

- Program comparison
- Case studies
  - Construction detail
  - Costs
  - Performance testing
- Seasonal performance



# PROGRAM COMPARISON



- **32 Affiliates in Minnesota**
- **125 Homes per year**
- **Green Communities standard**
- **Homes are not free**





- International Code Council
- 15% more efficient than 2009
- Up for adoption: MD, MO, WA, MN



- DOE / EPA
- 15% more efficient than “code”
- Required for financing / funding

**Table 1 – Thermal Envelope Requirements by IECC Climate Zone**

	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8
<b>Ceiling Insulation</b>								
2012 IECC	30	38	38	49	49	49	49	49
ENERGY STAR	30	30	30	38	38	49	49	49
<b>Wall Insulation</b>								
2012 IECC	13	13	20	20 <sup>1</sup>	20 <sup>1</sup>	20+5 <sup>2</sup>	20+5 <sup>2</sup>	20+5 <sup>2</sup>
ENERGY STAR	13	13	13	13	20 <sup>1</sup>	20 <sup>1</sup>	21	21
<b>Window U-value</b>								
2012 IECC	NR	0.40	0.35	0.35	0.32	0.32	0.32	0.32
ENERGY STAR	0.60	0.60	0.35	0.32	0.30	0.30	0.30	0.30
<b>Infiltration (ACH50)</b>								
2012 IECC	5	5	3	3	3	3	3	3
ENERGY STAR	6	6	5	5	4	4	4	3

- **Ducts tighter in IECC**
  - IECC = 4 CFM / 100 SF total if outside
  - ES 3.0 = 4 CFM / 100 SF to outside; 8 CFM / 100 SF total
- **Equipment efficiencies higher in ES**
  - ES = 90 AFUE gas
  - IECC = 80 AFUE gas
  - Includes all capacities of DWH, gas and electric
- **Foundation insulation identical**
  - R-15 exterior or interior OR
  - R-19 interior
- **Mechanical ventilation required in both**
  - based on square footage & bedrooms
  - continuous OR intermittent (with CFM & runtime reqs.)



## Sections

- **R303: Materials, Systems, Equipment**
- **R402: Building Thermal Envelope**
- **R403: Systems**



## Checklists

- **Thermal Enclosure System**
- **HVAC System Contractor**
- **HVAC System Rater**
- **Water Management**

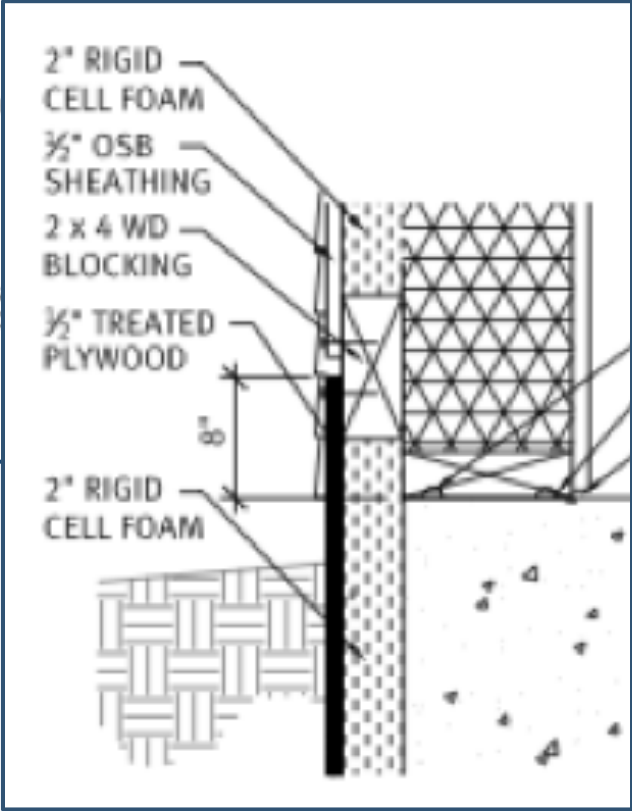
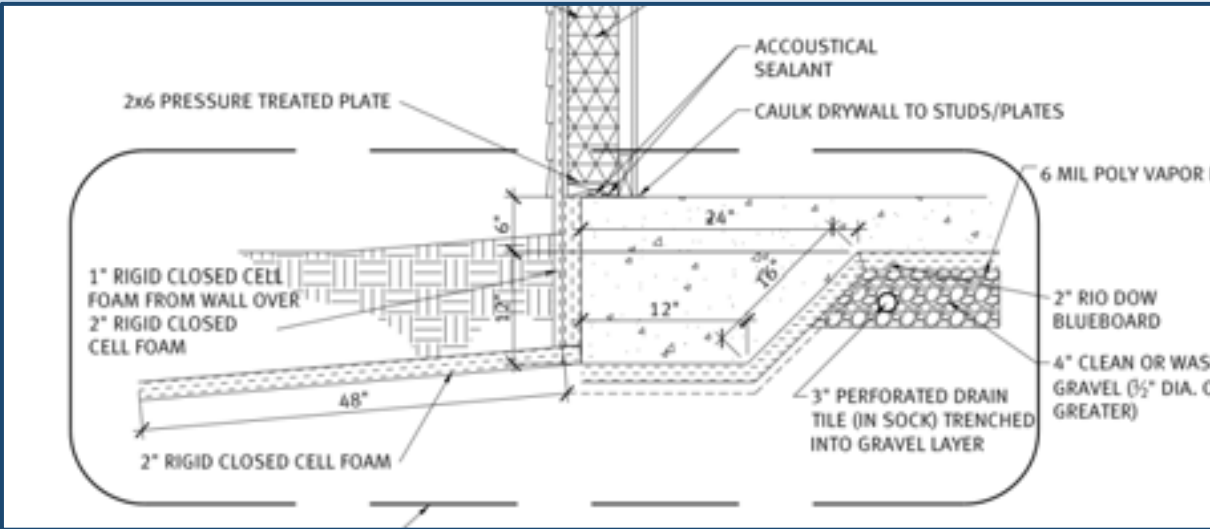


**North St. Louis County – Dave Alaspa**

**La Crosse Area – Jason Mather**

**Rochester Area – Brian Wimmer**





- R-10 slab insulation
- Sill plates caulked to foundation
- Exterior foam protected

