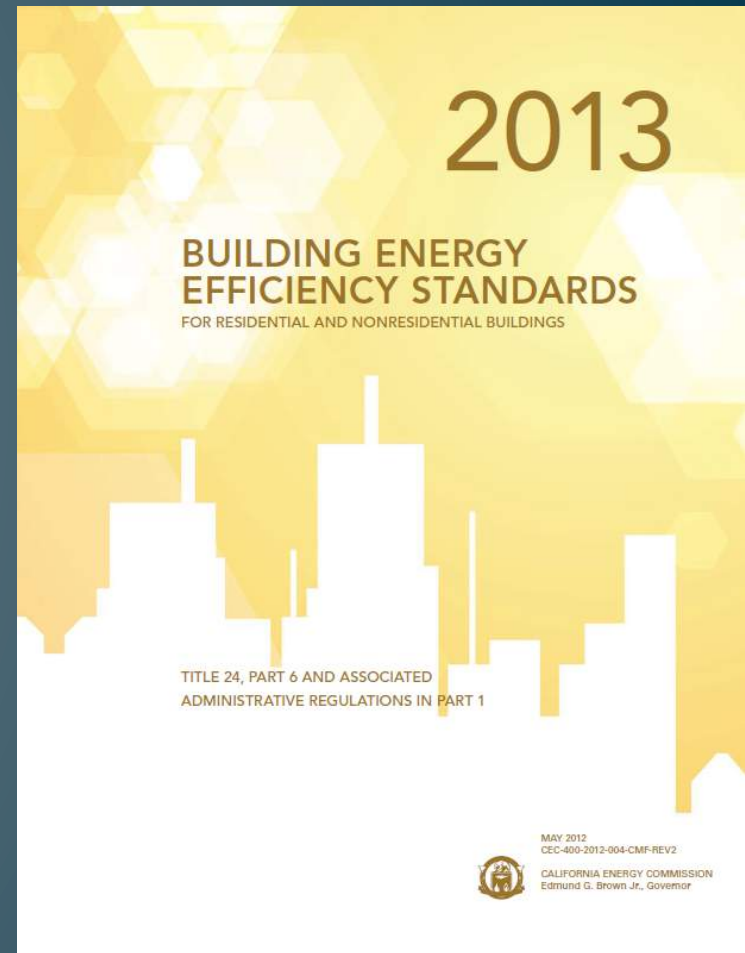


2013 Building Energy Efficiency Standards (California Energy Code)

Energy Code Navigation and
Compliance

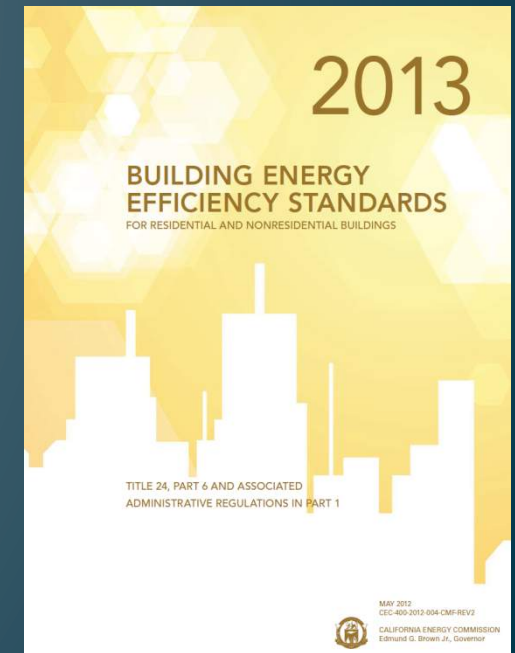
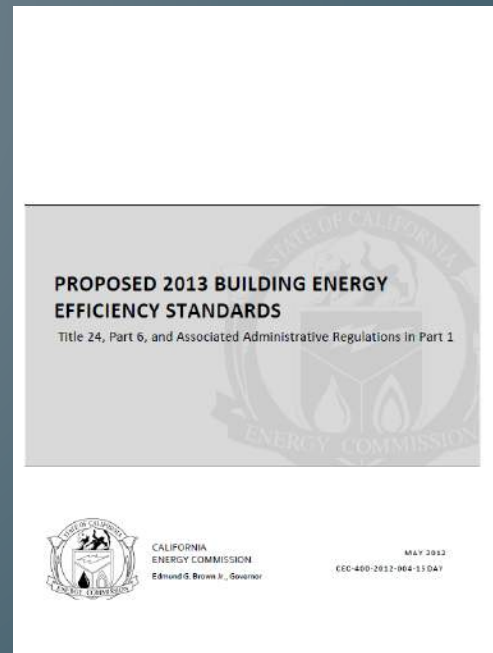
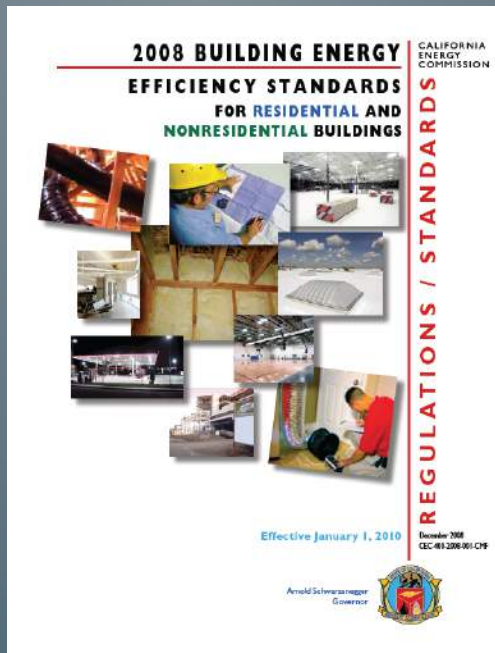
2013 Building Energy Efficiency Standards

- 25 percent more efficient than previous standards for residential construction
