2008 Residential Energy Plan Review Checklist
Alterations

(Prescriptive Approach)

Is the CF-1R ALT Form signed and dated by both the:	Yes	No	N/A
Designer and/or Owner			
Documentation Author			
Is the CF-1R ALT Form submitted with the building permit application?			
Is the correct Climate Zone listed on the CF-1R ALT Form?			
Does the CF-1R ALT Form have a registration number?			
Is the MF-1R Form submitted with the building permit application?			
DOES THE CF-1R ALT FORM MEET THE PRESCRIPTVE REQUIREMENTS?			
**** The Plans Examiner only needs to verify compliance for the altered building component ****			
Envelope *Alterations*			
Insulation for walls, ceilings, and floors			
Window area and orientation			
U-factor and SHGC values for fenestration			
Exterior Shading			
Cool Roof values (Solar Reflectance and Thermal Emittance)			
HVAC *Alterations*			
Efficiencies of HVAC equipment			
Duct Insulation			
HERS Measures			
Duct Sealing and Testing			
Refrigerant Charge Measurement			
Airflow (Fan Flow) and Fan Watt Draw			
Water Heating *Alterations*			
Efficiency and Fuel Type of the Water Heating equipment			
Pipe Insulation Values ***(Mandatory Measures)***			
Lighting *Alterations*			
All new/replaced lighting is high efficacy lighting (i.e. fluorescent, LED) or meets applicable alternative**s**			

2008 Residential Energy Plan Review Checklist GUIDE For Alterations

(Prescriptive Approach)

NOTE: This Guide will only discuss the Plan Review process for alterations to residential buildings and the applicable Prescriptive Approach requirements. If you have questions regarding alterations to residential buildings and the Performance Approach, please contact the Energy Standards Hotline:

Phone: 1-800-722-3300
Fax: 916-653-7480
Email: Title24@energy.state.ca.us

DEFINTIONS:
Alteration
An alteration is any change to a building's water-heating system, space-conditioning system, lighting system, or envelope that is not an addition. Some examples of an alteration include:

- Adding or replacing a skylight or window;
- Adding or replacing a central air conditioning system;
- Replacing the outdoor condensing unit of a split A/C system;
- Replacing a furnace;
- Adding or replacing a water heater;
- Adding or replacing hardwired lighting; and
- A reroof.

Repair
A repair is the reconstruction or renewal for the purpose of maintenance of any component, system, or equipment of an existing building. A repair is a component, system, or equipment of an existing building that breaks or malfunctions and a maintenance person fixes it so that it functions properly again. Repairs to low-rise residential buildings are not within the scope of the 2008 Energy Efficiency Standards (Standards) and do not require compliance. Some examples of a repair include:

- Replacing a broken pane of glass in a window;
- Replacing a failed compressor in an outdoor condensing A/C unit;
- Replacing a failed fan motor or gas valve in a furnace; and
- Replacing the heating element in water heater.

Is the CF-1R ALT Form signed and dated by both the Designer and/or Owner and the Documentation Author?
Signatures are necessary to show who is taking legal responsibility for the work of the alteration and the accuracy of the energy efficiency documentation.

For alterations, the individual who applies for the permit shall sign as the Building Designer; the contractor or the homeowner. The Building Designer is also responsible for the accuracy of the energy compliance documentation, even if the actual work is delegated to someone else (the Documentation Author as described below). The person's telephone number is provided to facilitate response to any questions that may arise.

The Documentation Author is the person who prepared the energy compliance documentation. The Documentation Author's signature declares that the energy compliance documentation is accurate and complete. The person's telephone number is provided to facilitate response to any questions that may arise. A Documentation Author may have additional certifications, such as an Energy Analyst or a Certified Energy Plans Examiner, and shall enter their certification number in the EA# or CEPE# box.

Both the Building Designer (contractor or home owner) and Documentation Author shall sign the CF-1R ALT Form. If the CF-1R ALT Form is not signed by both the Designer and the Documentation Author, the Plans Examiner shall request that both signatures be provided on the form prior to approval for a building permit.

Is the CF-1R ALT Form submitted with the building permit application?

Building Plans are usually not required for alterations to residential buildings, so the CF-1R ALT Form shall be submitted along with the building permit application. If the CF-1R ALT Form is not submitted with the building permit application, the Plans Examiner shall request that the applicant submit a completed CF-1R ALT Form to verify compliance.

