

Action Lab: Utility Cost-effectiveness Tests – Tips for Success

October 27, 2016







Introduction







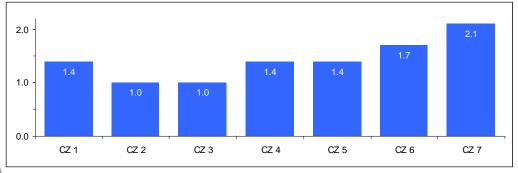
EPA support for utilities



Capital & Programmatic Assumptions	
Measure Life (Years)	29
Company Discount Rate	4.5%
Capital Recovery Factor	6.2%
Participant Discount Rate	8.5%
Societal Discount Rate	2.8%
Avoided Electric Energy Escalation Rate	1.5%
Avoided Electric Demand Escalation Rate	0.3%
Avoided Gas Energy Escalation Rate	1.1%
Net to Gross Ratio (NTGR)	90%
Program Administrator Costs (% of Incentive Cost)	75%

 Developed a standardized Cost-effectiveness calculator (Excel-based) to aid utilities.

_	CZ 1	
	Electricity	Gas
	Slab	Slab
	CZ 1 (E)	CZ 1 (G)
TRC Total Resource Cost	1.3	1.4
SCT Societal Cost Test	1.8	1.9
RIM Rate Impact Measure	n/a	n/a
PCT Participant Cost Test	1.3	1.4
UCT Utility Cost Test	6.3	6.2







EPA support for utilities



ENERGY STAR Certified Homes, Version 3
Cost & Savings Estimates

	Exhibit 4: ENERGY STAR v3 Certified	Home vs 2009 IECC Home - CZ 1 - Config. A	- Electric			
			Inc. Unit	Cost		Inc.
Measure	2009 IECC Baseline	ENERGY STAR v3	Cost	Qty	Cost Unit	Cost
	klists & Used to Meet ENERGY STAR HER					
Radiant Barrier	No Radiant Barrier	Radiant Barrier	\$19.03	13		
Infiltration	7.0 ACH50	6.0 ACH50	\$0.13	2,400	CFA (ft²)	\$312
Cooling Equipment	(See Heating Equipment)	(See Heating Equipment)				-
Heating Equipment	7.7 HSPF / 13 SEER	8.2 HSPF / 14.5 SEER	\$132.00	3	Tons	\$396
Water Heater	0.92 EF Electric DHW, 40 Gallons	0.93 EF Electric DHW, 40 Gallons	\$16.00	1	Water Heater	\$16
Lighting	50% Fluorescent Lighting	80% ENERGY STAR CFLs	\$2.80	14	Lamps	\$40
Thermostat	Programmable Thermostat	Programmable Thermostat				
Dishwasher	Standard Efficiency Dishwasher	ENERGY STAR Dishwasher	\$10.00	1	Dishwasher	\$10
Refrigerator	Standard Efficiency Refrigerator	ENERGY STAR Refrigerator	\$40.00	1	Refrigerator	\$40
Sub-Total of Measures Not Require	d by Checklists & Used to Meet ENERGY S	TAR HERS Index Target				\$1,054
Thermal Enclosure System Rate	r Checklist					
Ceiling Insulation	R-30	R-30				
Ceiling Insulation Installation	Grade II Installation	Grade I Installation	\$0.07	1,200	Ins. Surface Area (ft2)	\$85
Above-Grade Wall Insulation	R-13	R-13				
A-G Wall Insulation Installation	Grade III Installation	Grade I Installation	\$0.09	2,160	Ins. Surface Area (ft2)	\$204
Foundation Insulation	No Slab Insulation	No Slab Insulation				
Foundation Insulation Installation	Grade I Installation	Grade I Installation				
Windows	U-value: 0.65 / SHGC: 0.30	U-value: 0.60 / SHGC: 0.27	\$0.10	360	Window Area (ft ²)	\$35
Doors	R-1.5	R-4.8	\$64.71	2	Door	\$129
Additional Checklist Measures: Re	duced Lumber from Advanced Framing, Rate	r Verification				-\$25
Sub-Total of Thermal Enclosure Sy	stem Rater Checklist					\$429
HVAC System Quality Installatio						
Ventilation	None	Supply Ventilation System	\$367.80	1	Ventilation System	\$368
HVAC Equipment Right-Sizing	3.5 Tons	3.0 Tons	-\$672.00	0.5	Tons	-\$336
Additional Checklist Measures: Cre	edential Fee, HVAC Commissioning, Contrac	tor Completion of Checklist				\$200
Sub-Total of HVAC System QI Con	tractor Checklist					\$232
HVAC System Quality Installatio						
Duct Sealing - Total Leakage	12 CFM per 100 ft² of CFA Total Leakage	8 CFM per 100 ft2 of CFA Total Leakage	\$0.17	576	Duct Surface Area (ft²)	\$98
Duct Insulation	R-8 Attic, R-6 Other Uncond. Spaces	R-8 Attic, R-6 Other Uncond. Spaces	-			-
		ure Balancing, MERV 6 Filter, Rater Verification	n			\$350
Sub-Total of HVAC System QI Rat						\$448
Water Management System Bui						
	ystem Builder Checklist: Builder Completion	of Checklist				\$25
Total Incremental Cost for the H	ome					\$2,187

