

# Before and After:

## Two Chicago-area projects modeled to PHI and PHIUS+2015 adapted standard, plus a surprise bonus



Tom Bassett-Dilley, Architect and CPHC

Evolutionary Home Builders (Brandon Weiss), PH Certified builder plus a lot of other cred



Puffer Road, Downers Grove

PHIUS+ Certification planned

Modest sized for small family with frequent large gatherings

TFA 1,753



Hinsdale Rd., Hinsdale

PHIUS+ Certification planned

House for a family of 6, with attic and basement conditioned.

TFA 2,472

# PHIUS+2015 standard

## Metrics (West Chicago)



# Metrics comparison

## PHI:

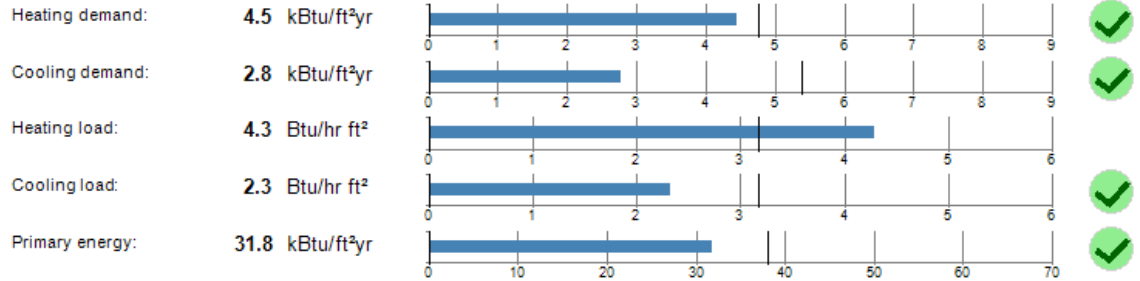
- Annual heating and cooling demand < 4.75kBTU/s.f. yr.  
--or--
- Peak heating load < 3.14kBTU/h
- Airtightness 0.6ACH50
- Primary Energy < 38.0kBTU/s.f. yr.

## PHIUS+2015:

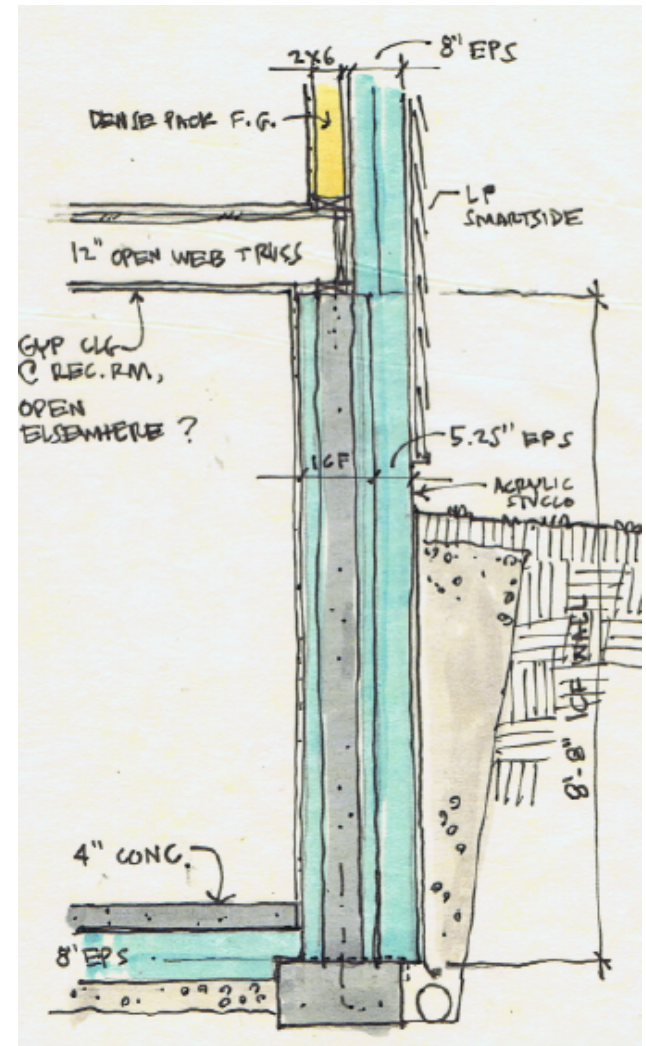
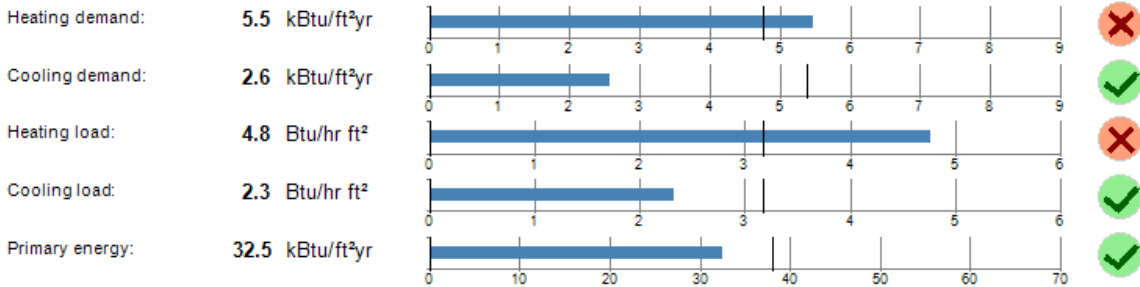
- Annual heat demand < 6.2 kBTU/s.f. yr.  
--and--
- Peak heating load < 4.3kBTU/s.f. hr.
- Annual cooling demand < 3.2kBTU/s.f. yr.  
--and--
- Peak cooling load < 4.3kBTU/s.f. hr.
- Airtightness 0.05cfm/s.f. envelope ACH50
- Primary Energy < 6,000kWh/person yr. (to phase down to 4,200kWh/person yr.), which is bedroom count +1. Partial credit for PV on-site. Note-PE factor raised to 3.16 for electricity.
- Manual J (?)

