2008 Building Energy Efficiency Standards

Effective Date: January 1, 2010

Warren Alquist Act

- The authority of the Energy Commission to develop and maintain Energy Efficiency Standards is provided in Section 25402 of the Public Resources Code (known as the Warren Alquist Act).
- The act created the Energy Commission in 1974 and gave it authority to develop and maintain Energy Efficiency Standards.
- Requires that the Standards be cost effective when taken in their entirety and amortized over the economic life of the structure.
- Requires that the Energy Commission periodically update the Standards and develop manuals to support the Standards (about every 3 years).

2008 Documents

- *Building Energy Efficiency Standards*
- *Residential and Nonresidential Alternative Calculation Method (ACM) Manuals*
- *Residential and Nonresidential Compliance Manuals*
- *Reference Appendices*
  - Joint Appendices
  - Residential Appendices (RA)
  - Nonresidential Appendices (NA)

http://www.energy.ca.gov/title24/2008standards/

Reference Appendices

- **Joint Appendices**
  - Still contains definitions, Climate Zone listings, Construction Assemblies, and Weather Data. New HERS measures and LED lighting testing methods added.
- **Residential Appendices**
  - HERS procedures and Energy Efficiency Measures for Residential Buildings.
- **Nonresidential Appendices**
  - HERS procedures, Acceptance testing methods, Luminaire Power, etc. for Nonresidential Buildings

What is New for 2008?
Residential Buildings

- **Mandatory Measures**

  §150(k) Lighting

  - Definitions of High Efficacy lighting and Low Efficacy lighting are more clearly defined (LED lighting, HID luminaires, and GU-24 lamps included). *Table 150-C*

  - Applicability of lighting requirements for night lights, lighting integral to exhaust fans, and lighting internal to cabinets clarified.

  - Switching devices and controls requirements are clarified: i.e. high efficacy lighting switched separately from low efficacy lighting, exhaust fans switched separately from lighting.

Residential Buildings Cont.

- **Mandatory Measures Cont.**

§150(o) Mechanical Ventilation

(Newly Constructed Buildings and Additions greater than 1,000 ft^2)

- All dwelling units shall meet ANSI/ASHRAE Standard 62.2 for Ventilation and Acceptable Indoor Air Quality.
- Methods of meeting ventilation requirements:
  - Exhaust ventilation
  - Supply ventilation
  - Combination of exhaust and supply ventilation
- Meet two requirements:
  - Local Ventilation Exhaust
  - Whole-Building Ventilation

www.ashrae.org/

Residential Buildings Cont.

- **Mandatory Measures Cont.**

§150(p) Pool Systems and Equipment

- Standards for pump sizing, flow rate, etc. were established to conserve energy and water.
- Each auxiliary load shall be served by either:
  - Separate pumps; or
  - A multi-speed pump

EXCEPTION: Pumps less than 1 horse power (hp) may be single speed.

Residential Buildings Cont.

❖Prescriptive Requirements

New HERS Requirements

- **Refrigerant Charge Measurement.** Split systems need to have a refrigerant charge measurement verified by a HERS Rater. Verification of a TXV is no longer an option. As an alternative, contractor can install a charge indicator display (CID). (§151(f)7A)

- Applicable in Climate Zones 2 and 8 through 15.

- Also applicable to alterations
  - Installation or replacement of the air handler, outdoor condensing unit, cooling or heating coil, or furnace heat exchanger of split systems. (§152(b)1F)

Residential Buildings Cont.

- **Prescriptive Requirements cont.**

New HERS Requirements cont.

- **Airflow (Fan Flow) and Watt Draw.** The airflow and watt draw of ducted split systems shall be verified by a HERS Rater to ensure adequate airflow and the energy efficiency of fans when indicated in Tables 151-B through 151-E. (§151(f)7B)
- Applicable in Climate Zones 10 through 15.
  - Also applicable to alterations
    - Installation or replacement of entire space-conditioning system (ducting and air handler unit). (§152(b)1C)

Residential Buildings Cont.

- **Prescriptive Requirements cont.**

New HERS Requirements cont.

