Green Design and Historic Preservation


Intro 5 minutes
3 projects 10 min each
Questions 10 min

Who is in the audience?

C&H- a small firm in Amherst, MA
We are conservationists, not preservationists

Building transform with time

Design for the next 100 years

Do the math and make deliberate decisions about energy

There are some sacred and iconic buildings that should be preserved in their place and time. They are few and far between, such as:

Monticello
Falling Water
Old North Church
Faneuil Hall
Others? The Fine Arts Center?
There are NO UNIVERSAL SOLUTIONS

Each designer must consider:
- Climate- Stamford, CT is not Burlington, VT
- Orientation of the walls
- Construction Type
- Bulk water management (some call it rain)
- Skill of the contractor
- Occupancy type
- Ambitions of the Owner

There are many tools in the tool box, they include:
- Our consultant and colleague network
- Modeling tools such as WUFI
- Spreadsheets
- Practice
Buildings that are loved will be taken care of over time.

Beauty and Joy may matter more than energy savings or keeping the status quo of a Historic Object.

Old is not the same as Historic.

If it’s ugly and uses little energy, what was accomplished?

There is no calculable return on investment for Joy.

“You know it when you see and experience it”
STRUCTURE AND INSULATION - pick a side!!!

MASONRY - Large industrial mill conversion into housing
Closed cell spray foam on the interior of brick
Union Crossing, Lawrence, MA

WOOD- Public educational center
Cellulose cavities with existing walls
The Harris Center, Hancock, NH

WOOD- Private Residence
Exterior foam with new siding and windows
Pelham, MA
Who here pays an electric bill????

Who knows how many $$$ it is???

Who knows how many kwh it is??

Who knows how many btu there are in a kwh?

Who knows how many MPG their cars get????
Some basics:

A thermal envelope is composed of numerous materials and assemblies. These assemblies can each be rated with an R value. Say R30. U value is the inverse of R value, R30 = U of 0.03.

The envelope of the building, all six sides (4 walls, roof and slab) can be rated for infiltration by the use of a blower door.

A good building is 0.1 cfm50 per square feet of building shell, or approximately 1 Air Changes per Hour at 50 pascals.

1 ACH50 = approximately 17 ACH Natural (ranges depending on factors)

C&H has buildings that are routinely less than 1 ACH 50.

Energy Star is approximately 5 ACH50 for a house.
Should there be climate licenses???
<table>
<thead>
<tr>
<th>Building Use Description</th>
<th>Median Source EUI¹ (kBtu/Sqft)</th>
<th>Average Percent (%) Electric Use</th>
<th>Median Site EUI (kBtu/Sqft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>144</td>
<td>63%</td>
<td>58</td>
</tr>
<tr>
<td>K-12 School</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>College/University (campus level)</td>
<td>244</td>
<td>63%</td>
<td>104</td>
</tr>
<tr>
<td><strong>Food Sales</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grocery Store/Food Market</td>
<td>570</td>
<td>86%</td>
<td>193</td>
</tr>
<tr>
<td>Convenience store (with or without gas station)</td>
<td>657</td>
<td>90%</td>
<td>228</td>
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<tr>
<td><strong>Food Service</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restaurant/Cafeteria</td>
<td>434</td>
<td>53%</td>
<td>207</td>
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<tr>
<td>Fast Food</td>
<td>1170</td>
<td>64%</td>
<td>418</td>
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<tr>
<td><strong>Inpatient Health Care (Hospital)</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Lodging</strong></td>
<td>163</td>
<td>61%</td>
<td>72</td>
</tr>
<tr>
<td>Dormitory/Fraternity/Sorority</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hotel/Motel/Inn</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Mall (Strip and Enclosed)</strong></td>
<td>247</td>
<td>71%</td>
<td>94</td>
</tr>
<tr>
<td>Nursing/Assisted Living</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Office</strong></td>
<td></td>
<td></td>
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<tr>
<td>Outpatient and Health Care</td>
<td>163</td>
<td>72%</td>
<td>62</td>
</tr>
<tr>
<td>Clinic/Other Outpatient Health</td>
<td>194</td>
<td>76%</td>
<td>67</td>
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<tr>
<td>Medical Office</td>
<td></td>
<td></td>
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<tr>
<td><strong>Public Assembly</strong></td>
<td>89</td>
<td>57%</td>
<td>42</td>
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<tr>
<td>Entertainment/Culture</td>
<td>94</td>
<td>63%</td>
<td>46</td>
</tr>
<tr>
<td>Library</td>
<td>246</td>
<td>59%</td>
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<tr>
<td>Recreation</td>
<td>100</td>
<td>55%</td>
<td>39</td>
</tr>
<tr>
<td>Social/Meeting</td>
<td>71</td>
<td>57%</td>
<td>43</td>
</tr>
<tr>
<td><strong>Public Order and Safety</strong></td>
<td>161</td>
<td>57%</td>
<td>82</td>
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<tr>
<td>Fire/Police Station</td>
<td>146</td>
<td>56%</td>
<td>82</td>
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<tr>
<td><strong>Service (Vehicle Repair/Service, Postal Service)</strong></td>
<td>96</td>
<td>63%</td>
<td>45</td>
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<tr>
<td>Storage/Shipping/Non-Refrigerated Warehouse</td>
<td>28</td>
<td>56%</td>
<td>10</td>
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<tr>
<td>Non-Refrigerated Warehouse/Distribution Center</td>
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<td></td>
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</tr>
<tr>
<td><strong>Refrigerated Warehouse</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Religious Worship</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Retail (non-Mall Stores, Vehicle Dealerships)</strong></td>
<td>139</td>
<td>67%</td>
<td>53</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>127</td>
<td>56%</td>
<td>70</td>
</tr>
</tbody>
</table>

