

Jason La Fleur
Jason@EcoAchievers.com



Brandon Weiss
Brandon@EvolutionaryHB.com



Evolutionary Home Builders

BY BRANDON WEISS

*Getting Results with Mid-Construction
Air Barrier Testing*

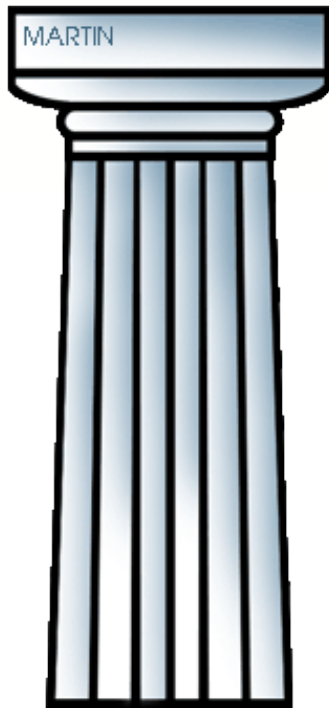


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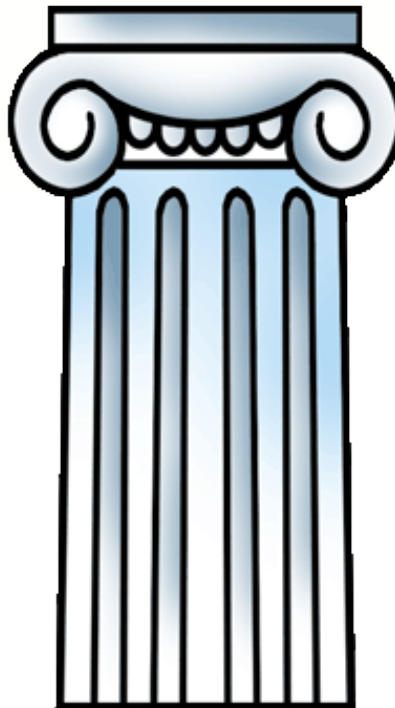
Jason La Fleur, Jason@TheEvolutionaryHome.com
Brandon Weiss, Brandon@TheEvolutionaryHome.com



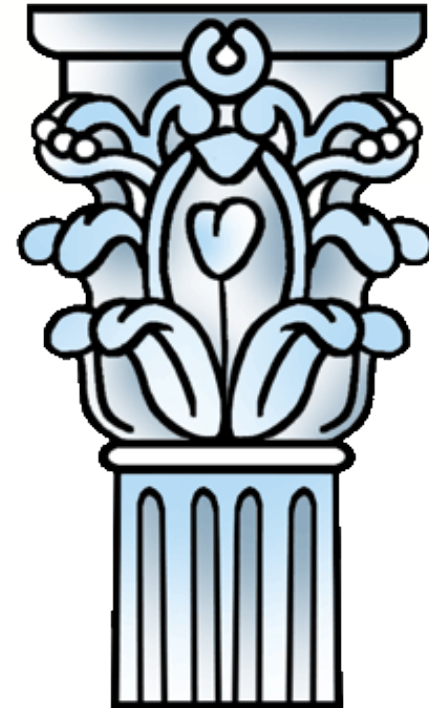
Passive House Pillars



Annual Demand
4.75 btu/sf/yr



Air Tightness
0.60 ACH 50

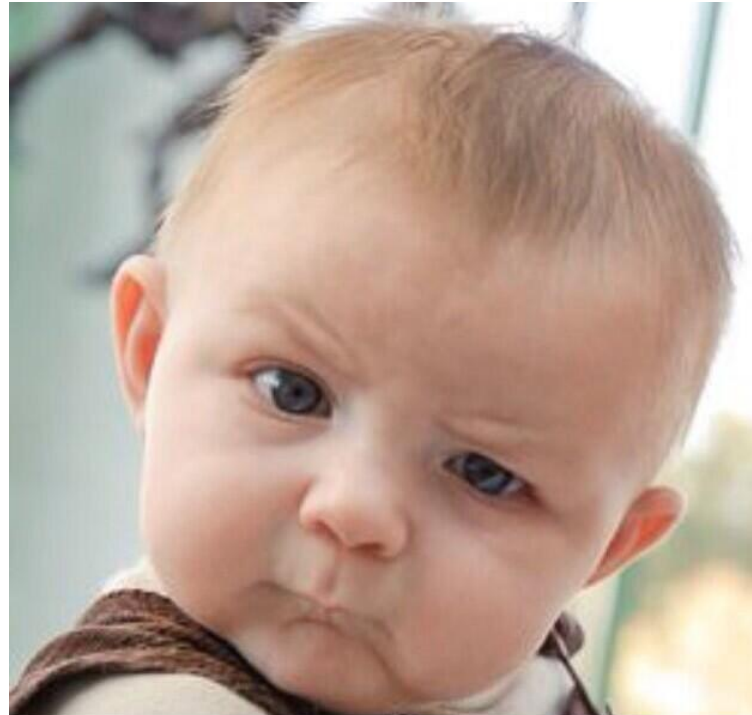


Peak Demand
38 kbtu/sf/yr



Air Barrier Choices Abound!