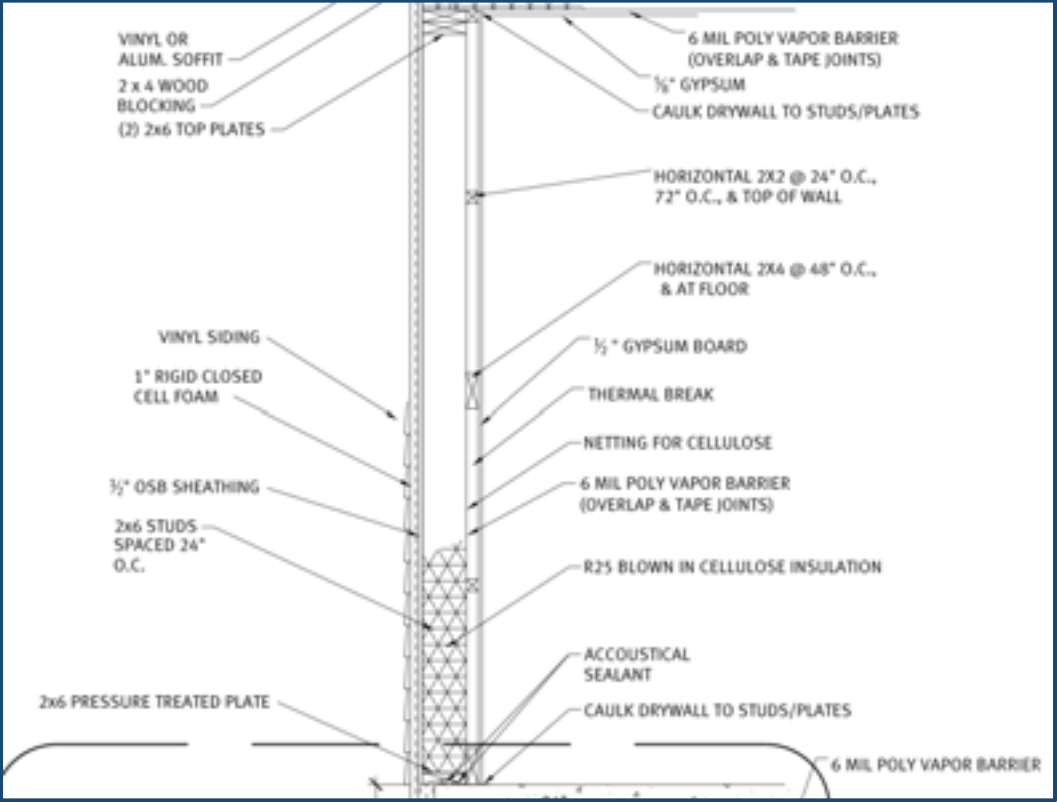
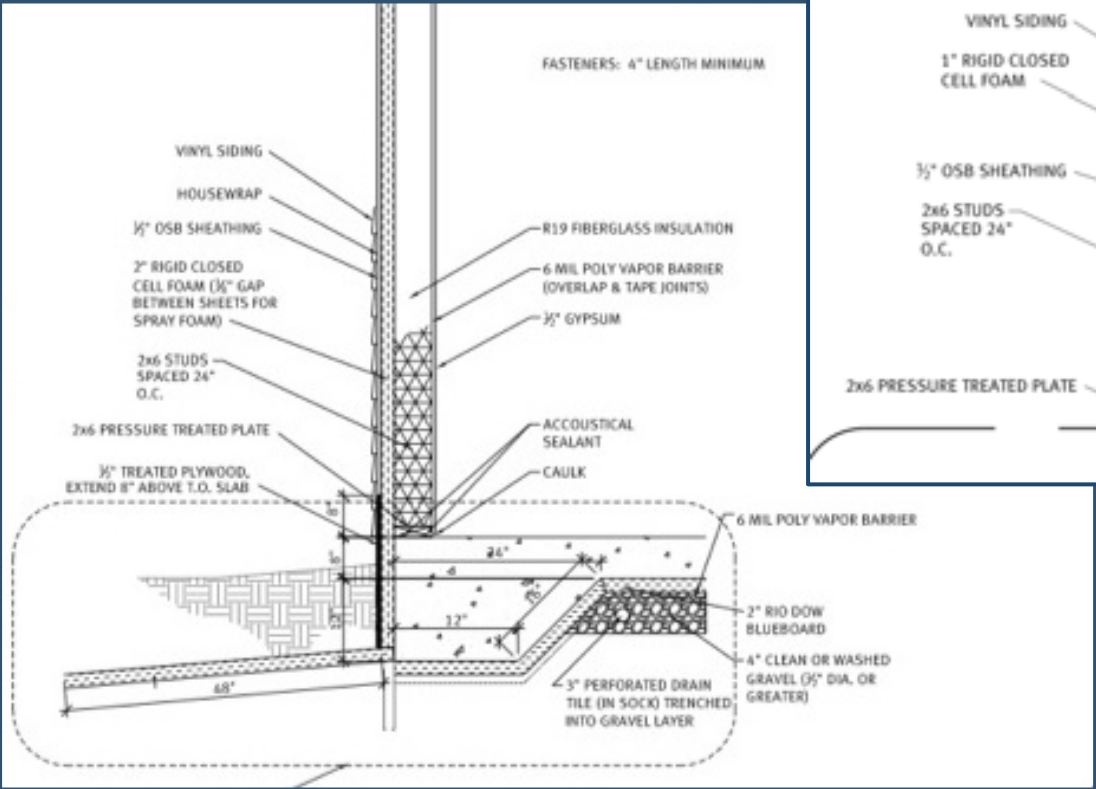




Foundation / slab insulation  
IECC 2012: R303, R402  
ES 3.0: Thermal Enclosure System



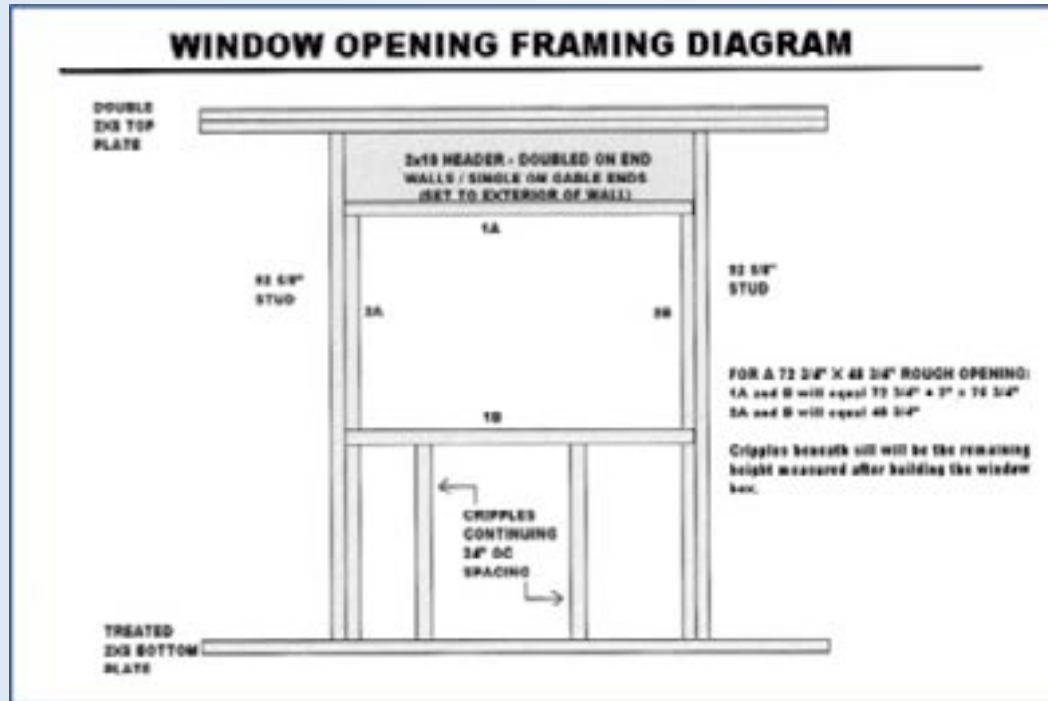
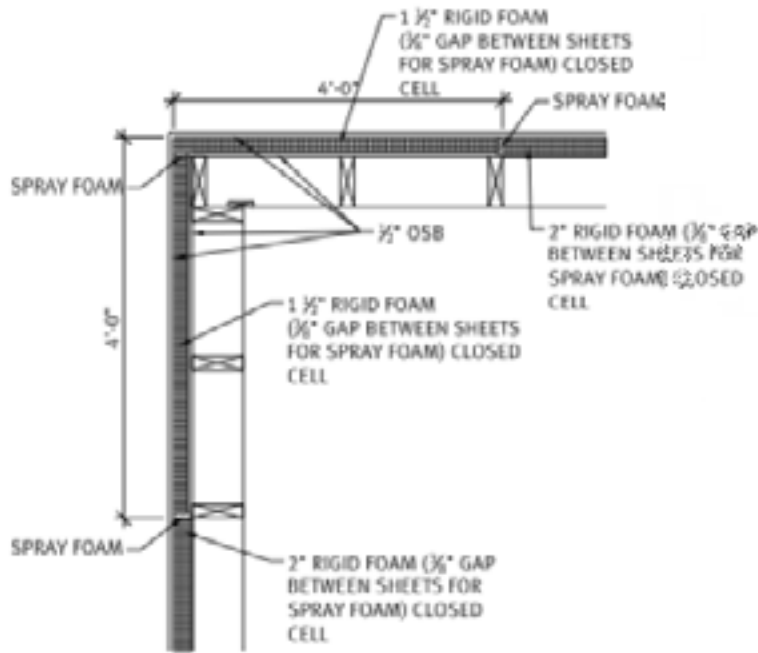
- R-24 – R-30 (≥ R-20 required)
- Continuous insulation



