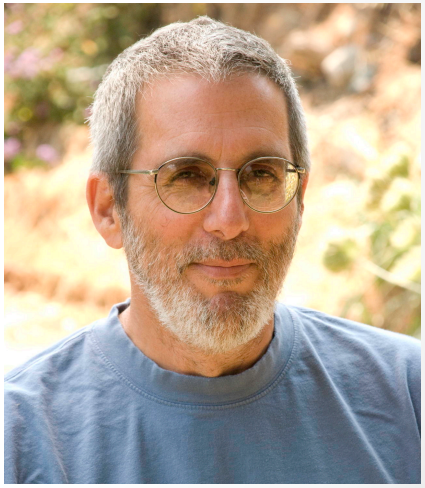
Whole House HERS Ratings (and Raters)

Steve Mann, Home Energy Services

Res CEA, Non-Res CEPE, HERS Rater
CalCERTS QA Rater/Certified Instructor, LEED AP+ Homes
Certified Passive House Consultant and Builder



CalCERTS inc.

Whole House HERS Ratings

- Overview and Background
- Whole House Audit/Rating Details
- Program-specific Applications
  - Energy Upgrade California (EUC)
  - Energy Efficient Mortgages (EEM)
- Title 24 Performance Modeling
  - 2013 Existing + Addition + Alterations (E+A+A)
- Scope: Low-rise Residential

Whole House Ratings & Audits

- Whole House Home Energy Rating
  - Calibrated comparison of different real estate properties
  - Official rating report – CA HERS Index (based on TDV)
- Whole House Home Energy Audit
  - Analysis/recommendations/efficiency improvements
- CEC-defined process not tied to Title 24, Part 6 code cycle
- Requires specially-trained HERS rater: Whole House Rater

Purposes

- “Consistent, accurate, and uniform ratings”
- “Reasonable estimates of potential utility bill savings”
- “Reliable recommendations on cost-effective measures to improve energy efficiency”

Legislative Sources

- *Home Energy Rating System Regulations*
- CEC-400-2008-011.CMF
- Part of Title 20, Part 4
- Administrative code: definitions, provider requirements, training content, rater conduct, conflict of interest, registry policies, records retention, QA, software approval process

Legislative Sources

- *Home Energy Rating System Technical Manual*
- CEC-400-2008-012.CMF
- Report formats, algorithms, modeling rules and assumptions, data inputs
- Software/registry requirements
- Calculations are different than Title 24 Part 6

Why Should You Care?

- Energy Upgrade California Calculations (EUC Rater)
- Energy Efficient Mortgage (EEM) documentation
- Voluntary Home Energy Audits/Home Energy Ratings
- Whole House Raters are required to do the visual verifications for 2013 Energy Code E+A+A compliance credit/permitting

The Participants

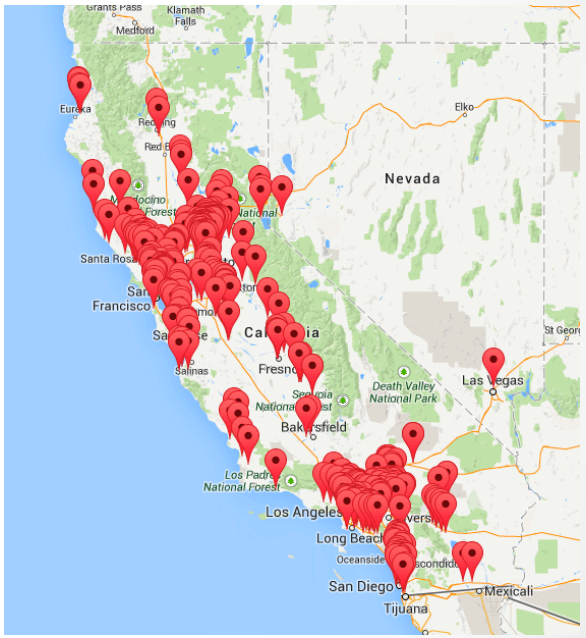
- Homeowners
- Whole House Energy Raters
- Program managers/IOUs (EUC)
- Financial institutions (EEMs)
- Energy consultants/building departments (E+A+A)
- CalCERTS: training/certification, registry, HERS Index reporting
- Building Performance Contractors (BPCs)

Whole House Rater Training

- HERS Basics (1 day)
- Hands-on Lab (2 days)
- Alterations to Existing Homes (Title 24-specific, 1 day)
- EPA 608 Refrigeration Technician (Type II) certification
- Newly Constructed Homes (Title 24-specific, 2 days)
- Compliance Rater Field House Exam (2 hours)
- Whole House Home Energy Rater (4 days)
- Whole House Rater Field House Exam (2 hours)

Where Are They?

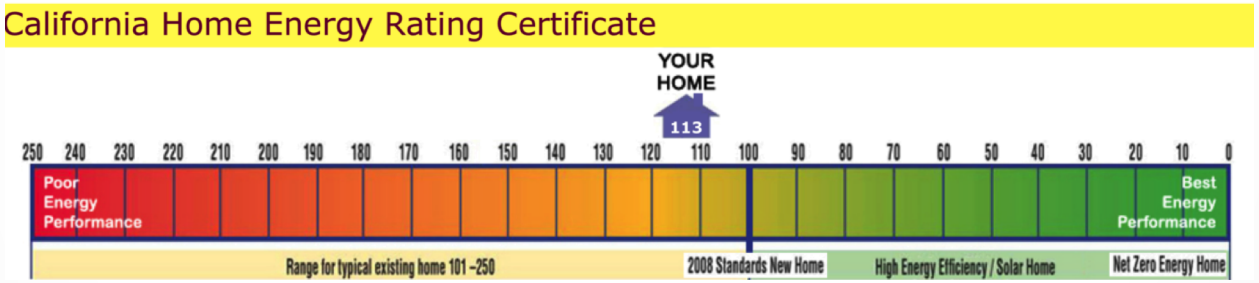
- There are currently about 275 Whole House Raters in California
- Look them up by type of rater, city, county, or zip code at www.calcerts.com



Whole House Rater Rules (Title 20)

- Conflict of interest requirements
  - Independent from providers, contractors
  - Relaxed for BPCs – they can make recommended changes
- Rules of conduct
  - Provide true, accurate, complete information
- Quality assurance process
  - 1% of the addresses per year
- Complaint response system/decertification

Whole House Rating



Whole House Rating

- Focus – comparing properties using a universal metric, HERS Index
- Collect utility bills – 12 months (optional but useful)
- Site visit is **required** to verify existing conditions
- Modeling using approved compliance software
  - EnergyPro 5.x + Res CalCerts module
- Create XML file for upload to project in CalCerts registry
- Create official HERS reports from registry
- Can only be done by Whole House Rater

Whole House Rating Site Visit

- Floor plan sketch w/dimensions
- Fenestration – types, sizes, use Title 24 default values
- Building assemblies – types, square footages, insulation values
- Appliances – types, model #s, age (default efficiencies)
- Lighting – types, location, controls
- Heating, cooling – types, model #s, efficiencies, capacities
- Water heating – type, efficiencies
- Blower door, duct test (optional)

Whole House Rating Modeling

- Reference house – 2008 Energy Code Standard Design
- Includes more than just heating/cooling/DHW
- Calculations based on TDV – kBTU/SF/yr
- Static evaluation of a building
- Index of 100 == 2008 code built house, lower is more efficient

