

**LEA's Maine Lake Science Center
High Performance Renovation
Bridgton, Maine, 04009
8,000 Heating DD, 3,500 Sq. Ft.**



House & Garage – Prior to 2014-15-Retrofit

Goal of Project

Convert residential log cabin with attached garage into a year-round institutional science center with lab, conference room, offices, & researcher housing



Front of House before renovations

The Vision

A multifunctional facility in harmony with surroundings



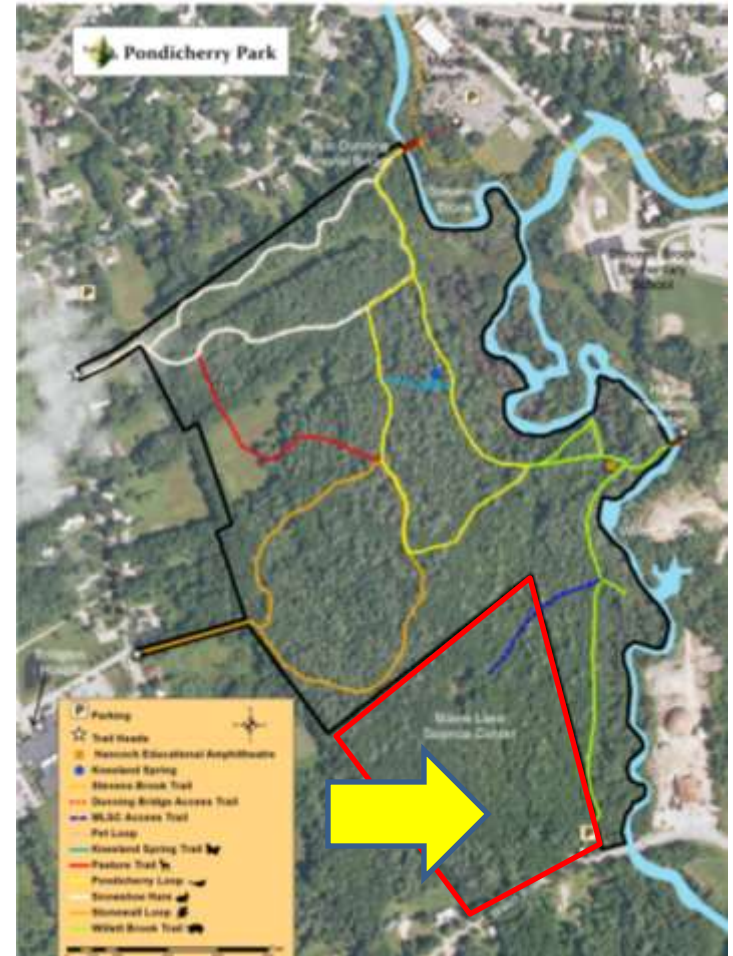
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Challenges

- Poorly insulated structure
- Unoccupied for several years
- Walk-out basement had humidity & condensation issues resulting in a mold & mildew odor in much of the cabin
- Original heating relied heavily on wood stoves all using one chimney
- Rodent issues in old building
- Significant interior reconstruction needed to function as an institutional building as well as exterior work such as advanced septic system & parking areas
- Transform building to one with low operating costs and sustainability features

Opportunities

- 16 acre woodland lot abutting new municipal 66-acre park
- 2-minute walk to supermarket & 5-minute walk to downtown
- Larger conference space badly needed for organization
- Housing for researchers is expensive & hard to come by
- New facility will provide hands on training & educational activities within the property
- Property & building to provide demonstration of conservation practices & energy efficiency



Timetable

- **August 2014** – Property purchased
- **September 2014** – Exterior ground work begins
- **October 2014** – New, advanced septic system installed, driveway & parking lot construction begins
- **November 2014** – Interior deconstruction begins
- **December 2014** – Dormer above garage added
- **January 2015** – Roof insulated, steel roof complete
- **February to March 2015** – Exterior rigid insulation added, cellulose blown in, deconstruction continues
- **April 2015** – Interior framing complete, plumbing, wiring, & heating roughed in
- **May 2015** – Drywall installed & painted, interior finish work begins
- **June 2015** – Plumbing, wiring & heating completed
- **July to August 2015** – Interior and exterior finish work, painting & staining completed.

Center opens for first presentation July 9th!

