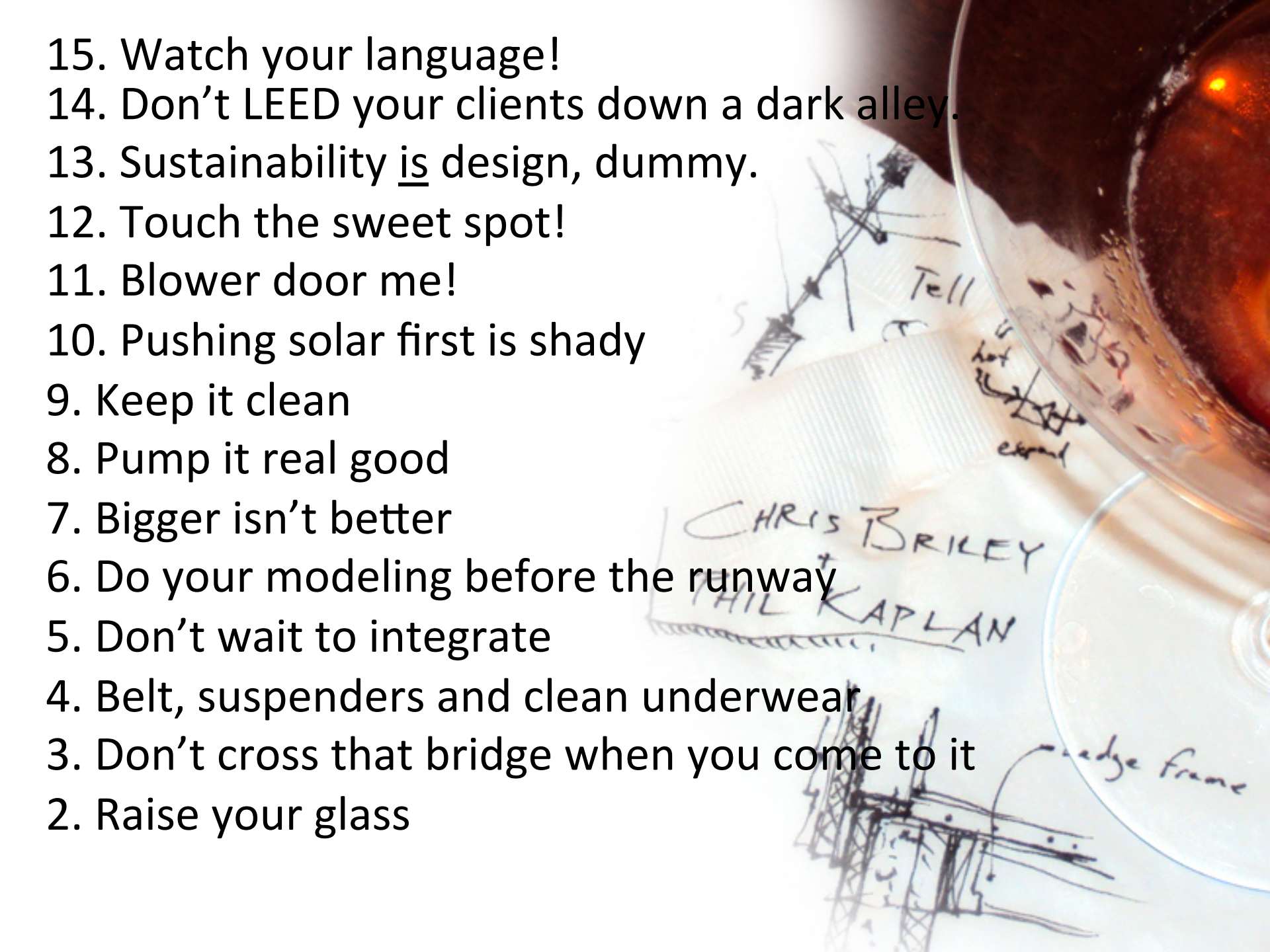
5. Don't wait to integrate
4. Belt, suspenders and clean underwear
3. Don't cross that bridge when you come to it
2. Raise your glass



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