¹ 2003 CBECs
² National Median Source Energy Use and Performance Comparisons by Building Type
³ Use EPA’s Target Finder / Portfolio Manager

US Dept of Energy – Weighted Mean
Commercial Building Energy Consumption Survey
### Table 1. Target Energy Use Intensities\(^1\) for 30% savings relative to ANSI/ASHRAE/IESNA Standard 90.1-2004\(^2\) by Subsector and Climate Zone\(^3\): IP Units kBtu/ft\(^2\)-yr

<table>
<thead>
<tr>
<th>Subsectors</th>
<th>Climate Zones</th>
<th>1A</th>
<th>2A</th>
<th>2B</th>
<th>3A</th>
<th>3B</th>
<th>3C</th>
<th>4A</th>
<th>4B</th>
<th>4C</th>
<th>5A</th>
<th>5B</th>
<th>6A</th>
<th>6B</th>
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<tr>
<td>Nonrefrigerated warehouse</td>
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<td>Retail (except malls)</td>
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<td>Public order and safety</td>
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<td>Skilled nursing</td>
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<td>Refrigerated warehouse</td>
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</tbody>
</table>

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1. EUIs are site (delivered) energy use for the whole building.
2. 30% Targets were developed from modeling results for Standard 90.1-2004 multiplied by 0.7 (listed in Table 2).
<table>
<thead>
<tr>
<th>Building Type</th>
<th>U.S. National Average Site EUI</th>
<th>2003 CBECs Average*</th>
<th>Other</th>
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</thead>
<tbody>
<tr>
<td>Bank/Financial Institution</td>
<td>77</td>
<td>X</td>
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<tr>
<td>Courthouse</td>
<td>118</td>
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<tr>
<td>Data Center - use Target Finder to derive comparison</td>
<td>TF --&gt;</td>
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</tr>
<tr>
<td>Education - College/University (campus-level)</td>
<td>120</td>
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<tr>
<td>Education - General</td>
<td>76</td>
<td>X</td>
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</tr>
<tr>
<td>Education - K-12 School</td>
<td>75</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Food Sales - Convenience Store (w/ or w/out gas station)</td>
<td>241</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Food Sales - General</td>
<td>225</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Food Sales - Supermarket/Grocery</td>
<td>213</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Food Service - Fast Food</td>
<td>534</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Food Service - General</td>
<td>351</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Food Service - Restaurant/Cafeteria</td>
<td>302</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Health Care - Clinic</td>
<td>84</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Health Care - Hospital Inpatient</td>
<td>227</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Health Care - Medical Office</td>
<td>59</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Health Care - Nursing/Assisted Living</td>
<td>124</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Health Care - Outpatient - General</td>
<td>73</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Laboratory - recommend use of Labs21</td>
<td>370</td>
<td>Labs21</td>
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</tr>
<tr>
<td>Lodging - General</td>
<td>87</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lodging - Hotel/Motel</td>
<td>94</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lodging - Residence Hall/Dormitory</td>
<td>89</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Mixed-Use - use Calculator tab to derive comparison</td>
