In accordance with the Department of Labor and Industry's statute 326.0981, Subd. 11,

"This educational offering is recognized by the Minnesota Department of Labor and Industry as satisfying **1.5 hours** of credit toward **Building Officials and Residential Contractors code/ energy** continuing education requirements."

For additional continuing education approvals, please see your credit tracking card.

Who We Are: C&H Architects

c&h architects: design for the next hundred years.

designing buildings that are loved in the region where we live, for mission-driven clients with residential and institutional projects.

Tom Hartman - Principal

tom

Bruce Coldham – Principal Emeritus

Andrew Webster – Designer / Project Manager

Who Are You?

Deep Energy Retrofits

Energy Design Conference
Revolution

Notes from the Frontlines of the Deep Energy

Existing housing

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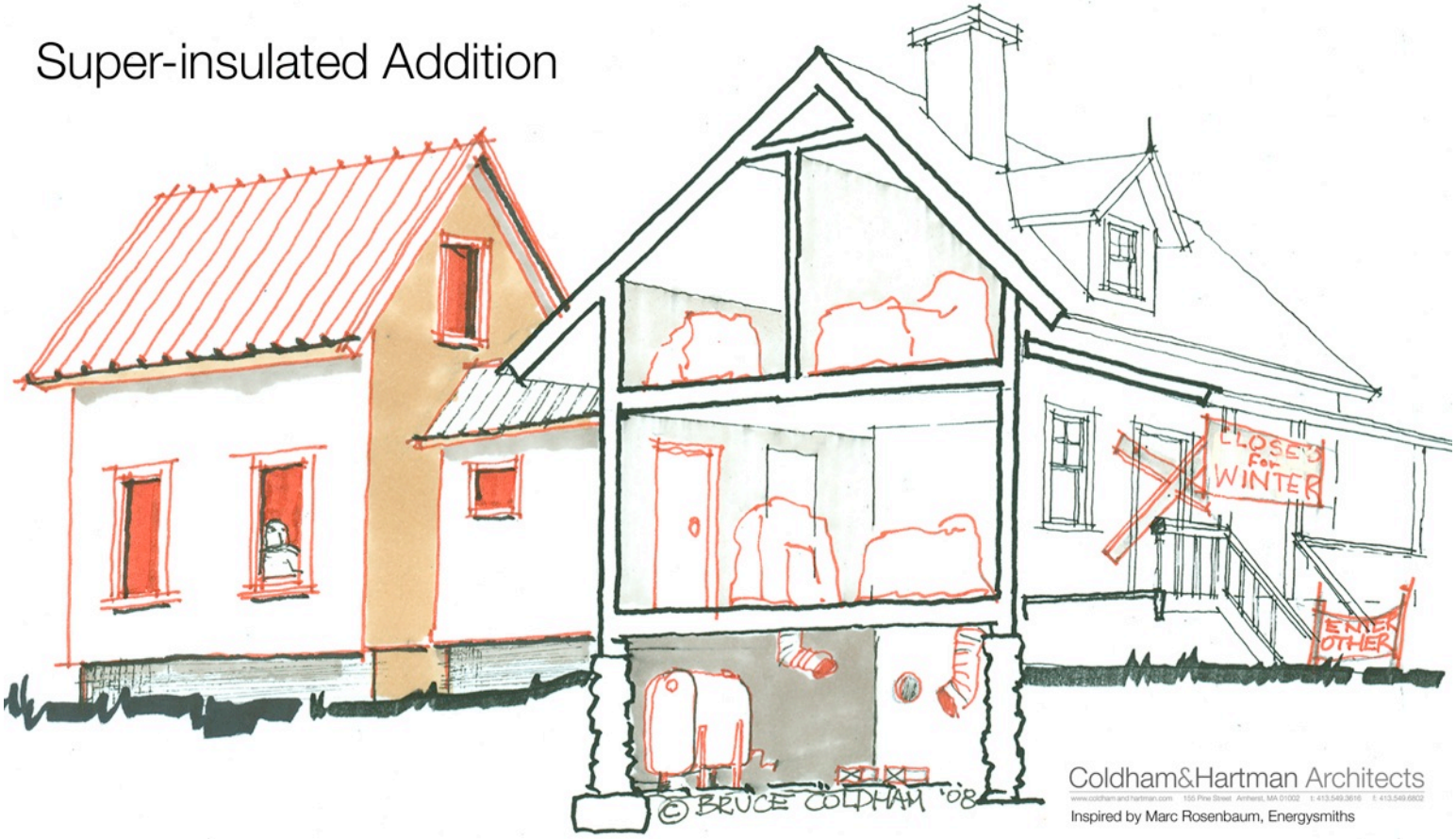
Extended
Family
BED ROSTER
NO VACANCY
UNTIL MONDAY
©BRUCE COLDHAM 2008
Inspired by Marc Rosenbaum, Energysmiths
Coldham&Hartman Architects


Cocoon
© BRUCE COLDHAM 2008
Coldham&Hartman Architects
Inspired by Marc Rosenbaum, Energysmiths

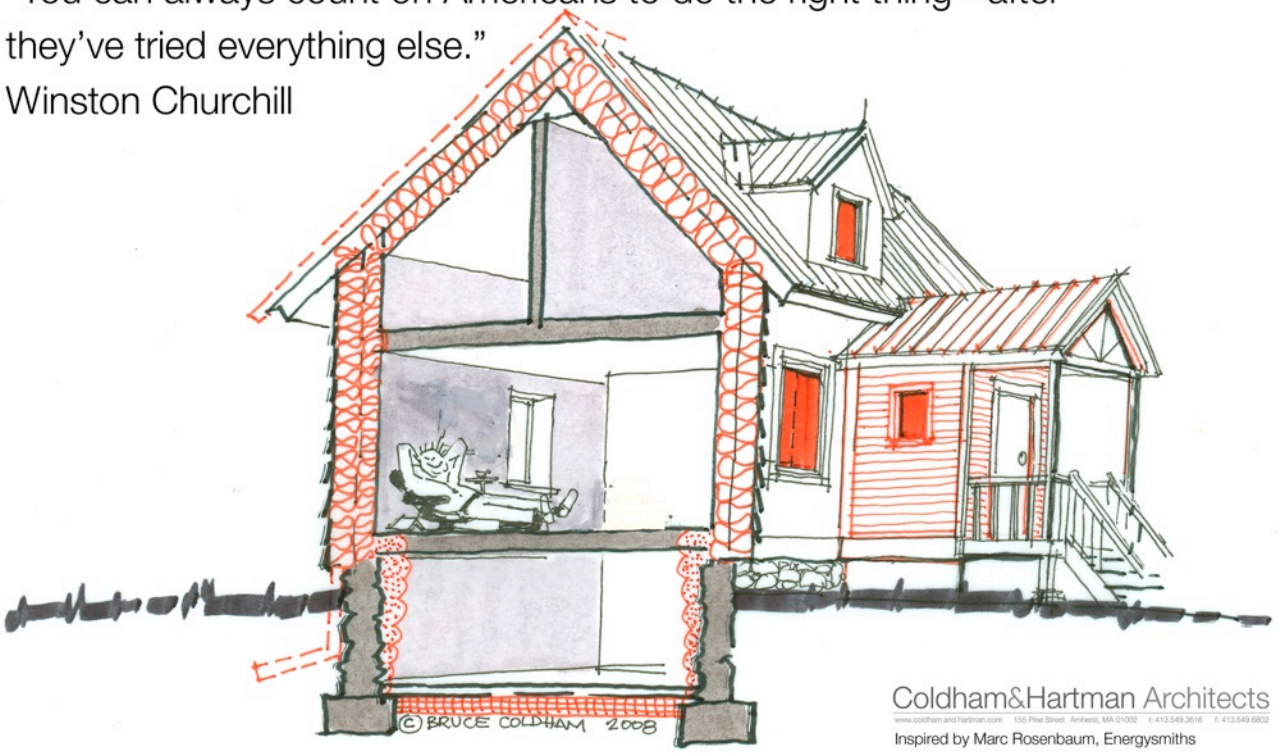
Pull back



Abandon and move on

Deep Energy Retrofit, aka Fix It

"You can always count on Americans to do the right thing - after they've tried everything else."
Winston Churchill