Res CalCERTS

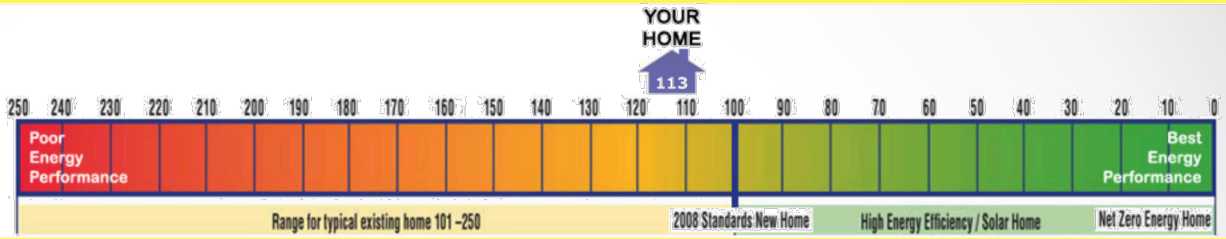
Calculation	Heating	Cooling	Int Light	Ext Light	Appliances	Misc	Renew	Fans	DHW Pump	DHW	Exterior	Total	HERS Index	Savings
Reference Home	22.46	22.86	7.68	0.55	28.92	0.00	0.00	7.00	0.00	24.70	0.00	114.17	100	$0
Rated Home	39.28	56.14	6.14	0.61	20.08	0.00	0.00	18.03	0.45	28.05	0.00	168.76	148	$0

Whole House Rating Reports

- Rating Certificate – property info, EE features, utility consumption, HERS Index
- Data Summary – similar to 2008 CF-1R
- Utility Consumption Analysis – kWh, Therms, $
- Key piece of information is the HERS Index – energy efficiency analysis of home related to 2008 CA Energy Code
- CA HERS Index vs. HERS Index

Whole House Rating Certificate

California Home Energy Rating Certificate



Information on Compliance With Other Programs: N/A

Qualifying Information:
BPC NOT AUTHORIZED

Software estimates are based on typical occupancy patterns which may be different from your household use patterns. As a result, these software estimates may not match the household's energy actual consumption. Occupant's energy use patterns may change after energy efficiency upgrades.

Energy Impact

Greenhouse Gas Emissions
CO_2 = 3.86 tons/year

Energy Consumption

Electricity (kWh/year)	
Heating	772
Cooling	603
Water Heating	0
Lights	623
Appliances	2,992
Total	4,990

Natural Gas (therms/year)	
Heating	155
Cooling	0
Water Heating	194
Lights	0
Appliances	17
Total	366

Operating Cost ($/year)

Electricity	$588
Gas	$366
Total	$954

Renewable Energy Production
Electricity 0

Ancillary Energy Uses
Electricity 0
Gas 0

Site Information

Address
1301 Bidwell
Folsom, CA 95630

General Information

Conditioned Floor Area	1,184 ft²
Bedrooms	2
House Type	SingleFamily
Foundation Type	Slab on Grade

Energy Efficiency Features

Insulation

Ceiling	R-30
Wall	R-13
Floor Over Crawlspace	None
Slab Edge	None, 0

Windows

SHGC	0.63, 0.67, 0.83
U-Factor	0.66, 0.84, 1.19

Heating System

GasFurnace Ducted	0.95 AFUE
Electric Heat Pump DuctlessFan	9 HSPF
Electric Heat Pump DuctlessFan	9 HSPF

Cooling System

Split A/C Ducted	14.5 SEER
Split A/C Ductless	18 SEER
Split A/C Ductless	18 SEER

Water Heating System
1 - 50 Gal GasFired (0.6 EF)

Official Home Energy Rating
in conformance with the requirements of the California Energy Commission
www.energy.ca.gov

HERS Provider:
CalCERTS, Inc
31 Natoma St Suite 120
Folsom, CA 95630
916-985-3400
www.calcerts.com

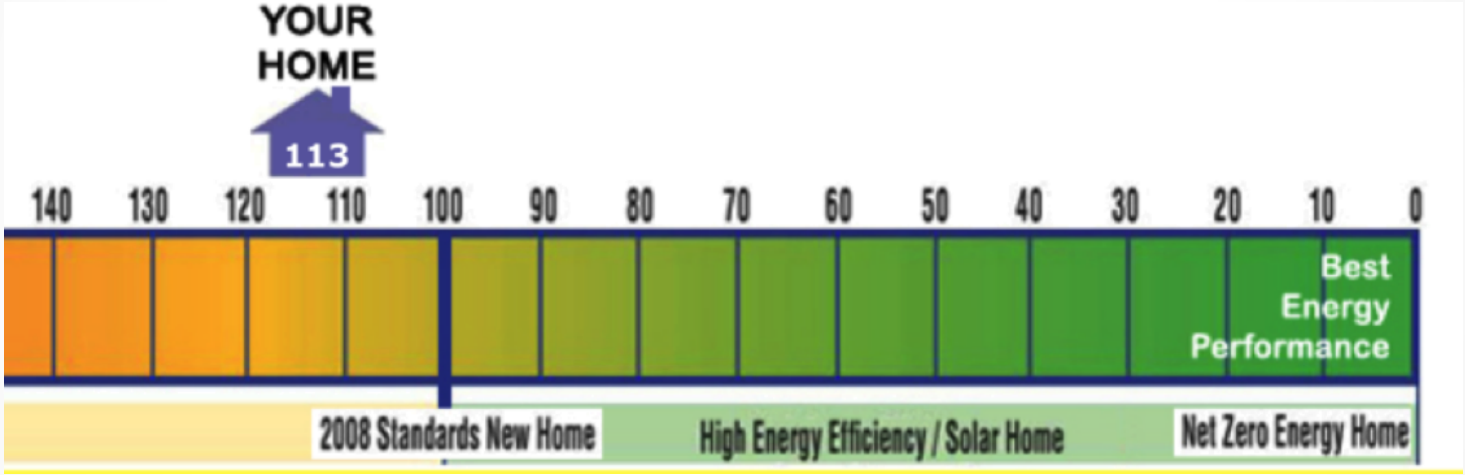
Rating Information

Rating Number:	CC11-1798847021
EnergyPro Version:	5.1.9.1
Certified Rater:	John Rater USR999999 John Rater's HVAC Folsom, 95630
Rating Date:	March 26, 2014

ELECTRONICALLY SIGNED by
John Rater
at CalCERTS, Inc

Rater Signature Date

The HERS Index



The Energy Impact

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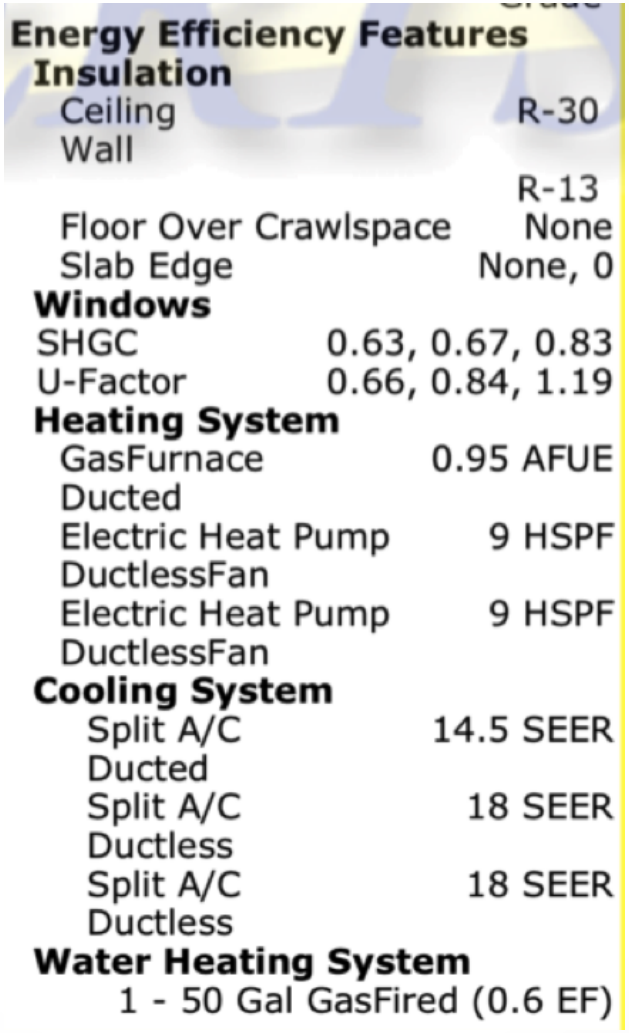
The Energy Consuming Features



