

BUILDING ENERGY ANALYSIS REPORT

PROJECT:

Mill Valley, Ca. 94941

Project Designer:

Report Prepared by:

Job Number:

Date:

12/14/2015

The EnergyPro computer program has been used to perform the calculations summarized in this compliance report. This program has approval and is authorized by the California Energy Commission for use with both the Residential and Nonresidential 2013 Building Energy Efficiency Standards.

This program developed by EnergySoft, LLC – www.energysoft.com.

TABLE OF CONTENTS

Cover Page	1
Table of Contents	2
Form CF-1R-PRF-01-E Certificate of Compliance	3
Form MF-1R Mandatory Measures Summary	11
HVAC System Heating and Cooling Loads Summary	15

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD
CF1R-PRF-01
Project Name:
Calculation Date/Time: 10:33, Mon, Dec 14, 2015

Page 1 of 8
Calculation Description: Title 24 Analysis

Input File Name:

GENERAL INFORMATION					
01	Project Name				
02	Calculation Description	Title 24 Analysis			
03	Project Location				
04	City	Mill Valley	05	Standards Version	Compliance 2015
06	Zip Code	94941	07	Compliance Manager Version	BEMCmpMgr 2013-4 (744)
08	Climate Zone	CZ3	09	Software Version	EnergyPro 6.6
10	Building Type	Single Family	11	Front Orientation (deg/Cardinal)	345
12	Project Scope	Addition and/or Alteration	13	Number of Dwelling Units	1
14	Total Cond. Floor Area (ft ²)	2407	15	Number of Zones	2
16	Slab Area (ft ²)	700	17	Number of Stories	2
18	Addition Cond. Floor Area	700	19	Natural Gas Available	Yes
20	Addition Slab Area (ft ²)	700	21	Glazing Percentage (%)	21.4%

COMPLIANCE RESULTS	
01	Building Complies with Computer Performance
02	This building DOES NOT require HERS Verification

ENERGY USE SUMMARY				
04	05	06	07	08
Energy Use (kTDV/ft ² -yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	41.86	34.47	7.39	17.7%
Space Cooling	3.10	2.10	1.00	32.3%
IAQ Ventilation	0.00	0.00	0.00	0.0%
Water Heating	12.70	10.00	2.70	21.3%
Photovoltaic Offset	----	0.00	0.00	----
Compliance Energy Total	57.66	46.57	11.09	19.2%

Registration Number:

Registration Date/Time:

HERS Provider:

CA Building Energy Efficiency Standards - 2013 Residential Compliance

Report Version - CF1R-08252015-744

Report Generated at: 2015-12-14 10:34:48

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD

CF1R-PRF-01

Project Name:

Calculation Date/Time: 10:33, Mon, Dec 14, 2015

Page 2 of 8

Calculation Description: Title 24 Analysis

Input File Name:

REQUIRED SPECIAL FEATURES

The following are features that must be installed as condition for meeting the modeled energy performance for this computer analysis.

NO SPECIAL FEATURES REQUIRED**HERS FEATURE SUMMARY**

The following is a summary of the features that must be field-verified by a certified HERS Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the building components tables below.

Building-level Verifications:

- -- None --

Cooling System Verifications:

- -- None --

HVAC Distribution System Verifications:

- -- None --

Domestic Hot Water System Verifications:

- -- None --

ENERGY DESIGN RATING

This is the sum of the annual TDV energy consumption for energy use components included in the performance compliance approach for the Standard Design Building (Energy Budget) and the annual TDV energy consumption for lighting and components not regulated by Title 24, Part 6 (such as domestic appliances and consumer electronics) and accounting for the annual TDV energy offset by an on-site renewable energy system.

	Reference Energy Use	Energy Design Rating	Margin	Percent Improvement
Total Energy (kTDV/ft ² -yr)*	103.85	92.76	11.09	10.7%

* includes calculated Appliances and Miscellaneous Energy Use (AMEU)

BUILDING - FEATURES INFORMATION

01	02	03	04	05	06	07
Project Name	Conditioned Floor Area (ft ²)	Number of Dwelling Units	Number of Bedrooms	Number of Zones	Number of Ventilation Cooling Systems	Number of Water Heating Systems
	2407	1	3	2	0	1

ZONE INFORMATION

01	02	03	04	05	06	07
Zone Name	Zone Type	HVAC System Name	Zone Floor Area (ft ²)	Avg. Ceiling Height	Water Heating System 1	Water Heating System 2
Basement Addition	Conditioned	New Radiant Floor1	700	8	DHW Sys 1	
Existing Main Floor	Conditioned	New Radiant Floor1	1707	8	DHW Sys 1	

Registration Number:

Registration Date/Time:

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CA Building Energy Efficiency Standards - 2013 Residential Compliance

Report Version - CF1R-08252015-744

Report Generated at: 2015-12-14 10:34:48

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD
CF1R-PRF-01
Project Name:
Calculation Date/Time: 10:33, Mon, Dec 14, 2015

Page 3 of 8
Calculation Description: Title 24 Analysis

Input File Name:

OPAQUE SURFACES									
01	02	03	04	05	06	07	08	09	10
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft ²)	Window & Door Area (ft ²)	Tilt (deg)	Status	Verified Existing Condition
Front Wall	Basement Addition	R-13 Wall1	345	Front	212	81	90	New	N/A
Left Wall	Basement Addition	R-13 Wall1	75	Left	40		90	New	N/A
Right Wall	Basement Addition	R-13 Wall1	255	Right	140	29.4	90	New	N/A
Wall to Unc.	Basement Addition	R-13 Wall1	0	15	367		90	New	N/A
Underground Wall	Basement Addition	8 Concrete Wall			84			New	N/A
Front Wall 2	Existing Main Floor	R-0 Wall	345	Front	408	139	90	Existing	No
Left Wall 2	Existing Main Floor	R-0 Wall	75	Left	376	29	90	Existing	No
Back Wall	Existing Main Floor	R-0 Wall	165	Back	208	137	90	Existing	No
Right Wall 2	Existing Main Floor	R-0 Wall	255	Right	384	99.6	90	Existing	No
Roof	Existing Main Floor	Ex No Verification Roof			396			Existing	No
Roof 2	Existing Main Floor	Ex No Verification Roof			1338			Existing	No
Open Floor	Existing Main Floor	R-0 Floor No Crawlspace			528			Existing	No
Ex Raised Floor	Existing Main Floor	R-0 Floor Crawlspace			588			Existing	No
Front Wall 3	__Garage__	R-0 Wall	345	Front	192	104	90	Existing	No
Left Wall 3	__Garage__	R-0 Wall	75	Left	136	9.4	90	Existing	No
Interior Surface 3	__Garage__>>Basement Addition	R-13 Wall			176			New	N/A
Interior Surface 4	__Garage__>>Basement Addition	R-0 Wall1			200			Existing	No
Interior Surface 5	__Garage__>>Basement Addition	R-0 Wall1			100			Existing	No

ATTIC									
01	02	03	04	05	06	07	08	09	10
Name	Construction	Type	Roof Rise	Roof Reflectance	Roof Emittance	Radiant Barrier	Cool Roof	Status	Verified Existing Condition
Attic Existing Main Floor	Attic RoofExisting Main Floor	Ventilated	4	0.1	0.85	No	No	Existing	No

Registration Number:

Registration Date/Time:

HERS Provider:

CA Building Energy Efficiency Standards - 2013 Residential Compliance

Report Version - CF1R-08252015-744

Report Generated at: 2015-12-14 10:34:48

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD
CF1R-PRF-01
Project Name:
Calculation Date/Time: 10:33, Mon, Dec 14, 2015

Page 4 of 8
Calculation Description: Title 24 Analysis

Input File Name:

WINDOWS										
01	02	03	04	05	06	07	08	09	10	11
Name	Surface (Orientation-Azimuth)	Width(ft)	Height (ft)	Multiplier	Area (ft ²)	U-factor	SHGC	Exterior Shading	Status	Verified Existing Condition
Window	Front Wall (Front-345)	----	----	1	81.0	0.58	0.55	Insect Screen (default)	New	N/A
Window 2	Right Wall (Right-255)	----	----	1	29.4	0.58	0.55	Insect Screen (default)	New	N/A
New Window	Front Wall 2 (Front-345)	----	----	1	69.0	0.58	0.55	Insect Screen (default)	New	N/A
Existing Window	Front Wall 2 (Front-345)	----	----	1	70.0	1.28	0.80	Insect Screen (default)	Existing	No
New Window 2	Left Wall 2 (Left-75)	----	----	1	29.0	0.58	0.55	Insect Screen (default)	New	N/A
New Window 3	Back Wall (Back-165)	----	----	1	70.0	0.58	0.55	Insect Screen (default)	New	N/A
Existing Window 2	Back Wall (Back-165)	----	----	1	67.0	1.28	0.80	Insect Screen (default)	Existing	No
New Window 4	Right Wall 2 (Right-255)	----	----	1	74.0	0.58	0.55	Insect Screen (default)	New	N/A
Existing Window 3	Right Wall 2 (Right-255)	----	----	1	25.6	1.28	0.80	Insect Screen (default)	Existing	No

DOORS					
01	02	03	04	05	06
Name	Side of Building	Area (ft ²)	U-factor	Status	Verified Existing Condition

Registration Number:

CA Building Energy Efficiency Standards - 2013 Residential Compliance

Registration Date/Time:

Report Version - CF1R-08252015-744

HERS Provider:

Report Generated at: 2015-12-14 10:34:48

Project Name:

Calculation Date/Time: 10:33, Mon, Dec 14, 2015

Page 5 of 8

Calculation Description: Title 24 Analysis

Input File Name:

OPAQUE SURFACE CONSTRUCTIONS						
01	02	03	04	05	06	07
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Winter Design U-value	Assembly Layers
R-0 Wall	Exterior Walls	Wood Framed Wall	2x4 @ 16 in. O.C.	none	0.302	<ul style="list-style-type: none"> Inside Finish: Gypsum Board Cavity / Frame: no insul. / 2x4 Exterior Finish: Wood Siding/sheathing/decking
R-13 Wall	Interior Walls	Wood Framed Wall	2x4 @ 16 in. O.C.	R 13	0.092	<ul style="list-style-type: none"> Inside Finish: Gypsum Board Cavity / Frame: R-13 / 2x4 Other Side Finish: Gypsum Board
R-0 Wall1	Interior Walls	Wood Framed Wall	2x4 @ 16 in. O.C.	none	0.277	<ul style="list-style-type: none"> Inside Finish: Gypsum Board Cavity / Frame: no insul. / 2x4 Other Side Finish: Gypsum Board
R-13 Wall1	Exterior Walls	Wood Framed Wall	2x4 @ 16 in. O.C.	R 13	0.095	<ul style="list-style-type: none"> Inside Finish: Gypsum Board Cavity / Frame: R-13 / 2x4 Exterior Finish: Wood Siding/sheathing/decking
8 Concrete Wall	Underground Walls	Concrete / ICF / Brick			0.892	<ul style="list-style-type: none"> Inside Finish: Gypsum Board Mass Layer: 8 in. Concrete
Attic RoofExisting Main Floor	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O.C.	none	0.644	<ul style="list-style-type: none"> Cavity / Frame: no insul. / 2x4 Top Chrd Roof Deck: Wood Siding/sheathing/decking Roofing: Light Roof (Asphalt Shingle)
R-0 Floor Crawlspace	Floors Over Crawlspace	Wood Framed Floor	2x12 @ 16 in. O.C.	none	0.216	<ul style="list-style-type: none"> Floor Surface: Carpeted Floor Deck: Wood Siding/sheathing/decking Cavity / Frame: no insul. / 2x12
R-0 Floor No Crawlspace	Exterior Floors	Wood Framed Floor	2x12 @ 16 in. O.C.	none	0.240	<ul style="list-style-type: none"> Floor Surface: Carpeted Floor Deck: Wood Siding/sheathing/decking Cavity / Frame: no insul. / 2x12
Ex No Verification Roof	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 24 in. O.C.	R 30	0.032	<ul style="list-style-type: none"> Inside Finish: Gypsum Board Cavity / Frame: R-9.1 / 2x4 Over Floor Joists: R-20.9 insul.

SLAB FLOORS								
01	02	03	04	05	06	07	08	09
Name	Zone	Area (ft ²)	Perimeter (ft)	Edge Insul. R-value	Carpeted Fraction	Heated	Status	Verified Existing Condition
Slab-on-Grade	Basement Addition	700	60	None	0.8	No	New	No

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD
CF1R-PRF-01
Project Name:
Calculation Date/Time: 10:33, Mon, Dec 14, 2015

Page 6 of 8
Calculation Description: Title 24 Analysis

Input File Name:

BUILDING ENVELOPE - HERS VERIFICATION			
01	02	03	04
Quality Insulation Installation (QII)	Quality Installation of Spray Foam Insulation	Building Envelope Air Leakage	CFM50
Not Required	Not Required	Not Required	---

WATER HEATING SYSTEMS							
01	02	03	04	05	06	07	08
Name	System Type	Distribution Type	Water Heater	Number of Heaters	Solar Fraction (%)	Status	Verified Existing Condition
DHW Sys 1	DHW	Standard	DHW Heater 1	1	Annual	New	No

WATER HEATERS							
01	02	03	04	05	06	07	08
Name	Heater Element Type	Tank Type	Tank Volume (gal)	Energy Factor or Efficiency	Input Rating	Tank Exterior Insulation R-value	Standby Loss (Fraction)
DHW Heater 1	Natural Gas	Indirect	80	0.9	199000-Btu/hr	12	0

WATER HEATING - HERS VERIFICATION						
01	02	03	04	05	06	07
Name	Pipe Insulation	Parallel Piping	Compact Distribution	Point-of Use	Recirculation with Manual Control	Recirculation with Sensor Control
DHW Sys 1	n/a	n/a	n/a	n/a	n/a	n/a

SPACE CONDITIONING SYSTEMS										
01	02	03		04		05	06	07	08	09
Name	System Type	Heating System		Cooling System		Distribution System	Fan System	Floor Area Served	Status	Verified Existing Condition
		Name	Ducted	Name	Ducted					
New Radiant Floor1	Other Heating and Cooling System	Heating Component 1	No	Cooling Component 1	No	- none -	HVAC Fan 1	2407	New	No

HVAC - HEATING SYSTEMS		
01	02	03
Name	Type	Efficiency
Heating Component 1	CombHydro - Water heating system can be gas storage	90 AFUE

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Registration Date/Time:

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Report Version - CF1R-08252015-744

Report Generated at: 2015-12-14 10:34:48

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD
CF1R-PRF-01
Project Name:
Calculation Date/Time: 10:33, Mon, Dec 14, 2015

Page 7 of 8
Calculation Description: Title 24 Analysis

Input File Name:

HVAC - COOLING SYSTEMS						
01	02	03	04	05	06	07
Name	System Type	Efficiency EER SEER		Zonally Controlled	Multi-speed Compressor	HERS Verification
Cooling Component 1	NoCooling - No cooling equipment	N/A	N/A	No	No	

HVAC - FAN SYSTEMS & HERS VERIFICATION			
01	02	03	04
Name	Type	Fan Power (Watts/CFM)	HERS Verification
HVAC Fan 1	Single Speed PSC Furnace Fan	0.58	---

IAQ (Indoor Air Quality) FANS				
01	02	03	04	05
Name	IAQ CFM	IAQ Fan Type	IAQ Recovery Effectiveness(%)	HERS Verification
SFam IAQVentRpt	0	Default	0	Not Required

Registration Number:

CA Building Energy Efficiency Standards - 2013 Residential Compliance

Registration Date/Time:

Report Version - CF1R-08252015-744

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Report Generated at: 2015-12-14 10:34:48

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD

CF1R-PRF-01

Project Name:**Calculation Date/Time:** 10:33, Mon, Dec 14, 2015**Page 8 of 8****Calculation Description:** Title 24 Analysis**Input File Name:**

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name:	Documentation Author Signature:
Company:	Signature Date: 12/14/2015
Address:	CEA/HERS Certification Identification (If applicable):
City/State/Zip:	Phone:
RESPONSIBLE PERSON'S DECLARATION STATEMENT	
I certify the following under penalty of perjury, under the laws of the State of California: 1. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design identified on this Certificate of Compliance. 2. I certify that the energy features and performance specifications identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations. 3. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.	
Responsible Designer Name:	Responsible Designer Signature:
Company:	Date Signed:
Address:	License:
City/State/Zip:	Phone:

Registration Number:

CA Building Energy Efficiency Standards - 2013 Residential Compliance

Registration Date/Time:

Report Version - CF1R-08252015-744

HERS Provider:

Report Generated at: 2015-12-14 10:34:48

2013 Low-Rise Residential Mandatory Measures Summary

NOTE: Low-rise residential buildings subject to the Standards must comply with all applicable mandatory measures listed, regardless of the compliance approach used. Exceptions may apply. Review the respective code section for more information.