Reduced thermal bridging, insulation efficiency  
 IECC 2012: R402.1  
 ES 3.0: Thermal Enclosure System



Reduced thermal bridging, insulation efficiency  
IECC 2012: R402.1  
ES 3.0: Thermal Enclosure System



- Corners R-18 (≥ R6 required)

- Framing limited



Reduced thermal bridging  
IECC 2012: R402.1  
ES 3.0: Thermal Enclosure System

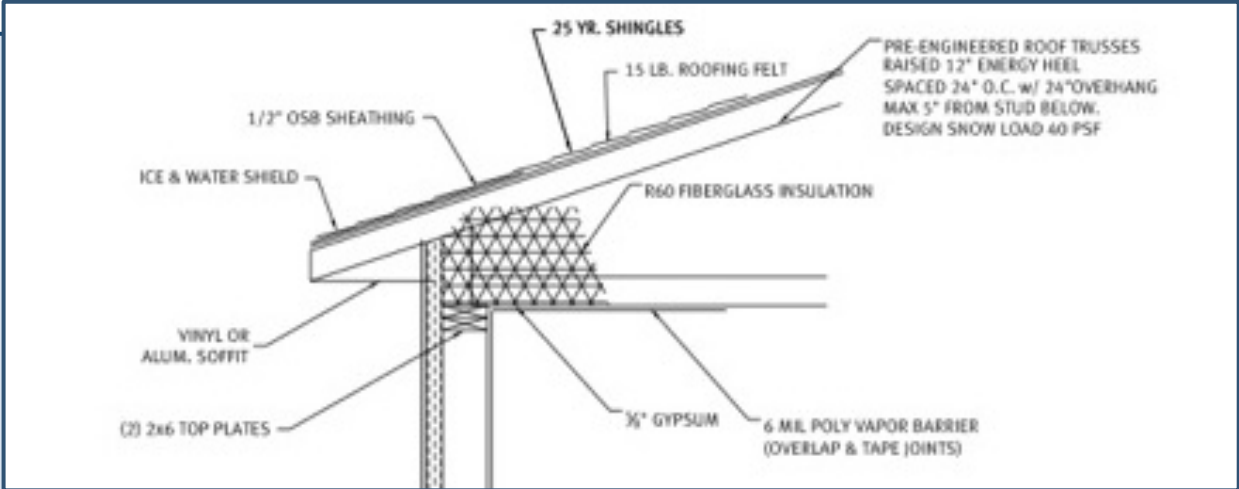
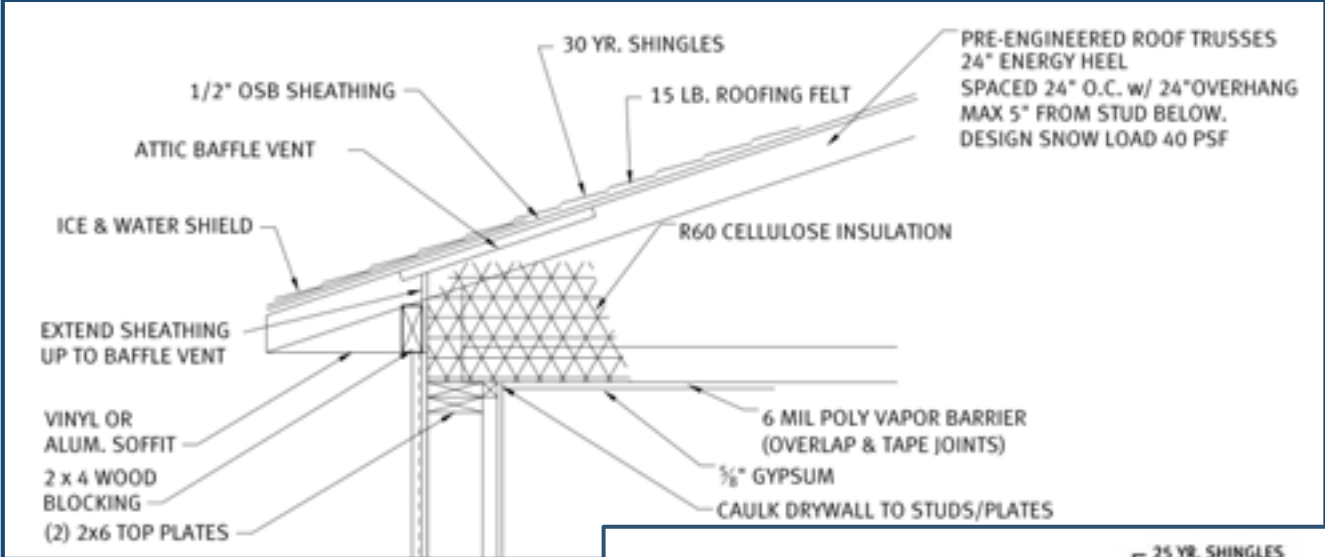


Air sealing  
IECC 2012: R402.4  
ES 3.0: Thermal Enclosure System





Fully aligned air barrier  
IECC 2012: R402.4  
ES 3.0: Thermal Enclosure System



- R-60 attic (≥ R-49 required)
- R-40 – R-60 eaves (≥ R-38 required)