If the Building Department requires Building Plans for an alteration, the CF-1R ALT Form shall be filed on the plans. To simplify enforcement the California Energy Commission (Energy Commission) recommends that the CF-1R ALT Form be printed on the plans (electronically incorporated on the plans).

Is the correct Climate Zone listed on the CF-1R ALT Form?

The Plans Examiner shall verify the correct Climate Zone on the CF-1R ALT Form because there are different energy efficiency requirements for each specific Climate Zone. There are 16 different Climate Zones in the state of California. To verify Climate Zone by zip code or city go to the Energy Commission's website at: www.energy.ca.gov/maps/building_climate_zones.html or call the Energy Standards Hotline at 1-800-772-3300.

The CF-1R ALT Form shall be re-submitted to determine compliance with the appropriate Climate Zone if the Climate Zone is incorrect or not listed on the CF-1R ALT Form.

Does the CF-1R ALT Form have a registration number?
Under the 2008 Standards the CF-1R ALT Form submitted with the building permit application will have to be a registered form from an approved HERS Provider for certain projects. Forms submitted for alterations will require HERS registration of the CF-1R ALT Form on the following date:

- October 1, 2010 – Any Low-rise residential home requiring HERS Verification will be required to submit a registered CF-1R ALT Form.

When registration is required the applicant will submit their energy documentation to one of the approved HERS providers for registration. The approved HERS Provider will input the data of the alteration into a registry database and create a CF-1R ALT Form with a registration number, date, and seal of the HERS Provider at the bottom of each page. An approved HERS Provider may be found on the Energy Commission website at: http://www.energy.ca.gov/HERS/

For alterations that require registration, the Plans Examiner shall verify that the CF-1R ALT Form has a registration number at the bottom of each page. If the submitted form does not have a registration number, the Plans Examiner shall require that the applicant submit a registered form from an approved HERS Provider.

Is the MF-1R Form submitted with the building permit application?
The MF-1R Form lists the Mandatory Measures, which are minimum energy efficiency requirements that apply to all alterations. The Mandatory Measures ensure a minimum level of energy performance for all alterations to obtain energy efficiency.

For the 2008 Standards, the MF-1R Form is no longer a checklist but a summary of the Mandatory Measures. Building Plans are usually not required for alterations to residential buildings, so the MF-1R Form should be submitted along with the building permit application. If the MF-1R Form is not submitted with the building permit application, the Plans Examiner should request that the applicant submit an MF-1R Form to verify compliance with the Mandatory Measures. The MF-1R Form can be found in Appendix A of the 2008 Residential Compliance Manual at: http://www.energy.ca.gov/title24/2008standards/

When a Building Department requires Building Plans for an alteration, the MF-1R Form should be filed on the plans. To simplify enforcement the Energy Commission recommends that the MF-1R be printed on the plans (electronically incorporated on the plans). Having the MF-1R Form on the plans simplifies the Plan Review process and helps the Inspector identify the Mandatory Measures that must be verified in the field.

Does the CF-1R ALT Form meet the Prescriptive Requirements?
The Plans Examiner shall verify that the energy efficiency values and building measures identified on the CF-1R ALT Form meet the Prescriptive Approach requirements detailed in the subsequent sections of this Guide. If the Building Department requires Building Plans for an alteration, the Plans Examiner shall also verify that the energy efficiency values and

building measures components identified on the CF-1R ALT Form are specified on the appropriate sections of the Building Plans. For more information on verifying the energy efficiency values and components on the plans, the Plans Examiner may refer to the 2008 Residential Energy Plan Review Checklist Guide for Newly Constructed Buildings at: www.energyvideos.com

NOTE: The Plans Examiner only needs to verify compliance for the altered building component.