- Fluid
- Sheet
- Tape
- Sealants
- Foam
- Concrete
- Plastic



How do they perform?



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Insulation Fail: Yay for spray foam!

Underside of Cantilvered Floor

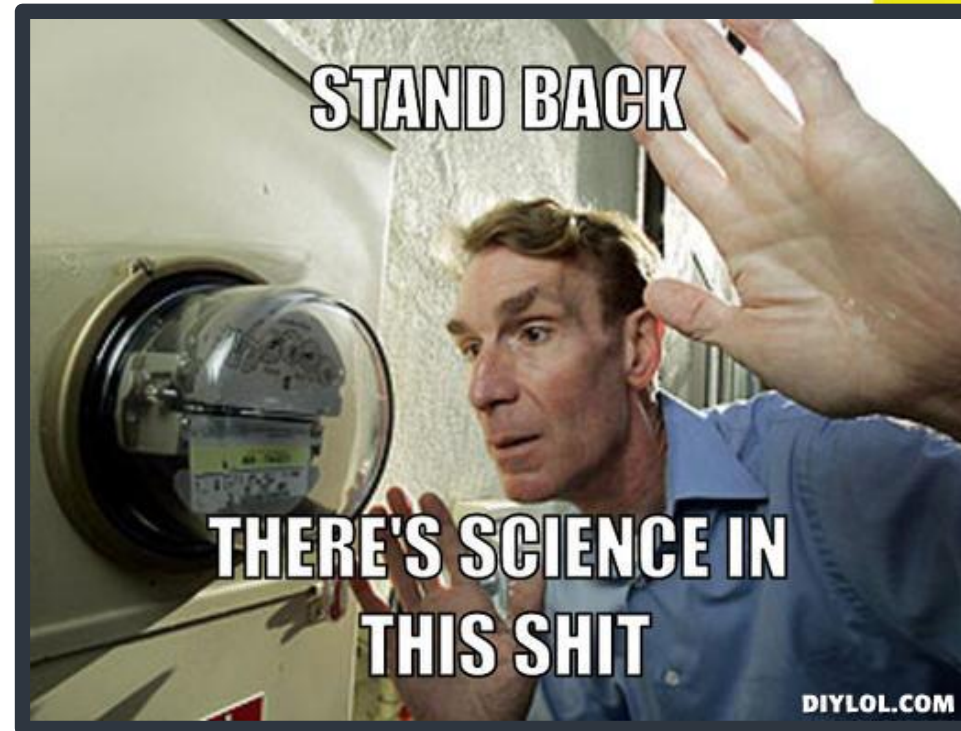


Except air still flows here!
(7.23 ACH 50 / 0.32 CFM50 per sq ft enclosure)

Experimental Experience Drives Performance

Goal: Make the intangible tangible with diagnostic testing

1. Blower door testing at mid-construction
2. Infrared Thermography
3. Smoke Testing



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Mid-construction Blower Door Tips

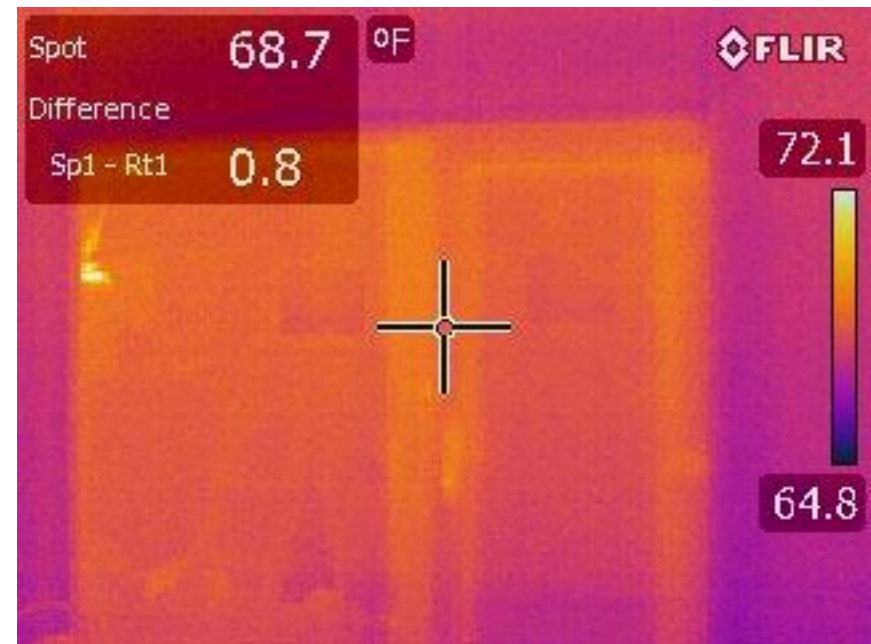
1. Create air sealing punchlist and confirm **BEFORE** site visit
 - **WWFFD?** Walls, windows, floors, foundations, doors tied together
 - Ceiling sealing? Attic hatches
 - Mechanical rough-ins and doorways
 - Windows all set and installed
 - Plug plumbing pipes
2. Don't be alone.
3. Performed before insulation
4. Raters: consider “construction” set of equipment

“We’re ready!”