<td>Calc --&gt;</td>
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</tr>
<tr>
<td>Office - 10,000 sf</td>
<td>74</td>
<td>X**</td>
<td></td>
</tr>
<tr>
<td>Office - 10,001 to 100,000 sf</td>
<td>90</td>
<td>X**</td>
<td></td>
</tr>
<tr>
<td>Office - 100,001 sf or greater</td>
<td>104</td>
<td>X**</td>
<td></td>
</tr>
<tr>
<td>Other - see FAQ #29</td>
<td>104</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Public Assembly - Entertainment/Culture</td>
<td>95</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Public Assembly - General</td>
<td>66</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Public Assembly - Library</td>
<td>104</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Public Assembly - Recreation</td>
<td>65</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Public Assembly - Social/Meeting</td>
<td>52</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Green Design and Historic Preservation

Context Plan

Coldham & Hartman Architects
Existing Site

Coldham&Hartman Architects
North Facade
Green Design and Historic Preservation

UMass, Amherst – 19 Oct 2012

Mural

Coldham & Hartman Architects
Entry Lobby
Apartment “porches”
Green Design and Historic Preservation

Apartment “porches”

Coldham&Hartman Architects
Green Design and Historic Preservation

UMass, Amherst – 19 Oct 2012

River View

Coldham&Hartman Architects
Green Design and Historic Preservation
UMass, Amherst – 19 Oct 2012

Heating Energy projections

Proposed Savings: 81%

Base

Proposed

Exterior Wall
As Is: Brick - R4.3
Insulated - R15

Window
U-value .5
U-value .33

Roof
As Is: R14
Re-roof: R30

Garage Ceiling
R-10
R-20

Air Leakage
.5cfm50 / sf of shell
.1cfm50 / sf of shell

Consumption (MMBtu/year)

Base
Proposed

Cooling
225.9
240.3

Heating
2720.2
515.9

It's The Envelope,

Building 9 Union Crossing

Coldham&Hartman Architects
Green Design and Historic Preservation

UMass, Amherst – 19 Oct 2012

Energy Reduction - Insulate the brick
Brick removal and testing – interior and exterior
Figures 3 and 4, show the results of the hygrothermal simulation following five years of exposure. The wall reached yearly equilibrium moisture content prior to five years of simulation. The pink columns represent the layers of brick in the wall. The main difference evident in the simulations is the range of relative humidity at the interior surface. The spray foam retrofit limits the moisture movement from the interior into the masonry wall. There are no significant differences in masonry moisture contents following five years of simulation. The interior withes of brick to not reach the critical moisture content in five years of simulation in either wall system.
Conclusions

- The average saturation coefficient of the brick samples meets the requirement for severe weathering brick according to ASTM C62
- Hygrothermal modeling was conducted using what we believe to be the worst case scenario and compared to a conservative threshold for freeze thaw resistance.
- The hygrothermal modeling predicted that there was no significant difference in the predicted moisture content of the existing masonry wall and the proposed insulated wall with high density spray foam.
- Modeling the proposed wall assembly with 3.5” of high density spray foam increased the freeze thaw cycles from two to three at the base of the structure. No increase in freeze thaw cycles was predicted near the top of the structure.
- There does not appear to be any significant durability risk to insulating the interior of the building enclosure with high density (2.0 pcf) spray foam based on the material properties measured, and hygrothermal modeling.
- The risk of freeze thaw damage should always be minimized by controlling the concentration of rain deposition and runoff.