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Insulation	
Ceiling	R-30
Wall	R-13
Floor Over Crawlspace	None
Slab Edge	None, 0
Windows	
SHGC	0.63, 0.67, 0.83
U-Factor	0.66, 0.84, 1.19
Heating System	
GasFurnace Ducted	0.95 AFUE
Electric Heat Pump DuctlessFan	9 HSPF
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Cooling System	
Split A/C Ducted	14.5 SEER
Split A/C Ductless	18 SEER
Split A/C Ductless	18 SEER
Water Heating System	
1 - 50 Gal GasFired (0.6 EF)	

Whole House Audit

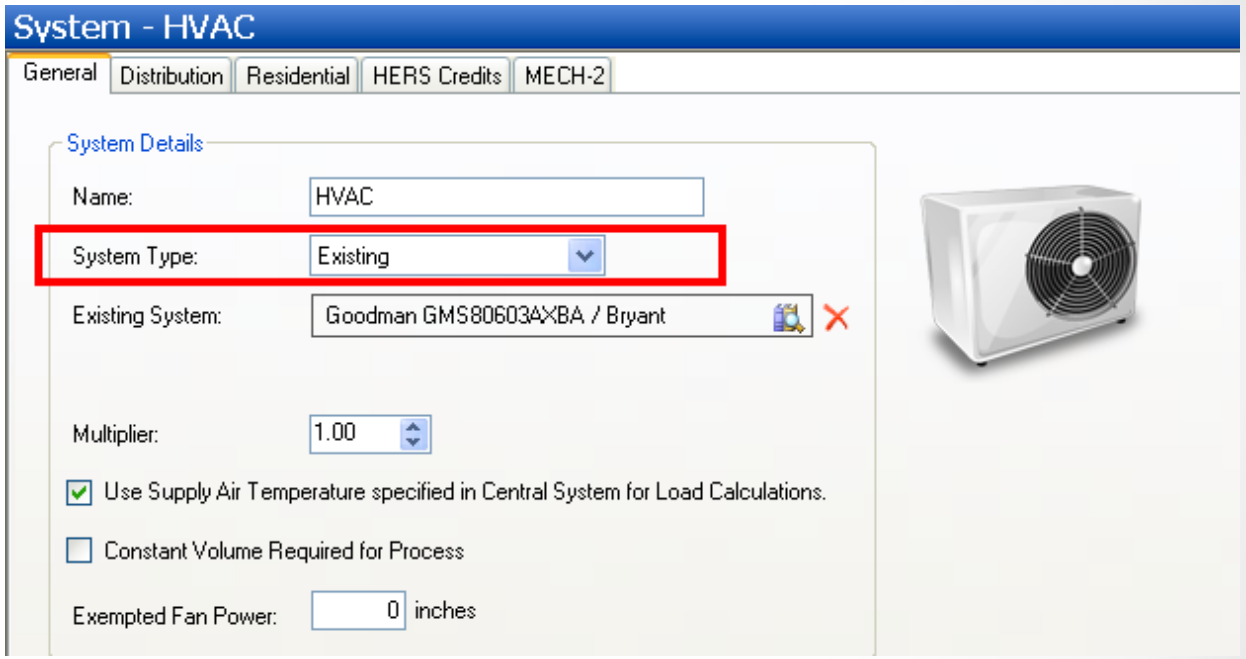
Whole House Audit

- Focus – evaluating energy efficiency recommendations
- Process similar to WHR but rater makes upgrade recommendations that are evaluated by the software
- Recommendations are rated according to cost effectiveness
- Loading order – envelope, mechanicals, appliances, DHW
- Reports are very similar to the Whole House Rating
- Modeling using approved compliance software
  - EnergyPro 5.x + Res CalCerts module

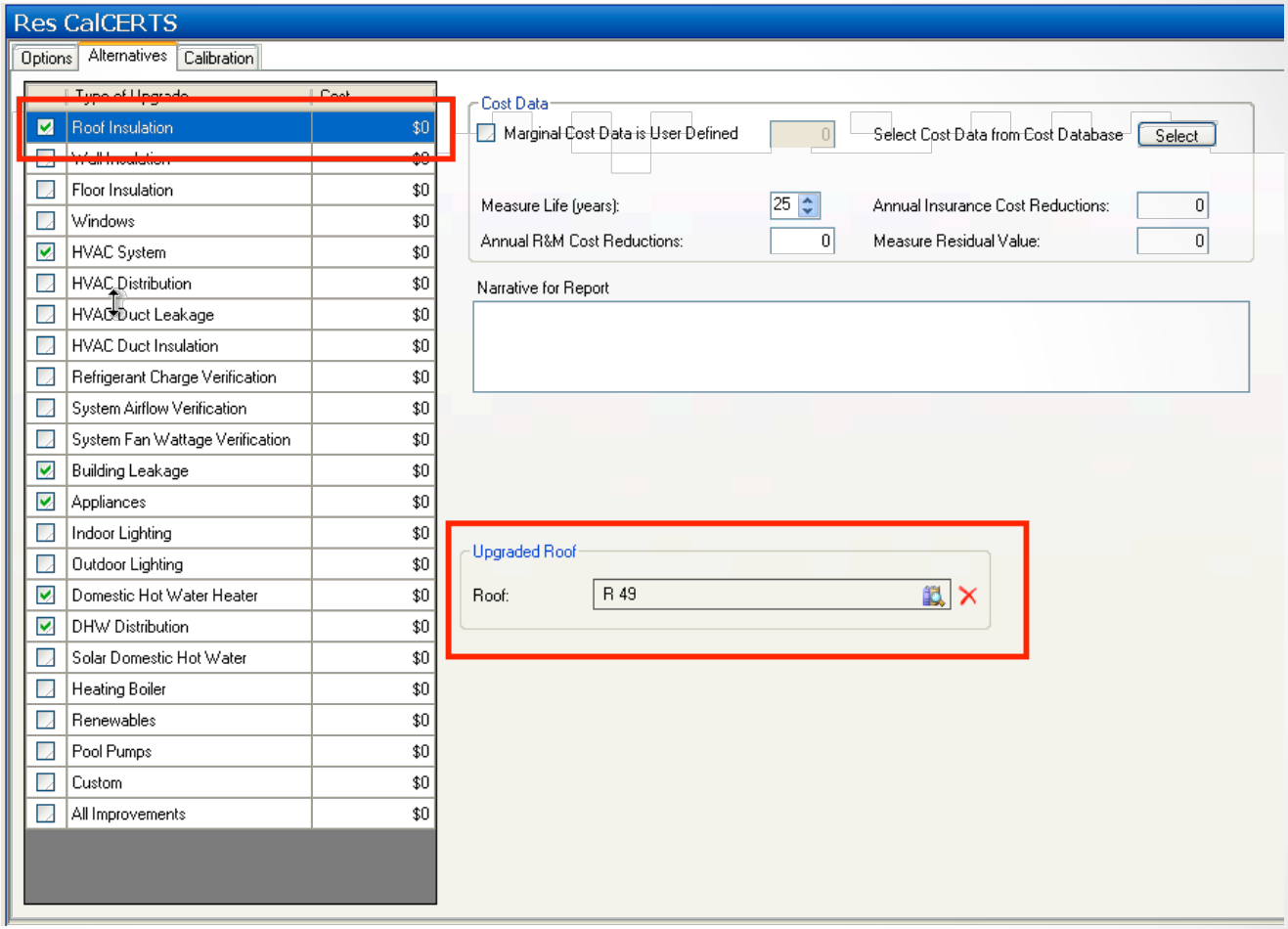
Alternatives Analysis

- Whole House Rater suggests upgrades in specific categories
  - Insulation, windows, HVAC, HERS measures, appliances, lighting, hot water/distribution, renewables, pool pumps
- Software analyzes utility savings for each measure, individually, or combined
- Calculates energy efficiency improvement in percentages, HERS Index (if requested), and utility bill reductions
- Algorithms come from *HERS Technical Manual*
- Triggered by changes to “Existing” components via “Calculations” tab