- 30 percent more efficient for nonresidential construction.
- The Standards take effect on July 1, 2014



Building Energy Efficiency Standards

- 2008 Standards, 169 pages
- Proposed 2013 Standards (15 Day Language), 349 pages
- 2013 Standards, 252 pages

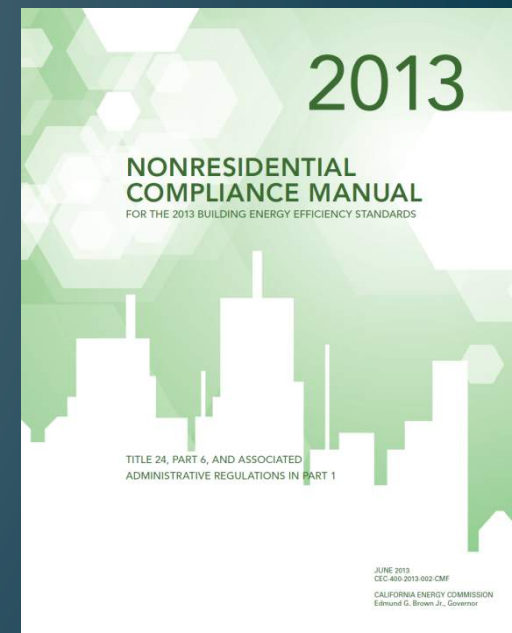
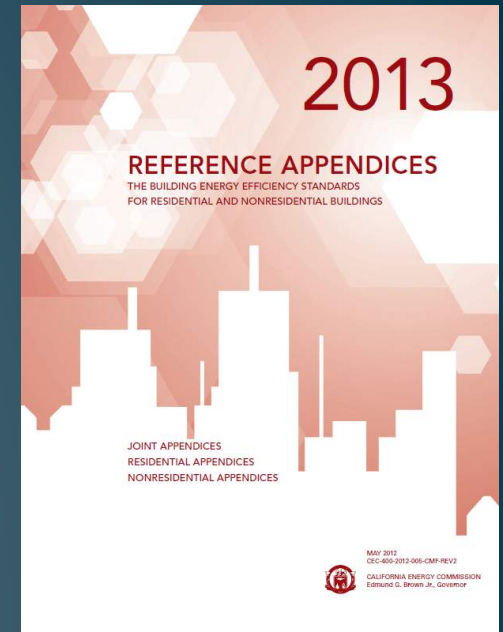
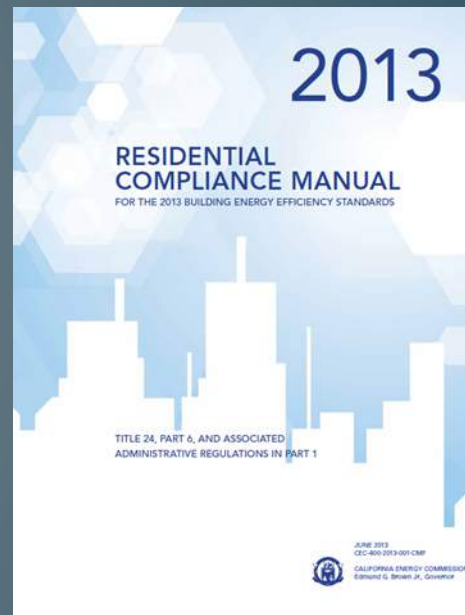