11/1/2013

- Created the ENERGY STAR Cost & Savings document.
 - Lists component and total incremental costs.
- REM/Rate files available by Climate Zone.
 - Can be easily modified to represent utility service territory.
 - Available for v3 and v3.1.





EPA support for utilities



- Type of support can vary greatly between utilities:
 - Some simply need more refined savings values.
 - For others, extra guidance is needed for:
 - What's included in their specific code.
 - How to calculate location-specific savings.
 - Other program-specific nuances.





1. Cost Test Assistance

- Two types of inputs that we see:
 - Utility-level inputs (likely out of your control)
 - Program-level inputs (some are in your control)





1. Cost Test Assistance: Key utility-level inputs

Escalation Rate:

- Electric Energy
- Electric Demand
- Gas Energy

Discount Rate:

- Utility Discount Rate
- Participant Discount Rate
- Societal Discount Rate
- Transmission & Distribution Losses
- Utility Reserve Margin

Avoided Costs:

- per kWh
- per kW / Capacity Building Costs
- per Therm

Retail Rate:

- per kWh
- per kW
- per Therm
- Economic Benefits Rate (\$/kWh)
- Other Benefits Rate (\$/kWh)





1. Cost Test Assistance: Key utility-level inputs

- Escalation Rate:
 - Electric Energy
 - Electric Demand
 - Gas Energy
- Discount Rate:
 - Utility Discount Rate
 - Participant Discount Rate
 - Societal Discount Rate
- Transmission & Distribution Losses
- Utility Reserve Margin

- Avoided Costs:
 - per kWh
 - per kW / Capacity Building Costs
 - per Therm
- Retail Rate:
 - per kWh
 - per kW
 - per Therm
- Economic Benefits Rate (\$/kWh)
- Other Benefits Rate (\$/kWh)





1. Cost Test Assistance: Key program-level inputs

- Incremental cost of upgrade
- Incentive amount
- Measure life
- Program administrator costs
- Net to gross ratio





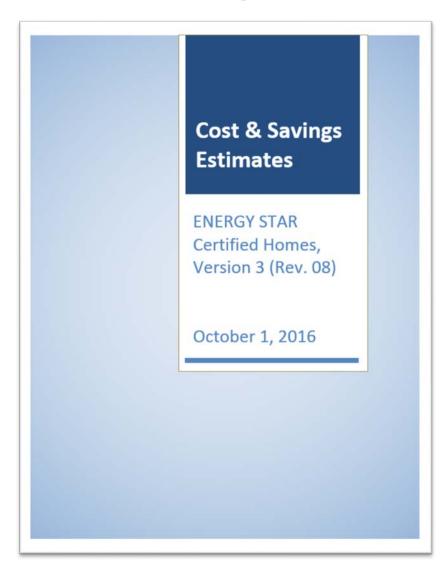
1. Cost Test Assistance: Key program-level inputs

