

# BUILDING ENERGY ANALYSIS REPORT

## PROJECT:

Residential Performance Sample

## Project Designer:

Jon Doe Design  
123 Easy St.  
San Diego, CA 92000  
858-123-4567

## Report Prepared by:

David Hensel, PE  
Hensel Consulting Engineers, Inc.  
5857 Owens Ave., 3rd Floor  
Carlsbad, CA 92008  
(619) 665-3259



## Job Number:

19479

## Date:

1/2/2020

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 2019 Building Energy Efficiency Standards.

This program developed by EnergySoft Software – [www.energysoft.com](http://www.energysoft.com).

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SAMPLE

**CERTIFICATE OF COMPLIANCE**

**CF1R-PRF-01E**

**Project Name:** 950 Chelham Way

**Calculation Date/Time:** 2020-01-02T08:33:56-08:00

**(Page 1 of 16)**

**Calculation Description:** Title 24 Analysis

**Input File Name:** 950 Chelham Way.ribd19x

GENERAL INFORMATION					
01	<b>Project Name</b>	950 Chelham Way			
02	<b>Run Title</b>	Title 24 Analysis			
03	<b>Project Location</b>	950 Chelham Way			
04	<b>City</b>	Montecito	05	<b>Standards Version</b>	2019
06	<b>Zip code</b>	93108	07	<b>Software Version</b>	EnergyPro 8.0
08	<b>Climate Zone</b>	6	09	<b>Front Orientation (deg/ Cardinal)</b>	20
10	<b>Building Type</b>	SingleFamily	11	<b>Number of Dwelling Units</b>	1
12	<b>Project Scope</b>	NewConstruction	13	<b>Number of Bedrooms</b>	6
14	<b>New Cond. Floor Area (ft<sup>2</sup>)</b>	0	15	<b>Number of Stories</b>	2
16	<b>Existing Cond. Floor Area (ft<sup>2</sup>)</b>	n/a	17	<b>Fenestration Average U-factor</b>	0.421
18	<b>Total Cond. Floor Area (ft<sup>2</sup>)</b>	4133	19	<b>Glazing Percentage (%)</b>	27.50%
20	<b>ADU Bedroom Count</b>	1	21	<b>ADU Conditioned Floor Area</b>	976

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

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Registration Date/Time:

2020-01-02 08:38:17

HERS Provider:

CalCERTS inc.

CA Building Energy Efficiency Standards - 2019 Residential Compliance

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ENERGY DESIGN RATING				
	Energy Design Ratings		Compliance Margins	
	Efficiency <sup>1</sup> (EDR)	Total <sup>2</sup> (EDR)	Efficiency <sup>1</sup> (EDR)	Total <sup>2</sup> (EDR)
Standard Design	43.1	22.2		
Proposed Design	42.8	21.1	0.3	1.1
<b>RESULT: <sup>3</sup> COMPLIES</b>				
<sup>1</sup> Efficiency EDR includes improvements to the building envelope and more efficient equipment				
<sup>2</sup> Total EDR includes efficiency and demand response measures such as photovoltaic (PV) systems and batteries				
<sup>3</sup> Building complies when efficiency and total compliance margins are greater than or equal to zero				
<ul style="list-style-type: none"> <li>Standard Design PV Capacity: 3.91 kWdc</li> <li>Proposed PV kWh output exceeds proposed electricity use by 2.9% which may violate NEM rules. Contact local utility.</li> </ul>				

ENERGY USE SUMMARY				
Energy Use (kTDV/ft <sup>2</sup> -yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	9.86	11.37	-1.51	-15.3
Space Cooling	4.68	4.35	0.33	7.1
IAQ Ventilation	2.58	2.58	0	0
Water Heating	13.05	11.4	1.65	12.6
Self Utilization Credit	n/a	0	0	n/a
<b>Compliance Energy Total</b>	<b>30.17</b>	<b>29.7</b>	<b>0.47</b>	<b>1.6</b>

REQUIRED PV SYSTEMS										
01	02	03	04	05	06	07	08	09	10	11
DC System Size (kWdc)	Exception	Module Type	Array Type	Power Electronics	CFI	Azimuth (deg)	Tilt Input	Array Angle (deg)	Tilt: (x in 12)	Inverter Eff. (%)
4	NA	Standard	Fixed (roof mount)	none	false	180	TiltDeg rees	22	4.85	96

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ENERGY DESIGN RATING BATTERY INPUTS					
01	02	03	04	05	06
Control	Capacity (kWh)	Efficiency	Rate (kW)Rate (kW)	Efficiency	Rate (kW)Rate (kW)
Basic	6	0.96	n/a	0.96	n/a

**REQUIRED SPECIAL FEATURES**

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

- PV System: 4 kWdc
- Battery System: 6 kWh (Self Utilization Credit taken)
- Cool roof
- Ceiling has high level of insulation
- Non-standard duct location (any location other than attic)

**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 tables below. Registered CF2Rs and CF3Rs are required to be completed in the HERS Registry

## Building-level Verifications:

- Quality insulation installation (QII)
- Indoor air quality ventilation
- Kitchen range hood

## Cooling System Verifications:

- Minimum Airflow
- Verified EER
- Verified SEER
- Verified Refrigerant Charge
- Fan Efficacy Watts/CFM

## Heating System Verifications:

- -- None --

## HVAC Distribution System Verifications:

- Duct leakage testing
- Ducts located within the conditioned space (except < 12 lineal ft)

## Domestic Hot Water System Verifications:

- -- None --

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BUILDING - FEATURES INFORMATION						
01	02	03	04	05	06	07
Project Name	Conditioned Floor Area (ft <sup>2</sup> )	Number of Dwelling Units	Number of Bedrooms	Number of Zones	Number of Ventilation Cooling Systems	Number of Water Heating Systems
950 Chelham Way	4133	1	6	3	0	2

ZONE INFORMATION						
01	02	03	04	05	06	07
Zone Name	Zone Type	HVAC System Name	Zone Floor Area (ft <sup>2</sup> )	Avg. Ceiling Height	Water Heating System 1	Water Heating System 2
First Floor	Conditioned	Split System HVAC1	1757	9	DHW Sys 1	N/A
Second Floor	Conditioned	Split System HVAC1	1400	8	DHW Sys 1	N/A
Lower Floor	Conditioned	Split System HVAC2	976	8	DHW Sys 3	N/A

OPAQUE SURFACES							
01	02	03	04	05	06	07	08
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft <sup>2</sup> )	Window and Door Area (ft <sup>2</sup> )	Tilt (deg)
Front Wall	First Floor	R-19 Wall	20	Front	385	121.83	90
Rear Wall	First Floor	R-19 Wall	200	Back	557	204.99	90
Left Wall	First Floor	R-19 Wall	110	Left	418	41.24	90
Right Wall	First Floor	R-19 Wall	290	Right	380	48.21	90
Front Wall 2	Second Floor	R-19 Wall	20	Front	495	125.09	90
Rear Wall 2	Second Floor	R-19 Wall	200	Back	495	146.42	90
Left Wall 2	Second Floor	R-19 Wall	110	Left	398	52.32	90
Right Wall 2	Second Floor	R-19 Wall	290	Right	372	153.16	90
Front Wall 3	Lower Floor	R-19 Wall	20	Front	192	102.27	90
Rear Wall 3	Lower Floor	R-19 Wall	200	Back	192	8.98	90
Left Wall 3	Lower Floor	R-19 Wall	110	Left	216	51.57	90