- **Central Fan Integrated Ventilation Systems.** The watt draw of central forced air system fans used in central fan integrated ventilation systems shall be verified by a HERS Rater to draw less than 0.58 W/CFM.
- System installed to meet §150(o) – ASHRAE 62.2 Ventilation requirements.
  - Applicable in ALL Climate Zones
  - Does NOT apply to Alterations

Residential Buildings Cont.

❖ Prescriptive Requirements Cont.

Roofing Products (Cool Roof) – §151(f)12

- Low-rise residential buildings roofing products shall meet the applicable requirements of Section 118(i) (Cool Roof), depending on:
  - Slope of roof
    - ✓Low-sloped – rise to run of 2:12 or less
    - ✓High-sloped – rise to run greater than 2:12
  - Density of roofing product
    - ✓Less than 5 pounds per square foot
    - ✓5 pounds per square foot or more
  - Climate Zone

www.coolroofs.org

Residential Buildings Cont.

- **Prescriptive Requirements Cont.**

Roofing Products (Cool Roof) – §151(f)12 cont.

- **Exceptions (Newly Constructed Buildings):**
  - Roofing area with integrated photovoltaic panels and integrated solar thermal panels.
  - Roof constructions that have a thermal mass over the roof membrane with a weight of at least 25 lb/ft^2.

Residential Buildings Cont.

- **Prescriptive Requirements Cont.**

Roofing Products (Cool Roof) – §152(b)1H cont.

- **Alterations –** Replacements of the exterior surface of existing roofs shall meet the Cool Roof requirements of Sections 118(i) when more than 50% of the roof or more than 1,000 ft^2 of roof, whichever is less, is replaced.

Alternatives for steep-sloped roofs and an exception for low-sloped roofs in specific Climate Zones are listed in §152(b)1H of the Standards.

Residential Buildings Cont.

- **Performance Method**
  - New HERS Compliance Options
    - Low leakage ducts in conditioned space
    - Low leakage air handlers
    - Evaporative cooling condensers
    - Ice Storage air conditioners
    - Quality Installation of Insulation (QII) for Spray Polyurethane Foam Insulation

Project Address

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2008 Residential Energy Plan Review Checklist
Newly Constructed Buildings

	Yes	No	N/A
Was the correct compliance software used? ***(Performance Only)***			
CalRes version 2008			
Energy Pro version 5.0			
Micropas version 8.0			
Is the CF-1R Form signed and dated by both the:			
Designer and/or Owner			
Documentation Author			
Does the building "Comply" according to the CF-1R Form?			
Is the correct Climate Zone listed on the CF-1R Form?			
Does the CF-1R Form have a registration number?			
Is the MF-1R Form attached or incorporated onto plans?			
DOES THE CF-1R FORM MATCH THE PLANS?			
Conditioned Floor Area for all floor types (i.e. slab on grade, raised floor, etc.)			
Front Orientation of the building			
Envelope			
Insulation for walls, ceilings, and floors ***(from Reference Joint Appendix JA4)***			
Number of windows, window area, and their orientation			
U-factor and SHGC values for fenestration ***(a window schedule required upon Plan Checker's request)***			
Exterior shading (i.e. overhangs, fins, exterior shades)			
HVAC			
Efficiencies of HVAC equipment			
Duct Insulation			
Indoor Air Quality and Mechanical Ventilation ***(Mandatory Measures)***			
Water Heating			
Efficiency and Type of Water Heating/Boiler equipment (i.e. storage, instantaneous, etc.)			
Distribution Type (i.e. recirculating, standard, pipe insulation credit, etc.)			
Pipe Insulation Values ***(Mandatory Measures)***			
Lighting			
All lighting is high efficacy lighting (i.e. fluorescent, LED) or meets applicable alternatives ***(Mandatory Measures)***			
ALL **Special Features** are verified on the plans and highlighted for the inspector? ***(i.e. Thermal Mass, Radiant Barrier, Cool Roof)***			
ALL **HERS Measures** are verified on the plans and highlighted for the inspector? [***i.e. Duct Leakage, Refrigerant Charge, Airflow (Fan Flow) and Watt Draw***]			

What is New for 2008?
Nonresidential Buildings

- **Indoor Lighting – Mandatory Measures**
  - Determining the wattage for luminaires clarified (LED lighting, HID luminaires, and GU-24 lamps included). §130(d) and §130(e)
    - Minimum values established for recessed luminaires at certain mounting heights §130(d)1B
  - Daylight areas have been re-defined to include Primary and Secondary sidelit areas for credit. §131(c)
  - Multi-level (formerly known as bi-level) control steps re-defined.