Envelope Alterations

Insulation for walls, ceilings, and floors

When the exterior envelope (wall, ceiling, or floor) will be altered, the Plans Examiner shall verify that the insulation values identified on the CF-1R ALT Form meet or exceed the following requirements:

- When the entire wall, ceiling, or floor is replaced, the altered assembly shall meet the insulation requirements of Component Package D (Package D) in Standards Table 151-C (see *Standards Table 151-C* on page 15).
- Alterations that involve opening the framed cavity of the wall, ceiling, or floor shall meet the mandatory minimum insulation requirements of §150. The opened cavity of the altered assembly shall meet the following insulation requirements:
    a) Walls R-13
    b) Ceilings R-19*
    c) Floors R-13

* R-19 insulation shall be placed in the opened cavity only if the existing insulation was installed between the framed studs. Insulation added to the attic space above the ceiling shall meet the insulation requirements of §118(d) detailed below in *Existing Attics*.

Existing Attics

Per §118(d), when insulation is installed in an existing attic, the R-value of the total amount of insulation (after addition of insulation to the amount, if any, already in the attic) shall be at least R-38 in Climate Zones 1 and 16, and R-30 in all other Climate Zones. If the accessible space in the attic is not large enough to accommodate the required R-value, then the entire attic space shall be filled with insulation (provided such installation does not violate Section 1203.2 of Title 24, Part 2).

Window area and orientation

When windows and/or skylights will be added, the Plans Examiner shall verify that the window areas identified on the CF-1R ALT Form meet the allowed fenestration area requirements of Package D:

- Alterations that add window and/or skylight area of 50 ft^2 or less are exempt from the Total Fenestration Area (20%) and West-Facing Fenestration Area (5%) requirements of Package D.
- Alterations that add more than 50 ft^2 of window and/or skylight shall meet the Total Fenestration Area (20%) and West-Facing Area (5% - Climate Zones 2, 4, and 7 through 15) requirements of Package D. The applicant shall complete the

Altered Fenestration Allowed Area table on Page 2 of the CF-1R ALT Form and identify all existing and added fenestration in this table to verify compliance with the fenestration area requirements of Package D.

NOTE: Alterations that only replace windows are exempt from the fenestration area requirements of Package D.

Front Orientation and Conditioned Floor Area (CFA)
When windows and/or skylights will be added or replaced, the Plans Examiner shall verify the front orientation of the existing home so that they may verify the correct orientation of the altered fenestration. When windows and/or skylights will be added (not replaced), the Plans Examiner shall also verify the conditioned floor area of the existing home so that they may verify compliance with the Prescriptive Approach fenestration area requirements.

U-factor and SHGC values for fenestration
When windows and/or skylights will be added or replaced, the Plans Examiner shall verify that the window U-factor and Solar Heat Gain Coefficient (SHGC) values identified on the CF-1R ALT Form meet the U-Factor and SHGC requirements of Package D in Standards Table 151-C (see *Standards Table 151-C* on page 15).

NOTE: Replacing the glass in an existing sash and frame or replacing a single sash in a multi-sash window are considered to be repairs and are exempt from the U-factor and SHGC requirements of Package D.

Exterior Shading
To obtain credit for exterior shading and reduce the SHGC of a window, the WS-3R Form shall be completed and submitted along with the CF-1R ALT Form. Because the WS-3R includes a simple addition and multiplication calculation, only a handful of exterior shading devices are considered. When a reduced SHGC value is identified on the CF-1R ALT Form, the Plans Examiner shall verify that the reduced SHGC value matches the SHGC value calculated on the WS-3R Form.

Cool Roof Values (Solar Reflectance and Thermal Emittance)
When more than 50% of the exterior surface of the roof or more than 1,000 ft^2 of roof will be replaced, whichever is less, the altered exterior surface area of the existing roofs shall meet the following requirements:

- For alterations to steep-sloped roofs (rise to run greater than 2:12):
    i. Roofing products with a density of less than 5 pounds per square foot in Climate Zones 10 through 15 shall have a minimum 3-year aged solar reflectance of 0.20 and a minimum thermal emittance of 0.75, or a minimum Solar Reflectance Index (SRI) of 16.
    ii. Roofing products with a density of 5 pounds per square foot or more in Climate Zones 1 through 16 shall have a minimum 3-year aged solar reflectance of 0.15 and a minimum thermal emittance of 0.75, or a minimum SRI of 10.

- Low-sloped roofs (rise to run of 2:12 or less) in Climate Zones 13 and 15 shall have a minimum 3-year aged solar reflectance equal or greater than 0.55 and a thermal emittance equal or greater than 0.75, or a minimum SRI of 64.