Building Envelope Measures:	
§110.6(a)1:	Doors and windows between conditioned and unconditioned spaces are manufactured to limit air leakage.
§110.6(a)5:	Fenestration products (except field-fabricated windows) have a label listing the certified U-Factor, certified Solar Heat Gain Coefficient (SHGC), and infiltration that meets the requirements of §10-111(a).
§110.7:	Exterior doors and windows are weatherstripped; all joints and penetrations are caulked and sealed.
§110.8(a):	Insulation specified or installed meets Standards for Insulating Material. Indicate type and include on the CF2R.
§110.8(i):	The thermal emittance and aged solar reflectance values of the cool roofing material meets the requirements of §110.8(i) when the installation of a cool roof is specified on the CF1R.
§110.8(j):	A radiant barrier shall have an emittance of 0.05 or less when the installation of a radiant barrier is specified on the CF1R.
§150.0(a):	Minimum R-30 insulation in wood-frame ceiling; or the weighted average U-factor shall not exceed 0.031. Minimum R-19 in a rafter roof alteration. Attic access doors shall have permanently attached insulation using adhesive or mechanical fasteners. The attic access shall be gasketed to prevent air leakage.
§150.0(b):	Loose fill insulation shall conform with manufacturer's installed design labeled R-value.
§150.0(c):	Minimum R-13 insulation in 2x4 inch wood framing wall or have a U-factor of 0.102 or less (R-19 in 2x6 or 0.074 maximum U-factor).
§150.0(d):	Minimum R-19 insulation in raised wood-frame floor or 0.037 maximum U-factor.
§150.0(g)1:	In Climate Zones 14 and 16 a Class II vapor retarder shall be installed on the conditioned space side of all insulation in all exterior walls, vented attics and unvented attics with air-permeable insulation.
§150.0(g)2:	In Climate Zones 1-16 with unvented crawl spaces the earth floor of the crawl space shall be covered with a Class I or Class II vapor retarder.
§150.0(g)3:	In a building having a controlled ventilation crawl space, a Class I or Class II vapor retarder shall be placed over the earth floor of the crawl space to reduce moisture entry and protect insulation from condensation, as specified in the exception to Section 150.0(d).
§150.0(l):	Slab edge insulation shall: have a water absorption rate, for the insulation material alone without facings, no greater than 0.3%; have water vapor permeance rate is no greater than 2.0 perm/inch, be protected from physical damage and UV light deterioration; and when installed as part of a heated slab floor meets the requirements of §110.8(g).
§150.0(q):	Fenestration, including skylights, separating conditioned space from unconditioned space or outdoors shall have a maximum U-factor of 0.58; or the weighted average U-factor of all fenestration shall not exceed 0.58.
Fireplaces, Decorative Gas Appliances and Gas Log Measures:	
§150.0(e)1A:	Masonry or factory-built fireplaces have a closable metal or glass door covering the entire opening of the firebox.
§150.0(e)1B:	Masonry or factory-built fireplaces have a combustion outside air intake, which is at least six square inches in area and is equipped with a readily accessible, operable, and tight-fitting damper or a combustion-air control device.
§150.0(e)1C:	Masonry or factory-built fireplaces have a flue damper with a readily accessible control.
§150.0(e)2:	Continuous burning pilot lights and the use of indoor air for cooling a firebox jacket, when that indoor air is vented to the outside of the building, are prohibited.
Space Conditioning, Water Heating and Plumbing System Measures:	
§110.0-§110.3:	HVAC equipment, water heaters, showerheads, faucets and all other regulated appliances are certified to the Energy Commission.
§110.3(c)5:	Water heating recirculation loops serving multiple dwelling units meet the air release valve, backflow prevention, pump isolation valve, and recirculation loop connection requirements of §110.3(c)5.
§110.5:	Continuously burning pilot lights are prohibited for natural gas: fan-type central furnaces, household cooking appliances (appliances without an electrical supply voltage connection with pilot lights that consume less than 150 Btu/hr are exempt), and pool and spa heaters.
§150.0(h)1:	Heating and/or cooling loads are calculated in accordance with ASHRAE, SMACNA or ACCA using design conditions specified in §150.0(h)2.
§150.0(h)3A:	Installed air conditioner and heat pump outdoor condensing units shall have a clearance of at least five feet from the outlet of any dryer vent.
§150.0(i):	Heating systems are equipped with thermostats that meet the setback requirements of §110.2(c).
§150.0(j)1A:	Storage gas water heaters with an energy factor equal to or less than the federal minimum standards shall be externally wrapped with insulation having an installed thermal resistance of R-12 or greater.
§150.0(j)1B:	Unfired hot water tanks, such as storage tanks and backup storage tanks for solar water-heating systems, have R-12 external insulation or R-16 internal insulation where the internal insulation R-value is indicated on the exterior of the tank.
§150.0(j)2A:	For domestic hot water system piping, whether buried or unburied: the first 5 feet of hot and cold water pipes from the storage tank, all piping with a nominal diameter of 3/4 inch or larger, all piping associated with a domestic hot water recirculation system regardless of the pipe diameter, piping from the heating source to storage tank or between tanks, piping buried below grade, and all hot water pipes from the heating source to kitchen fixtures must be insulated according to the requirements of TABLE 120.3-A.
§150.0(j)2B:	All domestic hot water pipes that are buried below grade must be installed in a water proof and non-crushable casing or sleeve that allows for installation, removal, and replacement of the enclosed pipe and insulation.