Original Structure

1980s log cabin, with 2 x 4 stick built ell & garage, 2" rigid insulation on cabin roof, fiberglass insulation in ell & garage

Living room &
kitchen before
renovations





Original Downstairs

- Partially below grade
- 3 bedrooms & one bath
- Damp, musty smell





Original Garage

1.5 bay garage with
oil boiler room & oil tank





Wall Renovations

Exterior or Interior 2" XPS

Dormer added above garage for office space



Roofs 4-6" XPS

Plus cellulose between rafters



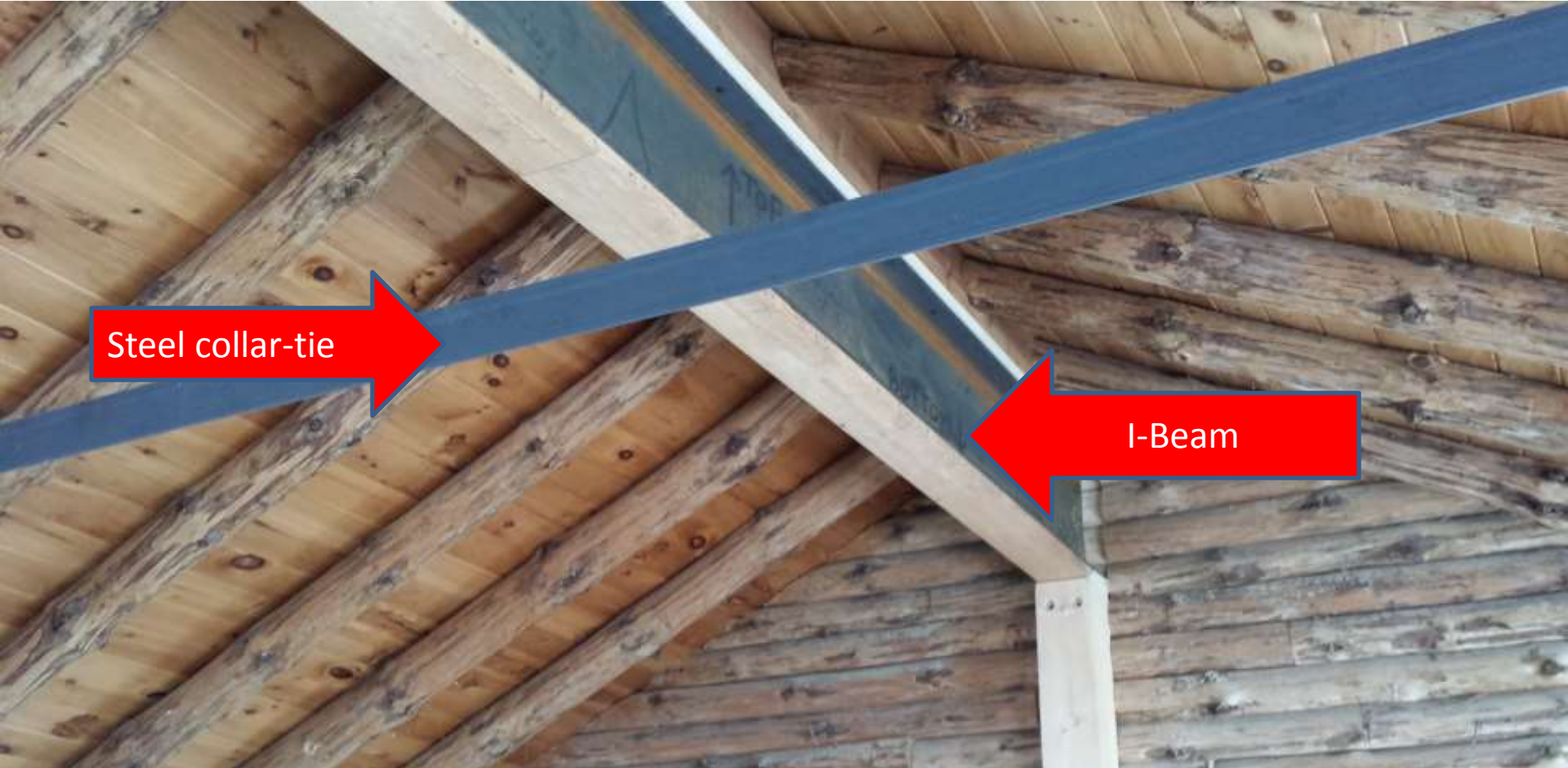
All Cavity Walls & All Roof Rafters Dense Pack Cellulose 6-8" or more