# Hinsdale

## PHI basis



## PHIUS+ proposed adapted basis

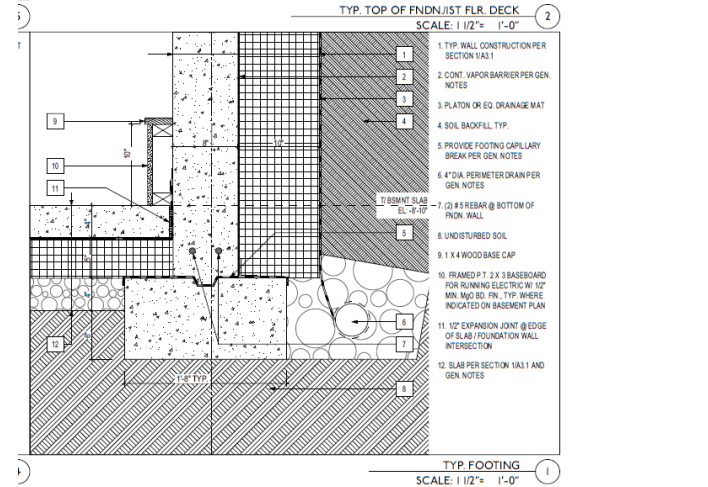
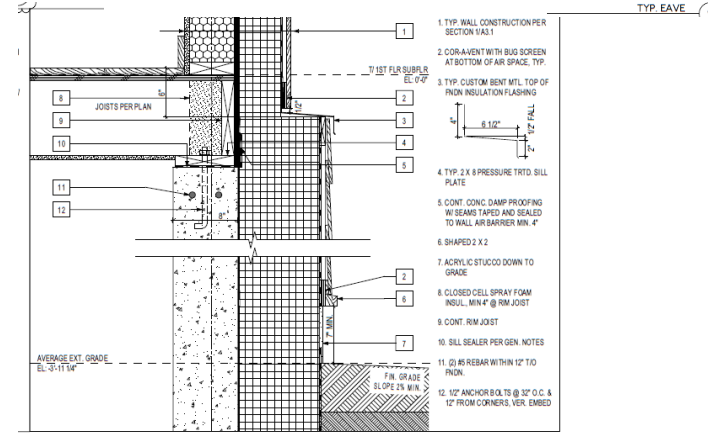
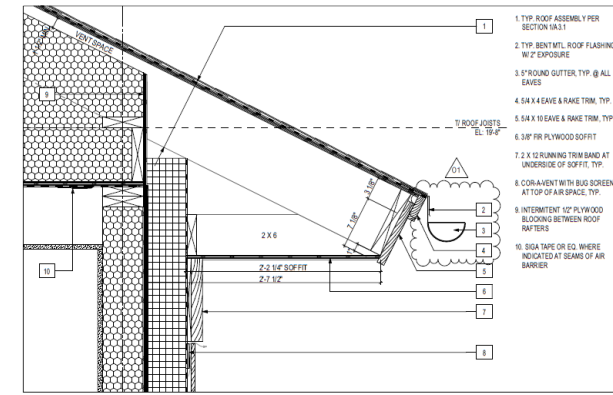
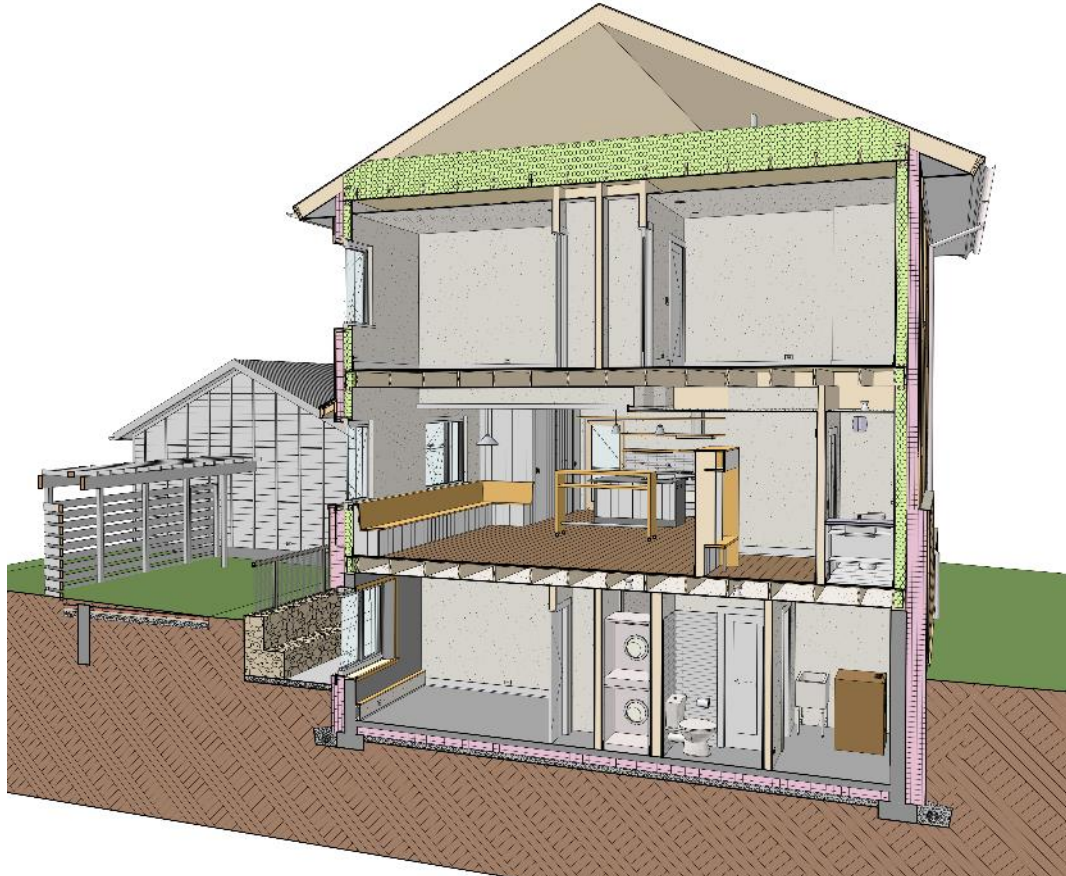
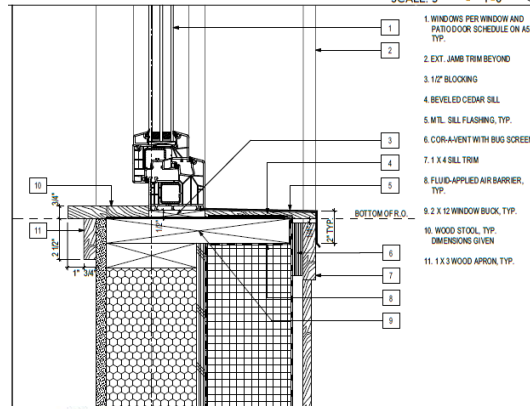


- 8" EPS under slab reduced to 5" (R-20)
- 8" EPS at walls, roof, and foundation reduced by 2"
- Slab R-20 (was 32)
- Walls R-45 (were 54)
- Roof R-80 (was 89)