**Habitat**  
for Humanity®

Insulation efficiency  
IECC 2012: R402.2  
ES 3.0: Thermal Enclosure System



- Dropped ceiling
- Heat Recovery Ventilation



## HOME ENERGY RATING SYSTEM (HERS) INDEX: 54

### INFILTRATION:

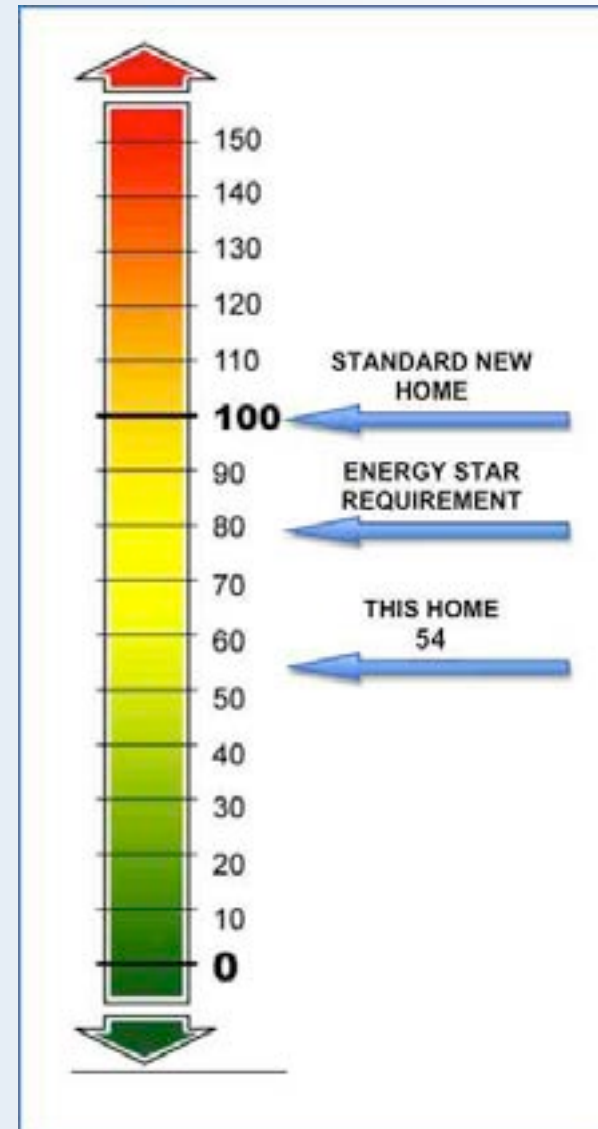
79 CFM@50

0.08 CFM / SF conditioned floor area

0.59 ACH@50

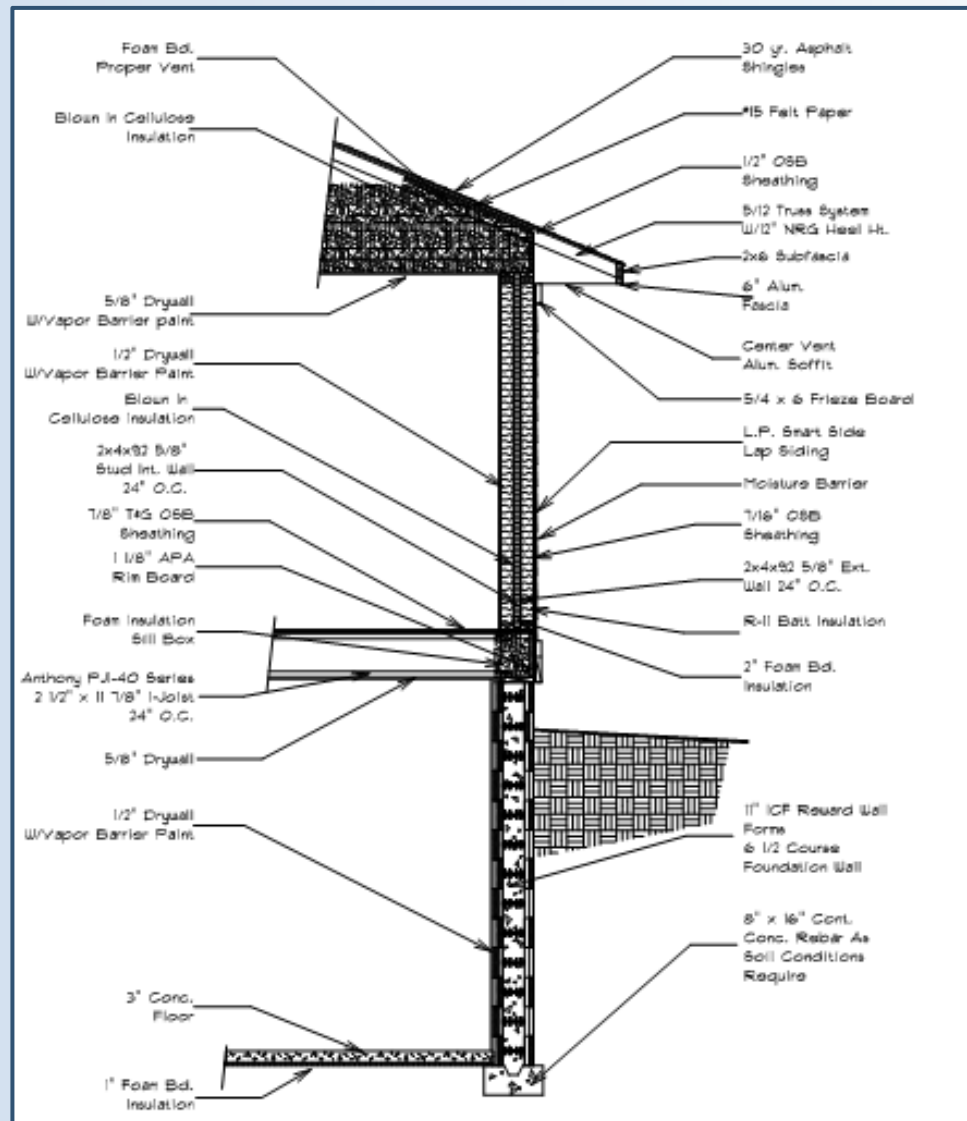
4.4 inch hole (Effective Leakage Area)

8.2 inch hole (Equivalent Leakage Area)





<b>Excavating</b>	<b>\$5,581</b>
<b>Foundation</b>	<b>\$5,808</b>
<b>Framing</b>	<b>\$8,725</b>
<b>Insulation</b>	<b>\$3,806</b>
<b>Heating</b>	<b>\$9,000</b>
<b>Plumbing</b>	<b>\$6,000</b>
<b>Electric</b>	<b>\$5,752</b>
<b>Windows</b>	<b>\$2,559</b>