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- Residential Compliance Manual, 550 pages
- Non-Residential Compliance Manual, 1056 pages
- Reference Appendices, 561 pages



Reference Appendices

Joint Appendices

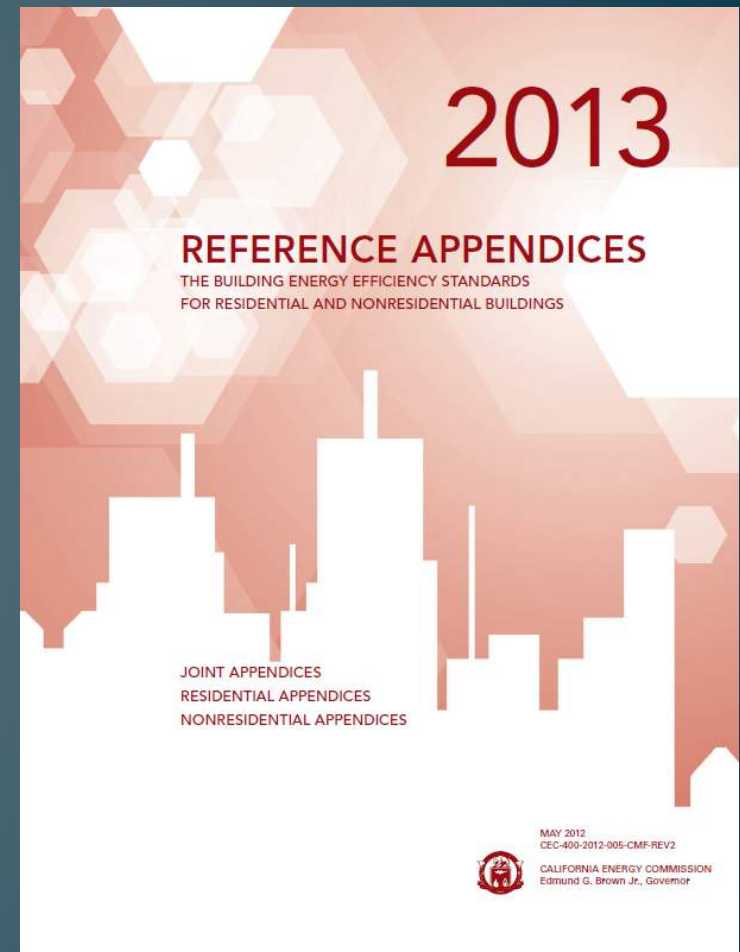
- Weather/Climate Data
- Technical Specifications
- Data Registry Requirements
- Qualifications

Residential Appendices

- Residential HERS Verification, Testing, and Documentation Procedures
- Residential HERS Testing Protocols