# Hinsdale

## End assemblies



# Hinsdale

## Energy/cost comparison

Project	Primary Energy (kBtu/ft2vr)	kBTU/kWh conversion	Primary Energy (kWh/ft2vr)	Site Energy (2.7 PE factor)	TFA	Site Energy (kWh/yr)	Elec cost (\$/kWh)	Elec cost (annual)	Elec delta (monthly)	Added insul. cost	Yrs to payback
<b>Hinsdale</b>											
PHI	31.8	0.2931	9.3196	3.4517	2,472	8,533	0.084	\$717	\$1.31	3414	216.4
PHIUS+ proposed	32.5	0.2931	9.5248	3.5277	2,472	8,720	0.084	\$733			
<b>Downers Grove</b>											
PHI	32.6	0.2931	9.5541	3.5385	1,753	6,203	0.084	\$521	\$2.13	7328	286.5
PHIUS+ proposed	34.2	0.2931	10.0230	3.7122	1,753	6,508	0.084	\$547			
<b>Updated PE metrics</b>											
	<b>total kWh/yr</b>										
<b>Hinsdale kWh/yr</b>											
5BR+1*6,000	36,000										
5BR+1*4200	25,200										
<b>Downers Grove kWh/yr</b>											
3BR+1*6,000	24,000										
3BR+1*4200	16,800										

The proverbial no-brainer.

# Hinsdale

Latest rendering





# Hinsdale

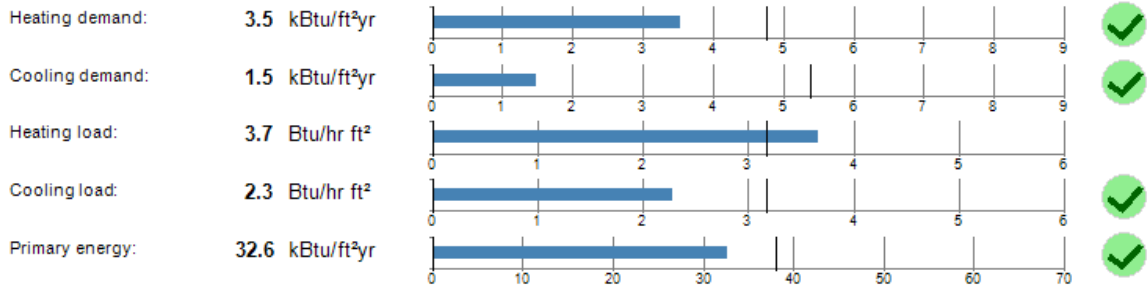
## Construction photos



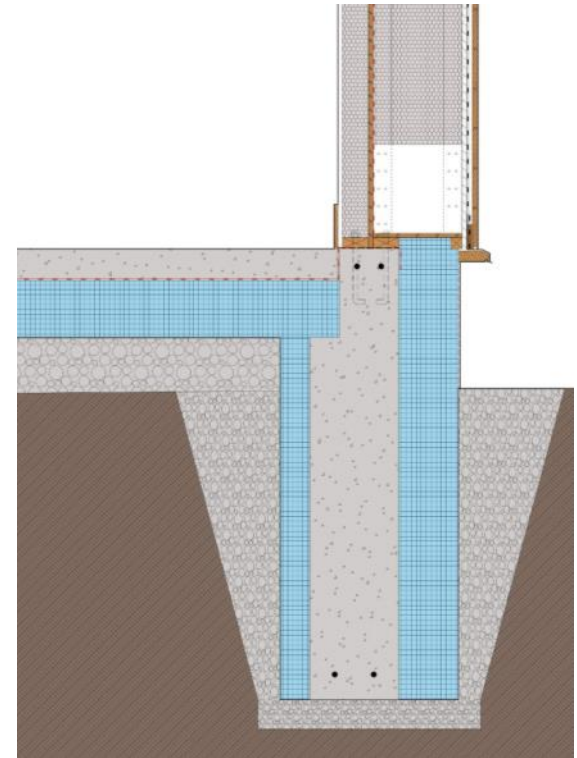
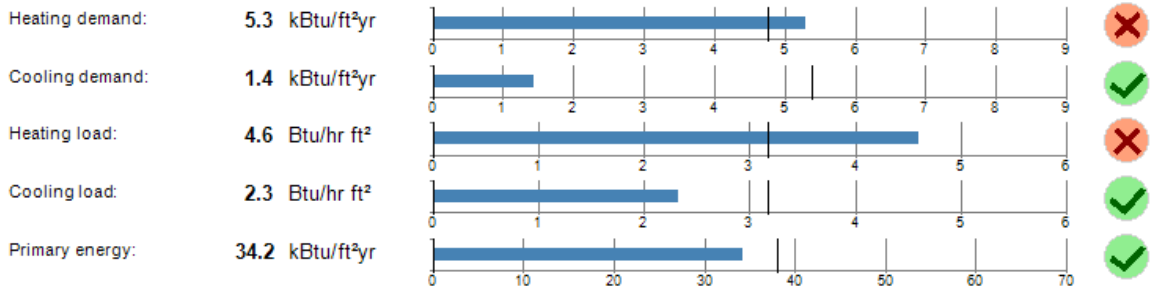