Nonresidential Buildings cont.

❖ Indoor Lighting – Prescriptive

- ➢ Default wattage for portable lighting removed.
  - o Up to 0.2 watts per square foot of portable lighting for office area shall not be required to be included in the calculation of actual indoor lighting power density. §146(a)
- ➢ Indoor Lighting Power Trade-offs clarified for:
  - o Different Buildings
  - o Conditioned and Unconditioned Space
  - o Indoor and Outdoor Lighting
  - o Complete, Area Category, and Tailored Method

Nonresidential Buildings cont.

❖ Outdoor Lighting – Mandatory Measures

Requirements are the same. Couple of new exceptions.

➢Lamp Efficacy Requirements §132(a)

Exceptions: Searchlights, Film or live performance lighting, LEDs, Neon and cold cathode lighting, ***Sign lighting***.

➢Cutoff Requirements §132(b)

Exceptions: Lighting for building facades, Public monuments, Statues, Temporary lighting, ***Replacement luminaires.***

➢Multi-level Controls §132(c)

Exceptions: Lighting controlled by a motion sensor and photocontrol, Stairs or steps that require illumination during the day, etc.

Nonresidential Buildings cont.

- **Outdoor Lighting – Prescriptive**
  - Outdoor Lighting Power Density Trade-offs clarified:
    - General hardscape and specific application lighting
    - Local ordinance lighting
    - Outdoor and indoor lighting
  - Calculation of allowed lighting power density now determined by the sum of hardscape lighting, specific application lighting, and local ordinance lighting individually.
  - All new lighting allowance values established in Tables 147-A through Table 147-C.

Nonresidential Buildings Cont.

- **Envelope – Mandatory Measures** §118(i)

  Roofing Product Solar Reflectance and Thermal Emittance (Cool Roof)

  - Now must meet an aged solar reflectance; or
  - If CRRC testing for the aged reflectance is not available, the initial solar reflectance can be used in a calculation (included on the Envelope forms); or
  - Use the Solar Reflectance Index (SRI) calculator which considers both the aged solar reflectance and thermal emittance performance of the Cool Roof product. (Website)

* ***<u>This applies to both residential and nonresidential buildings.</u>***

Nonresidential Buildings Cont.

- **Envelope – Prescriptive (Cool Roof)** §143(a)

  Nonresidential, High-rise Residential, and Hotel and Motel building roofing products shall meet the applicable requirements of Section 118(i) (Cool Roof), depending on:

  - Slope of roof
    - ✓Low-sloped – rise to run of 2:12 or less
    - ✓High-sloped – rise to run greater than 2:12
  - Density of roofing product
    - ✓Less than 5 pounds per square foot
    - ✓5 pounds per square foot or more
  - Climate Zone

Nonresidential Buildings Cont.

❖ Envelope – Prescriptive (Cool Roof) cont.

Alterations §149(b)1B

- ➢Replacement, recovering, or recoating of the exterior surface of existing roofs shall meet the Cool Roof requirements of Section 118(i) when more than 50% of the roof or more than 2,000 ft^2 of roof, whichever is less, is replaced.

- **** Exceptions and Alternatives (including a Roof Insulation Alternative) for specific Climate Zones are listed in §149(b)1B and Table 149-A.***

Nonresidential Buildings Cont.

- **Envelope – Prescriptive cont.**
  - All assemblies: walls, floors, roofs/ceilings, etc. must meet the applicable U-Factor requirements of Tables 143-A through 143-C.
  - Meeting a minimum installed R-Value for cavity insulation is no longer an option.
    - Provides greater variety in assembly selection for Nonresidential, High-Rise Residential, Hotel and Motel Buildings.

Nonresidential Buildings Cont.

- **Mechanical – Mandatory Measures** §126

  Refrigerated warehouses greater than 3,000 ft^2 will have requirements for:

  - Fan-powered Evaporators
  - Fan-powered Condensers
  - Compressors

  Standards designed to ensure mechanical equipment will cool the space in an efficient manner.

  **** Refrigerated warehouse will also have to meet the minimum wall, floor, and ceiling insulation requirements of Table 126-A.***

Nonresidential Buildings Cont.