Identifying Existing Components



Sample Trigger



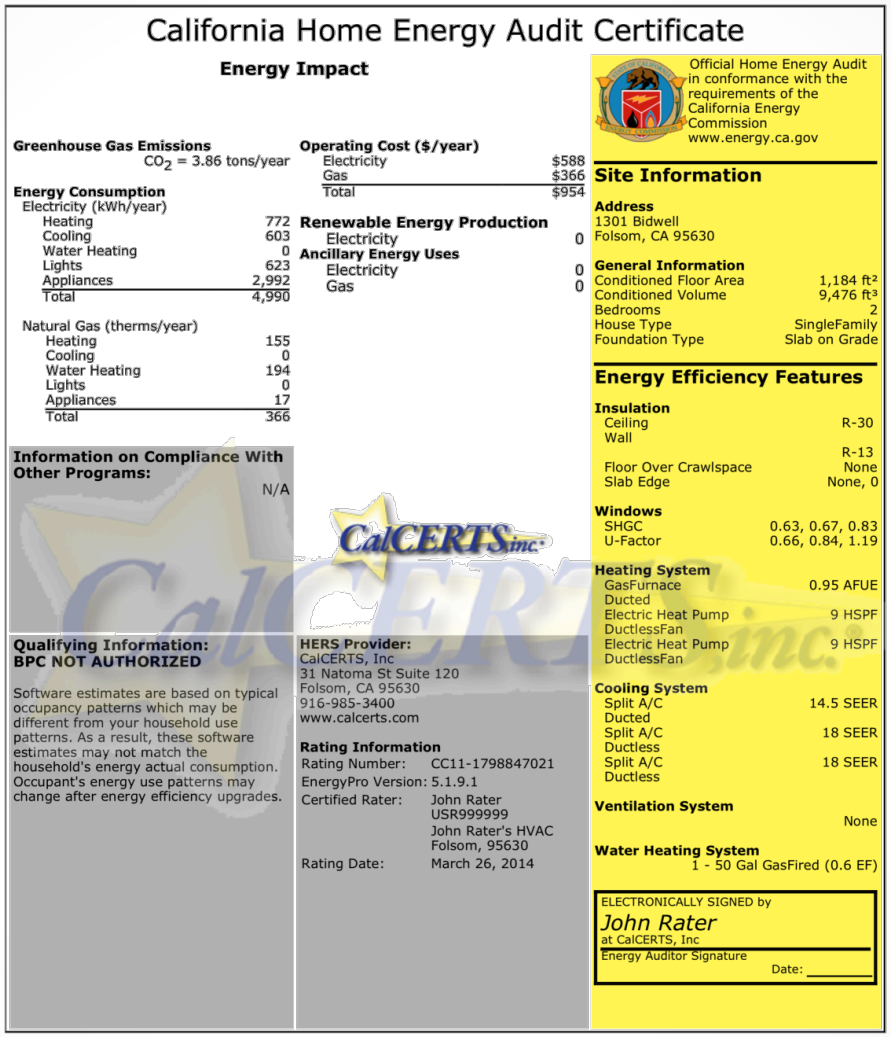
Whole House Audit Modeling

- **Baseline – 2008 Energy Code Standard Design**
- **Calculations based on TDV – kBTU/SF/yr, $ savings**
- **Evaluation of building before and after improvements**

Res CalCERTS

Calculation	Heating	Cooling	Int Light	Ext Light	Appliances	Misc	Renew	Fans	DHW Pump	DHW	Exterior	Total	HERS Index	Savings
Reference Home	22.46	22.86	7.68	0.55	28.92	0.00	0.00	7.00	0.00	24.70	0.00	114.17	100	$0
Rated Home	39.28	56.14	6.14	0.61	20.08	0.00	0.00	18.03	0.45	28.05	0.00	168.76	148	$0
Roof Insulation	31.63	39.20	6.14	0.61	20.08	0.00	0.00	13.12	0.45	28.05	0.00	139.27	122	$211
DHW Distribution	31.63	39.20	6.14	0.61	20.08	0.00	0.00	13.12	0.00	24.47	0.00	135.25	118	$250
HVAC System	26.21	36.46	6.14	0.61	20.08	0.00	0.00	13.15	0.00	24.47	0.00	127.11	111	$307
Domestic Hot Water Heater	26.21	36.46	6.14	0.61	20.08	0.00	0.00	13.15	0.00	21.58	0.00	124.22	109	$335
Renewables	26.21	36.46	6.14	0.61	20.08	0.00	0.00	13.15	0.00	21.58	0.00	124.22	109	$335

Whole House Audit Certificate



California Home Energy Audit Certificate

Energy Impact

Greenhouse Gas Emissions
CO_2 = 3.86 tons/year

Energy Consumption

Electricity (kWh/year)	
Heating	772
Cooling	603
Water Heating	0
Lights	623
Appliances	2,992
Total	4,990

Natural Gas (therms/year)	
Heating	155
Cooling	0
Water Heating	194
Lights	0
Appliances	17
Total	366

Operating Cost ($/year)

Electricity	$588
Gas	$366
Total	$954

Renewable Energy Production
Electricity 0

Ancillary Energy Uses

Electricity	0
Gas	0

Official Home Energy Audit in conformance with the requirements of the California Energy Commission
www.energy.ca.gov

Site Information

Address
1301 Bidwell
Folsom, CA 95630

General Information

Conditioned Floor Area	1,184 ft²
Conditioned Volume	9,476 ft³
Bedrooms	2
House Type	SingleFamily
Foundation Type	Slab on Grade

Energy Efficiency Features

Insulation

Ceiling	R-30
Wall	R-13
Floor Over Crawlspace	None
Slab Edge	None, 0

Windows

SHGC	0.63, 0.67, 0.83
U-Factor	0.66, 0.84, 1.19

Heating System

GasFurnace Ducted	0.95 AFUE
Electric Heat Pump DuctlessFan	9 HSPF
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Cooling System

Split A/C Ducted	14.5 SEER
Split A/C Ductless	18 SEER
Split A/C Ductless	18 SEER

Ventilation System
None

Water Heating System
1 - 50 Gal GasFired (0.6 EF)

Information on Compliance With Other Programs:
N/A

Qualifying Information:
BPC NOT AUTHORIZED

Software estimates are based on typical occupancy patterns which may be different from your household use patterns. As a result, these software estimates may not match the household's energy actual consumption. Occupant's energy use patterns may change after energy efficiency upgrades.

HERS Provider:
CalCERTS, Inc
31 Natoma St Suite 120
Folsom, CA 95630
916-985-3400
www.calcerts.com

Rating Information

Rating Number:	CC11-1798847021
EnergyPro Version:	5.1.9.1
Certified Rater:	John Rater USR999999 John Rater's HVAC Folsom, 95630
Rating Date:	March 26, 2014

ELECTRONICALLY SIGNED by
John Rater
at CalCERTS, Inc
Energy Auditor Signature
Date: _____

Whole House Audit Recommendations

Energy Upgrade Recommendations

Project Name
1301 Bidwell
Folsom, CA 95630

Documentation Author *CalCERTS*

Recommended Improvements	Description	Annual Individual Savings	Annual Cumulative Savings
Roof Insulation	*49.0*	*$16*	*N/A***
Building Leakage	*2.0 SLA / 1860 CFM*	*$22*	*N/A***
Appliances	*Indoor Ref: 450 kWh Dishwasher: 0.67 EF*	*$32*	*N/A***
Domestic Hot Water Heater	*Gas Fired / 0.0 gal / 0.840 EF*	*$68*	*N/A***
All Improvements		*N/A***	*$136*