Notes

- There does appear to be evidence of moisture in the client provided photograph of the large structural beam (Library-6248). It is unclear from the photo where this water came from or if it is currently an issue. It is important to control moisture from entering the enclosure to decrease risks of moisture related durability issues, including freeze thaw.
- The masonry wall on the north orientation does appear to be in good condition, although the maintenance history is unknown, and the area photographed is quite small. If the building enclosure has not had freeze thaw problems in the past, it is unlikely to experience any in the future, caused solely by the addition of spray foam insulation.
- In the drawings provided, the window sills appear to be flat and not sloped to the exterior. Flat window sills are a common place for rain water to collect, and could possibly enter into the masonry wall, or the interior of the building. It is always a good strategy to slope the window sills away from the water further than the exterior, wall if possible.
- There does appear to be an overhang on at least one side (north) of the building from the drawings. Overhangs with functional drip edges help decrease the amount of rain that falls against the surface of the enclosure, and should be used wherever possible.
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Interior closed cell spray foam- INSPECTIONS

Coldham&Hartman Architects
Green Design and Historic Preservation

Acoustical Mockup Testing

Date of measurement: 11/4/2009
Consultant: JS/CS
Acentech Project: 619804

Description of construction:
Existing wood floor and structure throughout. Ceiling in most of the room is one layer of gypsum board suspended on wire. 18-inch airspace, insulation in cavity. Ceiling at window is one layer of gypsum board attached to wood deck using RSIC-1 clips, insulation in small cavity.

<table>
<thead>
<tr>
<th>Third-Octave Band Center Frequency (Hz)</th>
<th>100</th>
<th>125</th>
<th>160</th>
<th>200</th>
<th>250</th>
<th>315</th>
<th>400</th>
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<tr>
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<td>97.4</td>
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</table>

Apparent Transmission Loss
29 28 35 39 49 51 51 54 55 58 57 52 62 64 65 66 68

Apparent Sound Transmission Class (ASTC): 52

Description of Source Room:
Lower mockup bedroom.

Description of Receiver Room:
Upper mockup bedroom.

Impact Insulation Measurement Report
Figure 5. Impact Sound At Window (Room A)

Date of measurement: 11/4/2009
Consultant: JS/CS
Acentech Project: 619804

Description of construction:
Existing wood floor and structure, ceiling at window is two layers of gypsum board attached to wood deck using RSIC-1 clips, insulation in small cavity.

<table>
<thead>
<tr>
<th>Third-Octave Band Center Frequency (Hz)</th>
<th>100</th>
<th>125</th>
<th>160</th>
<th>200</th>
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<td>52</td>
<td>51</td>
<td>53</td>
<td>50</td>
<td>45</td>
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</table>

Field Impact Insulation Class (FIIC): 39

Description of Source Room:
Upper bedroom mockup.

Description of Receiver Room:
Lower bedroom mockup.
Air Sealing - Section & Plan
Air Sealing Drawing Set - AS-2

**AIR SEALING SEQUENCE**

1. Seal existing channels in the underside of decking [see image above] with single component high-expansion poly foam. Seal the channel so that the foam extends 2" +/- on either side of the beams only. Ensure that the foam is flush with the decking so plywood can be applied (see 1A for existing channel).
2. Plywood attached to underside of existing wood decking. Plywood does not extend into the corridor. Edge of plywood will align with corridor demising wall below (corridor side of GVB to be applied to decking, not plywood - see detail 9A).
3. Seal plywood to beams with acoustical sealant.
4. Acoustical sealant at all connections to exterior brick wall.
5. All seams of plywood are sealed with non-hardening caulk.

For steps 1-5 see detail sections 5A & 5B.
Air Sealing Drawing Set - AS-3

Air Sealing Sequence

6. (2) Continuous beads of construction adhesive placed at location of corridor demising walls. Ensure all cracks and voids are filled prior to laying down demising wall plates. Review with architect.

7. (1) layer GWB installed (interior/unit side only) as air barrier of corridor demising wall.