2013 Low-Rise Residential Mandatory Measures Summary

§150.0(j)2C:	Pipe for cooling system lines shall be insulated as specified in §150.0(j)2A. Piping insulation for steam and hydronic heating systems or hot water systems with pressure > 15 psig shall meet the requirements in TABLE 120.3-A.
§150.0(j)3:	Insulation is protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind.
§150.0(j)3A:	Insulation exposed to weather shall either be rated for outdoor use or installed with a cover suitable for outdoor service. For example, protected by aluminum, sheet metal, painted canvas, or plastic cover. Cellular foam insulation protected as specified or painted with coating that is water retardant and provides shielding from solar radiation that degrades the material.
§150.0(j)3B:	Insulation covering chilled water piping and refrigerant suction piping located outside the conditioned space shall have a Class I or Class II vapor retarding facing, or the insulation shall be installed at the thickness that qualifies as a Class I or Class II vapor retarder.
§150.0(n)1:	Systems using gas or propane water heaters to serve individual dwelling units shall include: a 120V electrical receptacle within 3 feet of the water heater; a Category III or IV vent, or a Type B vent with straight pipe between the outside termination and the space where the water heater is installed; a condensate drain that is no more than 2 inches higher than the base of the installed water heater, and allows natural draining without pump assistance; and a gas supply line with a capacity of at least 200,000 Btu/hr.
§150.0(n)2:	Recirculating loops serving multiple dwelling units shall meet the requirements of §110.3(c)5.
§150.0(n)3:	Solar water-heating systems and collectors shall be certified and rated by the Solar Rating and Certification Corporation (SRCC) or by a testing agency approved by the Executive Director.
Ducts and Fans Measures:	
§150.0(m)1:	All air-distribution system ducts and plenums installed are sealed and insulated to meet the requirements of CMC §601.0, §602.0, §603.0, §604.0, §605.0 and ANSI/SMACNA-006-2006 HVAC Duct Construction Standards Metal and Flexible 3rd Edition. Supply-air and return-air ducts and plenums are insulated to a minimum installed level of R-6.0 (or higher if required by CMC §605.0) or enclosed entirely in directly conditioned space as confirmed through field verification and diagnostic testing (RA3.1.4.3.8). Connections of metal ducts and inner core of flexible ducts are mechanically fastened. Openings shall be sealed with mastic, tape, or other duct-closure system that meets the applicable requirements of UL 181, UL 181A, or UL 181B or aerosol sealant that meets the requirements of UL 723. If mastic or tape is used to seal openings greater than ¼ inch, the combination of mastic and either mesh or tape shall be used. Building cavities, support platforms for air handlers, and plenums defined or constructed with materials other than sealed sheet metal, duct board or flexible duct shall not be used for conveying conditioned air. Building cavities and support platforms may contain ducts. Ducts installed in cavities and support platforms shall not be compressed to cause reductions in the cross-sectional area of the ducts.
§150.0(m)2:	Factory-Fabricated Duct Systems shall comply with specified requirements for duct construction, connections, and closures; joints and seams of duct systems and their components shall not be sealed with cloth back rubber adhesive duct tapes unless such tape is used in combination with mastic and draw bands.
§150.0(m)3-6:	Field-Fabricated Duct Systems shall comply with requirements for: pressure-sensitive tapes, mastics, sealants, and other requirements specified for duct construction; duct insulation R-value ratings; duct insulation thickness; and duct labeling.
§150.0(m)7:	All fan systems that exchange air between the conditioned space and the outside of the building must have backdraft or automatic dampers.
§150.0(m)8:	Gravity ventilating systems serving conditioned space have either automatic or readily accessible, manually operated dampers except combustion inlet and outlet air openings and elevator shaft vents.
§150.0(m)9:	Insulation shall be protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind but not limited to the following: insulation exposed to weather shall be suitable for outdoor service. For example, protected by aluminum, sheet metal, painted canvas, or plastic cover. Cellular foam insulation shall be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation.
§150.0(m)10:	Flexible ducts cannot have porous inner cores.
§150.0(m)11:	When space conditioning systems use forced air duct systems to supply conditioned air to an occupiable space, the ducts shall be sealed and duct leakage tested, as confirmed through field verification and diagnostic testing, in accordance with Reference Residential Appendix RA3.
§150.0(m)12:	Mechanical systems that supply air to an occupiable space through ductwork exceeding 10 feet in length and through a thermal conditioning component, except evaporative coolers, shall be provided with air filter devices that meet the requirements of §150.0(m)12.
§150.0(m)13:	Space conditioning systems that utilize forced air ducts to supply cooling to an occupiable space shall have a hole for the placement of a static pressure probe (HSPP), or a permanently installed static pressure probe (PSPP) in the supply plenum. The space conditioning system must also demonstrate airflow ≥ 350 CFM per ton of nominal cooling capacity through the return grilles, and an air-handling unit fan efficacy ≤ 0.58 W/CFM as confirmed by field verification and diagnostic testing, in accordance with Reference Residential Appendix RA3.
§150.0(m)15:	Zonally controlled central forced air cooling systems shall be capable of simultaneously delivering, in every zonal control mode, an airflow from the dwelling, through the air handler fan and delivered to the dwelling, of ≥ 350 CFM per ton of nominal cooling capacity, and operating at an air-handling unit fan efficacy of ≤ 0.58 W/CFM as confirmed by field verification and diagnostic testing, in accordance with Reference Residential Appendix RA3.
§150.0(o):	All dwelling units shall meet the requirements of ASHRAE Standard 62.2. Neither window operation nor continuous operation of central forced air system air handlers used in central fan integrated ventilation systems are permissible methods of providing the Whole Building Ventilation.
§150.0(o)1A:	Whole Building Ventilation airflow shall be confirmed through field verification and diagnostic testing, in accordance with Reference Residential Appendix RA3.
Pool and Spa Heating Systems and Equipment Measures:	
§110.4(a):	Any pool or spa heating system shall be certified to have: a thermal efficiency that complies with the Appliance Efficiency Regulations; an on-off switch mounted outside of the heater that allows shutting off the heater without adjusting the thermostat setting; a permanent weatherproof plate or card with operating instructions; and shall not use electric resistance heating.