- Incremental cost of upgrade
- Incentive amount
- Measure life
- Program administrator costs
- Net to gross ratio





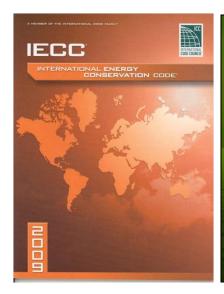
Cost input assistance!







- The challenge: Not <u>one</u> right answer, <u>lots</u> of right answers.
- The purpose of the cost & savings document is to give new builder partners and utility sponsors one right answer that can be used as a starting point for their needs.









Cost estimates to get to Version 3 from 2009 IECC

					2009 IECC	ENERGY STAR Version 3						
#	cz	Location	Found.	HVAC Equipment Type	Annual Purchased Energy Costs	Annual Purchased Energy Costs	Annual Purchased Energy Savings		Total Upgrade Cost	Monthly Purchased Energy Savings	Monthly Mortgage Upgrade Cost	Net Cash Flow
1	1	Miami, FL	Slab	Elec. Air-Source HP	\$1,865	\$1,571	\$294	16%	\$1,463	\$25	\$8	\$17
2	1	Miami, FL	Slab	Gas Furnace / Elec. AC	\$1,750	\$1,462	\$288	16%	\$1,517	\$24	\$8	\$1 6
3	2	Tampa, FL	Slab	Elec. Air-Source HP	\$1,912	\$1,636	\$276	14%	\$1,463	\$23	\$8	\$1 5
4	2	Tampa, FL	Slab	Gas Furnace / Elec. AC	\$1,782	\$1,496	\$285	16%	\$1,517	\$24	\$8	\$1 6
5	3	Fort Worth, TX	Slab	Elec. Air-Source HP	\$2,322	\$1,821	\$502	22%	\$1,696	\$42	\$ 9	\$33
6	3	Fort Worth, TX	Slab	Gas Furnace / Elec. AC	\$2,069	\$1,709	\$360	17%	\$1,750	\$30	\$ 9	\$21
7	4	St. Louis, MO	Bsmt.	Elec. Air-Source HP	\$2,823	\$2,359	\$464	16%	\$1,589	\$39	\$ 9	\$30
8	4	St. Louis, MO	Bsmt.	Gas Furnace / Elec. AC	\$2,215	\$1,852	\$362	16%	\$1,915	\$30	\$10	\$20
9	5	Indianapolis , IN	Bsmt.	Elec. Air-Source HP	\$3,080	\$2,347	\$732	24%	\$2,059	\$61	\$11	\$50
10	5	Indianapolis, IN	Bsmt.	Gas Furnace / Elec. AC	\$2,295	\$1,824	\$471	21%	\$2,117	\$39	\$11	\$28
11	6	Burlington, VT	Bsmt.	Elec. Air-Source HP	\$3,760	\$2,732	\$1,028	27%	\$2,155	\$86	\$12	\$74
12	6	Burlington, VT	Bsmt.	Gas Furnace / Elec. AC	\$2,438	\$1,902	\$535	22%	\$2,117	\$4 5	\$11	\$33
13	7	Duluth, MN	Bsmt.	Gas Furnace / Elec. AC	\$2,843	\$2,142	\$701	25%	\$2,117	\$58	\$11	\$47