First Forays – 2008 – Cottage Street - Gut

Ross came to us with this

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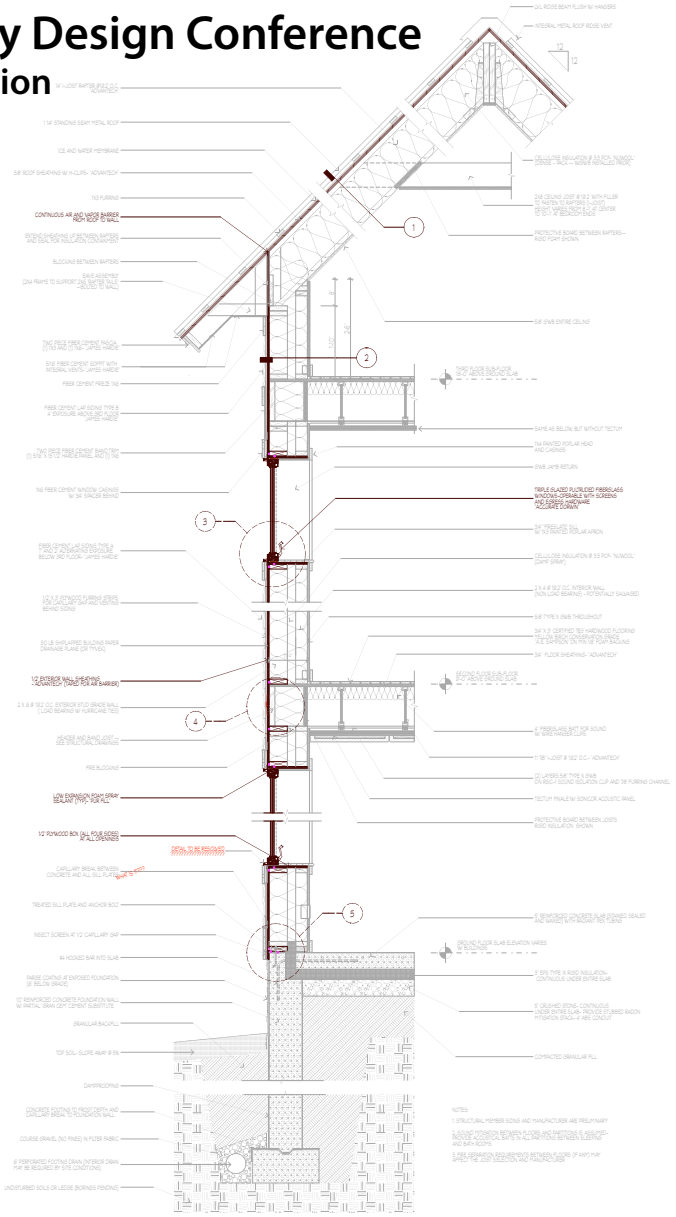
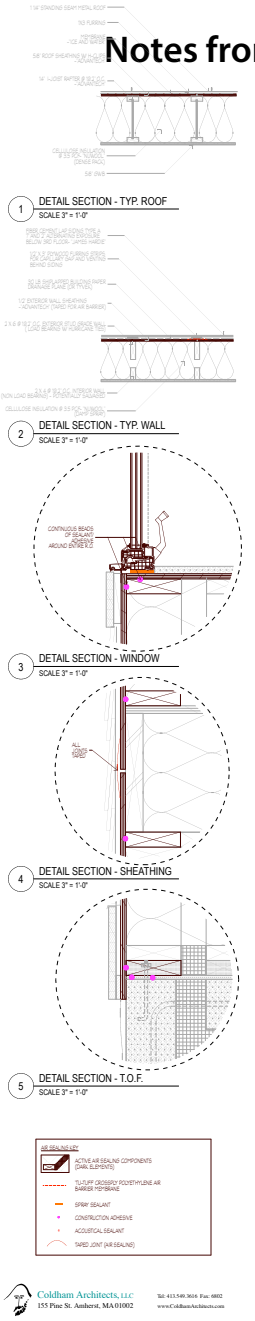
Revolution





2004 – 12" Double Stud with DPC (typ.)

At CoA (new construction) – first exterior air barrier (at sheathing) achieves exceptional air tightness.

College of the Atlantic

Typical Wall Section - Air Sealing
SCALE - 1"=1'-0"
STUDENT HOUSING
DESIGN DEVELOPMENT - JUNE 16, 2006

Coldham Architects, LLC
155 Pine St. Amherst, MA 01002
Tel: 413.549.3616 Fax: 6802
www.ColdhamArchitects.com

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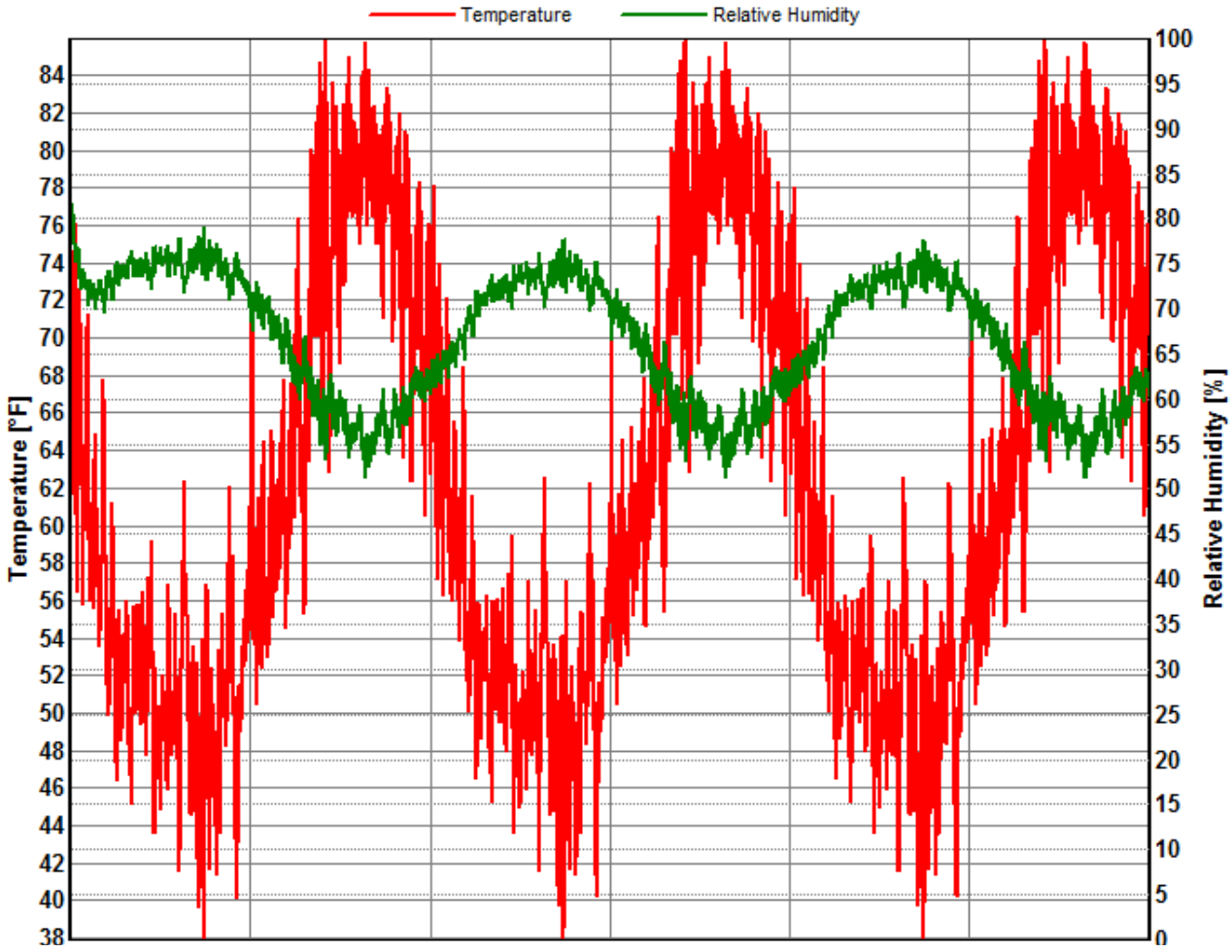
Concern – by WUFI