- Form-a-Drain connected to sump
- Capillary break



- ICF Wall
- Thermally isolated slab

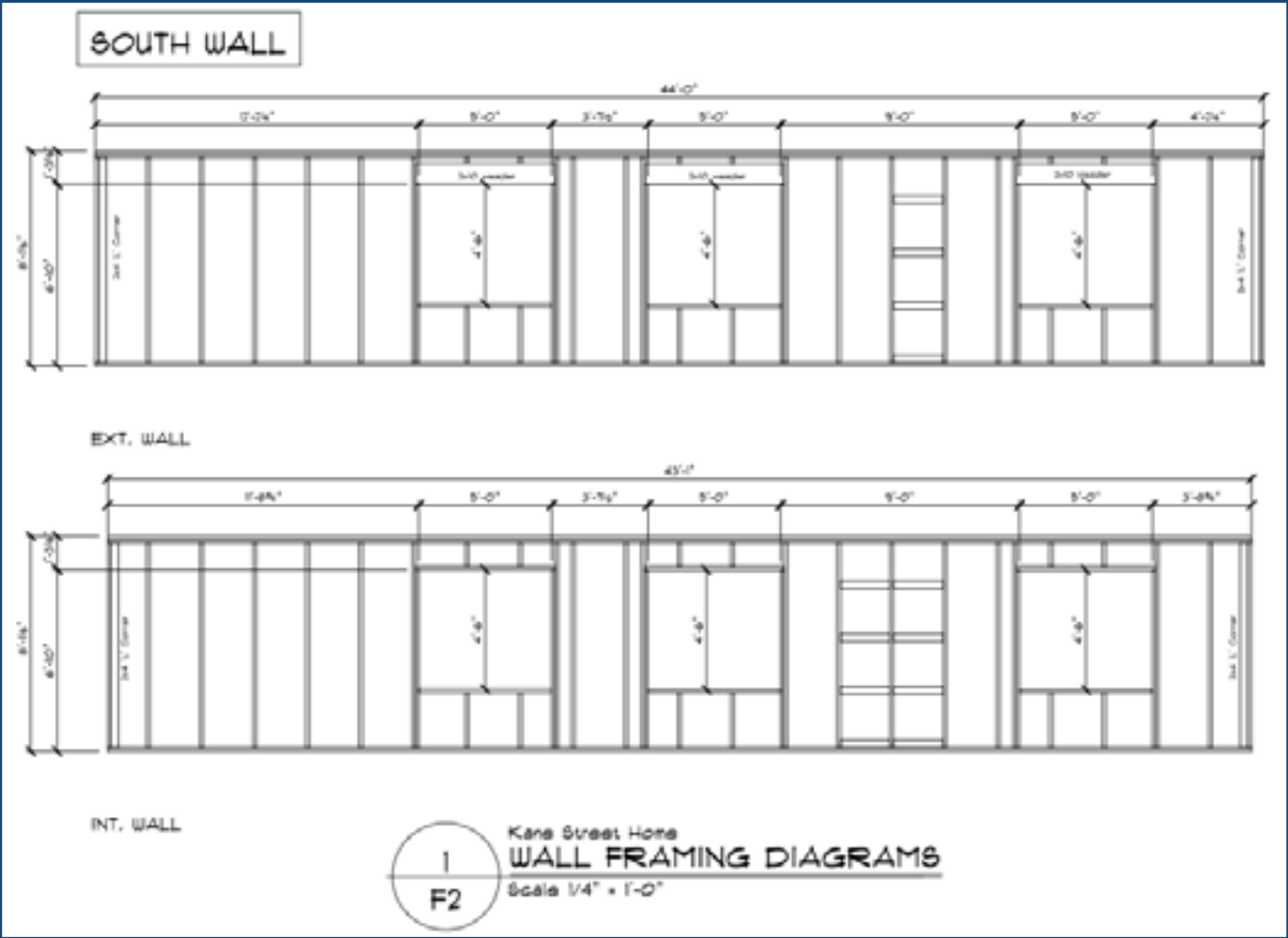




- Insulated rim
- Air sealed bays

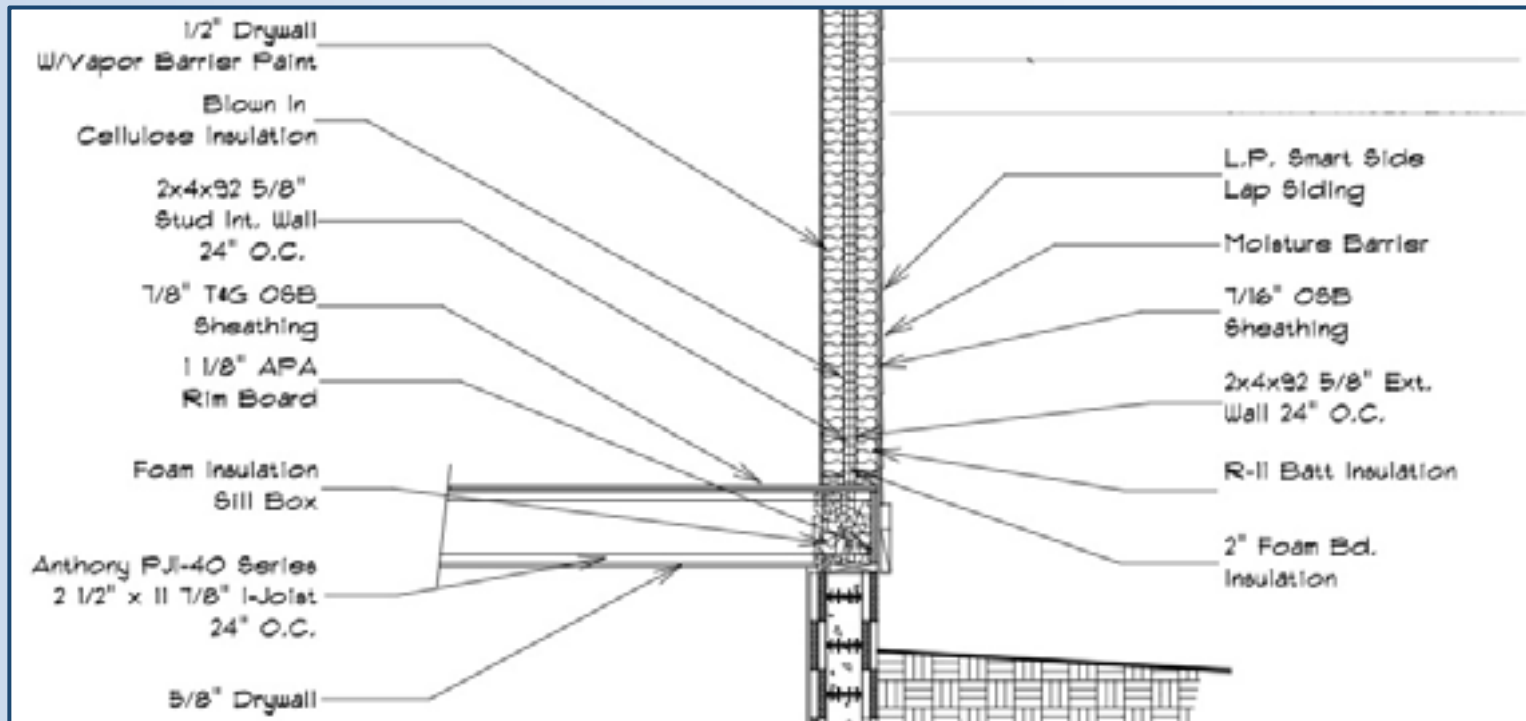
Insulation efficiency, air sealing  
IECC 2012: R402.4  
ES 3.0: Thermal Enclosure System





- Double wall





- Continuous Insulation



Reduced thermal bridging, insulation efficiency  
IECC 2012: R402.1  
ES 3.0: Thermal Enclosure System