Exhibit 8: ENERGY STAR v3 Certified Home vs 2009 IECC Home - CZ 3 - Config. A - Electric

		ed Home vs 2003 iEGG Home - GE 5 - Com	Inc. Unit			
Measure	2009 IECC Baseline	ENERGY STAR v3		Cost Qtv	Cost Unit	Inc. Cost
	klists & Used to Meet ENERGY STAR HER				GGGC GTINE	
Radiant Barrier	No Radiant Barrier	Radiant Barrier	\$6.56	13	Rad. Barrier (100 ft ²)	\$ 83
Infiltration	7.0 ACH50	5.0 ACH50	\$0.22	2,400	CFA (ft²)	\$528
Cooling Equipment	(See Heating Equipment)	(See Heating Equipment)		2,100	Ol A (It)	-
Heating Equipment	8.2 HSPF / 14 SEER	8.2 HSPF / 14.5 SEER	\$24.00	3	Tons	\$72
Water Heater	0.95 EF Electric DHW, 40 Gallons	0.95 EF Electric DHW, 40 Gallons	\$0.00	1	Water Heater	\$0
Lighting	50% Fluorescent Lighting	80% ENERGY STAR CFLs	\$2.80	14	Lamps	**
Thermostat	Programmable Thermostat	Programmable Thermostat	Ψ2.00		Lamps	-
Dishwasher	Standard Efficiency Dishwasher	ENERGY STAR Dishwasher	\$10.00	1	Dishwasher	\$10
Refrigerator	Standard Efficiency Refrigerator	ENERGY STAR Refrigerator	\$5.00	1	Refrigerator	\$5
	by Checklists & Used to Meet ENERGY STA		\$0.00	<u> </u>	rtenigerator	\$738
Rater Field Checklist: Thermal Er		TILITO IIIdex Target				VI 00
Ceiling Insulation	R-30	R-30	_			_
Ceiling Insulation Installation	Grade II Installation	Grade I Installation	\$0.07	1,200	Ins. Surface Area (ft2)	\$ 89
Above-Grade Wall Insulation	R-13	R-13		1,200	ins. Canace Area (it)	•••
A-G Wall Insulation Installation	Grade III Installation	Grade I Installation	\$0.10	2,118	Ins. Surface Area (ft2)	\$209
Foundation Insulation	No Slab Insulation	No Slab Insulation	00.10	2,110	ins. ounace Area (it)	-
Foundation Insulation Installation	Grade I Installation	Grade I Installation				
Windows	U-value: 0.50 / SHGC: 0.30	U-value: 0.35 / SHGC: 0.30	\$0.27	360	Window Area (ft2)	\$97
Doors	R-2.0	R-4.8	\$42.65	2	Door	\$85
	uced Lumber from Advanced Framing, Rater		Q-12.00		2001	-\$50
Sub-Total of Thermal Enclosure Sys		vermeation				\$431
Rater Field Checklist: HVAC Syste						****
Duct Sealing - Total Leakage	12 CFM per 100 ft ² of CFA Total Leakage	8 CFM per 100 ft² of CFA Total Leakage	\$0.17	576	Duct Surface Area (ft²)	\$98
Duct Insulation	R-8 Attic, R-6 Other Uncond. Spaces	R-8 Attic, R-6 Other Uncond. Spaces	_	-	-	-
		tatic Pressure, Bedroom Pressure Balancing,	Ventilation S	System, and	d Filter	\$250
Sub-Total of HVAC System Checklis				, , , , , , , , , , , , , , , , , , , ,	a r meer	\$348
Rater Design Review Checklist						
Sub-Total of Rater Design Review C	hecklist: Rater Collection of HVAC Design Re	port, Rater Review of Design, Partnership, & C	Credential			\$25
HVAC Design Report	·					
Ventilation	None	Supply Vent, System with Exhaust Backup	\$410.52	1	Ventilation System	\$411
HVAC Equipment Right-Sizing	3.5 Tons	3.0 Tons	-\$672.00	0.5	Tons	
Additional Checklist Measures: Chec	cklist Completion by Designer					\$5
Sub-Total of HVAC Design Report	,					\$80
HVAC Commissioning Checklist						
	Checklist: Credential Cost, Refrigerant Charg	e Check, Air Handler Airflow Check, Completion	n of Checkli	st		\$75
Water Management System Build						
	stem Builder Requirements: Relative to Code	No Incremental Tasks are Required				\$0
T-t-11		,				*



Total Incremental Cost for the Home



• The challenge: Not *one* right answer, *lots* of right answers.