** This Report utilized the CUSTOM (Individual) Process. Cumulative savings is not available by individual Measure.

Annual Results	Electricity (kWh)			Fossil Fuel (therms)		
End Use	Existing	Improved	Savings	Existing	Improved	Savings
Space Heating	772	765	7	155	139	16
Space Cooling	603	509	95	0		
Fans	535	484	51	0		
Pumps	0			0		
Domestic Hot Water	0			194	132	63
Indoor Lighting	577	577	0	0		
Outdoor Lighting	46	46	0	0		
Appliances	2,457	2,095	362	17	17	0
Ancillary	0			0		
Renewables	0			0		
TOTAL	**4,992**	**4,477**	**515**	**367**	**288**	**78**

CO_2 (lbs/year)	Existing	Improved	Savings
Electricity	3,444	3,089	355
Fossil Fuel	4,271	3,358	913
TOTAL	**7,715**	**6,447**	**1,268**

Average Demand (kW)	3	2.72	0.29
TDV Energy (kBtu/ft²-yr)	119.05	101.23	17.83
Energy Cost	$954	$818	$136

Climate Zone:	12
Floor Area:	1,184
Type:	SingleFamily
TDV % Savings:	**15%**

The estimated operating costs shown in this report are dependent upon many factors. The construction and conservation features of the home clearly are important. Equally important is the thermostat setting. How the thermostat is used, appliance use, and occupant interaction all influence the annual operating cost. The estimates provided in this report are based on typical conditions; your actual usage will vary. For investor owned utility rebate purposes, the site converted BTU % savings are 17.9%.

Rating Number: CC11-1798847021 EnergyPro Version: 5.1.9.1 Rating Date: 3/26/2014

Whole House Audit Recommendations

Energy Upgrade Recommendations

Project Name	Documentation Author *CalCERTS*
1301 Bidwell *Folsom, CA 95630*	

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Whole House Audit Savings

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Space Cooling	603	509	95	0		
Fans	535	484	51	0		
Pumps	0			0		
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Indoor Lighting	577	577	0	0		
Outdoor Lighting	46	46	0	0		
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Rating Number: CC11-1798847021 EnergyPro Version: 5.1.9.1 Rating Date: 3/26/2014

Energy Upgrade California

Energy Upgrade California

- Focus – evaluating energy efficiency recommendations for public utility incentive programs
- Analysis similar to Whole House Audit + combustion testing
- Instead of Whole House Audit report, XML file (+ other stuff) is uploaded to Green Energy Compass (PG&E)
- Modeling must be done by enrolled contractors or EUC-certified raters (Whole House Raters with BPI certification)
- Modeling using approved compliance software
  - EnergyPro 5.x/6.x + Res Performance module

Energy Upgrade California

- Contractors/raters do test-in, modeling, & recommendations
- Contractors install the upgrades to qualify for the incentive
- Testing is required after the work is complete (test-out)
- Incentive is based on projected energy savings: more % = more $
- Alternatives analysis identical to Whole House Audit
- Basic reports are EnergyPro reports, especially ECON-2
- Individual programs may tweak the EnergyPro results

ECON-2

Energy Upgrade Recommendations — ECON-2

Project Name	BPCi Field Test House HERS II	Documentation Author	Home Energy Services
Project Address	1301 Bidwell Folsom, CA 95630	Author Address	1609 8th Street Berkeley, CA 94710

Recommended Improvements	Description	Annual Savings	Est. Cost to Install	Savings Site	Savings TDV
Roof Insulation	Type = R 49 Cavity Insulation = 49.0 R-Value Interior Insulation = 0.0 R-Value Exterior Insulation = 0.0 R-Value	$211	$0	13.2 %	17.5 %
DHW Distribution	DHW Distribution Type = All Pipes Ins	$250	$0	17.3 %	19.9 %
Building Leakage	Building Leakage = 3.0 SLA Leakage Rate at 50 Pascals = 0 cfm	$232	$0	15.5 %	18.4 %
Appliances	Indoor Refrigerator = 500 kWh Garage Refrigerator = 0 kWh Dishwasher = 0.63 EF	$179	$0	14.2 %	14.6 %
HVAC System	Name = Carrier 58MVB40-14 CNP 38HD 2 T Type = Split DX Heating = Central Furnace Efficiency = 0.97 AFUE Cooling = Split Air Conditioner SEER = 13.00	$238	$0	20.2 %	19.5 %
Domestic Hot Water Heater	Name = A O Smith Water Products GPCR-40-200 Type = Gas Fired Volume = 40.0 gal Efficiency = 0.640 EF	$266	$0	23.4 %	21.2 %

Annual Results	Energy Cost			Electricity (kWh)			Fossil Fuel (therms)		
End Use	Existing	Improved	Savings	Existing	Improved	Savings	Existing	Improved	Savings
Space Heating	$328	$210	$118	0	0	0	311	207	104
Space Cooling	$283	$177	$106	2,342	1,494	848	0	0	0
Fans	$131	$96	$36	1,086	807	279	0	0	0
Pumps	$4	$0	$4	36	0	36	0	0	0
Domestic Hot Water	$249	$184	$65	0	0	0	237	182	55
Indoor Lighting	$66	$65	$1	547	547	0	0	0	0
Outdoor Lighting	$7	$7	$0	59	59	0	0	0	0
Appliances/Plug Loads	$213	$279	($65)	1,608	2,199	-592	18	18	0
Ancillary	$0	$0	$0	0	0	0	0	0	0
Renewables	$0	$0	$0	0	0	0	0	0	0
TOTAL	**$1,283**	**$1,017**	**$266**	**5,677**	**5,106**	**571**	**566**	**407**	**158**

CO_2 (lbs/year)	Existing	Improved	Savings
Electricity	3,917	3,523	394
Fossil Fuel	6,588	4,742	1,846
TOTAL	**10,505**	**8,265**	**2,240**
Average Demand (kW)	5.66	4.43	1.23
TDV Energy (kBtu/ft^2-yr)	168.76	132.98	35.78

Climate Zone:	12
Electric Rate:	SMUD RSG
Gas Rate:	PG&E G1 R
Floor Area:	1,253
Type:	Single Family

Improvements above shown with cumulative savings benefit for combined measures

The estimated operating costs shown in this report are dependent upon many factors. The construction and conservation features of the project clearly are important. Equally important is the thermostat setting. How the thermostat is used, appliance use, and occupant interaction all influence the annual operating cost. The estimates provided in this report are based on typical conditions; your actual usage will vary.

EnergyPro 5.1.9.2 by EnergySoft *User Number: 7523* ***RunCode: 2014-09-06T10:08:33*** *ID: Test House #2* *Page 1 of 1*

CalCERTS, inc.

ECON-2 Recommendations

Energy Upgrade Recommendations — ECON-2

Project Name	*BPCi Field Test House HERS II*	Documentation Author	*Home Energy Services*
Project Address	*1301 Bidwell* *Folsom, CA 95630*	Author Address	*1609 8th Street* *Berkeley, CA 94710*

Recommended Improvements	Description	Annual Savings	Est. Cost to Install	Savings	
				Site	TDV
Roof Insulation	*Type = R 49 Cavity Insulation = 49.0 R-Value Interior Insulation = 0.0 R-Value Exterior Insulation = 0.0 R-Value*	*$211*	*$0*	*13.2 %*	*17.5 %*
DHW Distribution	*DHW Distribution Type = All Pipes Ins*	*$250*	*$0*	*17.3 %*	*19.9 %*
Building Leakage	*Building Leakage = 3.0 SLA Leakage Rate at 50 Pascals = 0 cfm*	*$232*	*$0*	*15.5 %*	*18.4 %*
Appliances	*Indoor Refrigerator = 500 kWh Garage Refrigerator = 0 kWh Dishwasher = 0.63 EF*	*$179*	*$0*	*14.2 %*	*14.6 %*
HVAC System	*Name = Carrier 58MVB40-14 CNP 38HD 2 T Type = Split DX Heating = Central Furnace Efficiency = 0.97 AFUE Cooling = Split Air Conditioner SEER = 13.00*	*$238*	*$0*	*20.2 %*	*19.5 %*
Domestic Hot Water Heater	*Name = A O Smith Water Products GPCR-40-200 Type = Gas Fired Volume = 40.0 gal Efficiency = 0.640 EF*	*$266*	*$0*	*23.4 %*	*21.2 %*