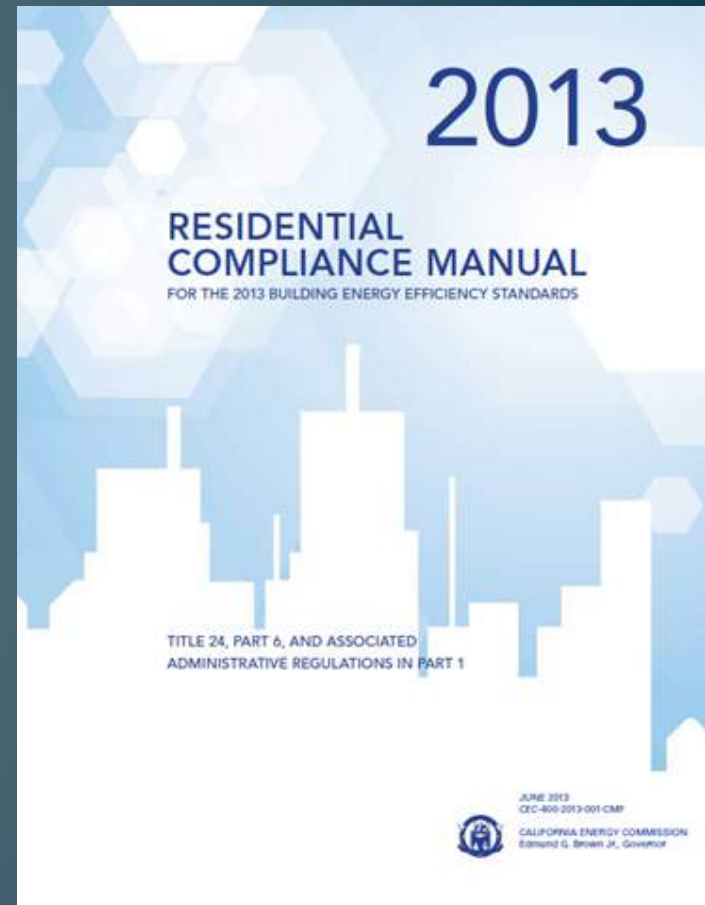
Nonresidential Appendices

- Nonresidential HERS Verification, Testing, and Documentation Procedures
- Nonresidential HERS Testing Protocols