Local Amendments!





Exhibit 8: ENERGY STAR v3 Certified Home vs 2009 IECC Home - CZ 3 - Config. A - Electric

	EXHIBITO: ENERGY STAR VO CETTIN		Inc. Unit			
Measure	2009 IECC Baseline	ENERGY STAR v3		Cost Qtv	Cost Unit	Inc. Cost
	ists & Used to Meet ENERGY STAR HER		0031	oost qty	0031 01111	1110. 0031
Radiant Barrier	No Radiant Barrier	Radiant Barrier	\$6.56	13	Rad. Barrier (100 ft ²)	\$83
Intiltration	17.0 ACH50	5.U ACHOU	\$0.22	2,400	CFA (II ²)	
Cooling Equipment	(See Heating Equipment)	(See Heating Equipment)	-	_,	-	-
Heating Equipment	8.2 HSPF / 14 SEER	8.2 HSPF / 14.5 SEER	\$24.00	3	Tons	\$72
Water Heater	0.95 EF Electric DHW, 40 Gallons	0.95 EF Electric DHW, 40 Gallons	\$0.00	1	Water Heater	4
Lighting	50% Fluorescent Lighting	80% ENERGY STAR CFLs	\$2.80	14	Lamps	
Thermostat	Programmable Thermostat	Programmable Thermostat	-		-	
Dishwasher	Standard Efficiency Dishwasher	ENERGY STAR Dishwasher	\$10.00	1	Dishwasher	\$10
Refrigerator	Standard Efficiency Refrigerator	ENERGY STAR Refrigerator	\$5.00	1	Refrigerator	
	by Checklists & Used to Meet ENERGY STA				ronigorator	\$738
Rater Field Checklist: Thermal End						
Ceiling Insulation	R-30	R-30	-	-	-	_
Ceiling Insulation Installation	Grade II Installation	Grade I Installation	\$0.07	1,200	Ins. Surface Area (ft2)	\$89
Above-Grade Wall Insulation	R-13	R-13	_	_	-	_
A-G Wall Insulation Installation	Grade III Installation	Grade I Installation	\$0.10	2,118	Ins. Surface Area (ft2)	\$209
Foundation Insulation	No Slab Insulation	No Slab Insulation	_	· -		_
Foundation Insulation Installation	Grade I Installation	Grade I Installation	_			_
. Januarion modiation motaliation						
vvindows	U-value. 0.50 / SHGC. 0.30	U-value. 0.35 / SHGC. 0.30	\$0.27	300	vvindow Area (it²)	397
			\$0.27 \$42.65	300 2	vvindow Area (it²) Door	
vvindows Doors Additional Checklist Measures: Reduc	O-value: 0.50 / SHGC: 0.30 R-2.0 ed Lumber from Advanced Framing, Rater V	U-value, 0.35 / SHOC, 0.30 R-4.8				\$85 -\$50
Ovindows Doors Additional Checklist Measures: Reductional Sub-Total of Thermal Enclosure Systems	R-2.0 led Lumber from Advanced Framing, Rater Vern Checklist	U-value: 0.35 / SHOC: 0.30 R-4.8				\$85
Doors Additional Checklist Measures: Reductional of Thermal Enclosure System Rater Field Checklist: HVAC System	R-2.0 led Lumber from Advanced Framing, Rater Vern Checklist	U-value: 0.35 / SHGC: 0.30 R-4.8 Verification	\$42.65	2	Door	\$85 -\$50 \$431
Doors Additional Checklist Measures: Reductional Checklist Measures: Reductional Sub-Total of Thermal Enclosure System Rater Field Checklist: HVAC System Duct Sealing - Total Leakage	R-2.0 led Lumber from Advanced Framing, Rater Nem Checklist 12 CFM per 100 ft² of CFA Total Leakage	V-value: 0.35 / SHGC: 0.30 R-4.8 Verification 8 CFM per 100 ft² of CFA Total Leakage		2		\$85 -\$50 \$431
Doors Additional Checklist Measures: Reductional Checklist Measures: Reductional Checklist: HVAC System Checklist: HVAC System Duct Sealing - Total Leakage Duct Insulation	R-2.0 ded Lumber from Advanced Framing, Rater Nem Checklist 12 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces	8 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces	\$42.65	576	Duct Surface Area (ft²)	\$85 -\$50 \$431 \$98 -