And even that gave us concern

Cottage Street – Hemming and Hawing with Numbers

Heat Loss Component Budget 08-09-Ross-HeatLoss-090623.xls				
Ross Residence- Proposed				
R VALUES			Design Temperature Diff.	69
2x4 Wall, 3" Ext. Foam	30		Flat Ceiling R Value	1
Wall Type 2	1		Joist Bays	14
Floor over air	1		Skylight R Value	1
Window R Value	5		1/2 Glass Door R Value	4
Sloped Ceiling R Value	42		Full Glass Door R Value	3
Slab edge	1		Basement Wall R Value	14
ELEMENT	AREA	AU		
2x4 Wall - 3" Ext. Foam	2,680	88.60		
Basement Wall	267	72.75	Basement perimeter	150
Slab edge	x	104.25	Slab edge perimeter	150
7" Wall	0	0.00		
Floor over air	0	0.00		
Joist Bays	112	7.78		
Window	330	66.00		
Sloped Ceiling	1,775	42.47		
Flat Ceiling	0	0.00		
Skylight	0	0.00		
1/2 Glass Door	42	10.50		
Full Glass Door	21	7.00		
Ventilation (@75% eff.)		18.90	Ventilation system capacity	70
Composter exhaust		0.00	ventilation rate	0
INFILTRATION Volume (cu.ft)	ACH (Nat)	Equiv. AU		
32000	0.20	115.20		
AU Conduction Only	399.35			
AU Total (Btu/deg/hr)	533.45			
Design Heat Loss, BTU/Hr	36,808		(capacity of heater required)	
Design Heat Loss, Kw	10.78			
Floor area,sf (finished, incl. attic)	2700			
	13.6	Design heat loss per unit area		

4" Wall Cavity with Exterior Rigid Foam

Cavity depth (inches)	4	
Continuous insulation depth (inches)	3	
Stud Cavity Depth (inches)	4	
Stud/XPS Thermal Resistance (R/inch)	*5.69*	*22.75*
Stud % of wall surface area	0.24	
Cavity/XPS Thermal Resistance (R/inch)	*8.19*	*32.75*
Cavity insulation thermal resistance (R/inch)	3.5 Icynene	
Continuous insulation thermal resistance (R/inch)	6.25 Polyiso Board	
System R Value	**29.62**	

2 x 4 wood stud @16" frame with 2 x 3 horiz. strapping @16"

Stud Depth (inches)	4	
Strapping Depth (inches)	1.5	
Zone A — percentage of wall area	75.00%	all insulation
Zone B — percentage of wall area	15.00%	all wood
Zone C — percentage of wall area	5.00%	insulation plus strapping
Zone D — percentage of wall area	5.00%	insulation plus stud
Insulation Depth (inches)	5.5	
Wood Framing Thermal Resistance (R/inch)	1.00	
Insulation Thermal Resistance (R/inch)	6.25	
System R Value	22.72	34.375
Add 1.5" Polyiso Board to the exterior - no Thermal Bridge	9.375	
Cumulative R-Value	**32.10**	

Peak heat loss with marc

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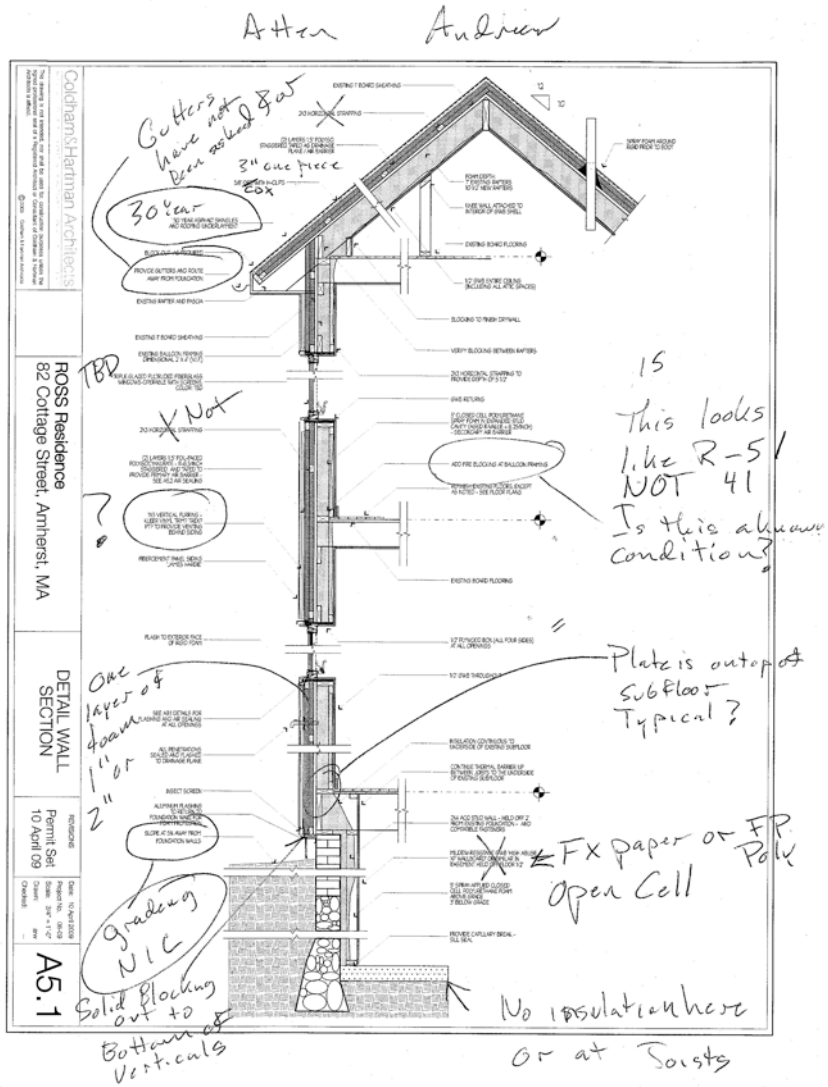
Revolution

Notes from the Frontlines of the Deep Energy



Struggle with GC matches our learning curve.

Pricing un-certain. = High.

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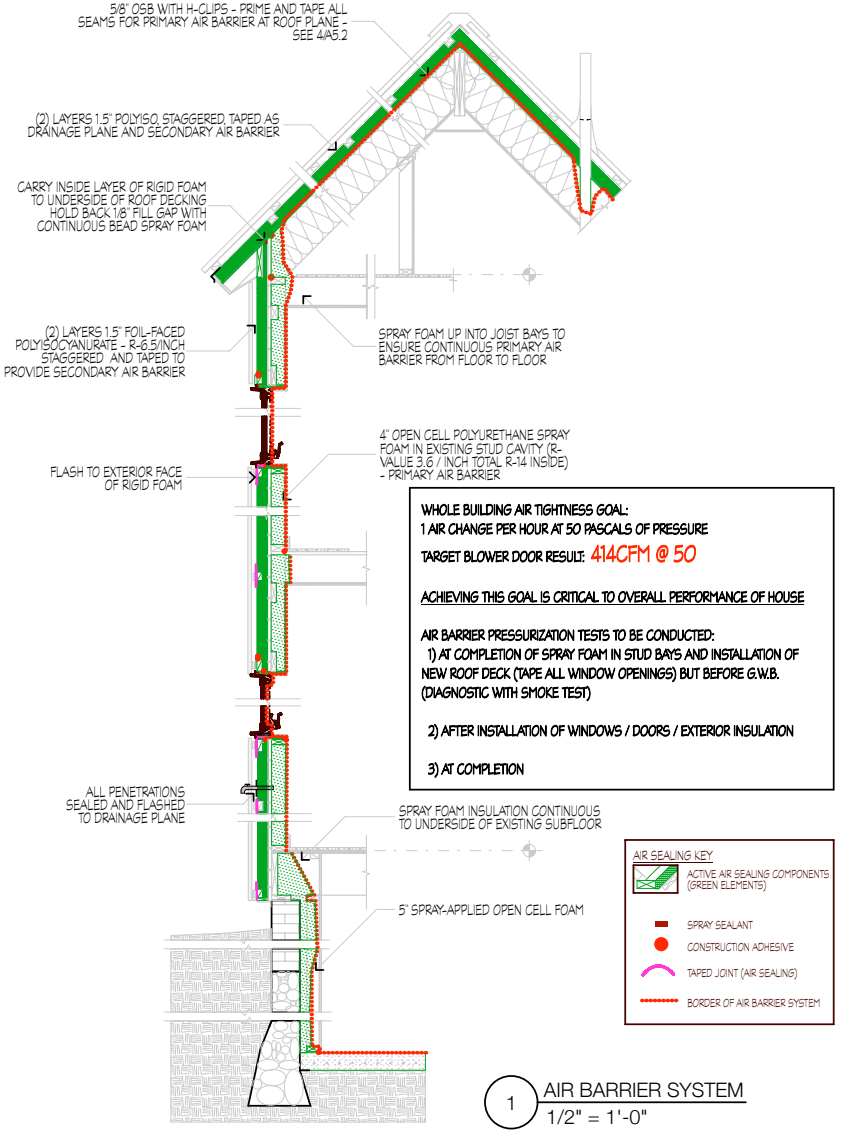
Notes from the Frontlines of the Deep Energy

Spray foam in, rigid foam out



Air barrier drawing, shown in red
Thermal in green. Fancy!