When a roof alteration requires a cool roof, the Plans Examiner shall verify that the solar reflectance and thermal emittance values, or the Solar Reflectance Index value identified on the CF-1R ALT Form meets or exceeds the Prescriptive Approach requirements.

Alternatives and Exception

- For steep-sloped roofs, the following shall be considered equivalent to (an alternative) the cool roof requirements (see Cool Roof Values on page 6):
    a) Insulation with a thermal resistance of at least 0.85 hr·ft2·°F/Btu or at least a 3/4 inch air-space is added to the roof deck over an attic; or
    b) Existing ducts in the attic are insulated and sealed according to Section 151(f)10; or
    c) In Climate Zones 10, 12 and 13, with 1 ft^2 of free ventilation area of attic ventilation for every 150 ft^2 of attic floor area, and where at least 30 percent of the free ventilation area is within 2 feet vertical distance of the roof ridge; or
    d) Buildings with at least R-30 ceiling insulation; or
    e) Buildings with a radiant barrier in the attic meeting the requirements of Section 151(f)2; or
    f) Buildings that have no ducts in the attic; or
    g) In Climate Zones 10, 11, 13 and 14, R-3 or greater roof deck insulation above vented attic.
- For low-sloped roofs, buildings with no ducts in the attic are exempt from the cool roof requirements (see Cool Roof Values above).

When a roof alteration is exempt from or meets an alternative to the Cool Roof requirements, the Plans Examiner shall verify that the applicable exception or alternative is identified on the CF-1R ALT Form.

Solar Reflectance and Thermal Emittance – §118(i)
The Mandatory Measures require that all roofing products installed to meet the Cool Roof requirements for alterations shall be certified to the Cool Roof Rating Council (CRRC). Roofing products that are not certified to the CRRC cannot be installed to meet the Cool Roof requirements. Certified roofing products can be found on the CRRC website at: http://www.coolroofs.org/

The Mandatory Measures also mandate how the applicant shall determine the Solar Reflectance and Thermal Emittance of the roofing product to meet the Cool Roof Requirements. Under the 2008 Standards, the Prescriptive Approach requires that the roofing product meet a 3-year aged solar reflectance value; not an initial solar reflectance value. The efficiency values of the roofing product shall be determined by one of the following methods (on next page):

- The roofing product is certified to the CRRC with a 3-year aged solar reflectance and thermal emittance values.

- The roofing product is certified to the CRRC with an initial solar reflectance and thermal emittance values. The applicant shall input the initial solar reflectance into the equation R_{aged} below to calculate the aged solar reflectance:

  $R_{aged} = 0.2 + 0.7(\text{initial solar reflectance} - 0.2)$

  Here is an example of how to calculate the aged solar reflectance for a CRRC certified roofing product with an initial solar reflectance of 0.77:

  $R_{aged} = 0.2 + 0.7(0.77 - 0.2)$
  $R_{aged} = 0.2 + 0.7(0.57)$
  $R_{aged} = 0.2 + 0.40$
  $R_{aged} = 0.60$

- The roofing product is certified to the CRRC with a 3-year aged solar reflectance and thermal emittance values, but these values do not meet the Prescriptive requirements (see Cool Roof Values on pages 6 and 7). As an alternative, the applicant may input the 3-year aged solar reflectance and thermal emittance into the Solar Reflectance Index (SRI) calculator to meet the SRI requirement (see Cool Roof Values on pages 6 and 7). The SRI calculator can be downloaded from the Energy Commission website at: http://www.energy.ca.gov/title24/

HVAC Alterations

Efficiencies of HVAC equipment

When HVAC equipment will be added or replaced, the Plans Examiner shall verify that the HVAC equipment efficiencies identified on the CF-1R ALT Form meet the minimum HVAC efficiency requirements in the 2007 Appliance Efficiency Regulations:

- Single phase air conditioners and heat pumps with an output capacity below 65,000 Btu/hr shall have a minimum 13 Seasonal Energy Efficiency Ratio (SEER).
- Central furnaces with an output capacity below 225,000 Btu/hr shall have a minimum 78% Annual Fuel Utilization Efficiency (AFUE).

When higher efficient equipment (above 13 SEER or above 78% AFUE) is identified on the CF-1R ALT Form, the Plans Examiner should highlight (circle in red pen, use a stamp, highlight, etc.) the higher HVAC values on the CF-1R ALT Form to inform the Inspector that higher HVAC efficiency values shall be verified in the field.

