



Miller Homes is in the planning stages to construct 80 units in a new lot known as ‘Inverness Gardens’ with the first one demonstrating cost effective energy efficient measures as described below:

Recommended Thermal Envelope Details: Inverness Gardens

	Base Design	Improved Design
Walls	Vinyl Siding, 1-1/2” exterior foam, 2x6” framing w/ Fiberglass batts R29	Vinyl Siding, 2” Exterior Foam, 2x6” framing w/ dense packed cellulose R33
Garage (Exterior)	Vinyl Siding, 2x6” framing	Vinyl Siding, 2x6” framing
Attic	2x12 rafters frame with Fiberglass batts R38	2x12 rafters frame with 16” cellulose R49
Cathedral Ceiling	R38 Fiberglass Batt	Blown Fiberglass with 2” Exterior Foam above roof deck R64
Basement Walls	10” CMU w/ 5’ Hanging Blown in Fiberglass R10	10” CMU, 2.5” white thermax R15
Windows	U=0.33 Low E Argon double hung	Super Seal Windows U = 0.20
Rim/Band Joists	6” Fiberglass batts w/ 1-1/2” Ext Foam R 29	3” Closed Cell foam in Band joists w/ 2” ext Foam R32
Garage-to-house Wall	2x6 framing w/ Fiberglass batts R19	2” Exterior Foam, 2x6” framing w/ dense packed cellulose R33
Air Tightness & Thermal Bypass	5 ACH50 (with basement)	2 ACH50 (with basement) Various air sealing and thermal bypass improvements
Heating/ Cooling	90% Natural Gas Furnace 13 SEER AC Unit	94% Natural Gas Furnace 13 SEER AC Unit
Ventilation	Exhaust Only Ventilation	HRV Fantech SH704 run 24 hours, 36 watts, 55 cfm

There will be 3 different types of units for this development, a single-bedroom one story, a two-bedroom two story and a two-bedroom two story with a loft. The single bedroom unit will be attached to an identical single bedroom unit while the two bedroom units will be paired as a lofted unit attached to a non-lofted unit. The following breakdowns will be

for the each unit. Cooling is included in the calculations for the proposed design. The Energy savings predicted by RemRate is shown below.

July 2010 Final Proposed Design						
	Heating Load (MMBtu)	Cooling Load (MBtu)	Fuel (MMBtu)	Relative Heating	Annual Cost	Savings
Inverness 2 Story with Loft						
Baseline	62	13.5	116.9	100%	\$ 1,754	\$ -
All Improvements	32.3	13.4	81.6	70%	\$ 1,224	\$ 530
Inverness 2 Story without Loft						
Baseline	56.2	12.7	106.4	100%	\$ 1,596	\$ -
All Improvements	30.7	12.3	76	71%	\$ 1,140	\$ 456
Inverness 1 Story						
Baseline	48.5	10.2	89.9	100%	\$ 1,349	\$ -
All Improvements	28.7	9.5	65.8	73%	\$ 987	\$ 362

- Savings are due to air tightness, and added insulation. The Proposed Designs have around a 30% lower heating costs.

The table below shows a breakdown of the different energy savings measures put into effect in the 2 story unit with a loft. The addition of the Super Seal windows adds around \$125/year savings to the unit.

Troy Adams 2 Story with Loft Energy Savings Breakdown						
	Heating Load (MMBtu)	Cooling Load (MBtu)	Fuel (MMBtu)	Relative Fuel	Annual Cost	Savings
Baseline	62.0	13.5	116.9	100%	\$ 1,754	\$ -
Improved Basement	55.4	14.3	109.6	94%	\$ 1,644	\$ 110
Bsmt + Walls + (2 ACH 50)	43.2	15.1	96.1	82%	\$ 1,442	\$ 312
Bsmt + Walls + (2 ACH 50) + Windows	35.9	13.5	87.4	75%	\$ 1,311	\$ 443
All Shell	32.3	13.4	83.3	71%	\$ 1,250	\$ 504
All Improvements (add 94% Furnace)	32.3	13.4	81.6	70%	\$ 1,224	\$ 530