Move insulation out

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Drainage plane goes where?

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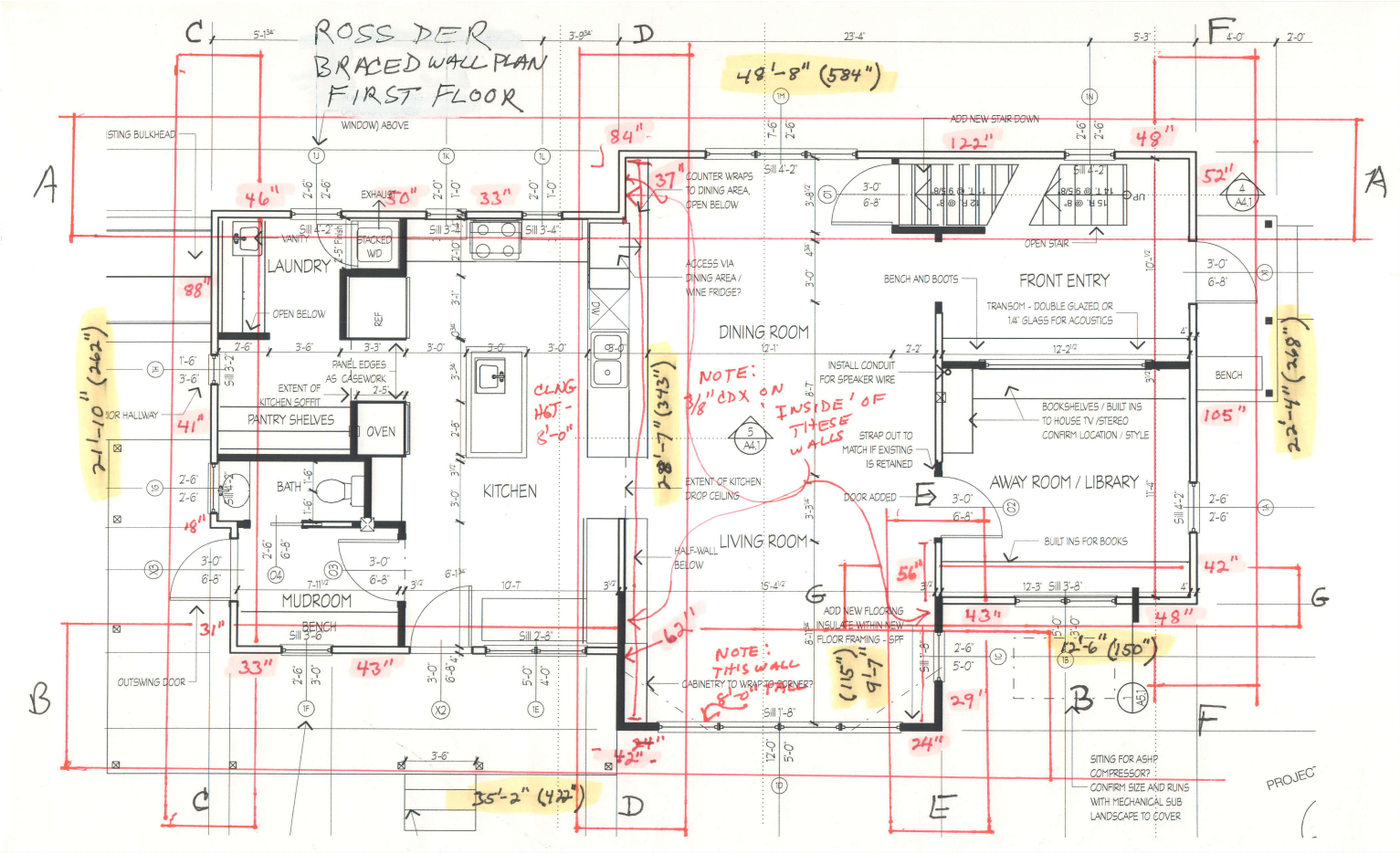
Notes from the Frontlines of the Deep Energy



Shear means plywood – should've moved aB

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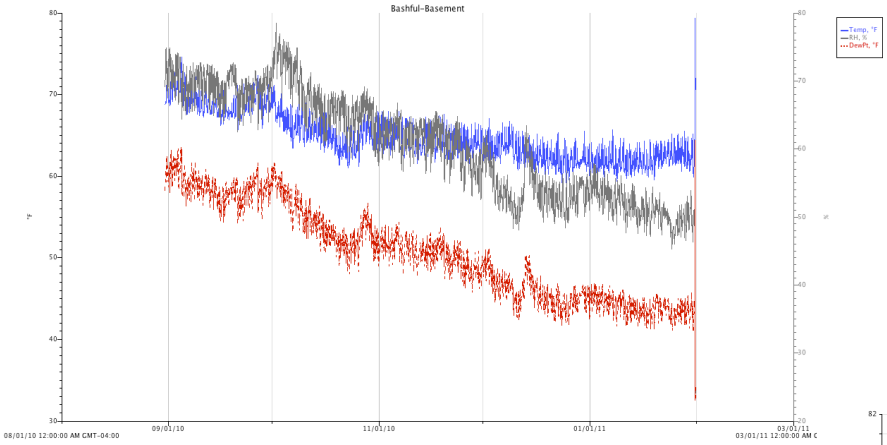
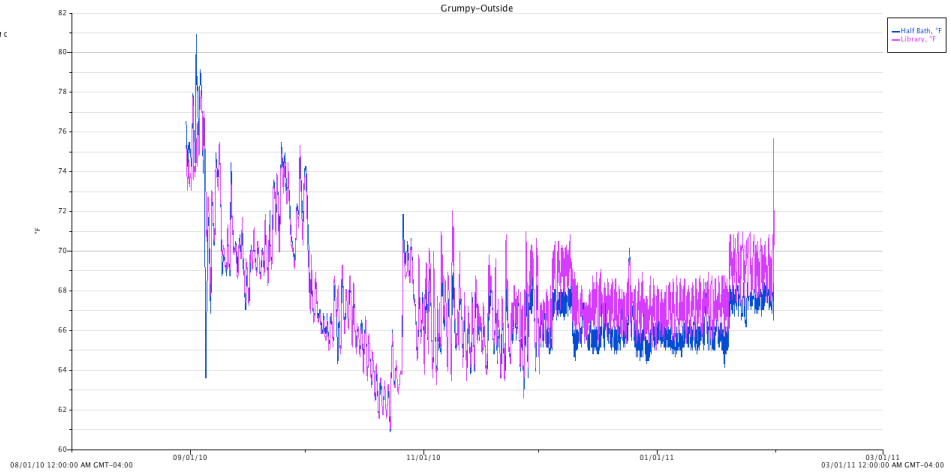
Air Sealing, Excellent Performance, Maxi-splits





Generates interest on many levels

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National Grid territory

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Had always wanted to go fossil-free

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WALL USE ONLY ESR-1474
ZIPSystem

