Residential Building Energy Efficiency Meeting 2010

Advanced Residential Integrated Energy Solutions Collaborative

Creating Opportunities for Reducing Energy Use in Affordable Housing

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High Performance Residential Development Challenge: Case Study

- The NYSERDA Challenge
- Lake Haven Estates Case Study
- Gaps/Barriers to High Performance
- Passive House
- Future Work Needed

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High Performance Residential Development Challenge

- A series of high-performance case study homes sponsored by the New York State Energy Research and Development Authority




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Goals of the Challenge

- Recruit 30 projects
- Demonstrate high performance construction
- Publicize to builders throughout New York
- Evaluate incremental costs and performance

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The Challenge Houses

- Low-rise residential
- New construction or rehab
- Up to 2,500 sf living area
- Emphasis on envelope
- Target NY HERS Score of 91 (HERS Index 45)
- Mixed-Humid and Cold climates

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Lake Haven Estates

- Lake Haven Homes
- Infill development of four homes in New York City
- Two-family home includes four-bedroom owner's residence over two-bedroom rental unit

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Upgrades

Original specs

- Un-insulated cellar
- Fiberglass batt walls (R-11), floor (R-19)
- Cellulose ceiling (R-19)
- A/H in unconditioned attic
- No mechanical ventilation
- Good equipment efficiencies

Upgrade specs

- Slab insulation (R-10)
- Spray foam wall (R-13), floor (R-43) + exterior foam (R-12)
- Cellulose ceiling (R-59)
- A/H in conditioned space
- HRVs
- Upgraded equipment

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Energy Modeling

- Predicted energy consumption using REM/Rate

Performance Metric	Original	Upgrade
Heating (MMBtu/yr)	92.2	41.3
Cooling (MMBtu/yr)	6.5	5.1
Baseload (MMBtu/yr)	87.6	71.7
Total (MMBtu/yr)	186.2	118.1
Energy per sf conditioned space (MBtu/sqft/yr)	50	31.7
NY HERS Score (HERS Index)	85.4 (73)	90.6 (47)

Co-heating Test

Calculated UA (Btu/h-F)

UA, walls, windows, ceiling: 310

Estimated UA, basement: +56

366

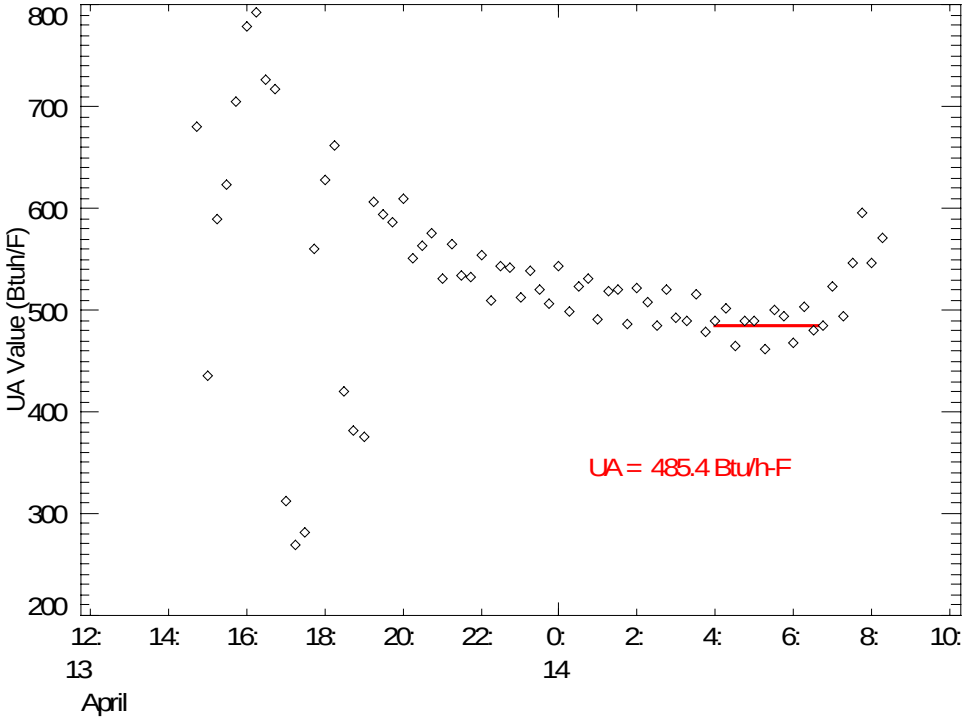
Measured UA (Btu/h-F)

UA, test : 485

UA, infiltration: -74

411

Calculated is 11% lower than measured



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Gaps/Barriers to High Performance