- **New Acceptance Tests (Mandatory Measures)**
  - Acceptance Tests were first introduced into the 2005 Energy Standards.
  - Tests were developed to ensure equipment functions properly after installation (Mechanical and Lighting) i.e.
    - Economizers
    - CO_2 Sensors
    - Occupancy Sensors
  - ALL are Mandatory Measures
  - Applicant identifies applicable Acceptance Tests on the Certificate of Compliance (the 1C Forms), and Acceptance Forms shall be available for final inspection.

Nonresidential Buildings Cont.

- **New Acceptance Tests**
  - Envelope
    - Site-built fenestration (§116)
  - Mechanical
    - Automatic demand shed controls (§125)
    - Thermal Energy Storage (§125)
    - Distributed Energy Storage AC systems (§125)
    - Fault detection and diagnostics (FDD) (§125)
  - Lighting
    - All applicable lighting controls for indoor and outdoor lighting systems must meet the Acceptance Tests specified in Section 134.

Project Address

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2008 Nonresidential Energy Plan Review Checklist for Newly Constructed Buildings

Was the correct compliance software used? *(Performance Only)*	Yes	No	N/A
Energy Pro version 5.0			
Perform 2008			
eQuest version 4.0			
Is the Certificate of Compliance or PERF-1 Form *(Performance)* **signed and dated** by the Documentation Author(s) **AND** the Principal Designer(s)?			
ENV-1C			
LTG-1C			
MECH-1C			
OLTG-1C			
SLTG-1C			
RWH-1C			
Does the building "Comply" according to the PERF-1 Form? *(Performance Only)*			
Is the correct Climate Zone listed on the Certificate of Compliance or modeled on the PERF-1 Form? *(Performance)*			
Were all applicable forms submitted? *(See Documentation Checklist or PERF-1 Form)*			
Does the Energy Documentation match the plans?			
Conditioned Floor Area			
Front Orientation of the Building			
Envelope – Is the Mandatory Measures note block on the plans?			
Insulation for walls, ceilings, and floors *(from Reference Joint Appendix JA4)*			
Number of windows, window area, and their orientation			
U-factor and SHGC values for fenestration			
Exterior shading devices (i.e. overhangs, fins, exterior shades)			
Cool Roof values (aged Solar Reflectance and Thermal Emittance)			
Mechanical – Is the Mandatory Measures note block on the plans?			
Efficiencies and capacities of HVAC equipment			
Duct Insulation			
Efficiencies of Water Heating/Boiler equipment			
Pipe Insulation			
Ventilation Rates (cfm)			
Indoor Lighting – Is the Mandatory Measures note block on the plans?			
LPDs (watts per square foot)			
Area Controls			
Multi-level lighting controls			
Daylight area controls			
Automatic daylighting controls			
Shut-off controls			
Outdoor Lighting – Is the Mandatory Measures note block on the plans?			
LPDs (watts per square foot)			

Project Address

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			Yes	No	N/A
	Cutoff luminaires				
	Automatic shut-off controls				
	Automatic Multi-level lighting controls				
Sign Lighting – Is the Mandatory Measures note block on the plans?					
	LPDs (watts per square foot) OR meets alternative lighting sources requirements				
	Photocontrol or Astronomical Time Switch Controls				
	Dimming Controls				
Refrigerated Warehouses (Greater than 3,000 ft^2)					
	Insulation for walls, ceilings, and floors				
	Evaporators				
	Condensers				
	Compressors				
Are all appropriate Acceptance Tests checked **AND** Equipment Requiring Testing identified on the Certificate of Compliance?					
	Envelope	*ENV-1C*			
	Mechanical	*MECH-1C*			
	Indoor Lighting	*LTG-1C*			
	Outdoor Lighting	*OLTG-1C*			
NOTE: Please refer to the Nonresidential Plan Review Guide or Reference Nonresidential Appendix NA7 for additional information on when Acceptance Tests are required and Acceptance Testing procedures.					

For More Information

- **Energy Standards Website:**

  www.energy.ca.gov/title24

- **Energy Standards Hotline:**

  - 1 (800) 772-3300 (Public)
  - (916) 654-5106 (Outside of CA)

  title24@energy.state.ca.us