Doors Additional Checklist Measures: Reduct Sub-Total of Thermal Enclosure System Rater Field Checklist: HVAC System Duct Sealing - Total Leakage Duct Insulation Additional Checklist Measures: Rater	R-2.0 ded Lumber from Advanced Framing, Rater Nem Checklist 12 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces	V-value: 0.35 / SHGC: 0.30 R-4.8 Verification 8 CFM per 100 ft² of CFA Total Leakage	\$42.65	576	Duct Surface Area (ft²)	\$85 -\$50 \$431 \$98 - \$250
Doors Additional Checklist Measures: Reduct Sub-Total of Thermal Enclosure System Rater Field Checklist: HVAC System Duct Sealing - Total Leakage Duct Insulation Additional Checklist Measures: Rater Sub-Total of HVAC System Checklist	R-2.0 ded Lumber from Advanced Framing, Rater Nem Checklist 12 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces	8 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces	\$42.65	576	Duct Surface Area (ft²)	\$85 -\$50 \$431 \$98 -
Doors Additional Checklist Measures: Reduct Sub-Total of Thermal Enclosure System Rater Field Checklist: HVAC System Duct Sealing - Total Leakage Duct Insulation Additional Checklist Measures: Rater Sub-Total of HVAC System Checklist Rater Design Review Checklist	R-2.0 led Lumber from Advanced Framing, Rater Nem Checklist 12 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces Verification of Equipment Model Numbers, S	8 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces tatic Pressure, Bedroom Pressure Balancing, V	\$42.65 \$0.17 Ventilation \$	576	Duct Surface Area (ft²)	\$85 -\$50 \$431 \$98 - \$250 \$348
Doors Additional Checklist Measures: Reduct Sub-Total of Thermal Enclosure System Rater Field Checklist: HVAC System Duct Sealing - Total Leakage Duct Insulation Additional Checklist Measures: Rater Sub-Total of HVAC System Checklist Rater Design Review Checklist Sub-Total of Rater Design Review Checklist	R-2.0 led Lumber from Advanced Framing, Rater Nem Checklist 12 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces Verification of Equipment Model Numbers, S	8 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces	\$42.65 \$0.17 Ventilation \$	576	Duct Surface Area (ft²)	\$85 -\$50 \$431 \$98 - \$250
Doors Additional Checklist Measures: Reduct Sub-Total of Thermal Enclosure System Rater Field Checklist: HVAC System Duct Sealing - Total Leakage Duct Insulation Additional Checklist Measures: Rater Sub-Total of HVAC System Checklist Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Rater Design Report	R-2.0 led Lumber from Advanced Framing, Rater Verm Checklist 12 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces Verification of Equipment Model Numbers, Specklist: Rater Collection of HVAC Design Research	8 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces tatic Pressure, Bedroom Pressure Balancing, Veport, Rater Review of Design, Partnership, & C	\$0.17 - Ventilation S	576 - System, and	Door Duct Surface Area (ft²) - d Filter	\$85 -\$50 \$431 \$98 - \$250 \$348
Doors Additional Checklist Measures: Reduct Sub-Total of Thermal Enclosure System Rater Field Checklist: HVAC System Duct Sealing - Total Leakage Duct Insulation Additional Checklist Measures: Rater Sub-Total of HVAC System Checklist Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Ventilation	R-2.0 led Lumber from Advanced Framing, Rater Verm Checklist 12 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces Verification of Equipment Model Numbers, Secklist: Rater Collection of HVAC Design Research	8 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces tatic Pressure, Bedroom Pressure Balancing, Veport, Rater Review of Design, Partnership, & C	\$0.17 - Ventilation Scredential	576 System, and	Door Duct Surface Area (ft²) Filter Ventilation System	\$85 -\$50 \$431 \$98 - \$250 \$348 \$25