# Downers Grove

## PHI basis



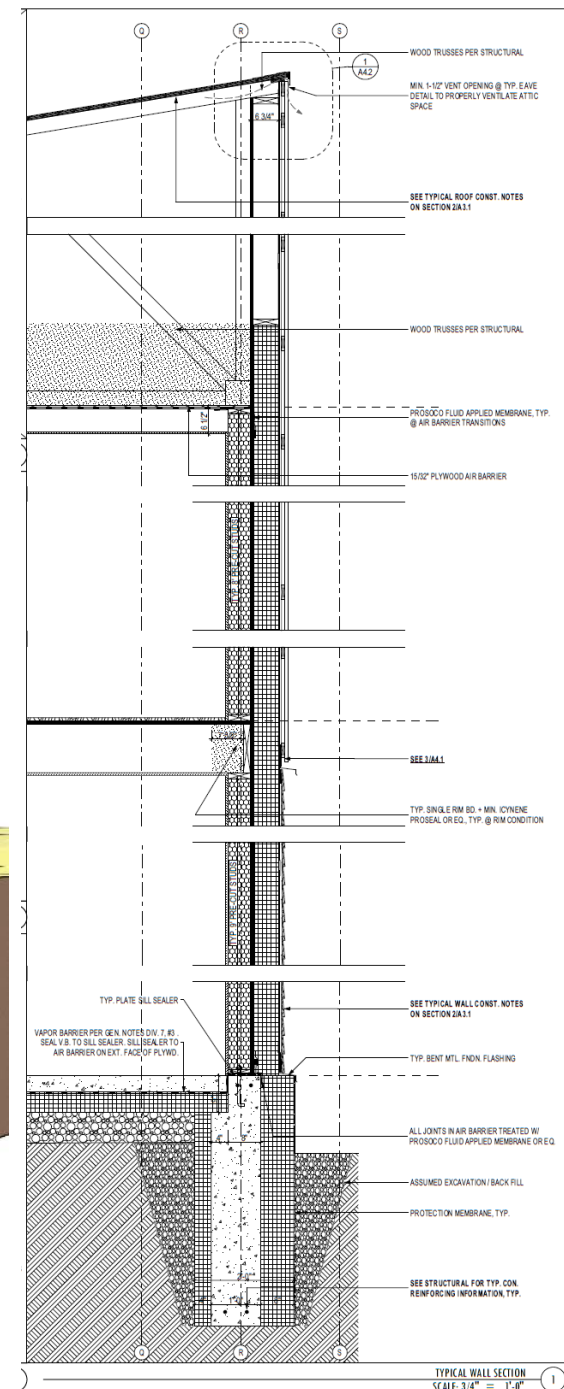
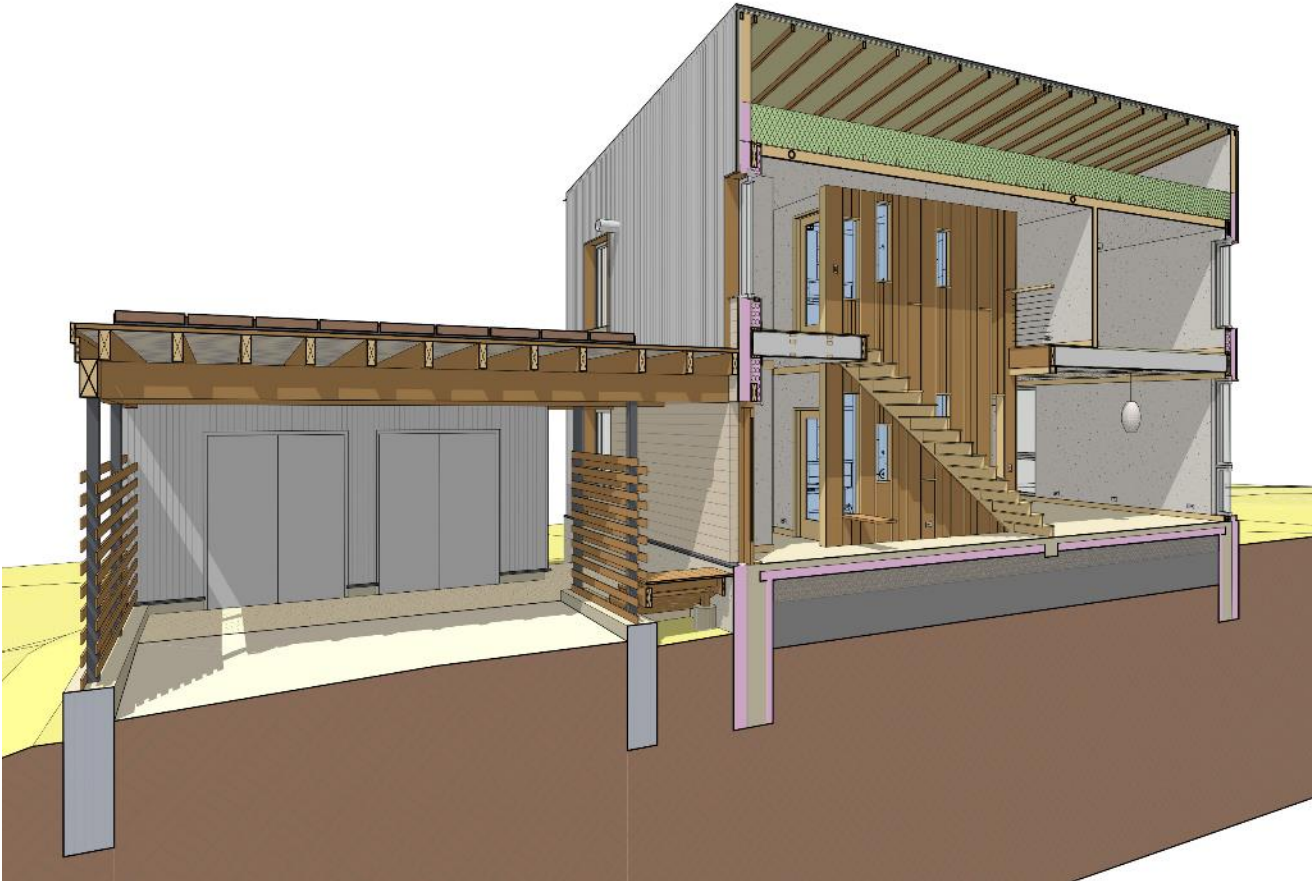
## PHIUS+ proposed adapted basis