Windows & Doors

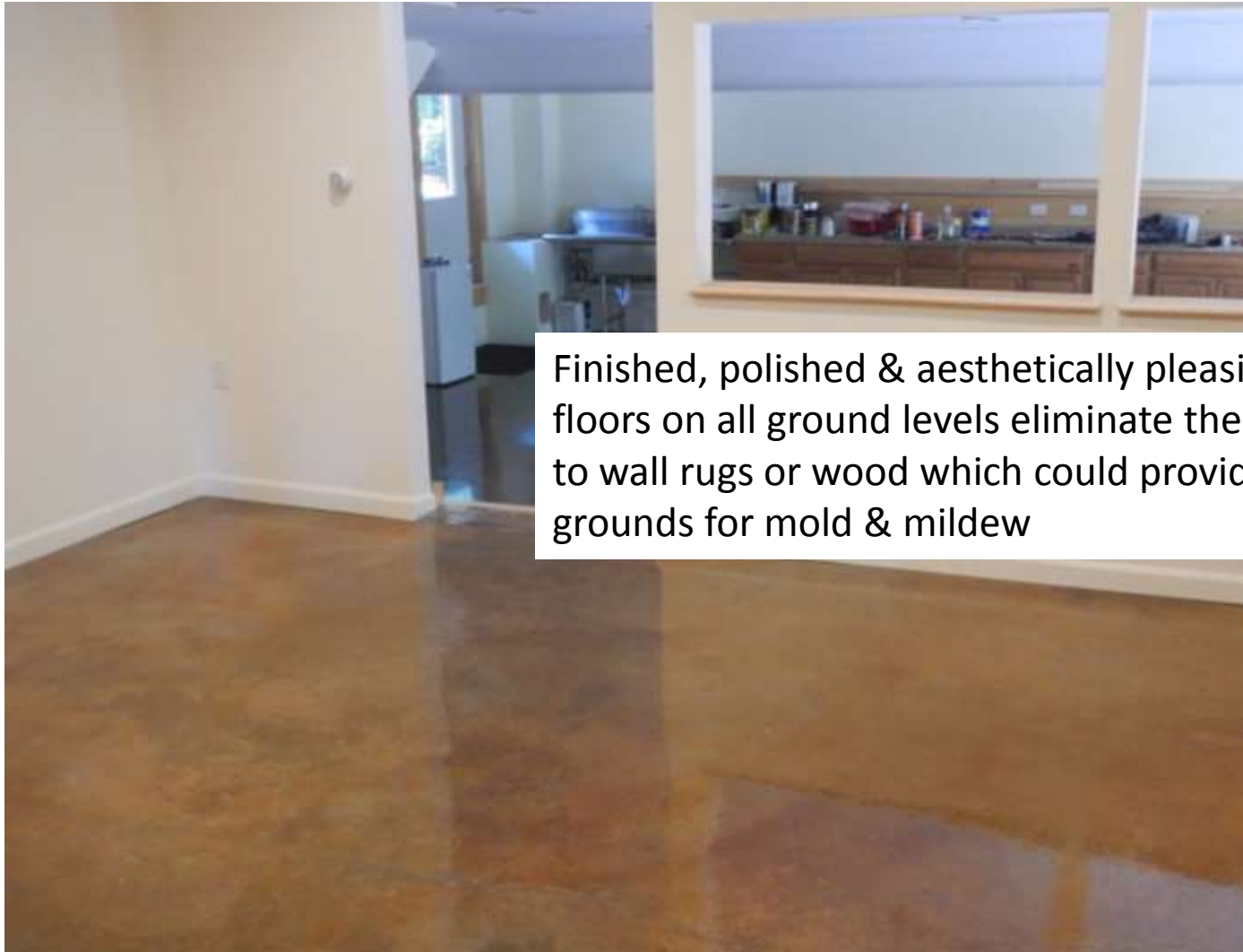
- Low E, thermal
- Some Re-use
- Minimal windows on north (except large meeting room)

Interior Ridge Pole Strengthening



Thin, high, steel collar ties replaced one large and low, log collar tie – thus providing for a better view of the presentation screen. One large steel beam was also installed to carry the weight of the roof without the need of an obstructive post in the center of the room.

Ground & Polished Concrete Floors



Finished, polished & aesthetically pleasing concrete floors on all ground levels eliminate the need for wall to wall rugs or wood which could provide breeding grounds for mold & mildew

Renovated Downstairs

3-bedroom researcher housing,
kitchen & living space





New Office Created Above Garage
served by ductless mini-split, LED can lights

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Garage Converted to Open Lab

Heated by condensing propane boiler with efficient LED can lights



Cabin Main Floor Now Open Conference Space
ductless mini-split heat/AC/dehumidification &
monitor propane heater