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OPAQUE SURFACES							
01	02	03	04	05	06	07	08
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft <sup>2</sup> )	Window and Door Area (ft <sup>2</sup> )	Tilt (deg)
Right Wall 3	Lower Floor	R-19 Wall	290	Right	216	25.04	90
Front Wall 4	Lower Floor	R-19 Wall	20	Front	128	16.15	90
Rear Wall 4	Lower Floor	R-19 Wall	200	Back	128	16.15	90
Left Wall 4	Lower Floor	R-19 Wall	110	Left	160	16.04	90
Right Wall 4	Lower Floor	R-19 Wall	290	Right	160	16.04	90
Interior Surface	First Floor>>__Garage__	R-19 Wall1	n/a	n/a	208	0	n/a
Roof-Attic 2	First Floor	R-38 Roof Attic-No Vent	n/a	n/a	224	n/a	n/a
Roof-Attic 3	Second Floor	R-38 Roof Attic-No Vent	n/a	n/a	1395.48	n/a	n/a
Roof-Attic 4	__Garage__	R-0 Roof Attic-No Vent	n/a	n/a	526	n/a	n/a
Interior Surface 2	Second Floor	R-19 Floor No Crawlspace	n/a	n/a	129	n/a	n/a
Interior Surface 3	Second Floor	R-0 Floor No Crawlspace	n/a	n/a	1271	n/a	n/a
Front Wall 5	__Garage__	R-0 Wall	20	Front	226	144	90
Rear Wall 5	__Garage__	R-0 Wall	200	Back	54	0	90
Left Wall 5	__Garage__	R-0 Wall	110	Left	198	136	90
Right Wall 5	__Garage__	R-0 Wall	290	Right	234	36.96	90

OPAQUE SURFACES - CATHEDRAL CEILINGS										
01	02	03	04	05	06	07	08	09	10	11
Name	Zone	Type	Azimuth	Orientation	Area (ft <sup>2</sup> )	Skylight Area (ft <sup>2</sup> )	Roof Rise (x in 12)	Roof Reflectance	Roof Emittance	Cool Roof
Roof-Cathedral	First Floor	R-38 Roof Cathedral	340	n/a	262	0	2	0.2	0.9	Yes
Roof-Attic	Second Floor	R-38 Roof Attic-No Vent1	340	n/a	4.62	4.52	6	0.2	0.9	Yes
Roof-Cathedral 2	Lower Floor	R-38 Roof Cathedral	340	n/a	320	0	5	0.2	0.9	Yes

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01	02	03	04	05	06	07	08	09	10	11
Name	Zone	Type	Azimuth	Orientation	Area (ft <sup>2</sup> )	Skylight Area (ft <sup>2</sup> )	Roof Rise (x in 12)	Roof Reflectance	Roof Emittance	Cool Roof
Roof-Cathedral 3	Lower Floor	R-38 Roof Cathedral	340	n/a	328	0	5	0.2	0.9	Yes

ATTIC							
01	02	03	04	05	06	07	08
Name	Construction	Type	Roof Rise (x in 12)	Roof Reflectance	Roof Emittance	Radiant Barrier	Cool Roof
Attic __Garage__	Attic Garage Roof Cons	Unventilated	3.5	0.2	0.9	No	No
Attic First Floor	Attic RoofFirst Floor	Unventilated	5	0.2	0.9	No	Yes
Attic Second Floor	Attic RoofSecond Floor	Unventilated	6	0.2	0.9	No	Yes

FENESTRATION / GLAZING													
01	02	03	04	05	06	07	08	09	10	11	12	13	14
Name	Type	Surface	Orientation	Azimuth	Width (ft)	Height (ft)	Mult.	Area (ft <sup>2</sup> )	U-factor	U-factor Source	SHGC	SHGC Source	Exterior Shading
Window-U	Window	Front Wall	Front	20			1	40.55	0.4	NFRC	0.28	NFRC	Bug Screen
Swinging Door-1	Window	Front Wall	Front	20			1	28	0.4	NFRC	0.28	NFRC	Bug Screen
Window-V	Window	Front Wall	Front	20			1	53.28	0.4	NFRC	0.28	NFRC	Bug Screen
Window-C	Window	Rear Wall	Back	200			1	3.85	0.4	NFRC	0.28	NFRC	Bug Screen
Window-U 2	Window	Rear Wall	Back	200			1	40.55	0.4	NFRC	0.28	NFRC	Bug Screen
Folding Door-5	Window	Rear Wall	Back	200			1	96	0.4	NFRC	0.28	NFRC	Bug Screen
Window-Y	Window	Rear Wall	Back	200			1	32.44	0.4	NFRC	0.28	NFRC	Bug Screen
Window-B	Window	Rear Wall	Back	200			1	7.32	0.4	NFRC	0.28	NFRC	Bug Screen
Swinging Door-4	Window	Rear Wall	Back	200			1	24.83	0.4	NFRC	0.28	NFRC	Bug Screen
Window-F	Window	Left Wall	Left	110			1	15.39	0.4	NFRC	0.28	NFRC	Bug Screen
Window-P	Window	Left Wall	Left	110			1	10.46	0.4	NFRC	0.28	NFRC	Bug Screen
Window-G	Window	Left Wall	Left	110			1	15.39	0.4	NFRC	0.28	NFRC	Bug Screen

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FENESTRATION / GLAZING													
01	02	03	04	05	06	07	08	09	10	11	12	13	14
Name	Type	Surface	Orientation	Azimuth	Width (ft)	Height (ft)	Mult.	Area (ft <sup>2</sup> )	U-factor	U-factor Source	SHGC	SHGC Source	Exterior Shading
Window-O	Window	Right Wall	Right	290			1	9.03	0.4	NFRC	0.28	NFRC	Bug Screen
Window-O 2	Window	Right Wall	Right	290			1	9.03	0.4	NFRC	0.28	NFRC	Bug Screen
Window-X	Window	Right Wall	Right	290			1	30.15	0.4	NFRC	0.28	NFRC	Bug Screen
Window-D	Window	Front Wall 2	Front	20			1	9.82	0.4	NFRC	0.28	NFRC	Bug Screen
Window-M	Window	Front Wall 2	Front	20			1	20.74	0.4	NFRC	0.28	NFRC	Bug Screen
Window-L	Window	Front Wall 2	Front	20			1	8.02	0.4	NFRC	0.28	NFRC	Bug Screen
Window-N	Window	Front Wall 2	Front	20			1	28.53	0.4	NFRC	0.28	NFRC	Bug Screen
Window-J	Window	Front Wall 2	Front	20			1	24.64	0.4	NFRC	0.28	NFRC	Bug Screen
Window-S	Window	Front Wall 2	Front	20			1	33.34	0.4	NFRC	0.28	NFRC	Bug Screen
Window-Q	Window	Rear Wall 2	Back	200			1	22.69	0.4	NFRC	0.28	NFRC	Bug Screen
Window-Z	Window	Rear Wall 2	Back	200			1	86.54	0.4	NFRC	0.28	NFRC	Bug Screen
Window-S 2	Window	Rear Wall 2	Back	200			1	33.34	0.4	NFRC	0.28	NFRC	Bug Screen
Window-E	Window	Rear Wall 2	Back	200			1	3.85	0.4	NFRC	0.28	NFRC	Bug Screen
Window-M 2	Window	Left Wall 2	Left	110			1	20.74	0.4	NFRC	0.28	NFRC	Bug Screen
Window-H	Window	Left Wall 2	Left	110			1	11.78	0.4	NFRC	0.28	NFRC	Bug Screen
Window-L 2	Window	Left Wall 2	Left	110			1	8.02	0.4	NFRC	0.28	NFRC	Bug Screen
Window-K	Window	Left Wall 2	Left	110			1	11.78	0.4	NFRC	0.28	NFRC	Bug Screen
Window-T	Window	Right Wall 2	Right	290			1	41.82	0.4	NFRC	0.28	NFRC	Bug Screen
Window-L 3	Window	Right Wall 2	Right	290			1	8.02	0.4	NFRC	0.28	NFRC	Bug Screen
Window-R	Window	Right Wall 2	Right	290			1	27.32	0.4	NFRC	0.28	NFRC	Bug Screen
Window-AA	Window	Right Wall 2	Right	290			1	76	0.4	NFRC	0.28	NFRC	Bug Screen
Window-F 2	Window	Front Wall 3	Front	20			1	16.15	0.4	NFRC	0.28	NFRC	Bug Screen
Swinging Door-1 2	Window	Front Wall 3	Front	20			1	46.25	0.4	NFRC	0.28	NFRC	Bug Screen
Window-H 2	Window	Front Wall 3	Front	20			1	39.87	0.4	NFRC	0.28	NFRC	Bug Screen
Window-D 2	Window	Rear Wall 3	Back	200			1	8.98	0.4	NFRC	0.28	NFRC	Bug Screen