8"EPS under slab reduced to 5"  
 Wall and ceiling insulation reduced  
 Slab R-20 (was 32)  
 Walls R-46 (were 63)  
 Roof R-81 (was 100)

# Downers Grove

## End assemblies



# Downers Grove

Interior renderings, construction photo





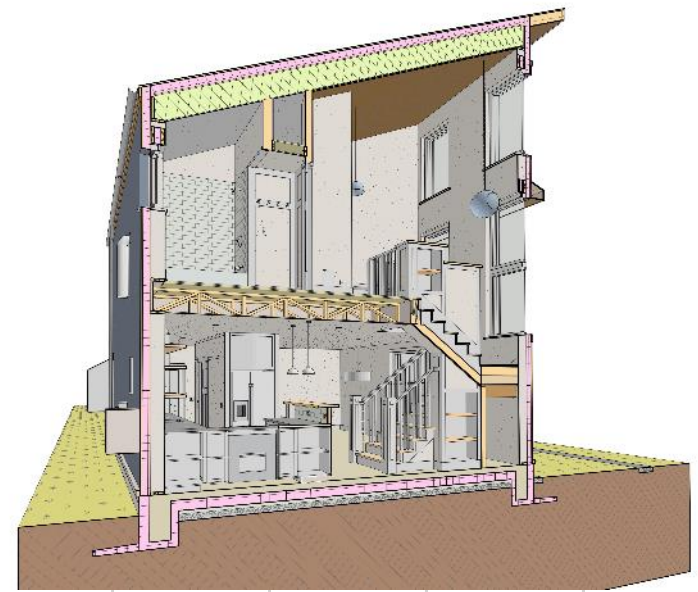
# Downers Grove

## Energy/cost comparison

Project	Primary Energy (kBTU/ft2yr)	kBTU/kWh conversion	Primary Energy (kWh/ft2yr)	Site Energy (2.7 PE factor)	TFA	Site Energy (kWh/yr)	Elec cost (\$/kWh)	Elec cost (annual)	Elec delta (monthly)	Added insul. cost	Yrs to payback
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PHI	31.8	0.2931	9.3196	3.4517	2,472	8,533	0.084	\$717	\$1.31	3414	216.4
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<b>Updated PE metrics</b>											
	<b>total kWh/yr</b>										
<b>Hinsdale kWh/yr</b>											
	23,545										
5BR+1*6,000	36,000										
5BR+1*4200	25,200										
<b>Downers Grove kWh/yr</b>											
	17,570										
3BR+1*6,000	24,000										
3BR+1*4200	16,800										