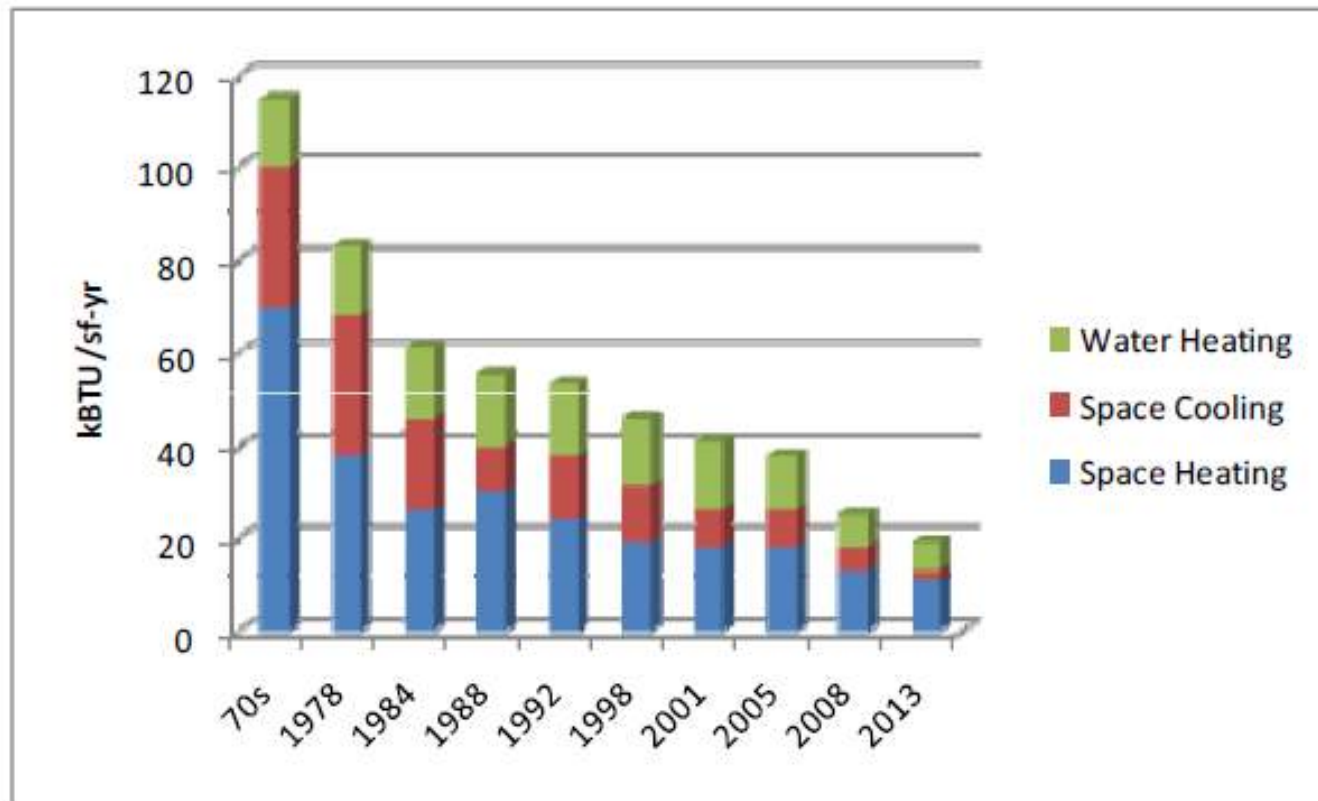
Compliance Manuals

This compliance manual is an aid to help plans examiners, inspectors, owners, designers, builders, and energy consultants comply with and enforce California's 2013 Building Energy Efficiency Standards



Standards Reduce Home Energy Use

Typical energy use for each Standards update
Northern CA Inland Climate



Title 24
2013
Standards



Policy Drivers for the 2013 Standards

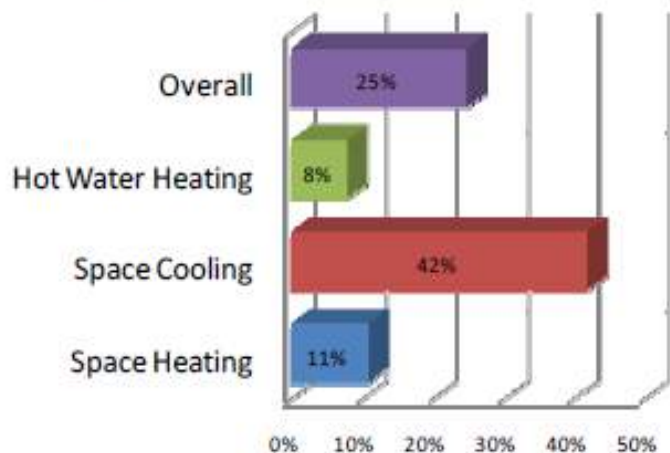
- Zero Net Energy Buildings
 - Newly constructed homes to be ZNE by 2020
 - Newly constructed commercial buildings to be ZNE by 2030
- Energy Efficiency 1st in the Loading Order
- Reduce Greenhouse Gas Emissions
 - 2006 AB32 California Global Warming Solutions Act
 - 2007 Integrated Energy Policy Report
 - 2008 Energy Action Plan
 - 2008 AB32 Scoping Plan
 - 2008 CA Long Term Energy Efficiency Strategic Plan
 - 2010 Governor Brown's Clean Energy Jobs Plan
 - 2010 Clean Energy Future Initiative
 - 2012 Governor Brown's Executive Order



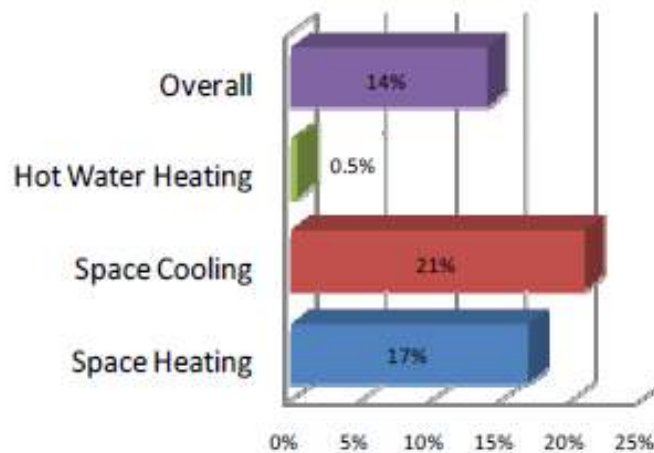
2013 Standards: Residential Energy Savings