Doors Additional Checklist Measures: Reduct Sub-Total of Thermal Enclosure System Rater Field Checklist: HVAC System Duct Sealing - Total Leakage Duct Insulation Additional Checklist Measures: Rater Sub-Total of HVAC System Checklist Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Ventilation HVAC Design Report	R-2.0 led Lumber from Advanced Framing, Rater Verm Checklist 12 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces Verification of Equipment Model Numbers, Seeklist: Rater Collection of HVAC Design Research	8 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces tatic Pressure, Bedroom Pressure Balancing, Veport, Rater Review of Design, Partnership, & C	\$0.17 - Ventilation S	576 - System, and	Door Duct Surface Area (ft²) - d Filter	\$85 -\$50 \$431 \$98 - \$250 \$348 \$25 \$411 -\$336
Doors Additional Checklist Measures: Reduct Sub-Total of Thermal Enclosure System Rater Field Checklist: HVAC System Duct Sealing - Total Leakage Duct Insulation Additional Checklist Measures: Rater Sub-Total of HVAC System Checklist Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Measures: Checklist Measure	R-2.0 led Lumber from Advanced Framing, Rater Verm Checklist 12 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces Verification of Equipment Model Numbers, Seeklist: Rater Collection of HVAC Design Research	8 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces tatic Pressure, Bedroom Pressure Balancing, Veport, Rater Review of Design, Partnership, & C	\$0.17 - Ventilation Scredential	576 System, and	Door Duct Surface Area (ft²) Filter Ventilation System	\$85 -\$50 \$431 \$98 - \$250 \$348 \$25 \$411 -\$336 \$5
Windows Doors Additional Checklist Measures: Reduct Sub-Total of Thermal Enclosure System Rater Field Checklist: HVAC System Duct Sealing - Total Leakage Duct Insulation Additional Checklist Measures: Rater Sub-Total of HVAC System Checklist Rater Design Review Checklist Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Measures: Checklis	R-2.0 led Lumber from Advanced Framing, Rater Verm Checklist 12 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces Verification of Equipment Model Numbers, Seeklist: Rater Collection of HVAC Design Research	8 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces tatic Pressure, Bedroom Pressure Balancing, Veport, Rater Review of Design, Partnership, & C	\$0.17 - Ventilation Scredential	576 System, and	Door Duct Surface Area (ft²) Filter Ventilation System	\$85 -\$50 \$431 \$98 - \$250 \$348 \$25
Doors Additional Checklist Measures: Reduct Sub-Total of Thermal Enclosure System Rater Field Checklist: HVAC System Duct Sealing - Total Leakage Duct Insulation Additional Checklist Measures: Rater Sub-Total of HVAC System Checklist Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Orange Report Ventilation HVAC Equipment Right-Sizing Additional Checklist Measures: Check Sub-Total of HVAC Design Report	R-2.0 ed Lumber from Advanced Framing, Rater Verm Checklist 12 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces Verification of Equipment Model Numbers, S ecklist: Rater Collection of HVAC Design Re None 3.5 Tons list Completion by Designer	8 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces tatic Pressure, Bedroom Pressure Balancing, \(\) eport, Rater Review of Design, Partnership, & C Supply Vent. System with Exhaust Backup 3.0 Tons	\$0.17 	576 System, and	Door Duct Surface Area (ft²) Filter Ventilation System	\$85 -\$50 \$431 \$98 - \$250 \$348 \$25 \$411 -\$336 \$5 \$80