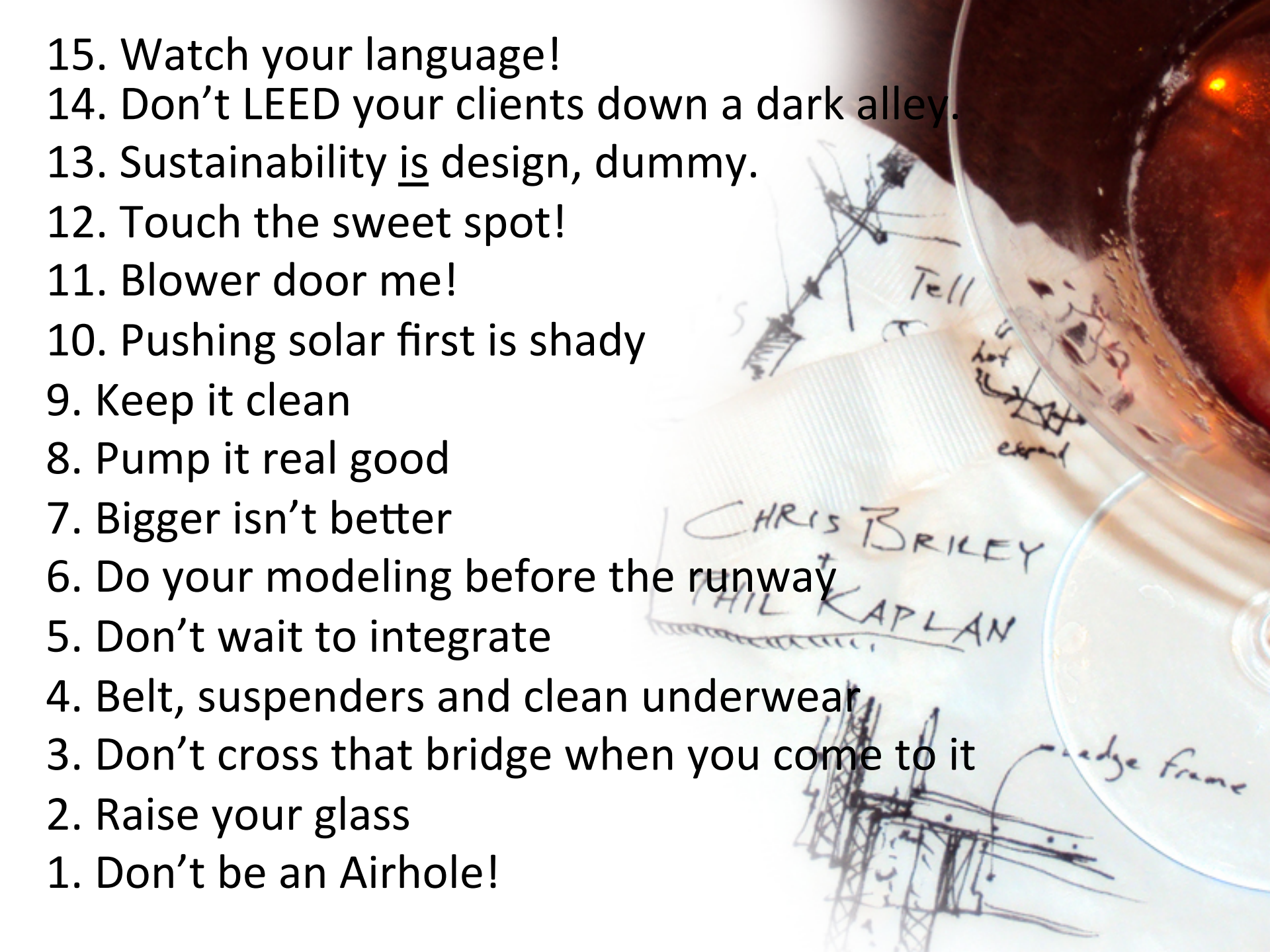
4. Belt, suspenders and clean underwear
3. Don't cross that bridge when you come to it
2. Raise your glass
1. Don't be an Airhole!



CHEERS!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