Rigid over AB, then drainage and strapping


TYPAR
HouseWrap
MILES

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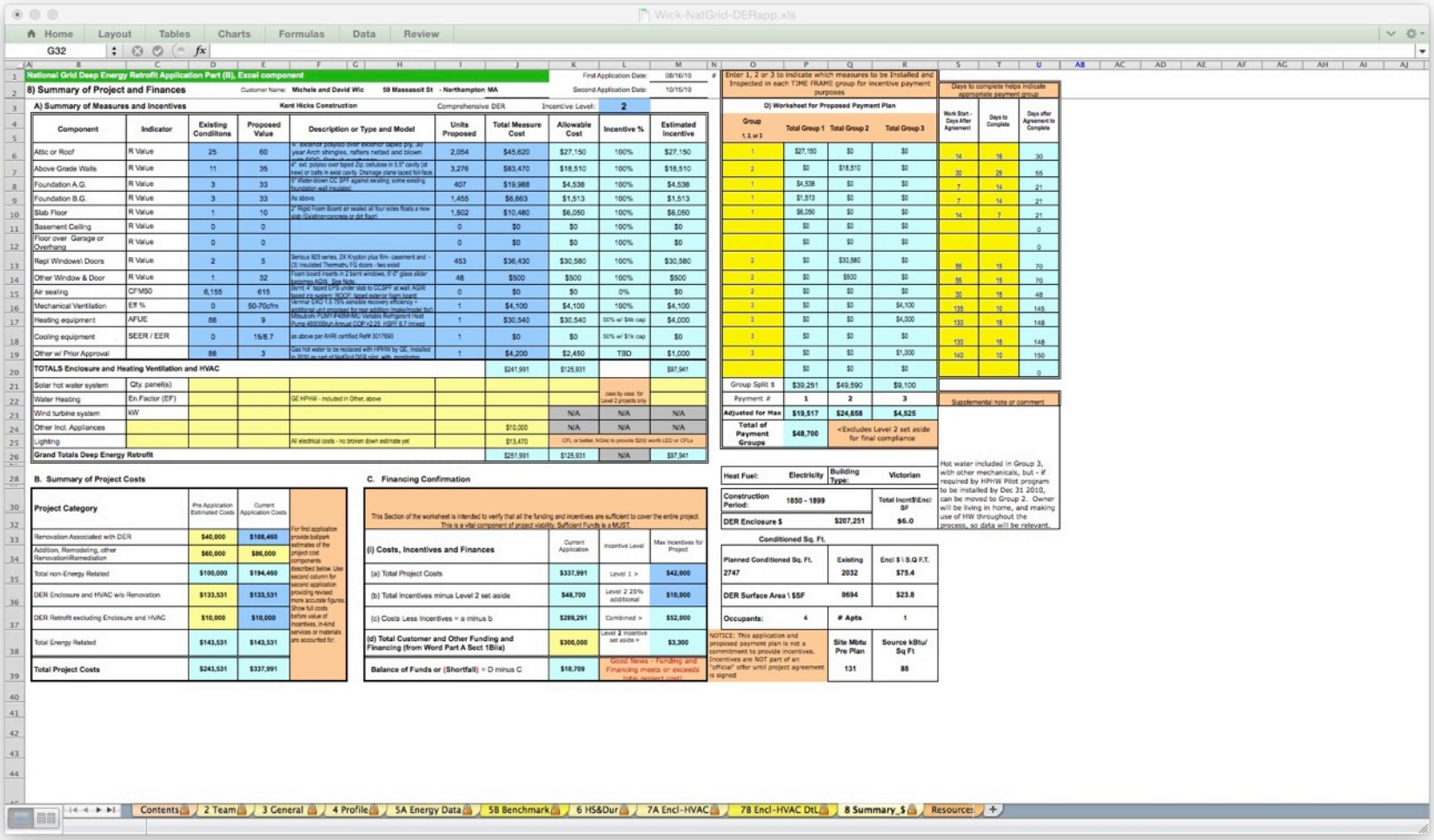

An expertise in paperwork

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Third party verification

BUILDING LEAKAGE TEST

Date of Test: 2011-07-06 Technician: HW
Test File: 2011-07-06 Wick Final Blower Door Test

Customer: National Grid DER Wick
59 Massasoit Street
Northampton, MA 01060
Phone

Building Address: 59 Massasoit Street
Northampton, MA 01060

Test Results

1.	Airflow at 50 Pascals: (50 Pa = 0.2 w.c.)	435 CFM (+/- 0.5 %) 0.75 ACH 0.16 CFM per ft2 floor area
2.	Leakage Areas:	43.0 in2 (+/- 3.3 %) Canadian EqLA @ 10 Pa 22.3 in2 (+/- 5.2 %) LBL ELA @ 4 Pa
3.	Minneapolis Leakage Ratio:	0.06 CFM50 per ft2 surface area
4.	Building Leakage Curve:	Flow Coefficient (C) = 30.8 (+/- 8.1 %) Exponent (n) = 0.677 (+/- 0.021) Correlation Coefficient = 0.99903
5.	Test Settings:	Test Standard: = CGSB Test Mode: = Depressurization Equipment = Model 3 Minneapolis Blower Door

Infiltration Estimates

1.	Estimated Average Annual Infiltration Rate:		42.9 CFM 0.07 ACH 8.6 CFM per person (using bedrooms + 1)
2.	Estimated Design Infiltration Rate:	Winter:	48.3 CFM 0.08 ACH
		Summer:	20.3 CFM 0.04 ACH
3.	Recommended Whole Building Mechanical Ventilation Rate: (based on ASHRAE 62.2)		65.0 CFM

Cost Estimates

1. Estimated Cost of Air Leakage for Heating:
2. Estimated Cost of Air Leakage for Cooling:

Massasoit – 5kW and GSHP

■ Actual ☐ Estimated

nationalgrid

PO Box 960
Northborough MA 01532

KEEP THIS PORTION FOR YOUR RECORDS.

RETURN THIS PORTION WITH YOUR PAYMENT.

ACCOUNT NUMBER	PLEASE PAY BY	AMOUNT DUE
[redacted]	No Payment Due	$ 0.00

Ward Street

Typical, to add small addition.

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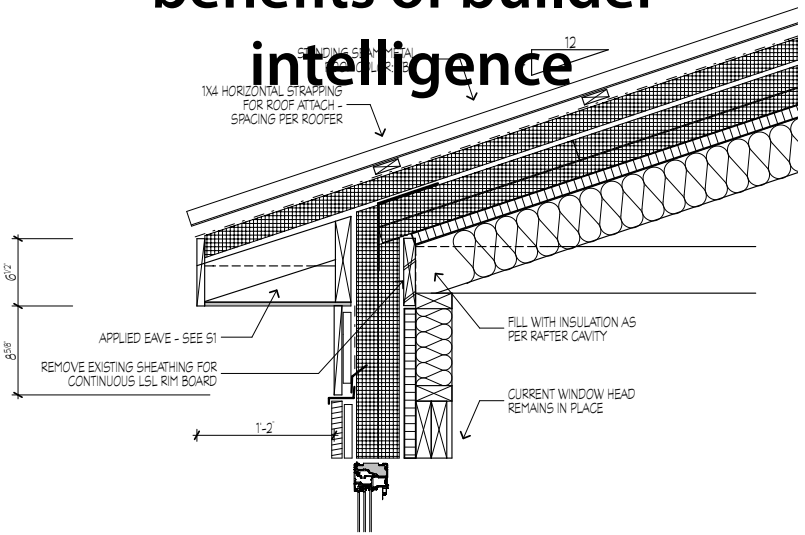
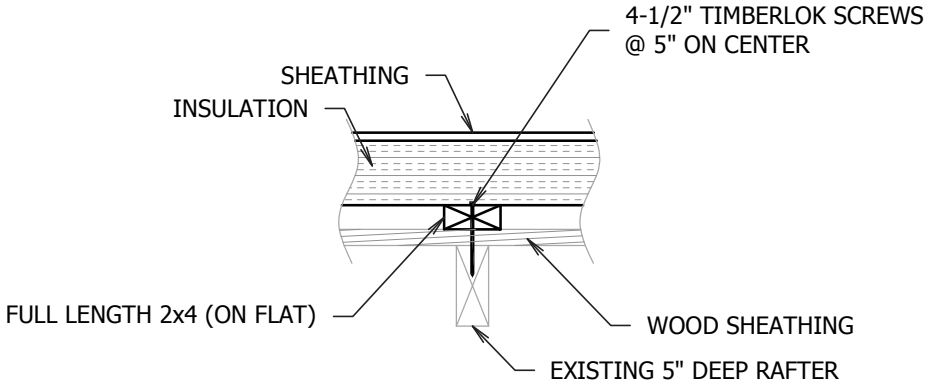
Notes from the Frontlines of the Deep Energy