- 23.6 GWh/yr; 1.1 Mtherms/yr; 35 MW
- Single Family: 25% better than current Standards
- Multi-Family: 14% better than current Standards

Single Family Savings by End Use



Multi-Family Savings by End Use



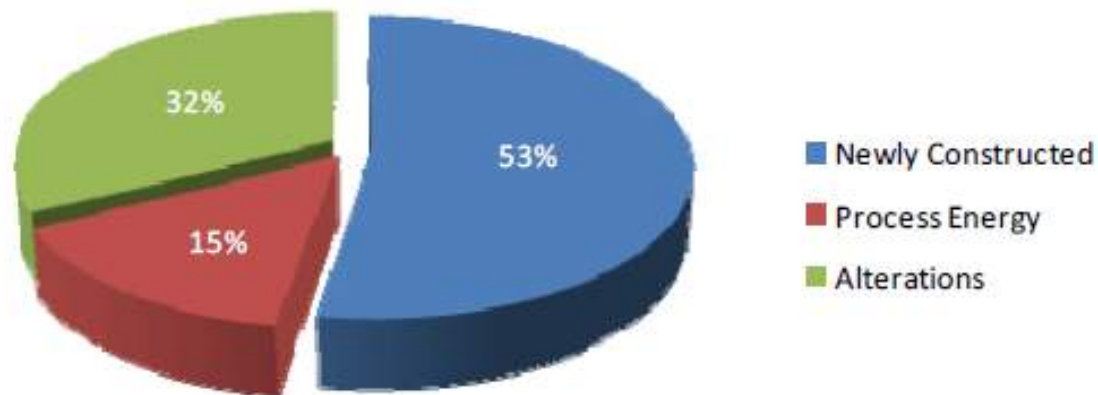
Residential

- Solar-ready roofs to allow homeowners to add solar photovoltaic panels at a future date
- More efficient windows to allow increased sunlight, while decreasing heat gain
- Insulated hot water pipes, to save water and energy and reduce the time it takes to deliver hot water
- Whole house fans to cool homes and attics with evening air reducing the need for air conditioning load
- Air conditioner installation verification to insure efficient operation

2013 Standards: Nonresidential Energy Savings

- 30% more energy efficiency compared to current Standards
- 372 GWh/yr; 6.7 Mtherms/yr; 84 MW

Nonresidential Savings Attribution

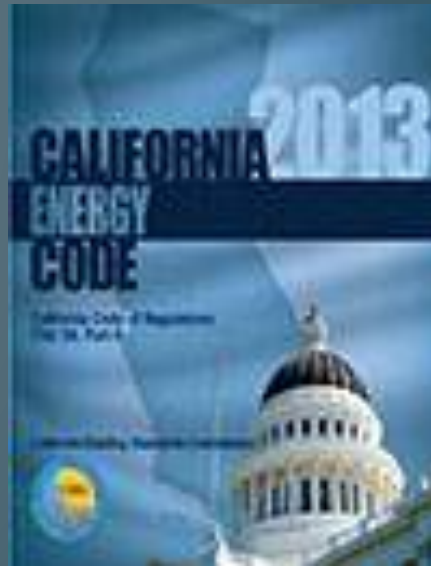
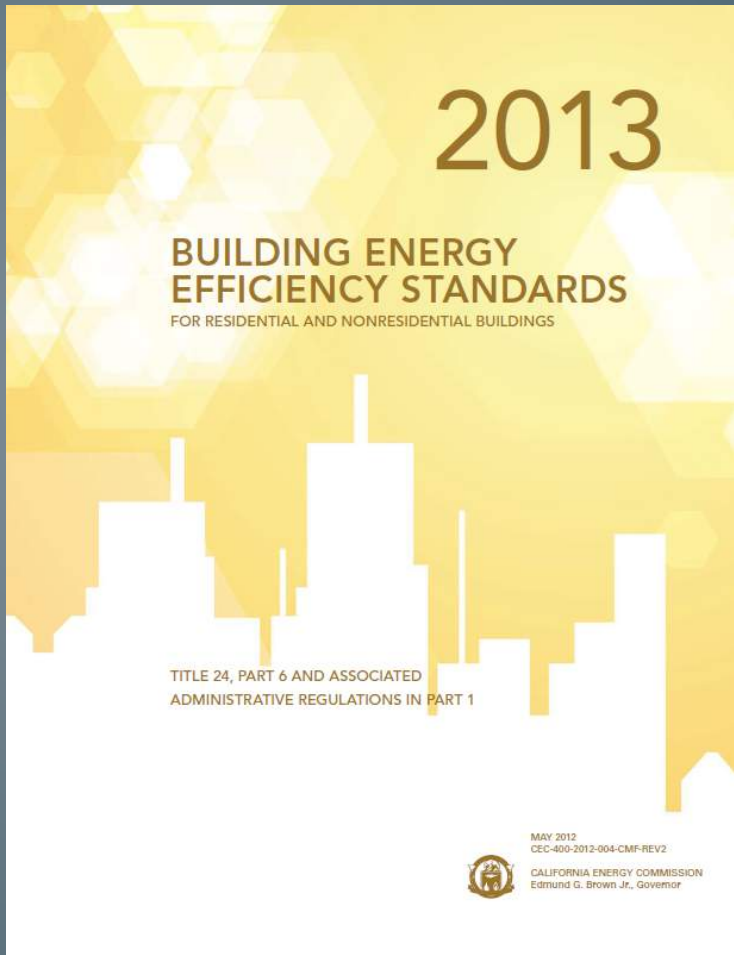