Infrared Thermography

- Useful for visualizing leakage with blower door running, and thermal bridge issues.
- May not show air leaks if no adjacent planes
- Use a good camera
- > 5 degree ΔT
(pre-conditioning building)
- Beware of solar radiant gain on uninsulated walls
- May not be too revealing in a Passive Building.



“My Ducts Never Leak”



Let's prove it.



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Smoke Testing at Midconstruction

- “Leak Detection for Dummies” (M. Holliday)
- Turn around blower door to Pressurize.
- Use smoke pen, wizard stick, or fog machine
- One person inside, one outside (w ladder!) marking leaks
- Keep a window cracked until fog reaches it



6 Projects / Assemblies (Chicago area)



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1. Chicago's First Passive House

- Constructed in 2012; River Forest, IL
- Square footage: 4763 sf
- Volume: 46,023 cf
- HERS: 27
- Project Team: Brandon Weiss and Tom Basset-Dilley
- Air barrier: ICF walls, plywood w/SIGA ceiling



MCT = 0.50 ACH 50



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2. *Adaptation House*

- Constructed in 2014; River Forest, IL
- Square footage: 4,766 sf
- Volume: 42,364 cf
- HERS: 31
- Project team: Brandon Weiss and Patrick Danaher
- Air barrier: Prosoco walls, plywood w/SIGA ceiling



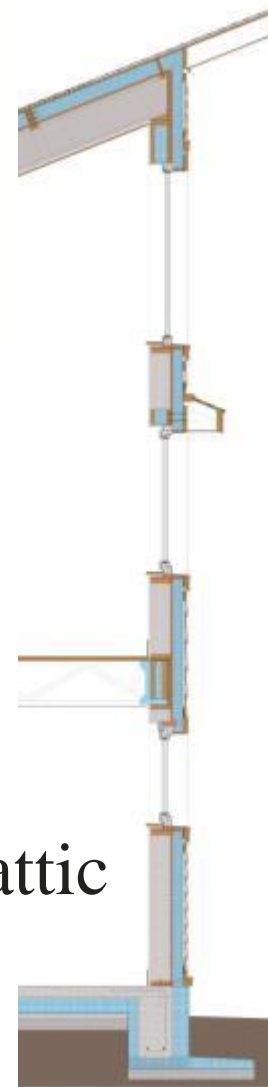
MCT = 0.40 ACH 50



3. *Right-Sized Home*

- Constructed in 2015; Oak Park, IL
- Square footage: 1,854 sf
- Volume: 16,418 cf
- HERS: 33
- Project team: Brandon Weiss and Tom Bassett-Dilley
- Air barrier: Prosoco walls, sealed attic

MCT = 0.46 ACH 50



ROOF: R-82
14" TJI w/dense-pack fiberglass, plywood sheathing/air barrier, 5" polyiso, plywood roof deck

WALL: R-53
2x8@24o.c. w/ dense-pack fiberglass, plywood sheathing/air barrier, 4" polyiso, rainscreen siding

SLAB: R-27
4" conc o/
6" EPS;
ring beam per ASCE
w/4" EPS in/6" out



4. *Über Haus*

- Constructed in 2015; Geneva, IL
- Square footage: 3449 sq ft
- Volume: 31,773 cu ft
- HERS: -15* (projected)
- Project team: Brandon Weiss
Tom Bassett-Dilley
- Air barrier: Prosoco CAT 5



MCT = TBD



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5. *Greenline #8 (Spec home non-PH)*

- Constructed in 2015; Chicago, IL
- Square footage: 2,460
- Volume: 24,376
- HERS: 45
- Project team: Greenline Dev.
- Air barrier: Henry Blueskin



MCT = 1.2 ACH 50



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6. *Greenline Custom 2-flat (non-PH)*

- Constructed in 2015; Chicago, IL
- Square footage: 3,753
- Volume: 40,729
- HERS: 64* (projected)
- Project team: Greenline Dev.
- Air barrier: Henry Blueskin
Compartmentalization: caulking



MCT = 1.2 ACH 50



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Chicago Area Testing Results

Project	Chicago's First PH	Adaptation Home	Right Sized	Uber Haus	Non PH Spec Home	Non PH Custom
Year	2012	2014	2015	2015*	2015*	2015*
Air Barrier	ICF + SIGA	Prosoco R-Guard	Prosoco R-Guard	Prosoco Cat5	Henry Blueskin / stagger stud	Henry Blueskin / stagger stud
Area (sf)	4,763	4,766	1,854	3449	2,460	3,753
Volume (cf)	46,023	42,364	16,418	31,773	24,376	40,729
Mid CFM50	384	283	129	Sept 2015	517	864
Mid ACH50	0.50	0.40	0.46	Sept 2015	1.27	1.27
Final CFM50						
Final ACH50						
CFM50 Post % improved						
ACH50 Post % improved						



Chicago Area Testing Results



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