Ward Street – Applied eave construction and the benefits of builder intelligence

Holden Builders' innovation with the applied eave





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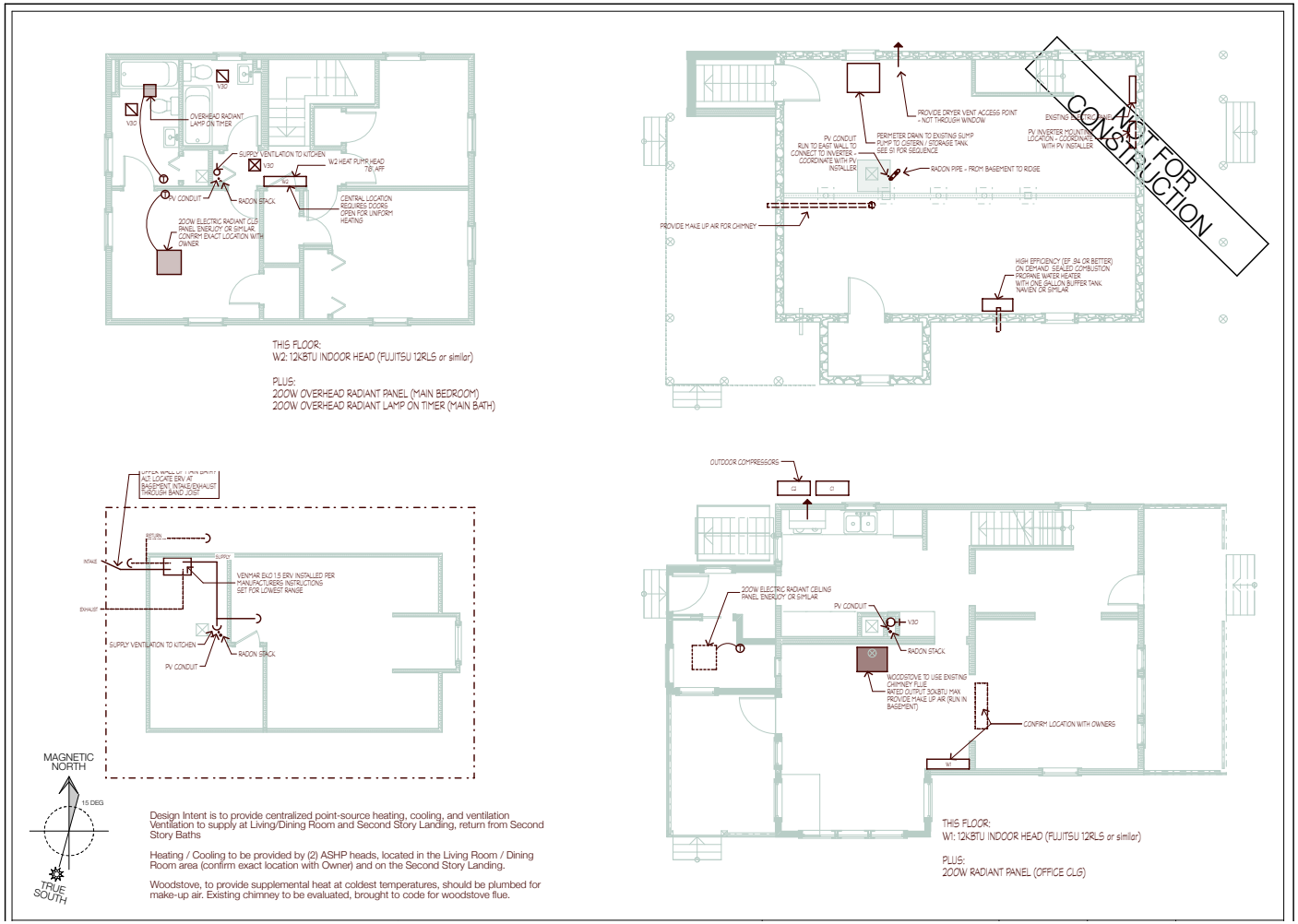
Ward Street – supply at the center



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Notes from the Frontlines of the Deep Energy

Renovation in place

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Educated client

Hampden Street – a new air barrier?

Another ambitious builder

Builder out in front of clients and designer

H 4”

The pattern gels


crocs

Stockbridge

Incentives bring interest

Powdermill Village – the affordable solution

How we can use this more broadly?

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Strategies not new

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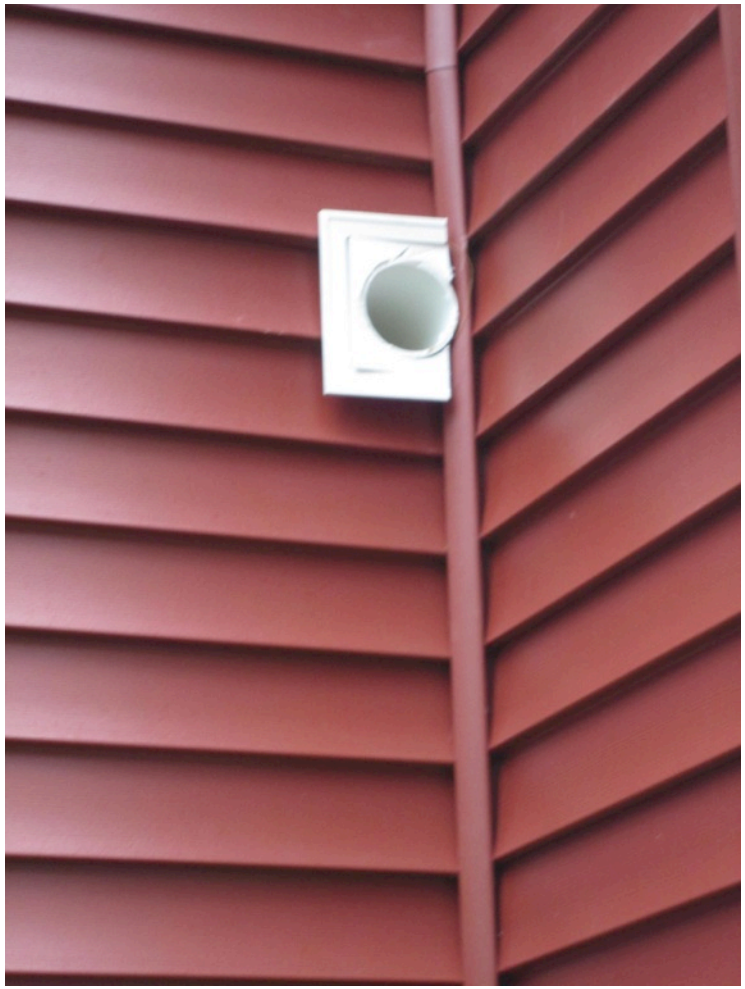
Powdermill Village - challenges