8. Acoustical sealant around entire base of GWB perimeter.

9. Acoustical sealant at top of corridor GWB (sealed to plywood).

For steps 6-9 see detail section 9A.
Air sealing results- not as good as hoped

4th floor isolated with mechanical running - 368,000 cubic foot volume - 3.7 ACH50 or 0.34 cfm50/sf/shell

Isolated unit was at 7 ACH 50, but with nearly perfect air barrier vertically Side to side via the “triscut” and corridor wall
PV's
Site Energy Use Intensity 23 kbtu/sf/year

Taken June 2012

Projections

28% heating
23% hot water
49% electricity

CBECS database national average 57 kbtu/sf/year

A 60% reduction, which meets the 2030 Challenge target
Project #2 - THE HARRIS CENTER

Coldham & Hartman Architects
Restoration of main house, addition in back
Two level entry
Green Design and Historic Preservation

UMass, Amherst – 19 Oct 2012

Interior spaces and animal cut outs

Coldham & Hartman Architects
Green Design and Historic Preservation

UMass, Amherst – 19 Oct 2012

View from East

Coldham & Hartman Architects
Pellet boiler and composting toilets

Coldham&Hartman Architects
Pellet silo feeds boiler with an auger
Green Design and Historic Preservation
UMass, Amherst – 19 Oct 2012

2030 Challenge National Average baseline
Office under 10,000 sf 74 kbtu/sf/year
Public Assembly – Social/Meeting 52 kbtu/sf/year
Average of two 63 kbtu/sf/year

Energy Usage in kBtu/ft²

<table>
<thead>
<tr>
<th></th>
<th>2002-2003 Season</th>
<th>2003/04 Season</th>
<th>2004/05 Season</th>
<th>2005/06 Season</th>
<th>Average</th>
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<td>Pellets and Oil</td>
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<tr>
<td>EUI</td>
<td>19.10</td>
<td>25.20</td>
<td>19.86</td>
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<td>21.38</td>
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<td>Combined EUI</td>
<td>2004 29.71</td>
<td>2005 34.20</td>
<td>2006 29.19</td>
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<td>32.11</td>
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</table>

Site Energy Use Intensity

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Wall System- old drawings! No .pdfs

Coldham&Hartman Architects
Construction Photos

Coldham & Hartman Architects
Strapped existing 2”x 4”
Cellulose with poly interior air barrier
CCSF at the tricky bits
Lessco boxes
Poly is the air barrier and Sealed to the plates with Acoustical sealant or “black death”

What we did in 2002 Probably not now

Construction Photos
What’s left for time?

One more project or questions?
Robert Frost lived here from 1915-1917
The house was built in 1913
From the 1930’s- side view

Coldham & Hartman Architects
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Side view - 2000

Coldham&Hartman Architects
Front of house-now
Side view–now
Shingles are original and
Nearly 100 years old

Splitting
Paper thin on the west
Weather tight- barely
Squirrels!!! – in 1970’s fiberglass insulation was added
Old growth red cedar
Dipped in creosote
10-12” wide
Snowman boiler with asbestos, electric hot water
New boiler and indirect tank- 2000

Coldham & Hartman Architects
### Historic Oil Consumption

<table>
<thead>
<tr>
<th>Year</th>
<th>Gallons</th>
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<tbody>
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<td>2011</td>
<td>369</td>
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<tr>
<td>2009</td>
<td>483</td>
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<tr>
<td>2006</td>
<td>497</td>
</tr>
<tr>
<td>2003</td>
<td>859</td>
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The table below details the oil consumption data from various years, including the date, degree day, gallons, and price per gallon.

<table>
<thead>
<tr>
<th>Year</th>
<th>Date</th>
<th>Degree Day</th>
<th>Gallons</th>
<th>Price per gallon</th>
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<td>2011</td>
<td>05/02/12</td>
<td>heat on/off</td>
<td>114.1</td>
<td>$3.999</td>
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<td>02/29/12</td>
<td>2210</td>
<td>102.2</td>
<td>fill up</td>
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<td>2011</td>
<td>01/09/12</td>
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<td>2010</td>
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<td>109.7</td>
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<td>121.5</td>
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<td>2008</td>
<td>12/12/08</td>
<td>heat on/off</td>
<td>131.9</td>
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<td>09/05/08</td>
<td>heat on/off</td>
<td>100</td>
<td>Full</td>
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<td>12/20/07</td>
<td>heat on/off</td>
<td>94.5</td>
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<td>2006</td>
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<td>12/28/05</td>
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**Historic Oil Consumption**