- Raised heel
- Pitch cut foam board, x2-2"





- Truss lock bolt
- Caulk every cavity



- **ALL seams sealed with mastic**
- **Boots sealed to subfloor**



Renewable energy  
IECC 2012: Not required  
ES 3.0: Performance path (not required)

## HOME ENERGY RATING SYSTEM (HERS) INDEX: 49

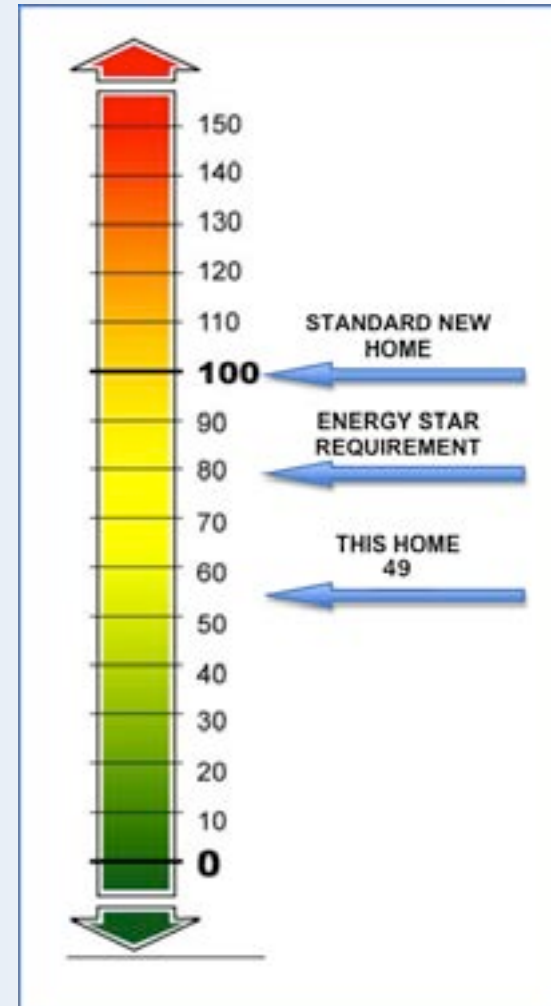
### INFILTRATION:

278 CFM@50

0.12 CFM / SF conditioned floor area

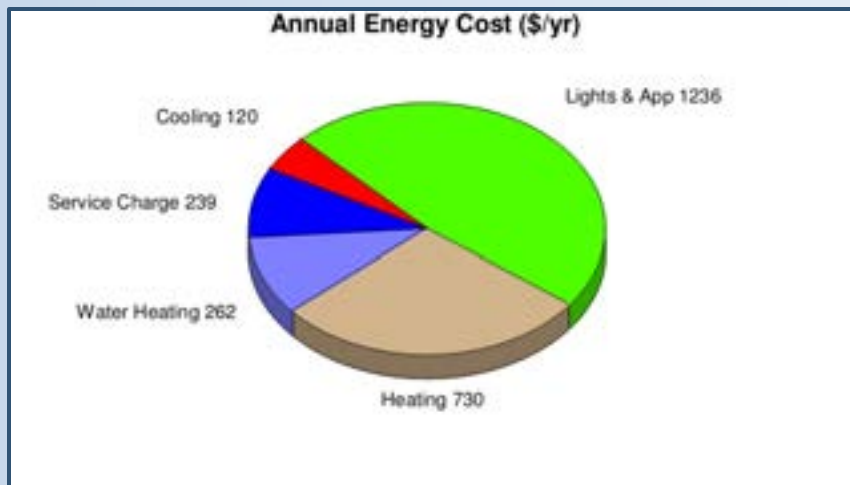
0.97 ACH@50

15.3 square inch hole (Effective Leakage Area)