Non-Central Gas Heaters

Non-ducted, non-central gas fired heating equipment (wall furnace, space heater, etc.) identified on the CF-1R ALT Form shall meet the minimum efficiency requirements in Table E-2 (on next page) of the 2007 Appliance Efficiency Regulations.

Table E-2 (2007 Appliance Efficiency Regulations)

Appliance	***Design Type***	***Capacity (Btu per hour)***	***Minimum AFUE (%)***
Wall furnace	Fan	≤ 42,000	73
Wall furnace	Fan	> 42,000	74
Wall furnace	Gravity	≤ 10,000	59
Wall furnace	Gravity	> 10,000 ≤ 12,000	60
Wall furnace	Gravity	> 12,000 ≤ 15,000	61
Wall furnace	Gravity	> 15,000 ≤ 19,000	62
Wall furnace	Gravity	> 19,000 ≤ 27,000	63
Wall furnace	Gravity	> 27,000 ≤ 46,000	64
Wall furnace	Gravity	> 46,000	65
Floor furnace	All	≤ 37,000	56
Floor furnace	All	> 37,000	57
Room heater	All	≤ 18,000	57
Room heater	All	> 18,000 and ≤ 20,000	58
Room heater	All	> 20,000 and ≤ 27,000	63
Room heater	All	> 27,000 and ≤ 46,000	64
Room heater	All	> 46,000	65

Duct Insulation

When ducting will be added or replaced, the Plans Examiner shall verify that the duct insulation values identified on the CF-1R ALT Form meet the Prescriptive duct insulation requirements:

- 40 linear feet or less of ducts are added in unconditioned space: R-4.2 [Mandatory Measures §150(m)].
- More than 40 linear feet of ducts are added in unconditioned space: Duct insulation requirements of Package D.
- Newly installed ducted HVAC systems shall meet the Prescriptive duct insulation requirements of Package D listed in Standards Table 151-C.

When higher duct insulation values (above R-4.2) are identified on the CF-1R ALT Form, the Plans Examiner should highlight (circle in red pen, use a stamp, highlight, etc.) the higher duct insulation values on the CF-1R ALT Form to inform the Inspector that higher duct insulation values shall be verified in the field.

HERS Measures

Items listed in the HERS Verification Summary on the CF-1R ALT Form identify features that rely on diagnostic testing and independent verification by certified HERS raters to

ensure proper field installation. For this reason, it is important that the Plans Examiner make special note of all of these measures on the CF-1R ALT Form (highlight, circle in red pen, use a stamp, etc.) to alert the Inspector that a completed CF-4R Form shall be submitted before the Final Inspection is complete.

Diagnostic testing and verification by a certified HERS Rater is in addition to local building department inspections. A listing of certified HERS raters maybe found on the HERS provider website at: http://www.energy.ca.gov/HERS/

Duct Sealing and Testing

The following HVAC alterations will require duct sealing and testing:

- In Climate Zones 2 and 9 through 16, when the entire existing duct system is replaced or a new space-conditioning system (HVAC equipment and ducting) will be added, the ducts are to be sealed and tested per §152(b)1Di.
- In Climate Zones 2 and 9 through 16, when more than more than 40 linear feet of ducting will be added or replaced in unconditioned space, the ducts are to be sealed and tested per §152(b)1Dii.
  Exception: Existing duct systems that are extended, which are constructed, insulated or sealed with asbestos.
- In Climate Zones 2 and 9 through 16, when HVAC equipment will be added or replaced (including the air handler, outdoor condensing unit of a split system A/C or heat pump, cooling or heating coil, or the furnace heat exchanger), the ducts are to be sealed and tested per §152(b)1E.
  Exceptions:
  a. Duct systems that are documented to have been previously sealed, confirmed through HERS verification in accordance with procedures in Reference Residential Appendix RA3.
  b. Duct systems with less than 40 linear feet in unconditioned space.
  c. Existing duct systems constructed, insulated or sealed with asbestos.

When applicable, the applicant shall identify that Duct Sealing and Testing is required under the HERS Verification Summary on Page 5 of the CF-1R ALT Form. The Plans Examiner shall make a special note (see *HERS Measures* on page 9) on the CF-1R ALT Form that the HERS Measure Duct Sealing and Testing is required and that a CF-4R shall be submitted before the Final Inspection.