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FENESTRATION / GLAZING													
01	02	03	04	05	06	07	08	09	10	11	12	13	14
Name	Type	Surface	Orientation	Azimuth	Width (ft)	Height (ft)	Mult.	Area (ft <sup>2</sup> )	U-factor	U-factor Source	SHGC	SHGC Source	Exterior Shading
Window-C 2	Window	Left Wall 3	Left	110			1	5.85	0.4	NFRC	0.28	NFRC	Bug Screen
Window-A	Window	Left Wall 3	Left	110			1	5.85	0.4	NFRC	0.28	NFRC	Bug Screen
Window-J 2	Window	Left Wall 3	Left	110			1	39.87	0.4	NFRC	0.28	NFRC	Bug Screen
Window-C 3	Window	Right Wall 3	Right	290			1	5.85	0.4	NFRC	0.28	NFRC	Bug Screen
Window-B 2	Window	Right Wall 3	Right	290			1	5.85	0.4	NFRC	0.28	NFRC	Bug Screen
Window-G 2	Window	Front Wall 4	Front	20			1	16.15	0.4	NFRC	0.28	NFRC	Bug Screen
Window-G 3	Window	Rear Wall 4	Back	200			1	16.15	0.4	NFRC	0.28	NFRC	Bug Screen
Window-E 2	Window	Left Wall 4	Left	110			1	8.02	0.4	NFRC	0.28	NFRC	Bug Screen
Window-E 3	Window	Left Wall 4	Left	110			1	8.02	0.4	NFRC	0.28	NFRC	Bug Screen
Window-E 4	Window	Right Wall 4	Right	290			1	8.02	0.4	NFRC	0.28	NFRC	Bug Screen
Window-E 5	Window	Right Wall 4	Right	290			1	8.02	0.4	NFRC	0.28	NFRC	Bug Screen
Swinging Door-2	Window	Left Wall 5	Left	110			1	24	0.4	NFRC	0.28	NFRC	Bug Screen
Window-A 2	Window	Right Wall 5	Right	290			1	6.48	0.4	NFRC	0.28	NFRC	Bug Screen
Window-A 3	Window	Right Wall 5	Right	290			1	6.48	0.4	NFRC	0.28	NFRC	Bug Screen
Swinging Door-3	Window	Right Wall 5	Right	290			1	24	0.4	NFRC	0.28	NFRC	Bug Screen
Skylight-CC	Skylight	Roof-Attic		0			1	4.52	0.4	NFRC	0.28	NFRC	None

OPAQUE DOORS			
01	02	03	04
Name	Side of Building	Area (ft <sup>2</sup> )	U-factor
Swinging Door-2 2	Right Wall 3	13.34	0.2
Garage Door-7	Front Wall 5	144	1
Garage Door-6	Left Wall 5	56	1
Garage Door-6 2	Left Wall 5	56	1

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SLAB FLOORS						
01	02	03	04	05	06	07
Name	Zone	Area (ft2)	Perimeter (ft)	Edge Insul. R-value and Depth	Carpeted Fraction	Heated
Slab-on-Grade	First Floor	1757	0.1	None	80%	No
Slab-on-Grade 2	Lower Floor	648	102	None	80%	No
Slab-on-Grade 3	__Garage__	655	0.1	None	0%	No

OPAQUE SURFACE CONSTRUCTIONS							
01	02	03	04	05	06	07	08
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Interior / Exterior Continuous R-value	U-factor	Assembly Layers
R-0 Wall	Exterior Walls	Wood Framed Wall	2x4 @ 16 in. O. C.	R-0	None / None	0.302	Inside Finish: Gypsum Board Cavity / Frame: no insul. / 2x4 Exterior Finish: Wood Siding/sheathing/decking
R-19 Wall	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-19	None / None	0.07	Inside Finish: Gypsum Board Cavity / Frame: R-19 in 5-1/2 in. (R-18) / 2x6 Exterior Finish: Wood Siding/sheathing/decking
R-38 Roof Cathedral	Cathedral Ceilings	Wood Framed Ceiling	2x12 @ 24 in. O. C.	R-38	None / None	0.028	Roofing: 10 PSF (RoofTile) Tile Gap: present Roof Deck: Wood Siding/sheathing/decking Cavity / Frame: R-38 / 2x12 Inside Finish: Gypsum Board

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CA Building Energy Efficiency Standards - 2019 Residential Compliance

Report Version: 2019.1.100

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**CERTIFICATE OF COMPLIANCE**

**CF1R-PRF-01E**

**Project Name:** 950 Chelham Way

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**Calculation Description:** Title 24 Analysis

**Input File Name:** 950 Chelham Way.ribd19x

OPAQUE SURFACE CONSTRUCTIONS							
01	02	03	04	05	06	07	08
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Interior / Exterior Continuous R-value	U-factor	Assembly Layers
R-38 Roof Attic-No Vent1	Cathedral Ceilings	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-38	None / None	0.034	Roofing: 10 PSF (RoofTile) Tile Gap: present Roof Deck: Wood Siding/sheathing/decking Cavity / Frame: R-38 / 2x4 Inside Finish: Gypsum Board
R-19 Wall1	Interior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-19	None / None	0.069	Inside Finish: Gypsum Board Cavity / Frame: R-19 in 5-1/2 in. (R-18) / 2x6 Other Side Finish: Gypsum Board
Attic Garage Roof Cons	Attic Roofs	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-0	None / None	0.4	Roofing: 10 PSF (RoofTile) Tile Gap: present Roof Deck: Wood Siding/sheathing/decking Cavity / Frame: no insul. / 2x4
Attic RoofFirst Floor	Attic Roofs	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-0	None / None	0.4	Roofing: 10 PSF (RoofTile) Tile Gap: present Roof Deck: Wood Siding/sheathing/decking Cavity / Frame: no insul. / 2x4
Attic RoofSecond Floor	Attic Roofs	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-0	None / None	0.4	Roofing: 10 PSF (RoofTile) Tile Gap: present Roof Deck: Wood Siding/sheathing/decking Cavity / Frame: no insul. / 2x4
R-0 Roof Attic-No Vent	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-0	None / None	0.481	Cavity / Frame: no insul. / 2x4 Inside Finish: Gypsum Board