2013 Low-Rise Residential Mandatory Measures Summary

§110.4(b)1:	Any pool or spa heating equipment shall be installed with at least 36 inches of pipe between filter and heater or dedicated suction and return lines, or built-up connections for future solar heating.
§110.4(b)2:	Outdoor pools or spas that have a heat pump or gas heater shall have a cover.
§110.4(b)3:	Pools shall have directional inlets that adequately mix the pool water, and a time switch that will allow all pumps to be set or programmed to run only during off-peak electric demand periods.
§110.5:	Natural gas pool and spa heaters shall not have a continuous burning pilot light.
§150.0(p):	Residential pool systems or equipment shall meet specified pump sizing, flow rate, piping, filters, and valve requirements.
Lighting Measures:	
§110.9:	All lighting control devices and systems, ballasts, and luminaires shall meet the applicable requirements of §110.9.
§150.0(k)1A:	Installed luminaires shall be classified as high-efficacy or low-efficacy for compliance with §150.0(k) in accordance with TABLE 150.0-A or TABLE 150.0-B, as applicable.
§150.0(k)1B:	When a high efficacy and low efficacy lighting system are combined in a single luminaire, each system shall separately comply with the applicable provisions of §150.0(k).
§150.0(k)1C:	The wattage and classification of permanently installed luminaires in residential kitchens shall be determined in accordance with §130.0(c). In residential kitchens, the wattage of electrical boxes finished with a blank cover or where no electrical equipment has been installed, and where the electrical box can be used for a luminaire or a surface mounted ceiling fan, shall be calculated as 180 watts of low efficacy lighting per electrical box.
§150.0(k)1D:	Ballasts for fluorescent lamps rated 13 watts or greater shall be electronic and shall have an output frequency no less than 20 kHz.
§150.0(k)1E:	Permanently installed night lights and night lights integral to installed luminaires or exhaust fans shall be rated to consume no more than 5 watts of power per luminaire or exhaust fan as determined in accordance with §130.0(c). Night lights do not need to be controlled by vacancy sensors.
§150.0(k)1F:	Lighting integral to exhaust fans (except when installed by the manufacturer in kitchen exhaust hoods) shall meet the applicable requirements of §150.0(k).
§150.0(k)2A:	High efficacy luminaires must be switched separately from low efficacy luminaires.
§150.0(k)2B:	Exhaust fans shall be switched separately from lighting systems.
§150.0(k)2C:	Luminaires shall be switched with readily accessible controls that permit the luminaires to be manually switched ON and OFF.
§150.0(k)2D:	Controls and equipment are installed in accordance with manufacturer's instructions.
§150.0(k)2E:	No control shall bypass a dimmer or vacancy sensor function if the control is installed to comply with §150.0(k).
§150.0(k)2F:	Lighting controls comply with applicable requirements of §110.9.
§150.0(k)2G:	An Energy Management Control System (EMCS) may be used to comply with dimmer requirements if: it functions as a dimmer according to §110.9; meets Installation Certificate requirements of §130.4; the EMCS requirements of §130.5; and all other requirements in §150.0(k)2.
§150.0(k)2H:	An Energy Management Control System (EMCS) may be used to comply with vacancy sensor requirements of §150.0(k) if: it functions as a vacancy sensor according to §110.9; meets Installation Certificate requirements of §130.4; the EMCS requirements of §130.5; and all other requirements in §150.0(k)2.
§150.0(k)2I:	A multiscene programmable controller may be used to comply with dimmer requirements of this section if it provides the functionality of a dimmer according to §110.9, and complies with all other applicable requirements in §150.0(k)2.
§150.0(k)3A:	A minimum of 50 percent of the total rated wattage of permanently installed lighting in kitchens shall be high efficacy.
§150.0(k)3B:	Kitchen lighting includes all permanently installed lighting in the kitchen except internal lighting in cabinets that illuminate only the inside of the cabinets. Lighting in areas adjacent to the kitchen, including but not limited to dining and nook areas, are considered kitchen lighting if they are not separately switched from kitchen lighting.
§150.0(k)4:	Permanently installed lighting that is internal to cabinets shall use no more than 20 watts of power per linear foot of illuminated cabinet.
§150.0(k)5:	A minimum of one high efficacy luminaire shall be installed in each bathroom; and all other lighting installed in each bathroom shall be high efficacy or controlled by vacancy sensors.
§150.0(k)6:	Lighting installed in attached and detached garages, laundry rooms, and utility rooms shall be high efficacy luminaires and controlled by vacancy sensors.
§150.0(k)7:	Lighting installed in rooms or areas other than in kitchens, bathrooms, garages, laundry rooms, and utility rooms shall be high efficacy, or shall be controlled by either dimmers or vacancy sensors.
§150.0(k)8:	Luminaires recessed into ceilings shall: be listed for zero clearance insulation contact (IC) by Underwriters Laboratories or other nationally recognized testing/rating laboratory; have a label that certifies that the luminaire is airtight with air leakage less than 2.0 CFM at 75 Pascals when tested in accordance with ASTM E283; be sealed with a gasket or caulk between the luminaire housing and ceiling, and shall have all air leak paths between conditioned and unconditioned spaces sealed with a gasket or caulk; and allow ballast maintenance and replacement without requiring cutting holes in the ceiling. For recessed compact fluorescent luminaires with ballasts to qualify as high efficacy for compliance with §150.0(k), the ballasts shall be certified to the Energy Commission to comply with the applicable requirements in §110.9.
§150.0(k)9A:	For single-family residential buildings, outdoor lighting permanently mounted to a residential building or other buildings on the same lot shall be high efficacy, or may be low efficacy if it meets all of the following requirements: i. Controlled by a manual ON and OFF switch that does not override to ON the automatic actions of Items ii or iii below; and ii. Controlled by a motion sensor not having an override or bypass switch that disables the motion sensor, or controlled by a motion sensor having a temporary override switch which temporarily bypasses the motion sensing function and automatically reactivates the motion sensor within 6 hours; and iii. Controlled by one of the following methods:

2013 Low-Rise Residential Mandatory Measures Summary

	<p>a. Photocontrol not having an override or bypass switch that disables the photocontrol; or</p> <p>b. Astronomical time clock not having an override or bypass switch that disables the astronomical time clock, and which is programmed to automatically turn the outdoor lighting OFF during daylight hours; or</p> <p>c. Energy management control system which meets all of the following requirements: At a minimum provides the functionality of an astronomical time clock in accordance with §110.9; meets the Installation Certification requirements in §130.4; meets the requirements for an EMCS in §130.5; does not have an override or bypass switch that allows the luminaire to be always ON; and, is programmed to automatically turn the outdoor lighting OFF during daylight hours.</p>
§150.0(k)9B:	<p>For low-rise multifamily residential buildings, outdoor lighting for private patios, entrances, balconies, and porches; and outdoor lighting for residential parking lots and residential carports with less than eight vehicles per site shall comply with one of the following requirements:</p> <p>i. Shall comply with §150.0(k)9A; or</p> <p>ii. Shall comply with the applicable requirements in §110.9, §130.0, §130.2, §130.4, §140.7 and §141.0.</p>
§150.0(k)9C:	For low-rise residential buildings with four or more dwelling units, outdoor lighting not regulated by §150.0(k)9B or 150.0(k)9D shall comply with the applicable requirements in §110.9, §130.0, §130.2, §130.4, §140.7 and §141.0.
§150.0(k)9D:	Outdoor lighting for residential parking lots and residential carports with a total of eight or more vehicles per site shall comply with the applicable requirements in §110.9, §130.0, §130.2, §130.4, §140.7 and §141.0.
§150.0(k)10:	Internally illuminated address signs shall comply with §140.8; or shall consume no more than 5 watts of power as determined according to §130.0(c).
§150.0(k)11:	Lighting for residential parking garages for eight or more vehicles shall comply with the applicable requirements for nonresidential garages in §110.9, §130.0, §130.1, §130.4, §140.6, and §141.0.
§150.0(k)12A:	In a low-rise multifamily residential building where the total interior common area in a single building equals 20 percent or less of the floor area, permanently installed lighting for the interior common areas in that building shall be high efficacy luminaires or controlled by an occupant sensor.
§150.0(k)12B:	<p>In a low-rise multifamily residential building where the total interior common area in a single building equals more than 20 percent of the floor area, permanently installed lighting in that building shall:</p> <p>i. Comply with the applicable requirements in §110.9, §130.0, §130.1, §140.6 and §141.0; and</p> <p>ii. Lighting installed in corridors and stairwells shall be controlled by occupant sensors that reduce the lighting power in each space by at least 50 percent. The occupant sensors shall be capable of turning the light fully On and Off from all designed paths of ingress and egress.</p>
Solar Ready Buildings:	
§110.10(a)1:	Single family residences located in subdivisions with ten or more single family residences and where the application for a tentative subdivision map for the residences has been deemed complete, by the enforcement agency, on or after January 1, 2014, shall comply with the requirements of §110.10(b) through §110.10(e).
§110.10(a)2:	Low-rise multi-family buildings shall comply with the requirements of §110.10(b) through §110.10(d).
§110.10(b)1:	<p>The solar zone shall have a minimum total area as described below. The solar zone shall comply with access, pathway, smoke ventilation, and spacing requirements as specified in Title 24, Part 9 or other Parts of Title 24 or in any requirements adopted by a local jurisdiction. The solar zone total area shall be comprised of areas that have no dimension less than 5 feet and are no less than 80 square feet each for buildings with roof areas less than or equal to 10,000 square feet or no less than 160 square feet each for buildings with roof areas greater than 10,000 square feet.</p> <p>For single family residences the solar zone shall be located on the roof or overhang of the building and have a total area no less than 250 square feet. For low-rise multi-family buildings the solar zone shall be located on the roof or overhang of the building or on the roof or overhang of another structure located within 250 feet of the building or on covered parking installed with the building project and have a total area no less than 15 percent of the total roof area of the building excluding any skylight area.</p>
§110.10(b)2:	All sections of the solar zone located on steep-sloped roofs shall be oriented between 110 degrees and 270 degrees of true north.
§110.10(b)3A:	No obstructions, including but not limited to, vents, chimneys, architectural features, and roof mounted equipment, shall be located in the solar zone.
§110.10(b)3B:	Any obstruction, located on the roof or any other part of the building that projects above a solar zone shall be located at least twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the solar zone, measured in the vertical plane.
§110.10(b)4:	For areas of the roof designated as solar zone, the structural design loads for roof dead load and roof live load shall be clearly indicated on the construction documents.
§110.10(c):	The construction documents shall indicate: a location for inverters and metering equipment and a pathway for routing of conduit from the solar zone to the point of interconnection with the electrical service (for single family residences the point of interconnection will be the main service panel); a pathway for routing of plumbing from the solar zone to the water-heating system.
§110.10(d):	A copy of the construction documents or a comparable document indicating the information from §110.10(b) through §110.10(c) shall be provided to the occupant.
§110.10(e)1:	The main electrical service panel shall have a minimum busbar rating of 200 amps.
§110.10(e)2:	The main electrical service panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation. The reserved space shall be: positioned at the opposite (load) end from the input feeder location or main circuit location, and permanently marked as "For Future Solar Electric".