# Oak Park

## From PHPP in 2013 to PHIUS+2015



Energy Consumption Comparison			
Both cases:			
TFA	1615	s.f.	
Net volume	16,729	cu. ft.	
2x8 frame/FG/4" polyiso outsulation			
Frost-protected slab on grade, 6" EPS			
Solar DHW, 32s.f. collector area			
Zola uPVC PH windows, 0.5 SHGC			
Case 1: as designed		Case 2: add 2" outsulation all around and under slab	
Envelope: Slab R-27, Walls R-53, Roof R-91		Envelope: Slab R-36, Walls R-65, Roof R-104	
		Add (2) windows to south	
SSHD:	6.24	kBTU	SSHD: 4.59
PE:	22.4		PE: 21.5
Heat Load:	5.46		Heat Load: 4.97
Annual elec cost:	\$848		Annual elec cost: \$814
		Insul. Premium: \$6,000	
		Payback time: 176 years	

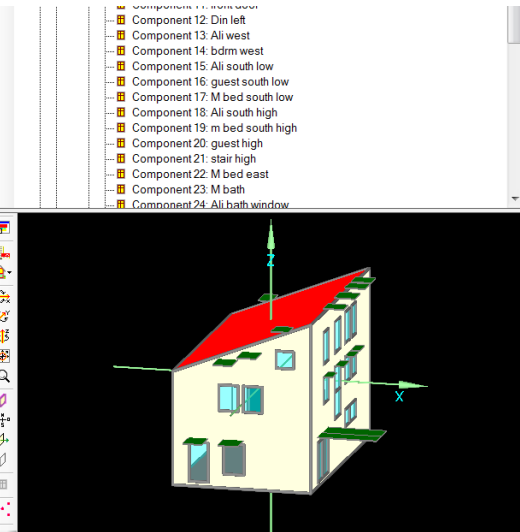
Due to diminishing returns, owners dropped PH and chose to certify under LEED (Platinum, pending)