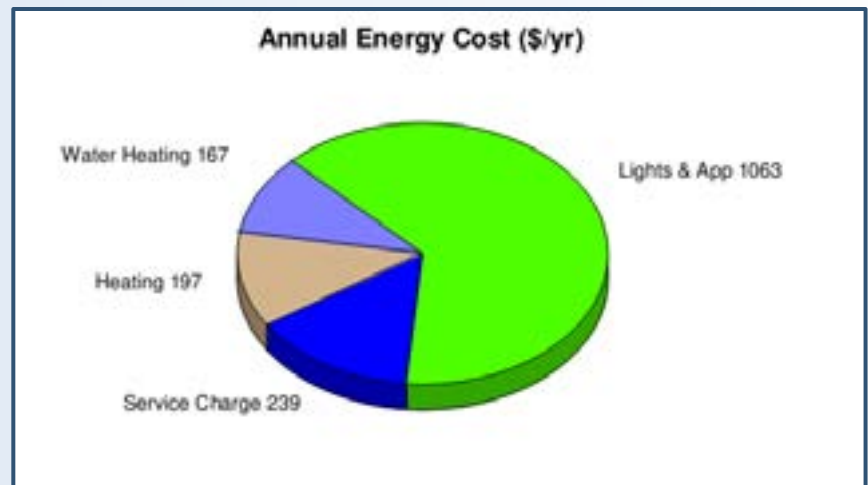




## 1118 Liberty



## 1733 Kane



Total savings in heating costs: \$533



**Excavating \$10,494**

**Foundation \$14,916**

**Framing \$7,515**

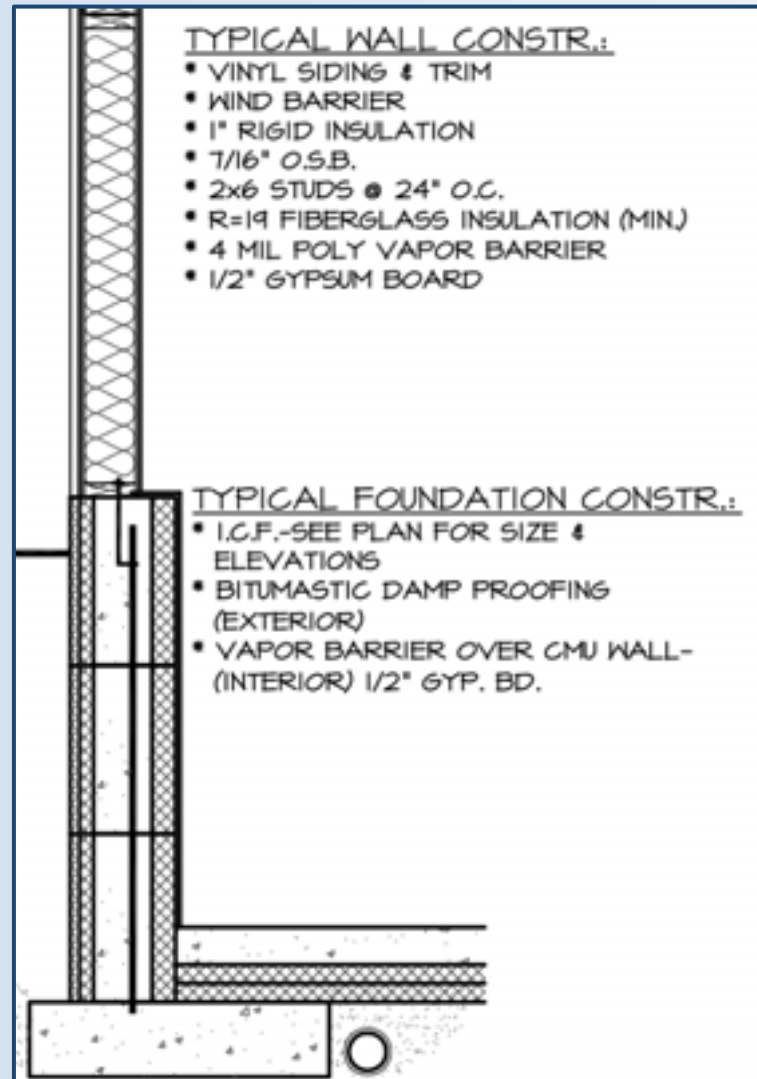
**Insulation \$2,433**

**Heating \$8,789**

**Plumbing \$4,270**

**Electric \$5,748**

**Windows \$5,335**



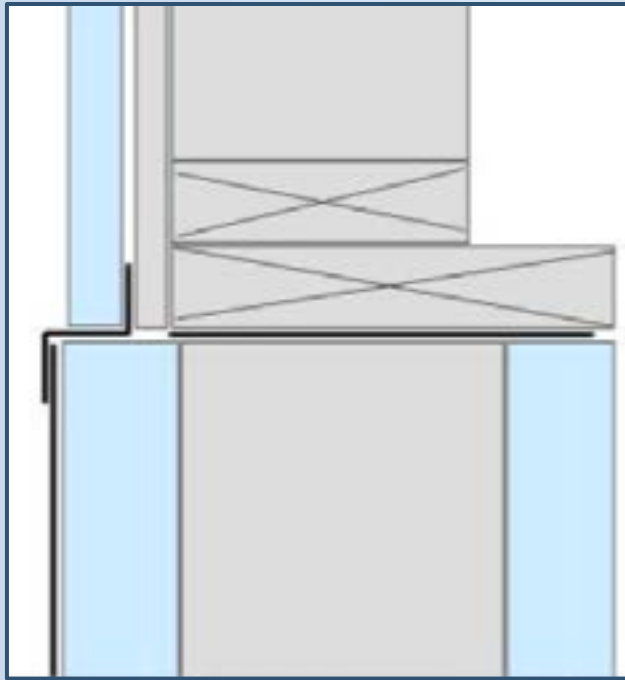


- Below grade moisture barrier
- Integrate with footing





- Thermally isolated slab
- Insulated, air sealed rim



- Integrated drainage plane
- Exterior insulation





Drainage plane, reduced thermal bridging  
IECC 2012: R402.1  
ES 3.0: Water Management, Thermal Enclosure System



- **Grade I insulation installation**
- **Acoustical sealant**









---

**Air sealing, duct sealing**  
**IECC 2012: R403.2**  
**ES 3.0: HVAC Contractor & Rater**



- ALL seams taped
- Minimize elbows



- Boots sealed to subfloor and drywall



## HOME ENERGY RATING SYSTEM (HERS) INDEX: 55

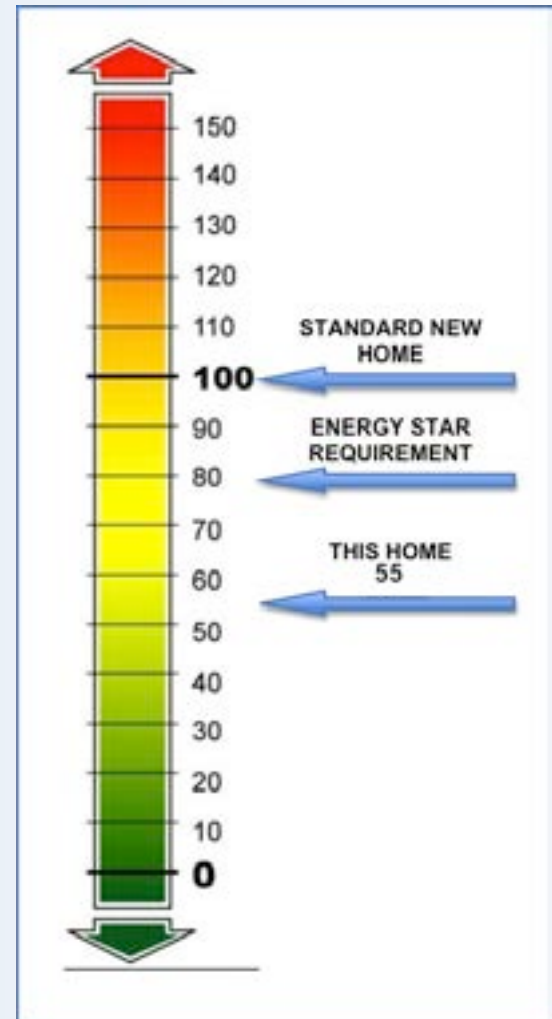
### INFILTRATION:

494 CFM@50

0.28 CFM / SF conditioned floor area

1.98 ACH@50

27.4 square inch hole (Effective Leakage Area)