2 Story Lofted Unit Additional Costs

Base Insulation	Area	Cost/sq ft	Cost
Fiberglass Batts on Exterior Walls R19	1,203	0.55	\$ 662
Fiberglass Batts on Interior Garage Walls R19	320	0.55	\$ 176
Fiberglass Batts in Ceiling R38	1,688	1.15	\$ 1,941
Basement Wall 5ft hanging Blown Fiberglass	885	0.50	\$ 443
1-1/2" Exterior Foam on Exterior Walls	1,203	1.29	\$ 1,552
Low E window	392	15.11	\$ 5,923
TOTAL			\$ 10,696
Recommended Improvements			
Blown Cellulose on Exterior Walls R20	1,203	0.75	\$ 902
Blown Cellulose in Ceiling R50	1,688	1.88	\$ 3,173
2" white thermax on Basement Wall R15	1,475	0.90	\$ 1,328
Blown Cellulose in Interior Garage Wall R20	320	0.75	\$ 240
2 in Exterior Foam on Interior Garage Wall	320	1.50	\$ 480
2 in Exterior Foam on Exterior Walls	1,203	1.50	\$ 1,805
2 in Exterior Foam on Cathedral Ceilings	1,012	1.50	\$ 1,518
low argon triple glaze window	392	25.44	\$ 9,972
add for 95% two-speed furnace and vent controls			\$ 700
TOTAL			\$ 20,118
ADDITIONAL COST (above base cost)			\$ 9,422

2 Story Unit with No Loft

Base Insulation	Area	Cost/sq ft	Cost
Fiberglass Batts on Exterior Walls R19	931	0.55 \$	512
Fiberglass Batts on Interior Garage Walls R19	320	0.55 \$	176
Fiberglass Batts in Ceiling R38	1,688	1.15 \$	1,941
Basement Wall 5ft hanging Blown Fiberglass	885	0.50 \$	443
1-1/2" Exterior Foam on Exterior Walls	931	1.29 \$	1,201
Low E window	380	15.11 \$	5,742
TOTAL			\$ 10,015
Recommended Improvements			
Blown Cellulose on Exterior Walls R20	931	0.75 \$	698
Blown Cellulose in Ceiling R50	1,688	1.88 \$	3,173
2" white thermax on Basement Wall R15	1,475	0.90 \$	1,328
Blown Cellulose in Interior Garage Wall R20	320	0.75 \$	240
2 in Exterior Foam on Interior Garage Wall	320	1.50 \$	480
2 in Exterior Foam on Exterior Walls	931	1.50 \$	1,397
2 in Exterior Foam on Cathedral Ceilings	1,412	1.50 \$	2,118
low argon triple glaze window	380	25.44 \$	9,667
add for 95% two-speed furnace and vent controls			\$ 700
TOTAL			\$ 19,801
ADDITIONAL COST (above base cost)			\$ 9,786

1 Story Unit

Base Insulation	Area	Cost/sq ft	Cost
Fiberglass Batts on Exterior Walls R19	738	0.55 \$	406
Fiberglass Batts on Interior Garage Walls R19	320	0.55 \$	176
Fiberglass Batts in Ceiling R38	1,461	1.15 \$	1,680
Basement Wall 5ft hanging Blown Fiberglass	837	0.50 \$	419
1-1/2" Exterior Foam on Exterior Walls	738	1.29 \$	952
Low E window	320	15.11 \$	4,835
TOTAL			\$ 8,468
Recommended Improvements			
Blown Cellulose on Exterior Walls R20	738	0.75 \$	554
Blown Cellulose in Ceiling R50	1,461	1.88 \$	2,747
2" white thermax on Basement Wall R15	1,395	0.90 \$	1,256
Blown Cellulose in Interior Garage Wall R20	320	0.75 \$	240
2 in Exterior Foam on Interior Garage Wall	320	1.50 \$	480
2 in Exterior Foam on Exterior Walls	738	1.50 \$	1,107
2 in Exterior Foam on Cathedral Ceilings	1,194	1.50 \$	1,791
low argon triple glaze window	320	25.44 \$	8,141
add for 95% two-speed furnace and vent controls			\$ 700
TOTAL			\$ 17,014
ADDITIONAL COST (above base cost)			\$ 8,547