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OPAQUE SURFACE CONSTRUCTIONS							
01	02	03	04	05	06	07	08
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Interior / Exterior Continuous R-value	U-factor	Assembly Layers
R-38 Roof Attic-No Vent	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-38	None / None	0.025	Over Ceiling Joists: R-28.9 insul. Cavity / Frame: R-9.1 / 2x4 Inside Finish: Gypsum Board
R-19 Floor No Crawlspace	Interior Floors	Wood Framed Floor	2x10 @ 16 in. O. C.	R-19	None / None	0.045	Floor Surface: Carpeted Floor Deck: Wood Siding/sheathing/decking Cavity / Frame: R-19 / 2x10 Ceiling Below Finish: Gypsum Board
R-0 Floor No Crawlspace	Interior Floors	Wood Framed Floor	2x12 @ 16 in. O. C.	R-0	None / None	0.196	Floor Surface: Carpeted Floor Deck: Wood Siding/sheathing/decking Cavity / Frame: no insul. / 2x12 Ceiling Below Finish: Gypsum Board

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

WATER HEATING SYSTEMS						
01	02	03	04	05	06	07
Name	System Type	Distribution Type	Water Heater Name (#)	Solar Fraction (%)	Compact Distribution	HERS Verification
DHW Sys 1	Domestic Hot Water (DHW)	Standard Distribution System	DHW Heater 1 (1)	0	None	n/a
DHW Sys 3	Domestic Hot Water (DHW)	Standard Distribution System	DHW Heater 3 (1)	0	None	n/a

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WATER HEATERS											
01	02	03	04	05	06	07	08	09	10	11	12
Name	Heating Element Type	Tank Type	# Units	Tank Vol. (gal)	Energy Factor or Efficiency	Input Rating or Pilot	Tank Insulation R-value (Int/Ext)	Standby Loss or Recovery Eff.	1st Hr. Rating or Flow Rate	NEEA Heat Pump Brand or Model / Other	Tank Location or Ambient Condition
DHW Heater 1	Natural Gas	Consumer Instantaneous	1	0	0.96-UEF	200000-Btu/Hr	0	n/a	n/a	n/a	n/a
DHW Heater 3	Natural Gas	Consumer Instantaneous	1	0	0.96-UEF	200000-Btu/Hr	0	n/a	n/a	n/a	n/a

WATER HEATING - HERS VERIFICATION							
01	02	03	04	05	06	07	08
Name	Pipe Insulation	Parallel Piping	Compact Distribution	Compact Distribution Type	Recirculation Control	Central DHW Distribution	Shower Drain Water Heat Recovery
DHW Sys 1 - 1/1	Not Required	Not Required	Not Required	None	Not Required	Not Required	Not Required
DHW Sys 3 - 1/1	Not Required	Not Required	Not Required	None	Not Required	Not Required	Not Required

SPACE CONDITIONING SYSTEMS								
01	02	03	04	05	06	07	08	09
Name	System Type	Heating Unit Name	Cooling Unit Name	Fan Name	Distribution Name	Required Thermostat Type	Heating Equipment Count	Cooling Equipment Count
Split System HVAC1	Heating and cooling system other	Heating Component 1	Cooling Component 1	HVAC Fan 1	Air Distribution System 1	SetbackSetback	2	2
Split System HVAC2	Heating and cooling system other	Heating Component 2	Cooling Component 2	HVAC Fan 2	Air Distribution System 2	SetbackSetback	2	2

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HVAC - HEATING UNIT TYPES				
01	02	03	04	05
Name	System Type	Number of Units	Heating Efficiency Type	Efficiency
Heating Component 1	Central gas furnace	2	AFUE	90
Heating Component 2	Central gas furnace	2	AFUE	90

HVAC - COOLING UNIT TYPES							
01	02	03	04	05	06	07	08
Name	System Type	Number of Units	Efficiency EER	Efficiency SEER	Zonally Controlled	Mult-speed Compressor	HERS Verification
Cooling Component 1	Central split AC	2	12.5	15	Not Zonal	Single Speed	Cooling Component 1-hers-cool
Cooling Component 2	Central split AC	2	12.5	15	Not Zonal	Single Speed	Cooling Component 2-hers-cool

HVAC COOLING - HERS VERIFICATION						
01	02	03	04	05	06	
Name	Verified Airflow	Airflow Target	Verified EER	Verified SEER	Verified Refrigerant Charge	
Cooling Component 1-hers-cool	Required	350	Required	Required	Required	
Cooling Component 2-hers-cool	Required	350	Required	Required	Required	

HVAC - DISTRIBUTION SYSTEMS												
01	02	03	04	05	06	07	08	09	10	11	12	
Name	Type	Design Type	Duct Ins. R-value		Duct Location		Surface Area		Bypass Duct	Duct Leakage	HERS Verification	
			Supply	Return	Supply	Return	Supply	Return				
Air Distribution System 1	Unconditioned attic	Non-Verified	R-6	R-6	Attic	Attic	n/a	n/a	No Bypass Duct	Sealed and Tested	Air Distribution System 1-hers-dist	

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HVAC - DISTRIBUTION SYSTEMS											
01	02	03	04	05	06	07	08	09	10	11	12
			Duct Ins. R-value		Duct Location		Surface Area				
Name	Type	Design Type	Supply	Return	Supply	Return	Supply	Return	Bypass Duct	Duct Leakage	HERS Verification
Air Distribution System 2	Conditioned space - except 12ft	Non-Verified	R-6	R-6	Conditioned Zone	Conditioned Zone	n/a	n/a	No Bypass Duct	Sealed and Tested	Air Distribution System 2-hers-dist

HVAC DISTRIBUTION - HERS VERIFICATION								
01	02	03	04	05	06	07	08	09
Name	Duct Leakage Verification	Duct leakage target (%)	Verified Duct Location	Verified Duct Design	Buried Ducts	Deeply Buried Ducts	Low-leakage Air Handler	Low Leakage Ducts Entirely in Conditioned Space
Air Distribution System 1-hers-dist	Yes	5	Not Required	Not Required	Not Required	Credit not taken	Not Required	No
Air Distribution System 2-hers-dist	Yes	5	Required	Not Required	Not Required	Credit not taken	Not Required	No

HVAC - FAN SYSTEMS			
01	02	03	04
Name	Type	Fan Power (Watts/CFM)	Name
HVAC Fan 1	HVAC Fan	0.45	HVAC Fan 1-hers-fan
HVAC Fan 2	HVAC Fan	0.45	HVAC Fan 2-hers-fan

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HVAC FAN SYSTEMS - HERS VERIFICATION		
01	02	03
Name	Verified Fan Watt Draw	Required Fan Efficiency (Watts/CFM)
HVAC Fan 1-hers-fan	Required	0.45
HVAC Fan 2-hers-fan	Required	0.45

IAQ (INDOOR AIR QUALITY) FANS					
01	02	03	04	05	06
Dwelling Unit	IAQ CFM	IAQ Watts/CFM	IAQ Fan Type	IAQ Recovery Effectiveness (%)	HERS Verification
SFam IAQVentRpt	136	0.25	Default	0	Yes
SFam ADU IAQVentRpt	44	0.25	Default	0	Yes



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**DOCUMENTATION AUTHOR'S DECLARATION STATEMENT**

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: Dave Hensel	Documentation Author Signature: 
Company: Title24ca.com	Signature Date: 2020-01-02 08:38:17
Address: 1747 Grain Mill Road	CEA/ HERS Certification Identification (If applicable):
City/State/Zip: San Marcos, CA 92078	Phone: 619-665-3259

**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: Dave Hensel	Responsible Designer Signature: 
Company: Title24ca.com	Date Signed: 2020-01-02 08:38:17
Address: 1747 Grain Mill Road	License: N/A
City/State/Zip: San Marcos, CA 92078	Phone: 619-665-3259

Digitally signed by CalCERTS. This digital signature is provided in order to secure the content of this registered document, and in no way implies Registration

Provider responsibility for the accuracy of the information.