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Green Design and Historic Preservation

Hats and boots

Coldham&Hartman Architects
Green Design and Historic Preservation

Harsh winter- ice dam comparison

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Coldham&Hartman Architects
Cozy – enough?
Green Design and Historic Preservation

Heat Loss Component Budget — EXISTING Conditions

4 Amherst Road

Design Temperature Difference 70 deg F

Based on Blower Door Testing - 2008

R VALUES

1/(Btu/hr*degF*sf)

Before attic insulation and airsealing

Exterior Wall (4" stud cavity w/fiberglass—settled) 14.00

Roof plane 40.00

ACH 50 11.23

Floor over air 35.00

Rim joists 24.00

After attic insulation and airsealing

Window — New 5.00

Skylights 1

3,000 cfm

Window — Existing 2.50

Opaque Door R Value 2.00

ACH50 = 9.69

6.7 not including basement

Glass Door R Value 2.00

ACH Nat = 0.57

Slab edge

Basement Wall R Value 10.00

CFM 50 = 2517

VOLUME of Building 22568 sf (Est.)

Floor area (nic basement) 1832 sf

Ventilation system capacity 60 cfm

ELEMENT

AREA (s.f.) AU (Btu/hr*deg F)

Exterior Wall 1,845 131.79

Slab edge perimeter linear ft

Basement Wall - below grade 68.76 116 linear ft

Slab edge (if no foundation wall) 0.00

Basement wall above grade 236 23.60

Bast. modification factor (to account for lower temp. diff.) 1

Floor over air 48 1.37

Rim joists 118 4.92

Window - New 20 4.00

Window — existing 197 78.80

Roof Plane 901 22.53

Skylights 0 0.00

Opaque Door 21 10.50

Glass Door 38 19.00

Total shell area 3,424

ACH-Natural 0.57 231.55

Equiv. AU

INfiltration

0.57 231.55

Evaporation

16.20

AU Conduction Only 365.26

AU Total 613.01 Btu/hr*deg F

Design Heat Loss, BTU/Hr 42,911 Btu/hr (Capacity of Heating System)

Design Heat Loss, Kw 12.57

Design heat loss per unit area 23.4 Btu/hr/sf
Green Design and Historic Preservation
UMass, Amherst – 19 Oct 2012

Heat Loss Component Budget — PROPOSED Conditions 11-May-12

4 Amherst Road

Design Temperature Difference 70 deg F

R VALUES

<table>
<thead>
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<th>ELEMENT</th>
<th>AREA (s.f.)</th>
<th>AU/(Btu/hr*degF)</th>
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<td>Glass Door R Value</td>
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<td>VOLUME of Building</td>
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<tr>
<td>Floor area (nic basement)</td>
<td>1832 sf</td>
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Based on Blower Door Testing: 2008

Before attic insulation and airsealing

ACH 50 11.23

3,000 cfm

6.7 not including basement

ACH Nat 0.57

CFM 50 = 2517

Ventilation system capacity 60 cfm

Proposed Peak Heat Loss

Coldham & Hartman Architects
The choices for insulation and how much matter- too much CAN be a bad thing. (The work of David White and EBN)
What would YOU do?

Hmmmm…..
This is our house.

Remove siding
Add 2 layers of 1 1/2” polyiso rigid insulation
First layer of foam is air barrier
Sheathing- taped
Homeslicker
New shingles to match previous- pre stained
New windows- triple glazed double hung w/integral aluminum trim

Energy Recovery Ventilator

Keep accent windows- storm panels already on both sides
Keep shingles under front porch as is- re-stained
And of course, a new master bathroom and landscaping

Air sourced heat pump to follow to get off oil- even though only 200 gallons
With 4.9 kw of pv- could be net zero, we’ll see…

Design for the next 100 years
WUFI- what’s the benefit of 3” of foam-by CRAIG MARDEN  
Coldham&Hartman Architects
WUFI - what's the benefit of 3" of foam-Cellulose
Green Design and Historic Preservation

Location: Providence, cold year;

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WUFI- what’s the benefit of 3” of foam-Fiberglass

Coldham&Hartman Architects
WUFI- what’s the benefit of 3” of foam
Front porch unchanged
The front dormer will be re-shingled but not added. Insulation due to cost of step flashing at the roof.