ECON-2 Utility Analysis

Annual Results	Energy Cost			Electricity (kWh)			Fossil Fuel (therms)		
End Use	**Existing**	**Improved**	**Savings**	**Existing**	**Improved**	**Savings**	**Existing**	**Improved**	**Savings**
Space Heating	$328	$210	$118	0	0	0	311	207	104
Space Cooling	$283	$177	$106	2,342	1,494	848	0	0	0
Fans	$131	$96	$36	1,086	807	279	0	0	0
Pumps	$4	$0	$4	36	0	36	0	0	0
Domestic Hot Water	$249	$184	$65	0	0	0	237	182	55
Indoor Lighting	$66	$65	$1	547	547	0	0	0	0
Outdoor Lighting	$7	$7	$0	59	59	0	0	0	0
Appliances/Plug Loads	$213	$279	($65)	1,608	2,199	-592	18	18	0
Ancillary	$0	$0	$0	0	0	0	0	0	0
Renewables	$0	$0	$0	0	0	0	0	0	0
TOTAL	**$1,283**	**$1,017**	**$266**	**5,677**	**5,106**	**571**	**566**	**407**	**158**

CO_2 (lbs/year)	Existing	Improved	Savings
Electricity	3,917	3,523	394
Fossil Fuel	6,588	4,742	1,846
TOTAL	**10,505**	**8,265**	**2,240**
Average Demand (kW)	5.66	4.43	1.23
TDV Energy (kBtu/ft^2-yr)	168.76	132.98	35.78

Climate Zone:	12
Electric Rate:	SMUD RSG
Gas Rate:	PG&E G1 R
Floor Area:	1,253
Type:	Single Family

Improvements above shown with cumulative savings benefit for combined measures

The estimated operating costs shown in this report are dependent upon many factors. The construction and conservation features of the project clearly are important. Equally important is the thermostat setting. How the thermostat is used, appliance use, and occupant interaction all influence the annual operating cost. The estimates provided in this report are based on typical conditions; your actual usage will vary.

EnergyPro 5.1.9.2 by EnergySoft *User Number: 7523* ***RunCode: 2014-09-06T10:08:33*** *ID: Test House #2* *Page 1 of 1*

Energy Efficient Mortgage

Property Rating	
Existing HERS Score:	289
HERS Score With Improvements:	133
Percent Improved:	54%

Energy Efficiency Mortgage

- Focus – evaluating the energy efficiency of a house to obtain financing to pay for home improvements
- Modeling/analysis same as Whole House Rating or Audit
- Reporting requirements depend on lender and program
- Typically CalCERTS rating reports + special lender forms
- Must be done by Whole House Rater (HUD)
- Modeling using approved compliance software
  - EnergyPro 5.x + Res CalCerts module

Energy Efficiency Mortgage

- Typically done before home purchase or when refinancing
- Analysis identifies cost-effective upgrades, financing pays for them
- Utility savings weighed off against larger mortgage
- Escrow holdback to pay for upgrades
- Work gets done, inspected by Whole House Rater
- Funds released to pay contractors
- Over 4000 done by CalCERTS Whole House Raters

EEM Report

CalCERTS inc.
environment ★ advocacy HERS Provider training ★ certification

CalCERTS Certificate ID:	[redacted]	Date: 3/16/2011	
CalCERTS Rater Name:	[redacted]	CalCERTS Rater ID:	[redacted]

Customer Information	
Name:	[redacted]
Address:	[redacted]
City / State / Zip:	[redacted]

CalRATE pro

Property Details	
CA Climate Zone:	3
Year Built:	1984
Electric Utility:	PG&E E1
Gas Utility:	PG&E G1
Square Foot/Floor Area:	960
Conditioned Volume:	7680
Front Orientation:	90
Stories:	1
Type:	SingleFamily
Interest Rate:	5.25%
Term:	30 Years

Annual Operating Usage / Costs	**Existing**		**Improved**	
	Usage	**Cost**	**Usage**	**Cost**
Gas (therms)	1086.65	$1,713.56	477.04	$715.56
Electricity (kWh)	5643.06	$1,805.78	3699.62	$1,183.88
Total		**$3,519.34**		**$1,899.44**

Property Rating

Existing HERS Score: **289**
HERS Score With Improvements: **133**
Percent Improved: **54%**

Recommended STANDARD Improvements	**Useful Life**	**Annual Savings**	**Lifecycle Savings / Present Value**	**Estimated Cost to Install**
Roof Insulation	30	$239.21	$3,609.93	$0.00
Windows	30	$477.86	$7,211.41	$0.00
Building Leakage	30	$198.54	$2,996.18	$0.00
HVAC Duct Leakage	30	$254.22	$3,836.45	$0.00
HVAC System	20	$283.98	$3,511.94	$0.00
Domestic Hot Water Heater	15	$166.09	$1,721.76	$0.00

DISCLAIMER: Annual Savings estimates vary based on features installed and Occupant Behavior. Present Value estimate is based on estimated Useful Life and estimated Annual Savings. Your actual results will vary.

HUD Certification: I certify to the best of my knowledge and belief, the information contained in this report is true and accurate and I understand that the information in this report may be used in connection with an application for an Energy Efficient Mortgage to be insured by the Federal Housing Administration of the U.S. Department of Housing and Urban Development.

Signature: _____

CalCERTS inc.

EEM Report Summary

Property Details	
CA Climate Zone:	3
Year Built:	1984
Electric Utility:	PG&E E1
Gas Utility:	PG&E G1
Square Foot/Floor Area:	960
Conditioned Volume:	7680
Front Orientation:	90
Stories:	1
Type:	SingleFamily
Interest Rate:	5.25%
Term:	30 Years

Annual Operating Usage / Costs	Existing		Improved	
	Usage	Cost	Usage	Cost
Gas (therms)	1086.65	$1,713.56	477.04	$715.56
Electricity (kWh)	5643.06	$1,805.78	3699.62	$1,183.88
Total		**$3,519.34**		**$1,899.44**

Property Rating

Existing HERS Score: **289**

HERS Score With Improvements: **133**

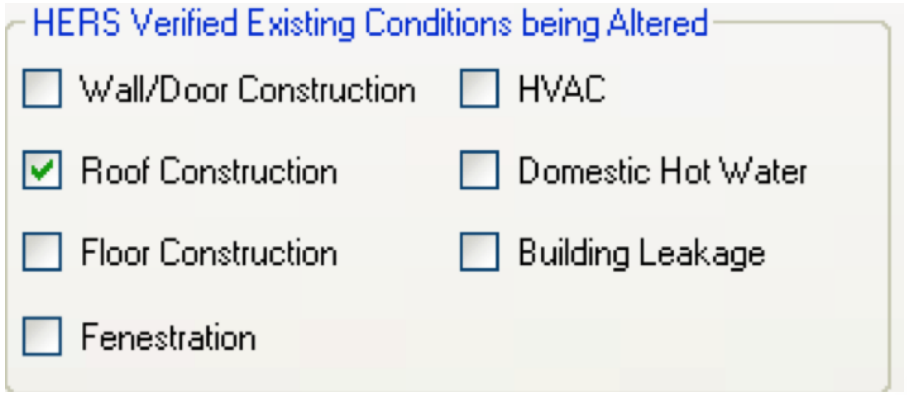
Percent Improved: **54%**

EEM Report Recommendations

Recommended STANDARD Improvements	Useful Life	Annual Savings	Lifecycle Savings / Present Value	Estimated Cost to Install
Roof Insulation	30	$239.21	$3,609.93	$0.00
Windows	30	$477.86	$7,211.41	$0.00
Building Leakage	30	$198.54	$2,996.18	$0.00
HVAC Duct Leakage	30	$254.22	$3,836.45	$0.00
HVAC System	20	$283.98	$3,511.94	$0.00
Domestic Hot Water Heater	15	$166.09	$1,721.76	$0.00