Doors Additional Checklist Measures: Reduct Sub-Total of Thermal Enclosure System Rater Field Checklist: HVAC System Duct Sealing - Total Leakage Duct Insulation Additional Checklist Measures: Rater Sub-Total of HVAC System Checklist Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Oracid System Checklist Oracid Sub-Total of HVAC Design Report Ventilation HVAC Equipment Right-Sizing Additional Checklist Measures: Check Sub-Total of HVAC Design Report HVAC Commissioning Checklist Sub-Total of HVAC Commissioning Checklist Sub-Total of HVAC Commissioning Checklist Sub-Total of HVAC Commissioning Checklist	R-2.0 ded Lumber from Advanced Framing, Rater Nem Checklist 12 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces Verification of Equipment Model Numbers, S decklist: Rater Collection of HVAC Design Ref None 3.5 Tons dist Completion by Designer hecklist: Credential Cost, Refrigerant Charge	8 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces tatic Pressure, Bedroom Pressure Balancing, Veport, Rater Review of Design, Partnership, & C	\$0.17 	576 System, and	Door Duct Surface Area (ft²) Filter Ventilation System	\$85 -\$50 \$431 \$98 - \$250 \$348 \$25 \$411 -\$336 \$5
Doors Additional Checklist Measures: Reduct Sub-Total of Thermal Enclosure System Rater Field Checklist: HVAC System Duct Sealing - Total Leakage Duct Insulation Additional Checklist Measures: Rater Sub-Total of HVAC System Checklist Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Sub-Total of Rater Design Review Checklist Oracid System Checklist Sub-Total of Rater Design Review Checklist Oracid System Checklist Oracid System Checklist Oracid System Sub-Total of HVAC Design Report HVAC Commissioning Checklist Sub-Total of HVAC Chec	R-2.0 ded Lumber from Advanced Framing, Rater Nem Checklist 12 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces Verification of Equipment Model Numbers, S decklist: Rater Collection of HVAC Design Ref None 3.5 Tons dist Completion by Designer hecklist: Credential Cost, Refrigerant Charge	R-4.8 Verification 8 CFM per 100 ft² of CFA Total Leakage R-8 Attic, R-6 Other Uncond. Spaces tatic Pressure, Bedroom Pressure Balancing, Verification Peport, Rater Review of Design, Partnership, & C Supply Vent. System with Exhaust Backup 3.0 Tons e Check, Air Handler Airflow Check, Completion	\$0.17 	576 System, and	Door Duct Surface Area (ft²) Filter Ventilation System	\$85 -\$50 \$431 \$98 - \$250 \$348 \$25 \$411 -\$336 \$5 \$80



Total Incremental Cost for the Home

\$1,696



Audience Poll

- What cost are you using for ENERGY STAR Certified Homes?
- A. Above ENERGY STAR estimates of ~\$1,500 \$2,000
- B. About the same as ENERGY STAR Estimates
- C. Less than \$1,000
- D. I don't know I'll have to look it up!





ENERGY STAR Certified Homes

Web:

Main:

www.energystar.gov/newhomespartners

Technical: www.energystar.gov/newhomesguidelines

Training: www.energystar.gov/newhomestraining

HVAC: <u>www.energystar.gov/newhomesHVAC</u>

Contacts:

Charlie Haack

ICF

Manager

Charlie.Haack@icfi.com

Email:

energystarhomes@energystar.gov

Social Media:



@energystarhomes



facebook.com/energystar