Energy Recovery, DHP, Condensing Boiler



Ventilation with very limited heat loss & humidity controls



High efficiency heating & air conditioning



Efficient propane boiler

Blower Door Results, IR Image, CO₂ Data

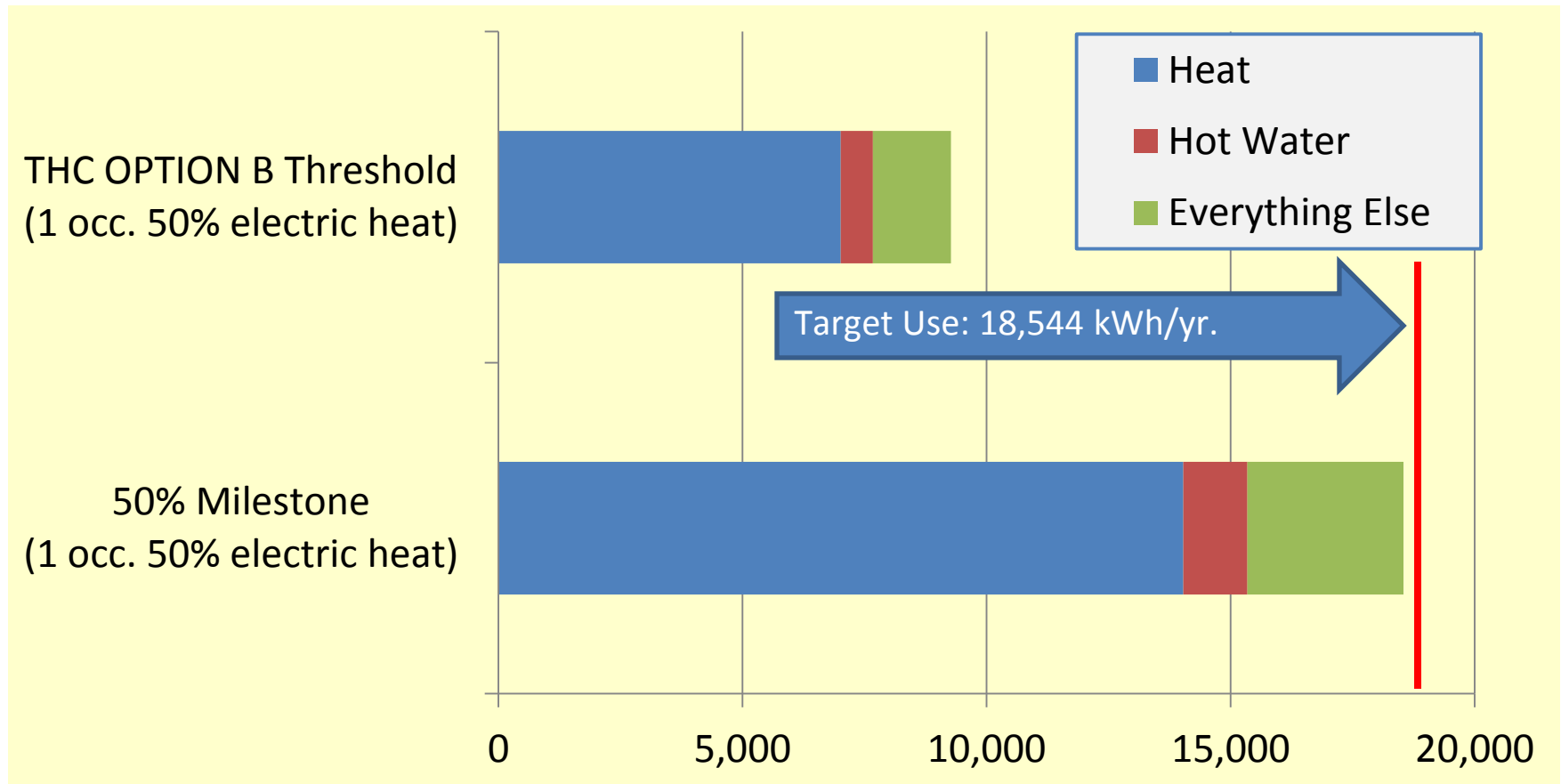
Stay tuned!

To Be Done Fall 2015

Maine Thousand Home Challenge

- Not a typical home, but provides housing & great example of possible upgrades for Maine homes
- 1000 Home Challenge inputs will be modified to address partial occupancy as well as events
- There is no submetering of separate building areas so threshold is based on entire building, lab, & office space

Thousand Home Challenge OPTION B & 50% Milestone Threshold in kWh/yr.



OPTION B Inputs: ZIP Code: 04009; 3,500 Ft² FFA; 1 occupant; 50% electric heat

Lessons Learned

- Letting in uncontrolled “fresh air” in is not always a good idea in a climate with hot humid summers & ice cold winters
- “Tight” structures need ventilation & humidity control for indoor air quality & mold prevention
- Polished concrete in basement/first floor eliminates mold sources, looks good, & is easy to clean
- New, energy efficient homes would all benefit from a “User’s Guide”
- Reconstruction always costs more than you estimate!

Finished Project



Summary R Values

Roofs $R = 30+$

Walls $R = 30+$

Windows $R = 3$

(Logs Left as Logs in Meeting Area)

For more information about the
Maine Lake Science Center
please visit: www.mainelakes.org

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