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# RESIDENTIAL MEASURES SUMMARY

RMS-1

Project Name <b>950 Chelham Way</b>	Building Type <input checked="" type="checkbox"/> Single Family <input type="checkbox"/> Addition Alone <input type="checkbox"/> Multi Family <input type="checkbox"/> Existing+ Addition/Alteration	Date <b>1/2/2020</b>
Project Address <b>950 Chelham Way Montecito</b>	California Energy Climate Zone <b>CA Climate Zone 06</b>	Total Cond. Floor Area <b>4,133</b>
	Addition <b>n/a</b>	# of Units <b>1</b>

INSULATION		Cavity	Area (ft <sup>2</sup> )	Special Features	Status
Slab	Unheated Slab-on-Grade	- no insulation	2,405	Perim = 102'	New
Roof	Wood Framed Attic	R 38	1,619	Cool Roof	New
Roof	Wood Framed Rafter	R 38	910	Cool Roof	New
Wall	Wood Framed	R 19	3,955		New
Demising	Wood Framed w/o Crawl Space	R 19	129		New
Demising	Wood Framed w/o Crawl Space	- no insulation	1,271		New
Door	Opaque Door	R-5	13		New

FENESTRATION		Total Area:	Glazing Percentage:	New/Altered Average U-Factor:		Status
Orientation	Area(ft <sup>2</sup> )	U-Fac	SHGC	Overhang	Sidefins	Exterior Shades
Front (N)	291.1	0.400	0.28	none	none	Bug Screen
Front (N)	74.3	0.400	0.28	none	none	Bug Screen
Rear (S)	255.7	0.400	0.28	none	none	Bug Screen
Rear (S)	96.0	0.400	0.28	none	none	Bug Screen
Rear (S)	24.8	0.400	0.28	none	none	Bug Screen
Left (E)	161.2	0.400	0.28	none	none	Bug Screen
Right (W)	229.1	0.400	0.28	none	none	Bug Screen
Skylight	4.5	0.400	0.28	none	none	None

HVAC SYSTEMS		Min. Eff	Cooling	Min. Eff	Thermostat	Status
Qty.	Heating					
2	Central Furnace	90% AFUE	Split Air Conditioner	15.0 SEER	Setback	New
2	Central Furnace	90% AFUE	Split Air Conditioner	15.0 SEER	Setback	New

HVAC DISTRIBUTION		Heating	Cooling	Duct Location	Duct R-Value	Status
Location						
Split System HVAC	Ducted	Ducted	Attic	6.0	New	
Split System HVAC	Ducted	Ducted	Conditioned	6.0	New	

WATER HEATING		Gallons	Min. Eff	Distribution	Status
Qty.	Type				
1	Small Instantaneous Gas	0	0.96	Standard	New
1	Small Instantaneous Gas	0	0.96	Standard	New



# 2019 Low-Rise Residential Mandatory Measures Summary

*NOTE: Low-rise residential buildings subject to the Energy Standards must comply with all applicable mandatory measures, regardless of the compliance approach used. Review the respective section for more information. \*Exceptions may apply. (Original 08/2019)*

<b>Building Envelope Measures:</b>	
§ 110.6(a)1:	<b>Air Leakage.</b> Manufactured fenestration, exterior doors, and exterior pet doors must limit air leakage to 0.3 cfm per square foot or less when tested per NFRC-400, ASTM E283 or AAMA/WDMA/CSA 101/I.S.2/A440-2011.*
§ 110.6(a)5:	<b>Labeling.</b> Fenestration products and exterior doors must have a label meeting the requirements of Section 10-111(a).
§ 110.6(b):	<b>Field fabricated exterior doors and fenestration</b> products must use U-factors and solar heat gain coefficient (SHGC) values from Tables 110.6-A, 110.6-B, or JA4.5 for exterior doors. They must be caulked and/or weather stripped.*
§ 110.7:	<b>Air Leakage.</b> All joints, penetrations, and other openings in the building envelope that are potential sources of air leakage must be caulked, gasketed, or weather stripped.
§ 110.8(a):	<b>Insulation Certification by Manufacturers.</b> Insulation must be certified by the Department of Consumer Affairs, Bureau of Household Goods and Services (BHGS).
§ 110.8(g):	<b>Insulation Requirements for Heated Slab Floors.</b> Heated slab floors must be insulated per the requirements of Section 110.8(g).
§ 110.8(i):	<b>Roofing Products Solar Reflectance and Thermal Emittance.</b> The thermal emittance and aged solar reflectance values of the roofing material must meet the requirements of § 110.8(i) and be labeled per §10-113 when the installation of a cool roof is specified on the CF1R.
§ 110.8(j):	<b>Radiant Barrier.</b> When required, radiant barriers must have an emittance of 0.05 or less and be certified to the Department of Consumer Affairs.
§ 150.0(a):	<b>Ceiling and Rafter Roof Insulation.</b> Minimum R-22 insulation in wood-frame ceiling; or the weighted average U-factor must not exceed 0.043. Minimum R-19 or weighted average U-factor of 0.054 or less in a rafter roof alteration. Attic access doors must have permanently attached insulation using adhesive or mechanical fasteners. The attic access must be gasketed to prevent air leakage. Insulation must be installed in direct contact with a continuous roof or ceiling which is sealed to limit infiltration and exfiltration as specified in § 110.7, including but not limited to placing insulation either above or below the roof deck or on top of a drywall ceiling.*
§ 150.0(b):	<b>Loose-fill Insulation.</b> Loose fill insulation must meet the manufacturer's required density for the labeled R-value.
§ 150.0(c):	<b>Wall Insulation.</b> Minimum R-13 insulation in 2x4 inch wood framing wall or have a U-factor of 0.102 or less, or R-20 in 2x6 inch wood framing or have a U-factor of 0.071 or less, (R-19 in 2x6 or U-factor of 0.074 or less). Opaque non-framed assemblies must have an overall assembly U-factor not exceeding 0.102, equivalent to an installed value of R-13 in a wood framed assembly. Masonry walls must meet Table 150.1-A or B.*
§ 150.0(d):	<b>Raised-floor Insulation.</b> Minimum R-19 insulation in raised wood framed floor or 0.037 maximum U-factor.*
§ 150.0(f):	<b>Slab Edge Insulation.</b> Slab edge insulation must meet all of the following: have a water absorption rate, for the insulation material alone without facings no greater than 0.3%; have a water vapor permeance no greater than 2.0 perm per inch; be protected from physical damage and UV light deterioration; and, when installed as part of a heated slab floor, meet the requirements of § 110.8(g).
§ 150.0(g)1:	<b>Vapor Retarder.</b> In climate zones 1 through 16, the earth floor of unvented crawl space must be covered with a Class I or Class II vapor retarder. This requirement also applies to controlled ventilation crawl space for buildings complying with the exception to § 150.0(d).
§ 150.0(g)2:	<b>Vapor Retarder.</b> In climate zones 14 and 16, a Class I or Class II vapor retarder must 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(q):	<b>Fenestration Products.</b> Fenestration, including skylights, separating conditioned space from unconditioned space or outdoors must have a maximum U-factor of 0.58; or the weighted average U-factor of all fenestration must not exceed 0.58.*
<b>Fireplaces, Decorative Gas Appliances, and Gas Log Measures:</b>	
§ 110.5(e)	<b>Pilot Light.</b> Continuously burning pilot lights are not allowed for indoor and outdoor fireplaces.
§ 150.0(e)1:	<b>Closable Doors.</b> Masonry or factory-built fireplaces must have a closable metal or glass door covering the entire opening of the firebox.
§ 150.0(e)2:	<b>Combustion Intake.</b> Masonry or factory-built fireplaces must 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 combustion-air control device.*
§ 150.0(e)3:	<b>Flue Damper.</b> Masonry or factory-built fireplaces must have a flue damper with a readily accessible control.*
<b>Space Conditioning, Water Heating, and Plumbing System Measures:</b>	
§ 110.0-§ 110.3:	<b>Certification.</b> Heating, ventilation and air conditioning (HVAC) equipment, water heaters, showerheads, faucets, and all other regulated appliances must be certified by the manufacturer to the Energy Commission.*
§ 110.2(a):	<b>HVAC Efficiency.</b> Equipment must meet the applicable efficiency requirements in Table 110.2-A through Table 110.2-K.*
§ 110.2(b):	<b>Controls for Heat Pumps with Supplementary Electric Resistance Heaters.</b> Heat pumps with supplementary electric resistance heaters must have controls that prevent supplementary heater operation when the heating load can be met by the heat pump alone; and in which the cut-on temperature for compression heating is higher than the cut-on temperature for supplementary heating, and the cut-off temperature for compression heating is higher than the cut-off temperature for supplementary heating.*
§ 110.2(c):	<b>Thermostats.</b> All heating or cooling systems not controlled by a central energy management control system (EMCS) must have a setback thermostat.*
§ 110.3(c)4:	<b>Water Heating Recirculation Loops Serving Multiple Dwelling Units.</b> Water heating recirculation loops serving multiple dwelling units must meet the air release valve, backflow prevention, pump priming, pump isolation valve, and recirculation loop connection requirements of § 110.3(c)4.
§ 110.3(c)6:	<b>Isolation Valves.</b> Instantaneous water heaters with an input rating greater than 6.8 kBtu per hour (2 kW) must have isolation valves with hose bibbs or other fittings on both cold and hot water lines to allow for flushing the water heater when the valves are closed.
§ 110.5:	<b>Pilot Lights.</b> 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:	<b>Building Cooling and Heating Loads.</b> Heating and/or cooling loads are calculated in accordance with the ASHRAE Handbook, Equipment Volume, Applications Volume, and Fundamentals Volume; the SMACNA Residential Comfort System Installation Standards Manual; or the ACCA Manual J using design conditions specified in § 150.0(h)2.