Refrigerant Charge Measurement

The following HVAC alterations will require a refrigerant charge measurement:

- In Climate Zones 2 and 8 through 15, when a new split space-conditioning system (HVAC equipment and ducting) will be added, a refrigerant charge measurement shall be verified per §151(f)7A.
- In Climate Zones 2 and 8 through 15, when HVAC equipment will be added or replaced (including the air handler, outdoor condensing unit of a split system A/C or heat pump, cooling or heating coil, or the furnace heat exchanger), a refrigerant charge measurement shall be verified per §152(b)1F.
  Exception: Heating only systems.

When applicable, the applicant shall identify that a Refrigerant Charge Measurement is required under the HERS Verification Summary on Page 5 of the CF-1R ALT Form. The Plans Examiner shall make a special note (see *HERS Measures* on page 9) on the CF-1R ALT Form that the HERS Measure Refrigerant Charge Measurement is required and that a CF-4R shall be submitted before the Final Inspection.

Airflow (Fan Flow) and Fan Watt Draw

The following HVAC alterations will require airflow and fan watt draw testing:

- In Climate Zones 10 through 15, when a central space-conditioning system (HVAC equipment and ducting) is added, the airflow and fan watt draw shall be verified per §151(f)7B.
- In Climate Zones 10 through 15, when the entire existing space-conditioning system (HVAC equipment and ducting) is replaced, the airflow and fan watt draw shall be verified per §152(b)1F.

When applicable, the applicant shall identify that Airflow and Fan Watt Draw testing is required under the HERS Verification Summary on Page 5 of the CF-1R ALT Form. The Plans Examiner shall make a special note (see *HERS Measures* on page 9) on the CF-1R ALT Form that the HERS Measure Airflow and Fan Watt Draw testing is required and that a CF-4R shall be submitted before the Final Inspection.

Water Heating Alterations

Efficiency and Fuel Type of Water Heating equipment

Water Heater Efficiency

When water heating equipment will be added or replaced, the Plans Examiner shall verify that the water heater efficiency (Energy Factor) identified on the CF-1R ALT Form meets the minimum water heater efficiency requirements in the 2007 Appliance Efficiency Regulations. Storage water heaters shall have an Energy Factor equal to or greater than the minimum efficiency requirements in Table F-4 (see 2007 *Appliance Efficiency Regulations Table F-4* on the next page).

When a higher efficiency storage water heater (an Energy Factor greater than 0.58) is identified on the CF-1R ALT Form, the Plans Examiner should highlight (circle in red pen, use a stamp, highlight, etc.) the higher Energy Factor of the water heater on the CF-1R ALT Form to inform the Inspector that a higher Energy Factor efficiency value shall be verified in the field.

NOTE: The 2007 Appliance Efficiency Regulations may be downloaded from the Energy Commission's website at: http://www.energy.ca.gov/appliances/

Water Heater Type

When water heater equipment will be added or replaced, the Plans Examiner shall verify that the type of water heater identified on the CF-1R ALT Form is either gas, propane, or the existing fuel type. The Prescriptive Approach will allow an existing electric water heater to be replaced with an electric water heater, but does not allow switching from a gas water heater to an electric water heater.

Water Heater Tank Insulation
When a storage water heater with an Energy Factor below 0.58 is identified on the CF-1R ALT Form, the Plans Examiner shall verify that an external insulation blanket of R-12 or greater is specified on the CF-1R ALT Form. The Plans Examiner should highlight (circle in red pen, use a stamp, highlight, etc.) the external tank insulation of the water heater on the CF-1R ALT Form to inform the Inspector that an insulation blanket of R-12 or greater shall be verified in the field.