Windows already replaced in 2010. Given tax credits were available. Also an emergency escape issue before.

Accent window and dormer.
MAIBEC CEDAR SHINGLES-
5" EXPOSURE- BAR HARBOR GRADE
2 COATS STAIN- #207 FUDGE

HOMESLICKER WITH INTEGRAL TYPAR

1/2 PLYWOOD- ALL JOINTS TAPE (ZIP WALL?)

(2) LAYERS OF 1 1/2" POLYISO RIGID
INSULATION - STAGGER JOINTS
AND TAPE ALL SEAMS (OUTER LAYER OR BOTH?)

5 1/2" SCREWS?

FILL FORMER WEIGHT POCKET
WITH LOW EXPANSION FOAM

TOP OFF ALL CAVITIES
WITH CELLULOSE
AND PLUG ALL HOLES

SCALE: 1 1/2" = 1'-0"

1 DETAIL

Wall detail

Coldham & Hartman Architects
Window Drawings - Head

- New stops at head & jambs
- Spray foam
- Shingle
- Homslicker with insect screen at all exposed edges
- Typar
- Marvin coil stock
- Match color to window
- Bend & install head flashing to pitch to exterior
- Flashing tape
- Continuous silicone bead
- 6" = 1'-0"; Hartman head
Window Drawings - Sill

SILL PAN FLASHING TAPE OVER CLAPBOARD PITCHED TO EXTERIOR LAPS OVER TYPAR RUN UP SIDES 10"

?? INSTALL BLOCK TO SHINGLE COURSE?!

SHINGLE

HOMESLICKER

TYPAR

6" = 1'-0"; HARTMAN SILL

INFILL SILL PIECE

SPRAY FOAM

INSURE COVERAGE OF BOTTOM EDGE OF WINDOW

INFILL BLOCK IF NEEDED TO

TYPAR

PITCHED TO EXTERIOR

LAPS OVER TYPAR

RUN UP SIDES 10"

TYPAR

TAPE OVER CLAPBOARD

SILICONE
Window Drawings - Jamb

**UMass, Amherst – 19 Oct 2012**

**MAIBEC CEDAR SHINGLES - 5" EXPOSURE**
- Bar Harbor Grade: 2 Coats Stain - #207 Fudge
- Homeslicker

**1/2 ZIP WALL - Taped**
- Ensure gap is adequate for foaming

**INTEGRAL TRIM**
- Center split double sided tape (adheres back of trim to Typar)
- Brown caulk to match siding

**MARVIN TRIPANE**
- New stop (thickness TBD; varies between custom and standard windows; see schedule)

**TYPAR WRAPS INTO CORNER; TAPE TO INTERIOR OF R.O. HOLD BACK TO ALLOW FOAM TO ADHERE DIRECTLY TO R.O.**

**SPRAY FOAM (3 LIFTS)**
- Insure gap is adequate for foaming

**Coldham & Hartman Architects**
The process begins
Window detail

Coldham&Hartman Architects
Green Design and Historic Preservation

UMass, Amherst – 19 Oct 2012

Thickened wall

XXX
Storm windows re-used and window weights to scrap metal

Coldham & Hartman Architects
Old shingles go to the dump—salvaged from old porch to garage
Board Sheathing
Green Design and Historic Preservation

Second Layer of Polyiso

Coldham&Hartman Architects
New Sheathing for Shingles
Layers of History and Transformation
Old sleeping porch becomes a M Bath
New North Elevation

Coldham&Hartman Architects
Minimal disruption

Coldham & Hartman Architects
Mulled unit with integral exterior trim
These guys are fast!
Maintain existing trim, but with reduced glazing area - 😊
House wrap and home slicker, casings look great. 😊
Green Design and Historic Preservation

UMass, Amherst – 19 Oct 2012

Shingles started yesterday

Coldham&Hartman Architects
Questions?

Thank you.