# Oak Park

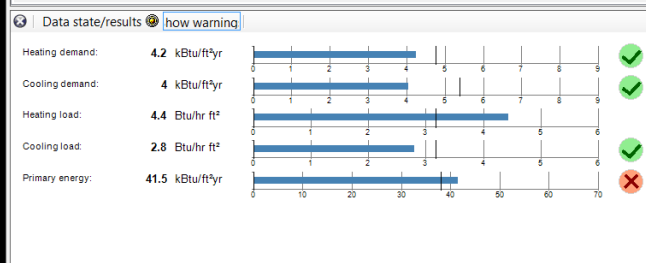
## From PHPP in 2013 to PHIUS+2015

### Energy Demands with Reference to the Treated Floor Area

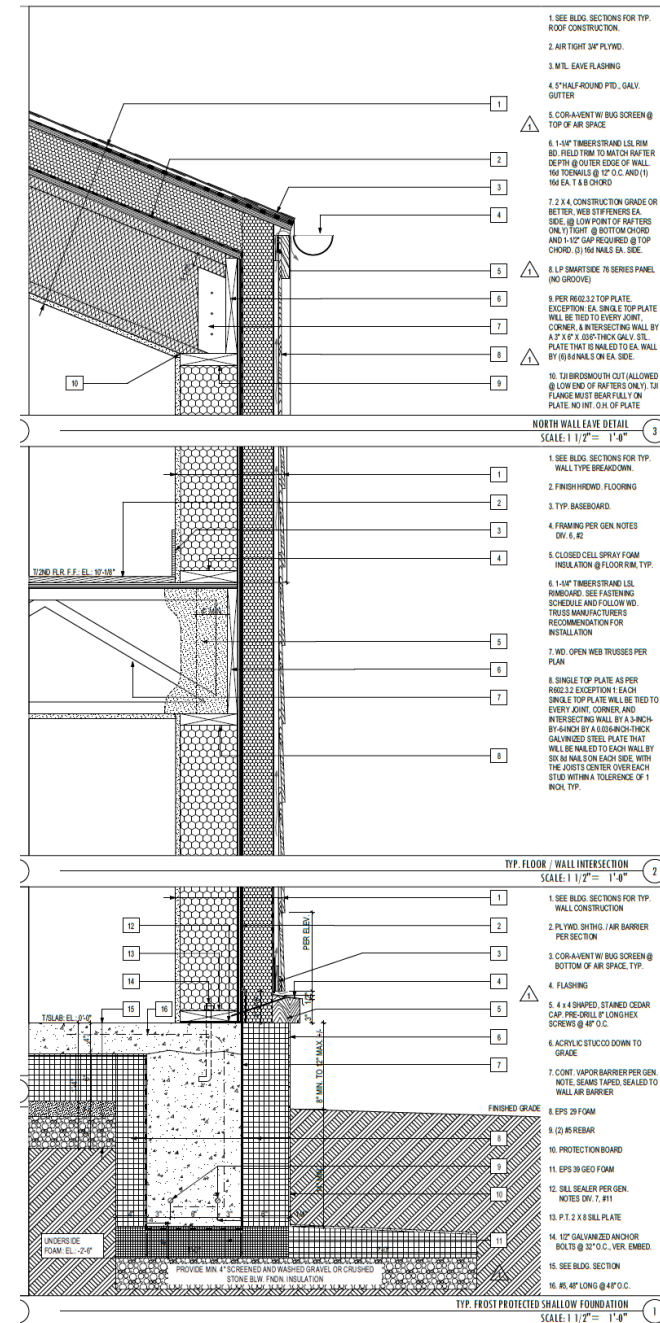
Treated Floor Area:	1615	ft <sup>2</sup>			
Applied:	Monthly Method		PH Certificate:	Fulfilled?	
<b>Specific Space Heat Demand:</b>	<b>6.47</b>	<b>kBTU/(ft<sup>2</sup>·yr)</b>	<b>4.75 kBTU/(ft<sup>2</sup>·yr)</b>	<b>No</b>	
<b>Pressurization Test Result:</b>	<b>0.40</b>	<b>ACH<sub>50</sub></b>	0.6 ACH <sub>50</sub>	<b>Yes</b>	
<b>Specific Primary Energy Demand</b> (DHW, Heating, Cooling, Auxiliary and Household Electricity):	<b>36.2</b>	<b>kBTU/(ft<sup>2</sup>·yr)</b>	38.0 kBTU/(ft <sup>2</sup> ·yr)	<b>Yes</b>	
<b>Specific Primary Energy Demand</b> (DHW, Heating and Auxiliary Electricity):	<b>21.7</b>	<b>kBTU/(ft<sup>2</sup>·yr)</b>			
<b>Specific Primary Energy Demand</b> Energy Conservation by Solar Electricity:		<b>kBTU/(ft<sup>2</sup>·yr)</b>			
<b>Heating Load:</b>	<b>5.04</b>	<b>BTU/(ft<sup>2</sup>·hr)</b>			
<b>Frequency of Overheating:</b>		<b>%</b>	over <b>77.0</b> °F		
<b>Specific Useful Cooling Energy Demand:</b>	<b>1.94</b>	<b>kBTU/(ft<sup>2</sup>·yr)</b>	4.75 kBTU/(ft <sup>2</sup> ·yr)	<b>Yes</b>	
<b>Cooling Load:</b>	<b>3.85</b>	<b>BTU/(ft<sup>2</sup>·hr)</b>			



Locality	Oak Park
Postal code	60304
Street	1026 Clinton Ave.
<b>Responsible person</b>	
Surname & Name	Tom Bassett-Dilley Architect, Ltd
Locality	Oak Park, IL
Postal code	60304
Street	301 Harrison Street
Tel.	708-434-0381
e-mail	tom@drawingonplace.com
Date	9/ 9/2015 / 12:00 AM



PE allowance = (3BR+1)\*6,000 = 24,000kWh Annual  
 PE calc just under 21,000kWh (small house, no penalty!)





# Oak Park

From PHPP in 2013 to PHIUS+2015



Maintained assemblies, changed the rules. (see it on the tour Sunday!)

p.s. Airtightness: 0.46ACH50, or 129cfm, which is 0.25cfm/s.f. envelope area

# Conclusion/ Q&A

PHIUS+2015 is working for us!

Questions?

Thanks.