# ROCHESTER AREA

---



**Excavating \$5,191**

**Foundation \$9,267**

**Framing \$9,933**

**Insulation \$2,972**

**Heating \$7,020**

**Plumbing \$7,275**

**Electric \$4,687**

**Windows \$2,552**

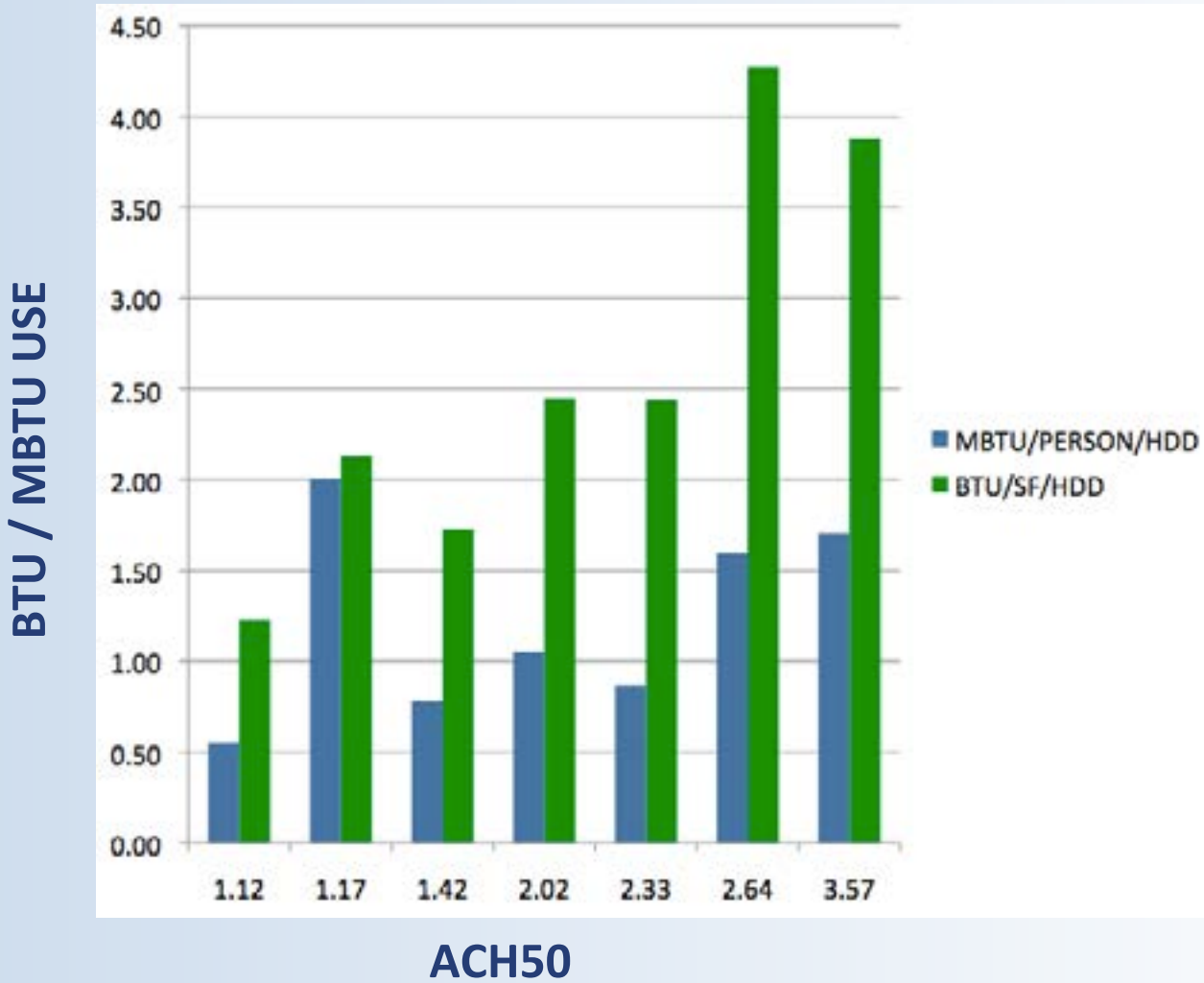


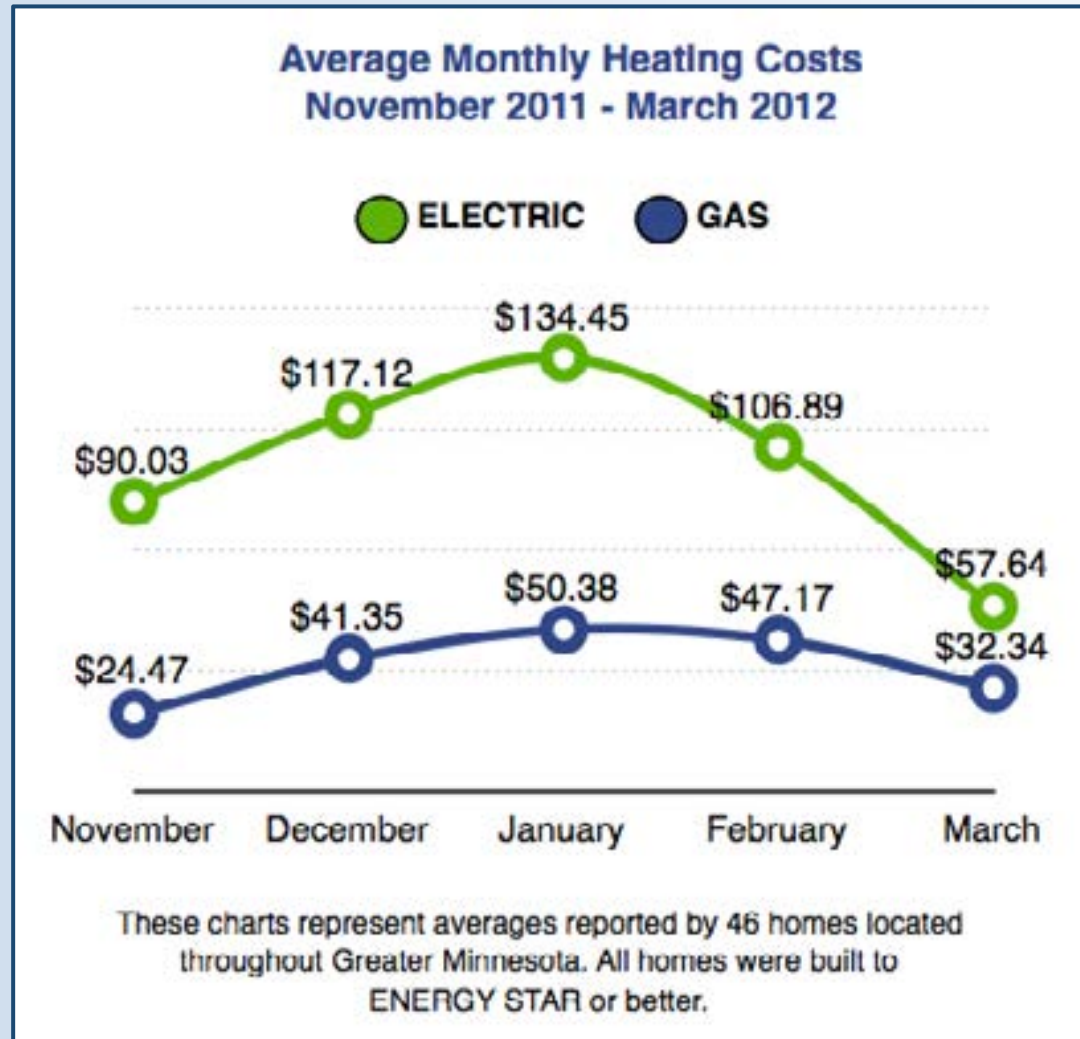
# SEASONAL PERFORMANCE

<b>Foundation</b>	<b>Construction</b>	<b>Insulation</b>	<b>ACH50</b>
Slab-on-grade	Stick - 24oc	Clls blwn + XPS	0.59
Slab-on-grade	SIS	SIS + CC Spray	0.59
Full basement	ICF / Double wall	Clls blwn + XPS	0.74
Slab-on-grade	Stick - 24oc	Fbg batt + XPS	1.08
Full basement	ICF	ICF	1.12
Split-level	ICF / Stick - 24oc	ICF / Fbg batt + XPS	1.98
Slab-on-grade	ICF	ICF	2.02
Slab-on-grade	Stick - 16oc	Fbg batt + XPS	2.64



# SEASONAL PERFORMANCE





### **INTERNATIONAL ENERGY CONSERVATION CODE 2012**

<http://publicecodes.cyberregs.com/icod/iecc/index.htm>

### **ENERGY STAR 3.0 GUIDLINES**

[http://www.energystar.gov/index.cfm?c=bldrs\\_lenders\\_raters.nh\\_v3\\_guidelines](http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_v3_guidelines)



---

**THANK YOU!**

DAVE ALASPA: [dave@nslchfh.org](mailto:dave@nslchfh.org)

JASON MATHER: [jason@habitatlacrosse.org](mailto:jason@habitatlacrosse.org)

BRIAN WIMMER: [construction@rahh.org](mailto:construction@rahh.org)

MOLLY BERG: [molly@hfhmn.org](mailto:molly@hfhmn.org)