## 2019 Low-Rise Residential Mandatory Measures Summary

§ 150.0(h)3A:	<b>Clearances.</b> Air conditioner and heat pump outdoor condensing units must have a clearance of at least 5 feet from the outlet of any dryer vent.
§ 150.0(h)3B:	<b>Liquid Line Drier.</b> Air conditioners and heat pump systems must be equipped with liquid line filter driers if required, as specified by the manufacturer's instructions.
§ 150.0(j)1:	<b>Storage Tank Insulation.</b> Unfired hot water tanks, such as storage tanks and backup storage tanks for solar water-heating systems, must have a minimum of 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:	<b>Water Piping, Solar Water-heating System Piping, and Space Conditioning System Line Insulation.</b> All domestic hot water piping must be insulated as specified in Section 609.11 of the California Plumbing Code. In addition, the following piping conditions must have a minimum insulation wall thickness of 1 inch or a minimum insulation R-value of 7.7: the first 5 feet of cold water pipes from the storage tank; all hot water piping with a nominal diameter equal to or greater than 3/4 inch and less than 1 inch; all hot water piping with a nominal diameter less than 3/4 inch that is: associated with a domestic hot water recirculation system, from the heating source to storage tank or between tanks, buried below grade, and from the heating source to kitchen fixtures.*
§ 150.0(j)3:	<b>Insulation Protection.</b> Piping insulation must be protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind as required by Section 120.3(b). Insulation exposed to weather must be water retardant and protected from UV light (no adhesive tapes). Insulation covering chilled water piping and refrigerant suction piping located outside the conditioned space must include, or be protected by, a Class I or Class II vapor retarder. Pipe insulation buried below grade must be installed in a waterproof and non-crushable casing or sleeve.
§ 150.0(n)1:	<b>Gas or Propane Water Heating Systems.</b> Systems using gas or propane water heaters to serve individual dwelling units must include all of the following: A dedicated 125 volt, 20 amp electrical receptacle that is connected to the electric panel with a 120/240 volt 3 conductor, 10 AWG copper branch circuit, within 3 feet from the water heater without obstruction. Both ends of the unused conductor must be labeled with the word "spare" and be electrically isolated. Have a reserved single pole circuit breaker space in the electrical panel adjacent to the circuit breaker for the branch circuit and labeled with the words "Future 240V Use"; 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 water heater, and allows natural draining without pump assistance; and a gas supply line with a capacity of at least 200,000 Btu per hour.
§ 150.0(n)2:	<b>Recirculating Loops.</b> Recirculating loops serving multiple dwelling units must meet the requirements of § 110.3(c)5.
§ 150.0(n)3:	<b>Solar Water-heating Systems.</b> Solar water-heating systems and collectors must be certified and rated by the Solar Rating and Certification Corporation (SRCC), the International Association of Plumbing and Mechanical Officials, Research and Testing (IAPMO R&T), or by a listing agency that is approved by the Executive Director.
<b>Ducts and Fans Measures:</b>	
§ 110.8(d)3:	<b>Ducts.</b> Insulation installed on an existing space-conditioning duct must comply with California Mechanical Code (CMC) Section 604.0. If a contractor installs the insulation, the contractor must certify to the customer in writing, that the insulation meets this requirement.
§ 150.0(m)1:	<b>CMC Compliance.</b> All air-distribution system ducts and plenums must meet the requirements of the CMC Section 601.0, 602.0, 603.0, 604.0, 605.0 and ANSI/SMACNA-006-2006 HVAC Duct Construction Standards Metal and Flexible 3rd Edition. Portions of supply-air and return-air ducts and plenums must be insulated to a minimum installed level of R-6.0 or a minimum installed level of R-4.2 when ducts are entirely in conditioned space as confirmed through field verification and diagnostic testing (RA3.1.4.3.8). Portions of the duct system completely exposed and surrounded by directly conditioned space are not required to be insulated. Connections of metal ducts and inner core of flexible ducts must be mechanically fastened. Openings must 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 must be used. Building cavities, support platforms for air handlers, and plenums designed or constructed with materials other than sealed sheet metal, duct board or flexible duct must not be used to convey conditioned air. Building cavities and support platforms may contain ducts. Ducts installed in cavities and support platforms must not be compressed to cause reductions in the cross-sectional area.
§ 150.0(m)2:	<b>Factory-Fabricated Duct Systems.</b> Factory-fabricated duct systems must comply with applicable requirements for duct construction, connections, and closures; joints and seams of duct systems and their components must 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:	<b>Field-Fabricated Duct Systems.</b> Field-fabricated duct systems must comply with applicable requirements for: pressure-sensitive tapes, mastics, sealants, and other requirements specified for duct construction.
§ 150.0(m)7:	<b>Backdraft Damper.</b> Fan systems that exchange air between the conditioned space and outdoors must have backdraft or automatic dampers.
§ 150.0(m)8:	<b>Gravity Ventilation Dampers.</b> Gravity ventilating systems serving conditioned space must have either automatic or readily accessible, manually operated dampers in all openings to the outside, except combustion inlet and outlet air openings and elevator shaft vents.
§ 150.0(m)9:	<b>Protection of Insulation.</b> Insulation must be protected from damage, sunlight, moisture, equipment maintenance, and wind. Insulation exposed to weather must be suitable for outdoor service. For example, protected by aluminum, sheet metal, painted canvas, or plastic cover. Cellular foam insulation must be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation.
§ 150.0(m)10:	<b>Porous Inner Core Flex Duct.</b> Porous inner core flex ducts must have a non-porous layer between the inner core and outer vapor barrier.
§ 150.0(m)11:	<b>Duct System Sealing and Leakage Test.</b> When space conditioning systems use forced air duct systems to supply conditioned air to an occupiable space, the ducts must be sealed and duct leakage tested, as confirmed through field verification and diagnostic testing, in accordance with § 150.0(m)11 and Reference Residential Appendix RA3.
§ 150.0(m)12:	<b>Air Filtration.</b> Space conditioning systems with ducts exceeding 10 feet and the supply side of ventilation systems must have MERV 13 or equivalent filters. Filters for space conditioning systems must have a 2 inch depth or can be 1 inch if sized per Equation 150.0-A. Pressure drops and labeling must meet the requirements in §150.0(m)12. Filters must be accessible for regular service.*
§ 150.0(m)13:	<b>Space Conditioning System Airflow Rate and Fan Efficacy.</b> Space conditioning systems that use ducts to supply cooling must have a hole for the placement of a static pressure probe, or a permanently installed static pressure probe in the supply plenum. Airflow must be $\geq 350$ CFM per ton of nominal cooling capacity, and an air-handling unit fan efficacy $\leq 0.45$ watts per CFM for gas furnace air handlers and $\leq 0.58$ watts per CFM for all others. Small duct high velocity systems must provide an airflow $\geq 250$ CFM per ton of nominal cooling capacity, and an air-handling unit fan efficacy $\leq 0.62$ watts per CFM. Field verification testing is required in accordance with Reference Residential Appendix RA3.3.*