DISCLAIMER: Annual Savings estimates vary based on features installed and Occupant Behavior. Present Value estimate

2013 E+A+A Performance Modeling



E+A+A for 2013 Compliance

- Focus – standard E+A+A performance modeling for permitting
  - There is currently no prescriptive option if there are HERS verifications
- Modeling requires approved 2013 residential software
  - EnergyPro 6.x/CBECC-res
- Registry project creation process is similar to any project
- Modeling can be done by anyone
- May involve existing conditions verification by Whole House Rater

E+A+A Modeling

- All building components of an E+A+A model are either “New”, “Existing”, or “Altered”
- Each has a different compliance baseline (Standard Design)
- “New” – Package A (Table 150.1-A)
- “Existing” – no affect on compliance margin
- “Altered” – Standard Design is column two of Table 150.2-B **OR** column three if HERS verifications are selected by the modeler

Identifying Altered Components

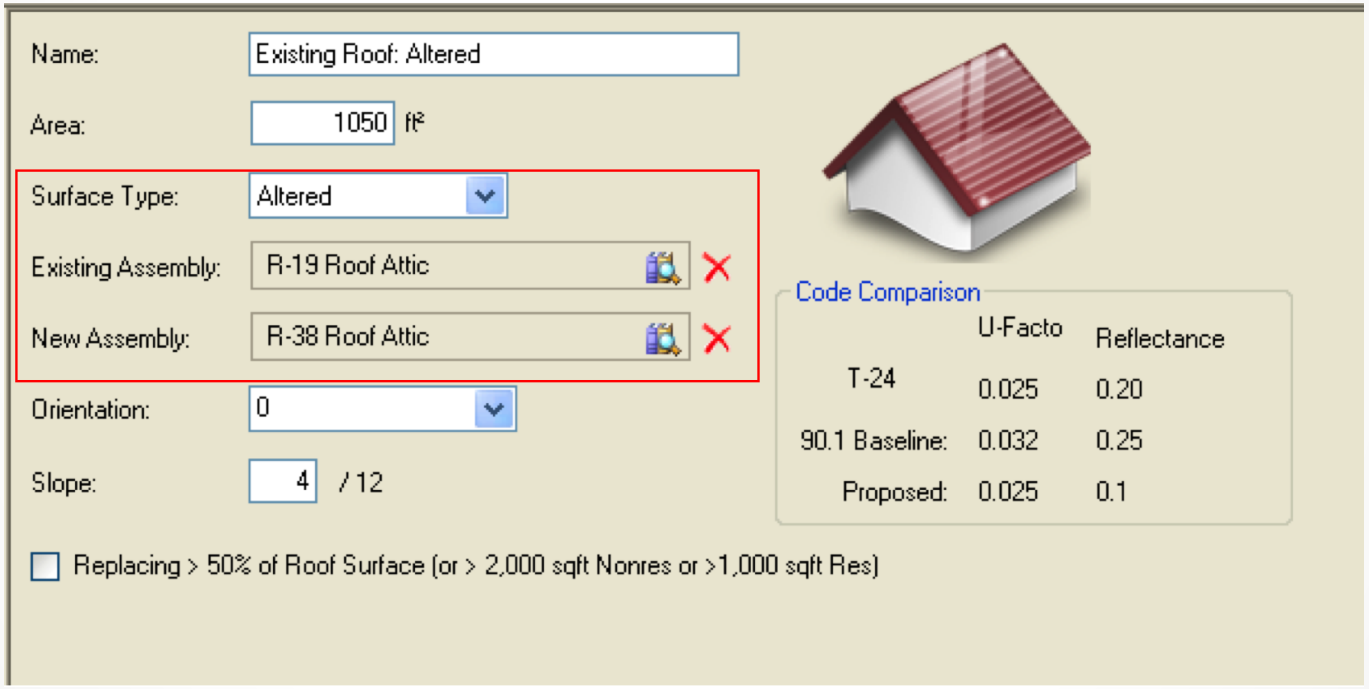


Table 150.2-B

TABLE 150.2-B STANDARD DESIGN FOR AN ALTERED COMPONENT

Altered Component	Standard Design Without Third Party Verification of Existing Conditions Shall be Based On	Standard Design With Third Party Verification of Existing Conditions Shall be Based On
Ceiling Insulation, Wall Insulation, and Raised-floor Insulation	The requirements of Sections 150.0(a), (c), and (d)	The existing insulation R-value
Fenestration	The U-factor of 0.40 and SHGC value of 0.35. The glass area shall be the glass area of the existing building.	If the proposed U-factor is ≤ 0.40 and SHGC value is ≤ 0.35, the standard design shall be based on the existing U-factor and SHGC values as verified. Otherwise, the standard design shall be based on the U-factor of 0.40 and SHGC value of 0.35. The glass area shall be the glass area of the existing building.
Window Film	The U-factor of 0.40 and SHGC value of 0.35.	The existing fenestration in the alteration shall be based on Table 110.6-A and Table 110.6-B.
Space-Heating and Space-Cooling Equipment	The requirements of TABLE 150.1-A.	The existing efficiency levels.
Air Distribution System – Duct Sealing	The requirements of Section 150.2(b)1D.	
Air Distribution System – Duct Insulation	The proposed efficiency levels.	The existing efficiency levels.
Water Heating Systems	The requirements of Section 150.1(b)1 without the solar water heating requirements.	The existing efficiency energy factor.
Roofing Products	The requirements of Section 150.2(b)1H.	
All Other Measures	The proposed efficiency levels.	The existing efficiency levels.

Table 150.2-B Summary

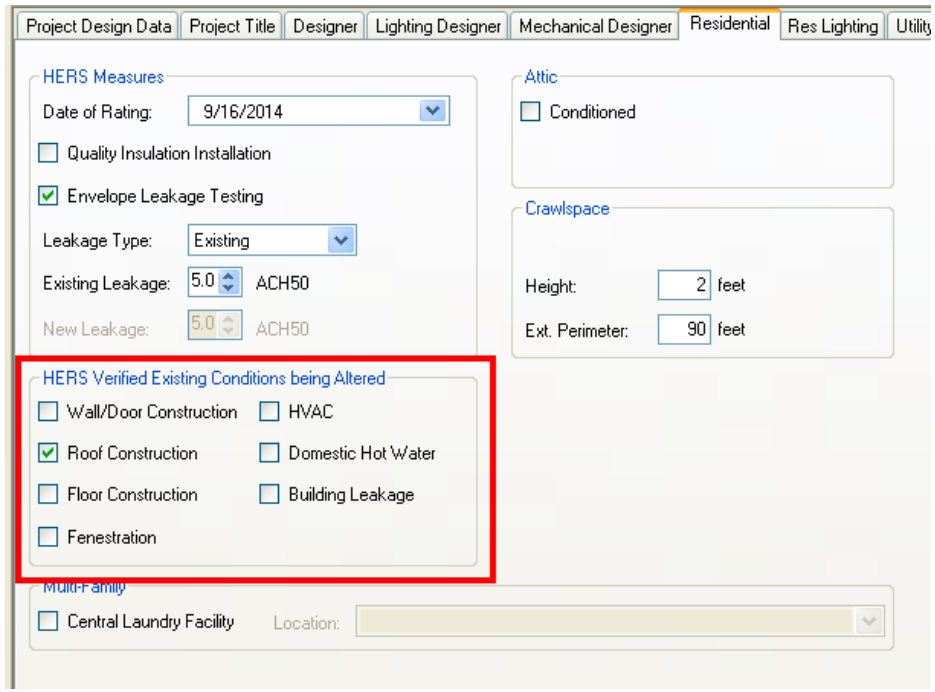
	No HERS	HERS
• Fenestration	0.40/0.35	Existing OR 0.40/0.35
• Heating/cooling	Package A	Existing
• Duct insulation	Proposed	Existing
• DHW	Prescriptive	Existing
• Insulation	Mandatory	Existing
• All Others	Proposed	Existing