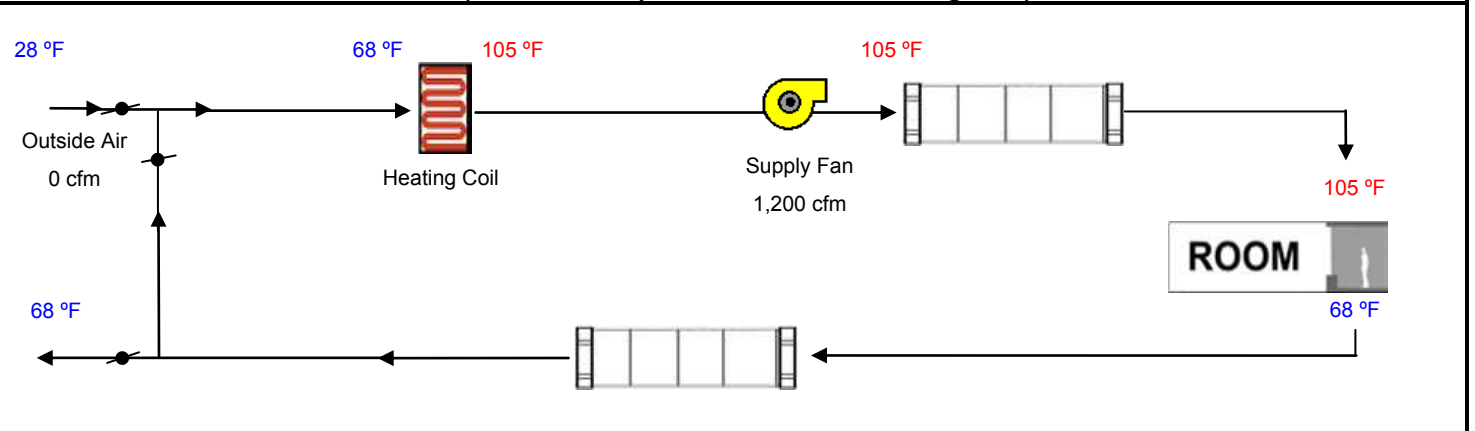
HVAC SYSTEM HEATING AND COOLING LOADS SUMMARY

Project Name		Date	12/14/2015
System Name	New Radiant Floor	Floor Area	2,407

ENGINEERING CHECKS		SYSTEM LOAD					
Number of Systems	1	Total Room Loads	COIL COOLING PEAK			COIL HTG. PEAK	
Heating System			CFM	Sensible	Latent	CFM	Sensible
Output per System	75,000		1,972	40,136	1,177	1,248	49,738
Total Output (Btuh)	75,000		Return Vented Lighting		0		
Output (Btuh/sqft)	31.2		Return Air Ducts		1,421	0	
Cooling System			Return Fan		0	0	
Output per System	0		Ventilation		0	0	0
Total Output (Btuh)	0		Supply Fan		0	0	
Total Output (Tons)	0.0		Supply Air Ducts		1,421	0	
Total Output (Btuh/sqft)	0.0						
Total Output (sqft/Ton)	0.0	TOTAL SYSTEM LOAD		42,978	1,177	49,738	

Air System		HVAC EQUIPMENT SELECTION				
CFM per System	1,200	New Radiant Floor	0	0		75,000
Airflow (cfm)	1,200					
Airflow (cfm/sqft)	0.50					
Airflow (cfm/Ton)	0.0					
Outside Air (%)	0.0 %	Total Adjusted System Output (Adjusted for Peak Design conditions)	0	0		75,000
Outside Air (cfm/sqft)	0.00					
Note: values above given at ARI conditions		TIME OF SYSTEM PEAK		Aug 3 PM	Jan 1 AM	

HEATING SYSTEM PSYCHROMETRICS (Airstream Temperatures at Time of Heating Peak)



COOLING SYSTEM PSYCHROMETRICS (Airstream Temperatures at Time of Cooling Peak)