Struggles are new

Right house, right place

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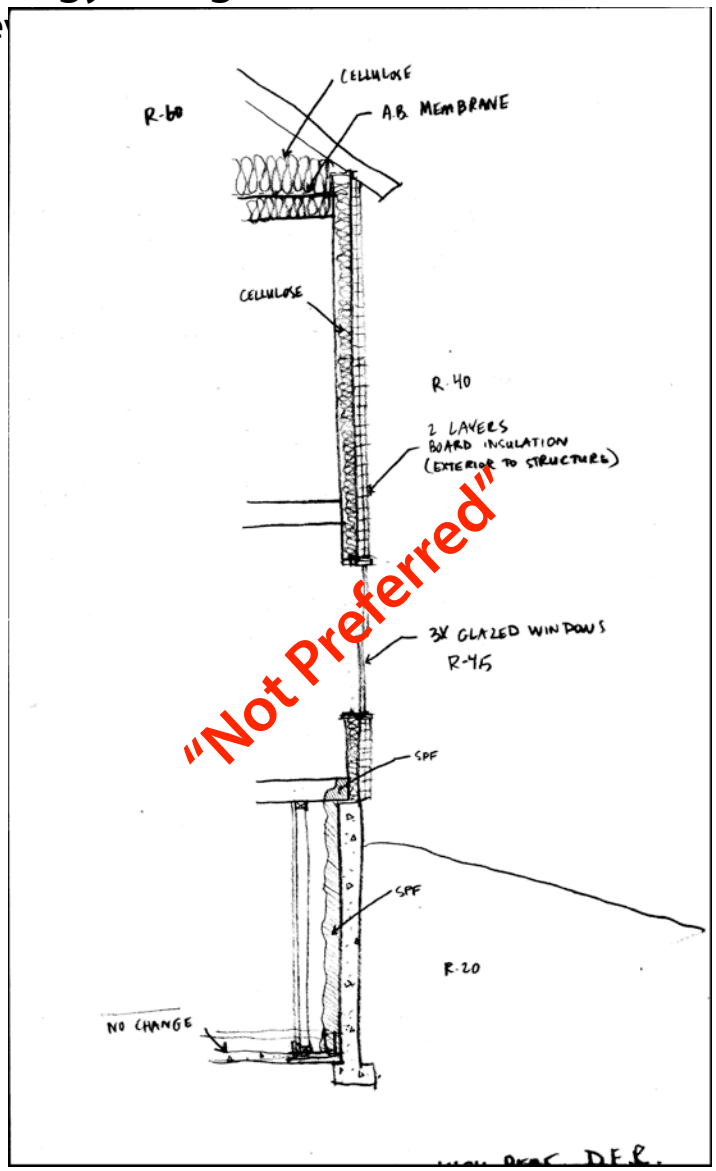
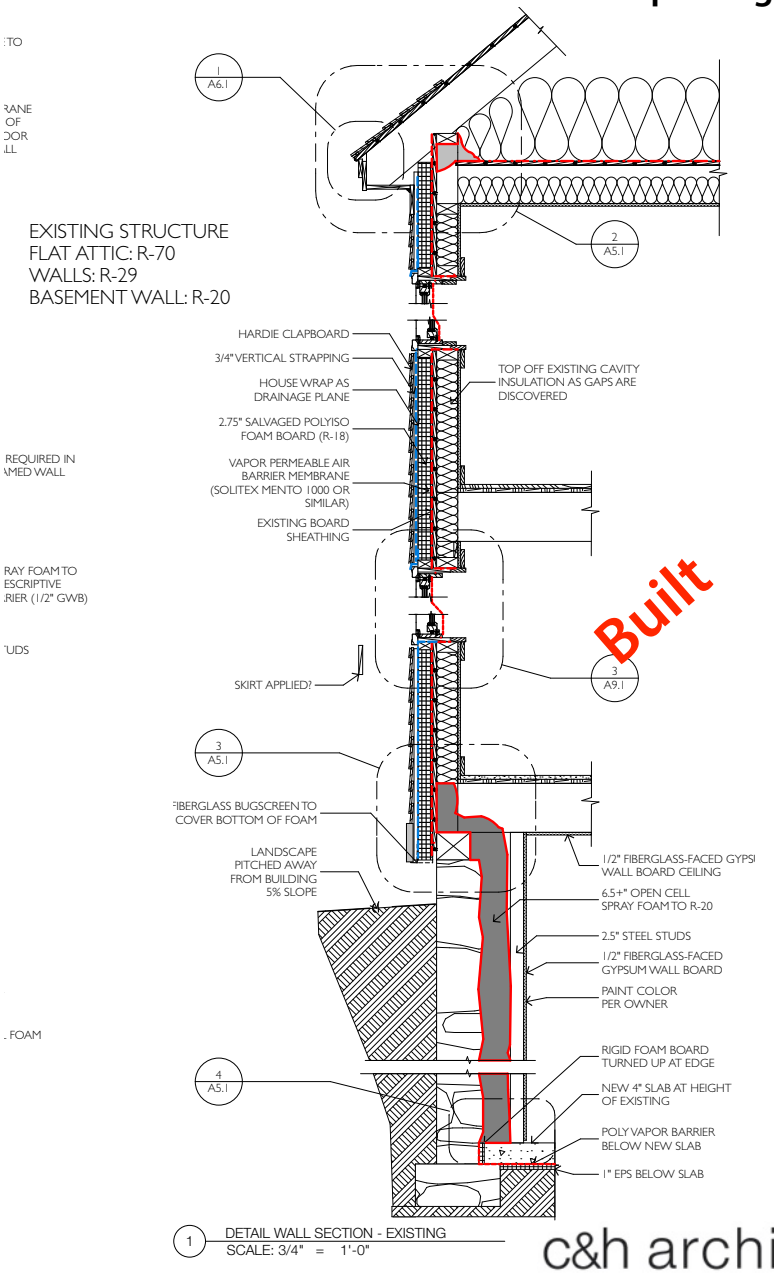
Re

Notes from the Frontlines of the Deep Energy





No DER as described – but when we got down to it..

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File: 13-26 Turners Four Square Print Date: 5/14/15

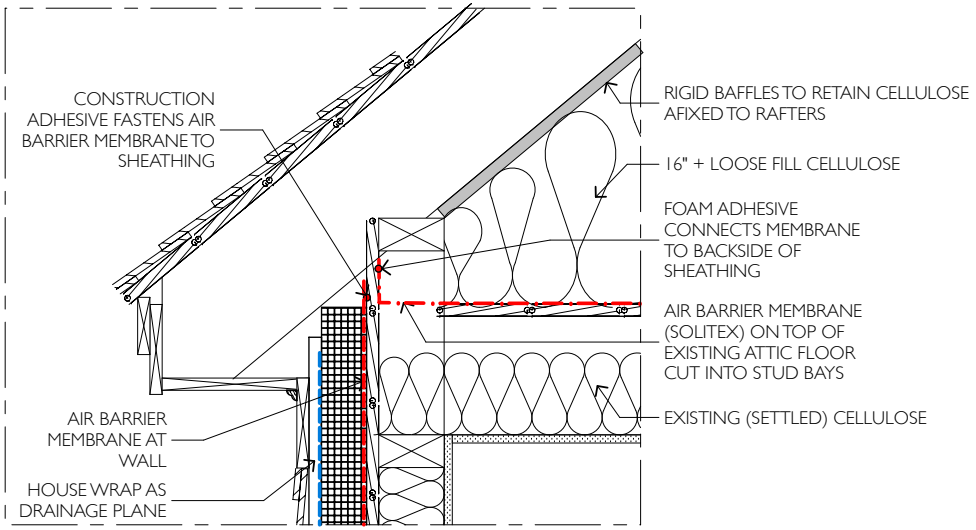
c&h architects
coldham and hartman.com amherst, ma

ATTIC FLOOR AB

Date: 14 May 2015
Project: Turners Four
Dwg Ref:
Scale: 1 1/2" = 1'-0"