Title 24
2013
Standards



Nonresidential

- High performance windows, sensors and controls that allow buildings to use "daylighting"
- Efficient process equipment in supermarkets, computer data centers, commercial kitchens, laboratories, and parking garages
- Advanced lighting controls to synchronize light levels with daylight and building occupancy, and provide demand response capability
- Solar-ready roofs to allow businesses to add solar photovoltaic panels at a future date
- Cool roof technologies



Administrative Regulations

- PERMIT, CERTIFICATE, INFORMATIONAL, AND ENFORCEMENT REQUIREMENTS FOR DESIGNERS, INSTALLERS, BUILDERS, MANUFACTURERS, AND SUPPLIERS .
- NONRESIDENTIAL LIGHTING CONTROLS ACCEPTANCE TEST TRAINING AND CERTIFICATION
- NONRESIDENTIAL MECHANICAL ACCEPTANCE TEST TRAINING AND CERTIFICATION
- DETERMINATION OF OUTDOOR LIGHTING ZONES

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Compliance Forms

- Residential-96 forms
- Non-Residential-95 forms
- Consider requiring the document author to list the forms required for final inspection.



Appendix A Compliance Forms

#	Doc Type	Doc Category	Category Description	Document Description	Pages
Performance Certificate of Compliance					
1	CF1R-	PRF-01-E	Newly Constructed Buildings; Additions; Alterations	performance compliance method for newly constructed buildings (N), Additions (A), and Alterations (A) => (NAA)	
Prescriptive Certificate of Compliance					
2	CF1R-	NCB-01-E	Newly Constructed Buildings	Newly Constructed Buildings and Additions Greater Than 1000 ft ² (Prescriptive)	
3	CF1R-	ADD-01-E	Additions	Additions less than 1,000 ft ² (Prescriptive)	
4	CF1R-	ALT-01-E	Alterations	Non-HVAC Alterations (Prescriptive) Break Out by Type	
5	CF1R-	ALT-02-E	Alterations-HVAC	HVAC Alterations, Climate Zones 1, 3-7, and 16 (Duct Leakage, Airflow and Fan Watt Draw) (Prescriptive)	
6	CF1R-	ALT-03-E	Alterations-HVAC	HVAC Alterations, Climate Zones 2 and 8-15 (Duct Leakage, Airflow and Fan Watt Draw, Refrigerant Charge) (Prescriptive)	
7	CF1R-	WKS-01-E	Work Sheet	worksheet for EZ-frame - opaque	
8	CF1R-	WKS-02-E	Work Sheet	Area Weighted Average Calculation Worksheet	
9	CF1R-	WKS-03-E	Work Sheet	Solar Heat Gain Coefficient (SHGC) Worksheet	
10	CF1R-	WKS-04-E	Work Sheet	Cool Roof and SRI Worksheet	
11	CF1R-	WKS-05-E	Work Sheet	OG 300 Solar Water Heating System Worksheet	
12	CF1R-	WKS-06-E	Work Sheet	OG 100 Solar Water Heating System Worksheet	
Certificate of Installation					
13	CF2R-	ENV-01-E	Envelope-NonHERS	Fenestration; and Site-built Fenestration	
14	CF2R-	ENV-02-E	Envelope-NonHERS	Envelope Air Sealing Requirements	