# 2019 Low-Rise Residential Mandatory Measures Summary

Requirements for Ventilation and Indoor Air Quality:	
§ 150.0(o)1:	<b>Requirements for Ventilation and Indoor Air Quality.</b> All dwelling units must meet the requirements of ASHRAE Standard 62.2, Ventilation and Acceptable Indoor Air Quality in Residential Buildings subject to the amendments specified in § 150.0(o)1.
§ 150.0(o)1C:	<b>Single Family Detached Dwelling Units.</b> Single family detached dwelling units, and attached dwelling units not sharing ceilings or floors with other dwelling units, occupiable spaces, public garages, or commercial spaces must have mechanical ventilation airflow provided at rates determined by ASHRAE 62.2 Sections 4.1.1 and 4.1.2 and as specified in § 150.0(o)1C.
§ 150.0(o)1E:	<b>Multifamily Attached Dwelling Units.</b> Multifamily attached dwelling units must have mechanical ventilation airflow provided at rates in accordance with Equation 150.0-B and must be either a balanced system or continuous supply or continuous exhaust system. If a balanced system is not used, all units in the building must use the same system type and the dwelling-unit envelope leakage must be $\leq 0.3$ CFM at 50 Pa (0.2 inch water) per square foot of dwelling unit envelope surface area and verified in accordance with Reference Residential Appendix RA3.8.
§ 150.0(o)1F:	<b>Multifamily Building Central Ventilation Systems.</b> Central ventilation systems that serve multiple dwelling units must be balanced to provide ventilation airflow for each dwelling unit served at a rate equal to or greater than the rate specified by Equation 150.0-B. All unit airflows must be within 20% of the unit with the lowest airflow rate as it relates to the individual unit's minimum required airflow rate needed for compliance.
§ 150.0(o)1G:	<b>Kitchen Range Hoods.</b> Kitchen range hoods must be rated for sound in accordance with Section 7.2 of ASHRAE 62.2.
§ 150.0(o)2:	<b>Field Verification and Diagnostic Testing.</b> Dwelling unit ventilation airflow must be verified in accordance with Reference Residential Appendix RA3.7. Kitchen range hoods must be verified in accordance with Reference Residential Appendix RA3.7.4.3 to confirm it is rated by HVI to comply with the airflow rates and sound requirements as specified in Section 5 and 7.2 of ASHRAE 62.2.
Pool and Spa Systems and Equipment Measures:	
§ 110.4(a):	<b>Certification by Manufacturers.</b> Any pool or spa heating system or equipment must be certified to have all of the following: 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 must not use electric resistance heating.*
§ 110.4(b)1:	<b>Piping.</b> Any pool or spa heating system or equipment must be installed with at least 36 inches of pipe between the filter and the heater, or dedicated suction and return lines, or built-in or built-up connections to allow for future solar heating.
§ 110.4(b)2:	<b>Covers.</b> Outdoor pools or spas that have a heat pump or gas heater must have a cover.
§ 110.4(b)3:	<b>Directional Inlets and Time Switches for Pools.</b> Pools must 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:	<b>Pilot Light.</b> Natural gas pool and spa heaters must not have a continuously burning pilot light.
§ 150.0(p):	<b>Pool Systems and Equipment Installation.</b> Residential pool systems or equipment must meet the specified requirements for pump sizing, flow rate, piping, filters, and valves.*
Lighting Measures:	
§ 110.9:	<b>Lighting Controls and Components.</b> All lighting control devices and systems, ballasts, and luminaires must meet the applicable requirements of § 110.9.*
§ 150.0(k)1A:	<b>Luminaire Efficacy.</b> All installed luminaires must meet the requirements in Table 150.0-A.
§ 150.0(k)1B:	<b>Blank Electrical Boxes.</b> The number of electrical boxes that are more than 5 feet above the finished floor and do not contain a luminaire or other device must be no greater than the number of bedrooms. These electrical boxes must be served by a dimmer, vacancy sensor control, or fan speed control.
§ 150.0(k)1C:	<b>Recessed Downlight Luminaires in Ceilings.</b> Luminaires recessed into ceilings must meet all of the requirements for: insulation contact (IC) labeling; air leakage; sealing; maintenance; and socket and light source as described in § 150.0(k)1C.
§ 150.0(k)1D:	<b>Electronic Ballasts for Fluorescent Lamps.</b> Ballasts for fluorescent lamps rated 13 watts or greater must be electronic and must have an output frequency no less than 20 kHz.
§ 150.0(k)1E:	<b>Night Lights, Step Lights, and Path Lights.</b> Night lights, step lights and path lights are not required to comply with Table 150.0-A or be controlled by vacancy sensors provided they are rated to consume no more than 5 watts of power and emit no more than 150 lumens.
§ 150.0(k)1F:	<b>Lighting Integral to Exhaust Fans.</b> Lighting integral to exhaust fans (except when installed by the manufacturer in kitchen exhaust hoods) must meet the applicable requirements of § 150.0(k).*
§ 150.0(k)1G:	<b>Screw based luminaires.</b> Screw based luminaires must contain lamps that comply with Reference Joint Appendix JA8.*
§ 150.0(k)1H:	<b>Light Sources in Enclosed or Recessed Luminaires.</b> Lamps and other separable light sources that are not compliant with the JA8 elevated temperature requirements, including marking requirements, must not be installed in enclosed or recessed luminaires.
§ 150.0(k)1I:	<b>Light Sources in Drawers, Cabinets, and Linen Closets.</b> Light sources internal to drawers, cabinetry or linen closets are not required to comply with Table 150.0-A or be controlled by vacancy sensors provided that they are rated to consume no more than 5 watts of power, emit no more than 150 lumens, and are equipped with controls that automatically turn the lighting off when the drawer, cabinet or linen closet is closed.
§ 150.0(k)2A:	<b>Interior Switches and Controls.</b> All forward phase cut dimmers used with LED light sources must comply with NEMA SSL 7A.
§ 150.0(k)2B:	<b>Interior Switches and Controls.</b> Exhaust fans must be controlled separately from lighting systems.*
§ 150.0(k)2C:	<b>Interior Switches and Controls.</b> Lighting must have readily accessible wall-mounted controls that allow the lighting to be manually turned ON and OFF.*
§ 150.0(k)2D:	<b>Interior Switches and Controls.</b> Controls and equipment must be installed in accordance with manufacturer's instructions.
§ 150.0(k)2E:	<b>Interior Switches and Controls.</b> Controls must not bypass a dimmer, occupant sensor, or vacancy sensor function if the control is installed to comply with § 150.0(k).
§ 150.0(k)2F:	<b>Interior Switches and Controls.</b> Lighting controls must comply with the applicable requirements of § 110.9.