Duct sealing & roofing – no difference

E+A+A Modeling

- Modeler selects which assemblies are HERS verified
- That only makes sense when “Altered” component is “worse” than Standard Design conditions listed in Table 150.2-B
- You get extra compliance margin
- The items that must be verified are listed on the CF-1R-PRF-01

Selecting HERS Verifications



Identifying HERS Verifications

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD **CF1R-PRF-02-E**

Project Name: Existing+Alterations+Addition
Calculation Description : Title 24 Analysis
Calculation Date/Time:10:01, Mon, Feb 17, 2014
Input File Name: Existing+Alterations+Addition.xml

GENERAL INFORMATION					
01	Project Name	Existing+Alterations+Addition			
02	Calculation Description	Title 24 Analysis			
03	Project Location	123 Main St.			
04	CA City	San Francisco	05	Standards Version	Compliance 2014
06	Zip code		07	Compliance Manager Version	BEMCmpMgr 2013-1e (532)
08	Climate Zone	CZ12	09	Software Version	EnergyPro 6.1
10	Building Type	Single Family	11	Front Orientation (deg/Cardinal)	0
12	Project Scope	Addition and/or Alteration	13	Number of Dwelling Units	1
14	Total Cond. Floor Area (FT2)	1275	15	Number of Zones	2
16	Slab Area (FT2)	0	17	Number of Stories	1
18	Addition Cond. Floor Area	NA	19	Natural Gas Available	Yes
20	Addition Slab Area (FT2)	NA	21	Glazing Percentage (%)	14.3%

COMPLIANCE RESULTS	
01	Building Complies with Computer Performance
02	This building incorporates features that require field testing and/or verification by a certified HERS rater under the supervision of a CEC-approved HERS provider.
03	This building incorporates one or more Special Features shown below
	ENERGY USE SUMMARY

Detailed help on using the CF-1R Certificate of Compliance is available via the Internet by either scanning the QR code or browsing to http://www.title24energycode.org/t24help/cf1r.aspx

Identifying HERS Verifications

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD — CF1R-PRF-01

Project Name: Existing+Alterations+Addition — Calculation Date/Time: 16:35, Tue, Sep 16, 2014 — Page 3 of 8

Calculation Description: Title 24 Analysis — Input File Name: Existing+Alterations+Addition.xml

OPAQUE SURFACES

01	02	03	04	05	06	07	08	09	10
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft^2)	Window or Door Area (ft^2)	Tilt(deg)	Status	Verified Existing Condition
Front: To Remain	Existing Home	R-0 Wall	0	Front	180	50	90	Existing	No
Left: To Remain	Existing Home	R-0 Wall	90	Left	135		90	Existing	No
Left: New	Existing Home	R-15 Wall	90	Left	135	30	90	New	N/A
Rear: To Remain	Existing Home	R-0 Wall	180	Back	135	20	90	Existing	No
Right: To Remain	Existing Home	R-0 Wall	270	Right	405	42	90	Existing	No
Existing Roof: Altered	Existing Home	R-30 Roof Attic			1050			Altered	Yes
Existing Floor: Remains	Existing Home	R-0 Floor Crawlspace			1050			Existing	No
Front	New Addition	R-15 Wall	0	Front	54		90	New	N/A
Left	New Addition	R-15 Wall	90	Left	135	20	90	New	N/A
Rear	New Addition	R-15 Wall	180	Back	135	20	90	New	N/A
New Roof	New Addition	R-38 Roof Attic			225			New	N/A
New Floor	New Addition	R-22 Floor Crawlspace			225			New	N/A

Identifying HERS Verifications

HVAC - COOLING SYSTEMS

01	02	03	04	05	06	07
Name	System Type	Efficiency EER	Efficiency SEER	Zonally Controlled	Multi-speed Compressor	HERS Verification
Cooling Component 1	SplitAirCond - Split air conditioning system	7.06	8	No	No	Cooling Component 1-hers-cool

HVAC - DISTRIBUTION SYSTEMS

01	02	03	04	05	06	07	08	09	08
Name	Type	Duct Leakage	Insulation R-value	Supply Duct Location	Return Duct Location	Bypass Duct	Status	Verify Existing Condition	HERS Verification

HERS RATER VERIFICATION OF EXISTING CONDITIONS

OPAQUE SURFACES - VERIFIED & ALTERED

01	02	03	04	05
Name	Zone	Existing Construction	Surface Type	Total Cavity R-value
Existing Roof: Altered	Existing Home	R-19 Roof Attic	Wood Framed Ceiling	R 19

E+A+A Project Registration

- Project is created like any other registry project
- Documentation author and designer sign the CF-1R
- HERS rater verifies existing conditions, completes CF-3R-EXC-20H
- Registered CF-1R is available after designer and documentation author sign it
- Registration (i.e., permitting) can't be completed until HERS rater does verifications

E+A+A Example

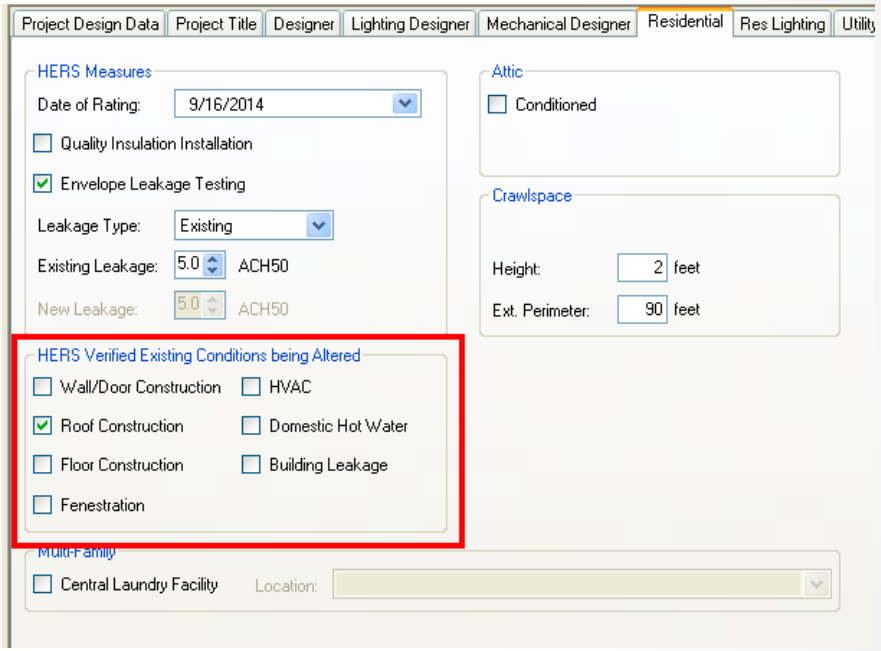
- 150.2-B lists 150.0(a) as Standard Design for roof insulation
  - Mandatory minimum of R-30
- Existing roof = R-19, insulate to R-30
- Don't select HERS verification, Standard Design = R-30
- No compliance credit – merely upgrading the roof to mandatory minimum

TABLE 150.2-B STANDARD DESIGN FOR AN

Altered Component	Standard Design Without Third Party Verification of Existing Conditions Shall be Based On
Ceiling Insulation, Wall Insulation, and Raised-floor Insulation	The requirements of Sections 150.0(a), (c), and (d)

E+A+A Example

- If you select HERS verification, Standard Design = R-19 (existing condition)
- Compliance credit for the increase from R-19 to R-30
- 5% on 1000 SF roof



E+A+A Timing

- You can't build an accurate model without knowing the existing conditions
- Logical/realistic sequence:
  - The HERS rater does their analysis BEFORE the modeling is done
  - Project is created in the registry, model is uploaded
  - Author and designer sign it
  - HERS rater enters the verification results
  - Registration happens and permit documents are submitted

Whole House Ratings (and Raters)

Thank you!