- Technical
- Education
- Market
- Cost

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Framing

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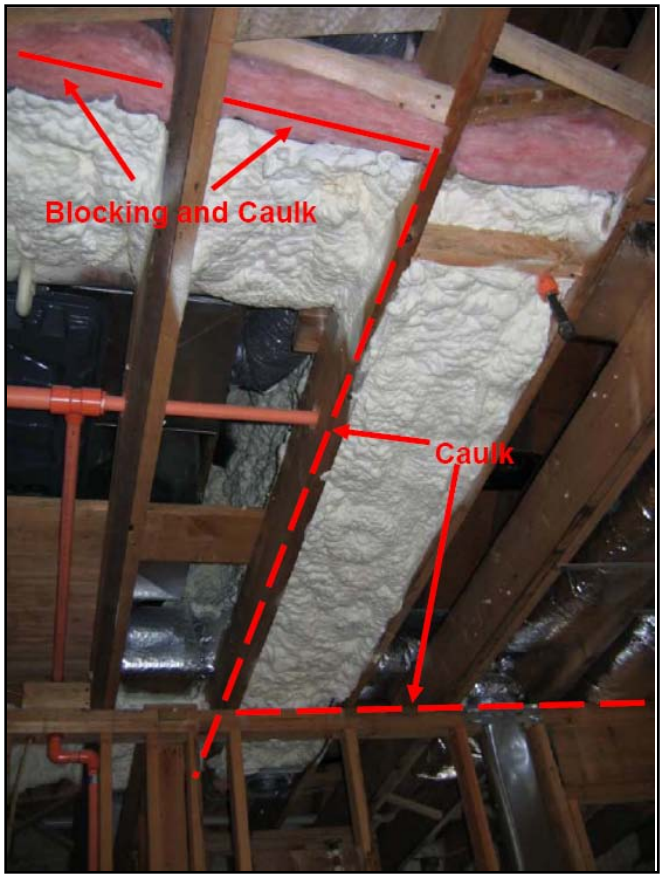
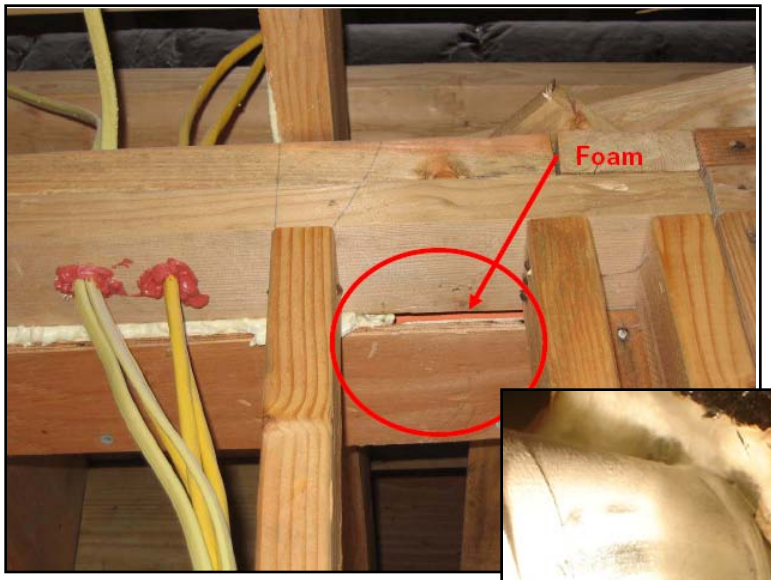
Air Sealing





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Equipment

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Market/Educational Barriers

- Many architects lack knowledge/don't emphasize energy
- Subcontractors resist going beyond comfort zone
- Suppliers have limited info/supply
- The market for energy efficiency is a niche
- High housing cost in some areas dwarfs energy expenses

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Cost Barrier

Item	Base	Upgrade	Increment
Cavity insulation (above grade and cellar walls, floors, ceiling, mechanical room)	$3,100	$11,550	$8,450
Slab insulation	$0	$871	$871
Exterior rigid insulation	$0	$6,805	$6,805
Boiler and DHW (Owner's unit)			$2,885
Furnace (Apartment)	$2,000	$3,300	$1,300
A/C (3 units)	$11,250	$14,000	$2,750
DHW (Apartment)			$2,400
HRV (2 units)	$0	$4,900	$4,900
Total incremental costs			**$30,361**

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Results from Other Houses

Project	Size (conditioned area)	Base Score (HERS Index)	Upgrade Score (HERS Index)	Incremental cost
Lake Haven	3,730 sf (2-family)	85.4 (73)	90.6 (47)	$30,361
United Way	2,210 sf (rehab, 2-family)	84.2 (79)	91.4 (43)	$24,510
Domus	1,960 sf (townhome)	84.6 (77)	90.4 (48)	$16,197
Deerfield	2,780 sf	87.2 (64)	91.0 (45)	$19,482
Nuvision	2,420 sf	86.0 (70)	91.0 (45)	$ 6,665*
Stephens	3,980 sf (SIPs)	86.8 (66)	90.2 (49)**	$12,983
The Good Home	1,660 sf (Passive House)	84.4 (78)	90.6 (47)	TBD

* Materials only ** With GSHP 91.6 (42)

The Passive House

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Logical extension of emphasis on envelope

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High performance envelope, minimal mechanicals

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Simple form, modest size, everything in conditioned space

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Future Work Needed

- More reliable systems for building airtight envelopes and hot roofs without resorting to spray foam
- Smaller capacity heating and cooling equipment readily available
- Generally, more foolproof technologies that depend less on site quality

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Thank You

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