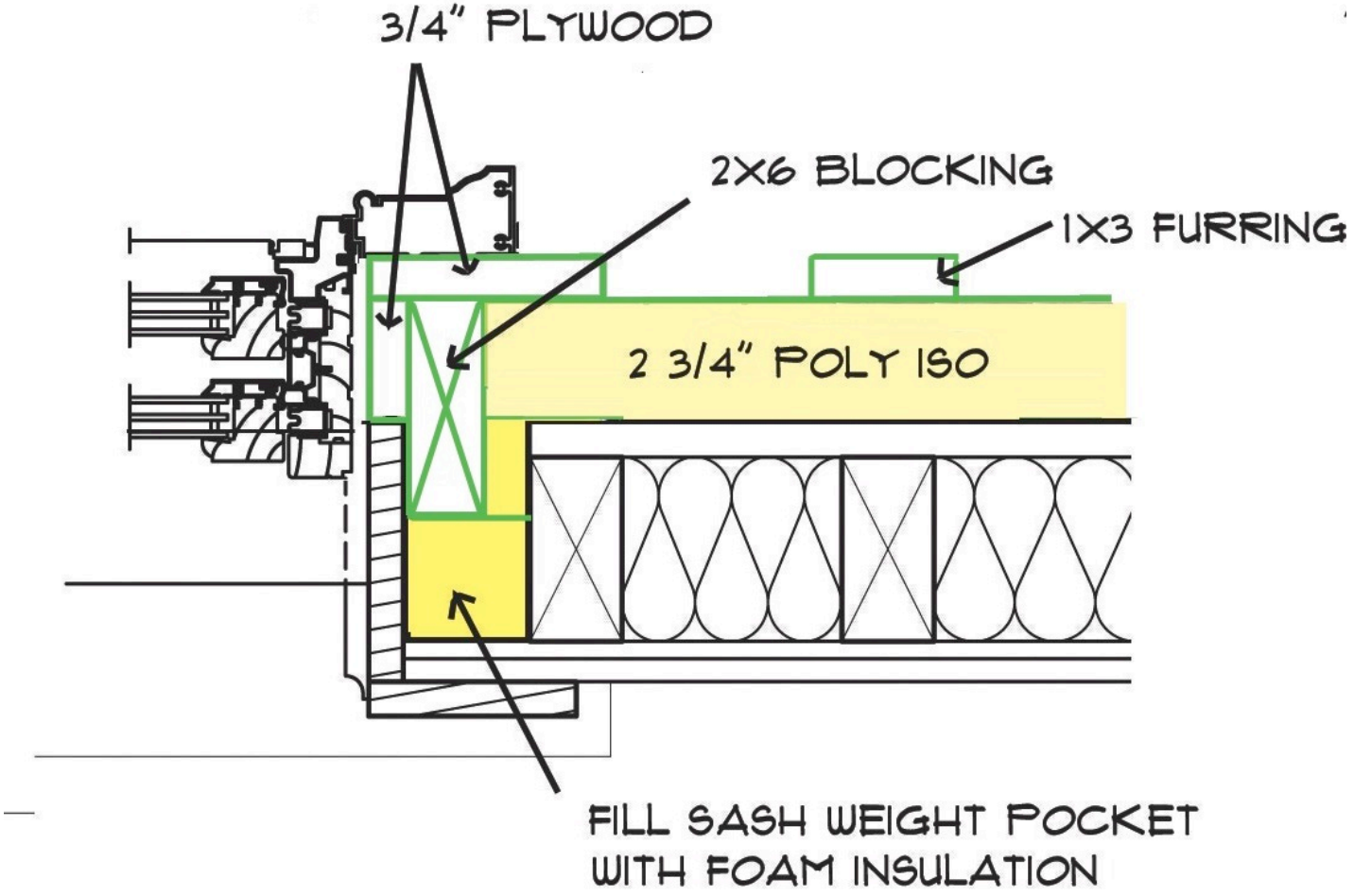
SK-DET

Keep the attic outside




TYPAR

Montague Road – retaining the trim



Keep the feel – building on Bruce and Tom

Fuel switch?

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Notes from the Frontlines of the Deep Energy

By now, there's a product to want

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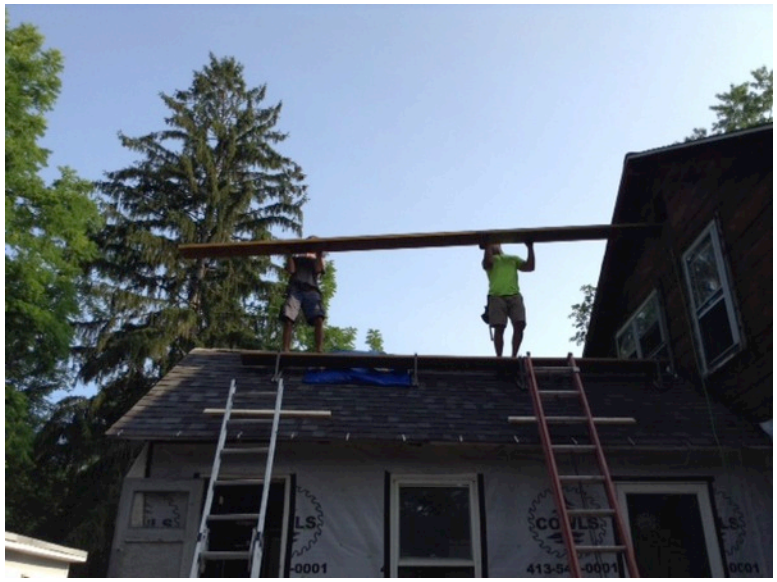
Beston Street – SIP roof overlay

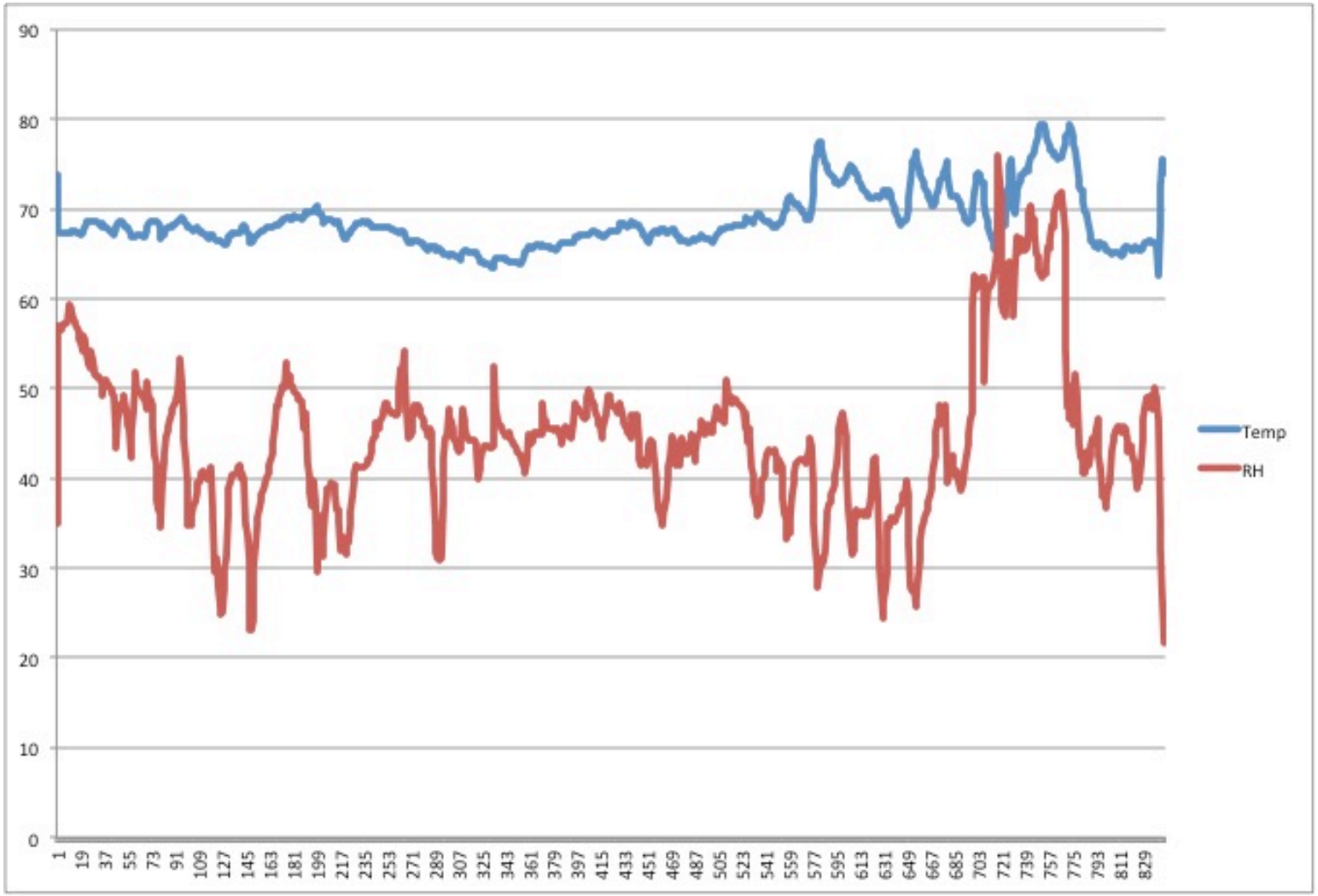


Ventilation still a big concern – in the form of humidity. For a piano.

Beston Street – ASHP and behavior

ASHP is training

What did we learn?



Humidity concerns – when the window opens

Aspirations?

Thank you.

Questions?

andrew@coldhamandhartman.com

candharchitects.com