2007 Appliance Efficiency Regulations – Table F-4

Appliance	***Minimum Energy Factor***	
	Effective April 15, 1991	***Effective January 20, 2004***
Gas-fired storage-type water heaters	0.62 – (.0019 x V)	0.67 – (.0019 x V)
Oil-fired water heaters (storage and instantaneous)	0.59 – (.0019 x V)	0.59 – (.0019 x V)
Electric storage water heaters (excluding tabletop water heaters)	0.93 – (.00132 x V)	0.97 – (.00132 x V)
Electric tabletop water heaters	0.93 – (.00132 x V)	0.93 – (.00132 x V)
Gas-fired instantaneous water heaters	0.62 – (.0019 x V)	0.62 – (.0019 x V)
Electric instantaneous water heaters (excluding tabletop water heaters)	0.93 – (.00132 x V)	0.93 – (.00132 x V)
Heat pump water heaters	0.93 – (.00132 x V)	0.97 – (.00132 x V)
V = rated volume in gallons.		

Pipe Insulation Values *(Mandatory Measures)*
Any newly added or replaced piping shall meet the mandatory insulation requirements of §150(j). The Mandatory Measures require that the following piping shall be insulated to meet the insulation conductivity and minimum insulation thickness requirements listed in Standards Table 150-A and Table 150-B. The Plans Examiner should highlight (circle in red pen, use a stamp, highlight, etc.) the pipe insulation requirements listed on the MF-1R Form to inform the Inspector that the following altered piping shall be insulated:

- First 5 feet of the hot and cold water lines from the storage tank (nonrecirculating systems)
- Recirculating sections
- Piping from the heating source to the storage tank (indirect-fired systems)

Lighting Alterations

All new/replaced lighting is high efficacy lighting (i.e. fluorescent, LED) or meets applicable alternatives

High Efficacy Lighting:

LED lighting systems and GU-24 lamp holders can now be installed to meet the High Efficacy requirements under the following conditions:

- LED lighting systems must be tested by the manufacturer and certified to the Energy Commission, and meet the lamp efficacy values listed in Table 150-C (*see Table 150-C* below).
  NOTE: LED lighting which is not listed as high efficacy on the Energy Commission database shall be classified as low efficacy.
- GU-24 lamp holders must be rated for use only with high efficacy lamps or high efficacy LED lighting that meet the lamp efficacy values listed in Table 150-C.

Standards Table 150-C

Lamp Power Rating for Non-LED Lighting (see Note 1)**, or System Power Rating for LED Lighting** (see Notes 2, 3, and 4)	**Minimum Lamp Efficacy for Non-LED Lighting, or Minimum System Efficacy for LED Lighting**
5 watts or less	30 lumens per watt
over 5 watts to 15 watts	40 lumens per watt
over 15 watts to 40 watts	50 lumens per watt
over 40 watts	60 lumens per watt

Notes:

1. Determine minimum lamp efficacy category for lighting systems which are not LED using the initial rated lumens divided by the rated watts of the lamp (not including the ballast).
2. To qualify as high efficacy, an LED luminaire shall meet the minimum system efficacy requirements in Table 150-C when determined according to Reference Joint Appendix JA8, and be certified to comply with Section 119(m), and input power shall be determined according to Section 130(d)5.
3. For a Hybrid LED Luminaire to qualify as a high efficacy luminaire, all lighting systems in the luminaire shall qualify as high efficacy according to Section 150(k)1, and the LED Light Engine with Integral Heat Sink shall comply with Note 4, below.
4. To qualify as high efficacy, an LED Light Engine with Integral Heat Sink shall meet the minimum system efficacy requirements in Table 150-C when determined according to Reference Joint Appendix JA8, shall be certified to comply with Section 119(m), and input power shall be determined according to Section 130(d)5.

Mandatory Measures:

ALL added or replaced lighting in a residential building shall be high efficacy *(except Kitchen Lighting;* see below and on the next page*)*, or depending on the location of the lighting, be controlled by a dimmer switch or a manual-on occupant sensor (occupant sensor). The Plans Examiner should highlight (circle in red pen, use a stamp, highlight, etc.) the lighting requirements listed on the MF-1R Form to inform the Inspector that the altered lighting shall meet the following requirements:

Kitchen Lighting

When lighting will added or replaced in the kitchen, all newly installed lights shall be high efficacy until a minimum of 50% of the total rated wattage of permanently installed

lighting is high efficacy. Lighting in areas adjacent to the kitchen, such as in dining and nook areas, is considered kitchen lighting if it is not separately switched from the kitchen lighting, and shall be considered when calculating the installed wattage of the kitchen lighting.