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§ 150.0(k)2G:	<b>Interior Switches and Controls.</b> An energy management control system (EMCS) may be used to comply with control requirements if it: provides functionality of the specified control according to § 110.9; meets the Installation Certificate requirements of § 130.4; meets the EMCS requirements of § 130.0(e); and meets all other requirements in § 150.0(k)2.
§ 150.0(k)2H:	<b>Interior Switches and Controls.</b> A multiscene programmable controller may be used to comply with dimmer requirements in § 150.0(k) 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)2I:	<b>Interior Switches and Controls.</b> In bathrooms, garages, laundry rooms, and utility rooms, at least one luminaire in each of these spaces must be controlled by an occupant sensor or a vacancy sensor providing automatic-off functionality. If an occupant sensor is installed, it must be initially configured to manual-on operation using the manual control required under Section 150.0(k)2C.
§ 150.0(k)2J:	<b>Interior Switches and Controls.</b> Luminaires that are or contain light sources that meet Reference Joint Appendix JA8 requirements for dimming, and that are not controlled by occupancy or vacancy sensors, must have dimming controls.
§ 150.0(k)2K:	<b>Interior Switches and Controls.</b> Under cabinet lighting must be controlled separately from ceiling-installed lighting systems.
§ 150.0(k)3A:	<b>Residential Outdoor Lighting.</b> For single-family residential buildings, outdoor lighting permanently mounted to a residential building, or to other buildings on the same lot, must meet the requirement in item § 150.0(k)3Ai (ON and OFF switch) and the requirements in either § 150.0(k)3Aii (photocell and either a motion sensor or automatic time switch control) or § 150.0(k)3Aiii (astronomical time clock), or an EMCS.
§ 150.0(k)3B:	<b>Residential Outdoor Lighting.</b> For low-rise residential buildings with four or more dwelling units, outdoor lighting for private patios, entrances, balconies, and porches; and residential parking lots and carports with less than eight vehicles per site must comply with either Section 150.0(k)3A or with the applicable requirements in Sections 110.9, 130.0, 130.2, 130.4, 140.7 and 141.0.
§ 150.0(k)3C:	<b>Residential Outdoor Lighting.</b> For low-rise residential buildings with four or more dwelling units, any outdoor lighting for residential parking lots or carports with a total of eight or more vehicles per site and any outdoor lighting not regulated by Section 150.0(k)3B or Section 150.0(k)3D must comply with the applicable requirements in Sections 110.9, 130.0, 130.2, 130.4, 140.7 and 141.0.
§ 150.0(k)4:	<b>Internally illuminated address signs.</b> Internally illuminated address signs must comply with § 140.8; or must consume no more than 5 watts of power as determined according to § 130.0(c).
§ 150.0(k)5:	<b>Residential Garages for Eight or More Vehicles.</b> Lighting for residential parking garages for eight or more vehicles must comply with the applicable requirements for nonresidential garages in Sections 110.9, 130.0, 130.1, 130.4, 140.6, and 141.0.
§ 150.0(k)6A:	<b>Interior Common Areas of Low-rise Multifamily Residential Buildings.</b> 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 must be comply with Table 150.0-A and be controlled by an occupant sensor.
§ 150.0(k)6B:	<b>Interior Common Areas of Low-rise Multifamily Residential Buildings.</b> 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 for the interior common areas in that building must: i. Comply with the applicable requirements in Sections 110.9, 130.0, 130.1, 140.6 and 141.0; and ii. Lighting installed in corridors and stairwells must be controlled by occupant sensors that reduce the lighting power in each space by at least 50 percent. The occupant sensors must be capable of turning the light fully on and off from all designed paths of ingress and egress.
<b>Solar Ready Buildings:</b>	
§ 110.10(a)1:	<b>Single Family Residences.</b> 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 and approved by the enforcement agency, which do not have a photovoltaic system installed, must comply with the requirements of § 110.10(b) through § 110.10(e).
§ 110.10(a)2:	<b>Low-rise Multifamily Buildings.</b> Low-rise multi-family buildings that do not have a photovoltaic system installed must comply with the requirements of § 110.10(b) through § 110.10(d).
§ 110.10(b)1:	<b>Minimum Solar Zone Area.</b> The solar zone must have a minimum total area as described below. The solar zone must 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 must 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. For single family residences, the solar zone must 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 must 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. The solar zone requirement is applicable to the entire building, including mixed occupancy.
§ 110.10(b)2:	<b>Azimuth.</b> All sections of the solar zone located on steep-sloped roofs must be oriented between 90 degrees and 300 degrees of true north.
§ 110.10(b)3A:	<b>Shading.</b> The solar zone must not contain any obstructions, including but not limited to: vents, chimneys, architectural features, and roof mounted equipment.
§ 110.10(b)3B:	<b>Shading.</b> Any obstruction located on the roof or any other part of the building that projects above a solar zone must 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:	<b>Structural Design Loads on Construction Documents.</b> For areas of the roof designated as a solar zone, the structural design loads for roof dead load and roof live load must be clearly indicated on the construction documents.
§ 110.10(c):	<b>Interconnection Pathways.</b> The construction documents must indicate: a location reserved for inverters and metering equipment and a pathway reserved for routing of conduit from the solar zone to the point of interconnection with the electrical service; and for single family residences and central water-heating systems, a pathway reserved for routing plumbing from the solar zone to the water-heating system.
§ 110.10(d):	<b>Documentation.</b> A copy of the construction documents or a comparable document indicating the information from § 110.10(b) through § 110.10(c) must be provided to the occupant.
§ 110.10(e)1:	<b>Main Electrical Service Panel.</b> The main electrical service panel must have a minimum busbar rating of 200 amps.
§ 110.10(e)2:	<b>Main Electrical Service Panel.</b> The main electrical service panel must have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation. The reserved space must be permanently marked as "For Future Solar Electric".