When lighting will be added or replaced inside cabinets for the purpose of illuminating only the inside of the cabinets, the total installed wattage of internal cabinet lighting shall not exceed 20 watts per linear foot of illuminated cabinets. *NOTE:* Internal cabinet lighting is not considered kitchen lighting and will not be included when calculating the installed wattage of the kitchen lighting.

Lighting in bathrooms, garages, laundry rooms, closets, and utility rooms
Lighting that will be added or replaced in these areas must be high efficacy luminaires, but low efficacy luminaires are allowed if they are controlled by a manual-on occupant sensor.

Lighting in other areas of the house (Hallways, living room, bedrooms, etc.)
Lighting that will be added or replaced in these areas must be high efficacy, but low efficacy luminaires are allowed if they are controlled by either a dimmer switch or a manual-on occupant sensor. *NOTE:* Closets less than 70 square feet are not required to be controlled by a manual-on occupant sensor, a dimmer, or be high efficacy.

Switching
Lighting that will be added or replaced shall meet the new switching requirements of the 2008 Energy Standards:

- All permanently installed high efficacy luminaires shall be switched separately from low efficacy luminaires; and
- Exhaust fans shall be switched separately from lighting system(s).

Outdoor Lighting
Permanently installed outdoor lighting (mounted/attached to the building) that will be added or replaced shall be high efficacy. Low efficacy lighting is allowed, but only when fixtures are controlled by:

- A motion sensor; and
- One of the following controls:
    a. A photo-control; or
    b. An astronomical time clock; or
    c. An energy management control system (EMCS).

NOTE: Permanently installed luminaires in or around swimming pools, water features, or other locations subject to Article 680 of the California Electric Code are exempt from the high efficacy requirements and can be low-efficacy luminaires.

Standards Table 151-C

			Climate Zone															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Insulation minimums[1]	Ceilings		R38	R30	R30	R30	R30	R30	R30	R30	R30	R30	R38	R38	R38	R38	R38	R38
	Walls	Wood-frame walls	R21	R13	R13	R13	R13	R13	R13	R13	R13	R13	R19	R19	R19	R21	R21	R21
		Heavy mass walls	R4.76	R2.44	R2.44	R2.44	R2.44	R2.44	R2.44	R2.44	R2.44	R2.44	R4.76	R4.76	R4.76	R4.76	R4.76	R4.76
		Light mass walls	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Below-grade walls	R0	R0	R0	R0	R0	R0	R0	R0	R0	R0	R0	R0	R0	R0	R0	R13
	Floors	Slab floor perim.	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	R7
		Raised floors	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19	R19
		Concrete raised floors	R8	R8	R0	R0	R0	R0	R0	R0	R0	R0	R8	R4	R8	R8	R4	R8
Radiant Barrier			NR	REQ	NR	REQ	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
Roofing Products	Low-sloped	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.55	NR	0.55	NR
		Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	NR	0.75	NR
	Steep Sloped (less than 5 lb/ft²)	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.20	0.20	0.20	0.20	0.20	0.20	NR
		Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	0.75	0.75	0.75	NR
	Steep Sloped (5 lb/ft² or more)	Aged Solar Reflectance	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
		Thermal Emittance	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Fenestration	Maximum U-factor[2]		0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
	Maximum Solar Heat Gain Coefficient (SHGC)[3]		NR	0.40	NR	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.35	NR
	Maximum Total Area		20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Maximum West Facing Area		NR	5%	NR	5%	NR	NR	5%	5%	5%	5%	5%	5%	5%	5%	5%	NR
THERMAL MASS[4]			NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SPACE-HEATING [5, 10]	Electric-resistant allowed		No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
	If gas, AFUE =		MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
	If heat pump, HSPF[6] =		MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
SPACE-COOLING	SEER =		MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
	If split system, Refrigerant charge measurement or charge indicator display		NR	REQ	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
Central Forced Air Handlers	Cooling Airflow and Watt Draw		NR	NR	NR	NR	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	NR
	Central Fan Integrated Ventilation System Watt Draw		REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
DUCTS	Duct sealing		REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
	Duct Insulation		R-6	R-6	R-6	R-6	R-6	R-4.2	R-4.2	R-4.2	R-6	R-6	R-6	R-6	R-6	R-8	R-8	R-8
WATER-HEATING			System shall meet Section 151(f)8 or Section 151(b)1															