15	CF2R-	ENV-03-E	Envelope-NonHERS	Insulation Installation	
16	CF2R-	ENV-04-E	Envelope-NonHERS	Additional Attic Ventilation	
17	CF2R-	ENV-05-E	Envelope-NonHERS	Roofing; Cool Roofs	
18	CF2R-	ENV-20a-H	Envelope-HERS	Building Envelope Air Leakage - Single-Point Test with Manual Meter	
19	CF2R-	ENV-20b-H	Envelope-HERS	Building Envelope Air Leakage - Single-Point Test with Automatic Meter	
20	CF2R-	ENV-20c-H	Envelope-HERS	Building Envelope Air Leakage - Multi-Point Test	
21	CF2R-	ENV-20d-H	Envelope-HERS	Building Envelope Air Leakage - Repeated Single Point with Manual Meter	
22	CF2R-	ENV-20e-H	Envelope-HERS	Building Envelope Air Leakage - Repeated Single Point with Automatic Meter	
23	CF2R-	ENV-21-H	Envelope-HERS	High Quality Insulation Installation (QII)-Framing Stage	
24	CF2R-	ENV-22-H	Envelope-HERS	High Quality Insulation Installation (QII)-Insulation	
Certificate of Verification					
25	CF3R-	ENV-20a-H	Envelope-HERS	Building Envelope Air Leakage - Single-Point Test with Manual Meter	
26	CF3R-	ENV-20b-H	Envelope-HERS	Building Envelope Air Leakage - Single-Point Test with Automatic Meter	
27	CF3R-	ENV-20c-H	Envelope-HERS	Building Envelope Air Leakage - Multi-Point Test	

Compliance Forms

- Residential forms - 5 pages
- Non-Residential forms – 6 pages

Keep lists handy to help determine which forms are necessary at final inspection.

APPENDIX A Compliance Forms

CERTIFICATE OF COMPLIANCE			
NRCC-CXR-01-E	Commissioning Review	Enforce Agency	Certificate of Compliance - Cx Design Review Kickoff
NRCC-CXR-02-E	Commissioning Review	Enforce Agency	Certificate of Compliance - Cx Construction Documents-General
NRCC-CXR-03-E	Commissioning Review	Enforce Agency	Certificate of Compliance - Cx Construction Documents-Simple HVAC Systems
NRCC-CXR-04-E	Commissioning Review	Enforce Agency	Certificate of Compliance - Cx Construction Documents-Complex Mechanical Systems
NRCC-CXR-05-E	Commissioning Review	Enforce Agency	Certificate of Compliance - Cx Design Review Signature Page
NRCC-ELC-01-E	Electrical	Enforce Agency	Certificate of Compliance - Disaggregation of Electrical Circuits
NRCC-ENV-01-E	Envelope	Enforce Agency	Certificate of Compliance - Envelope Component Approach
NRCC-ENV-02-E	Envelope	Enforce Agency	Certificate of Compliance - Fenestration Worksheet
NRCC-ENV-03-E	Envelope	Enforce Agency	Certificate of Compliance - CoolRoof And SRI Worksheet
NRCC-ENV-04-E	Envelope	Enforce Agency	Certificate of Compliance - Daylit Zone Worksheet
NRCC-ENV-05-E	Envelope	Enforce Agency	Certificate of Compliance - FENESTRATION CERTIFICATE LABEL
NRCC-ENV-06-E	Envelope	Enforce Agency	Area Weighted Average Calculation Worksheet
NRCC-LTI-01-E	Lighting - Indoor	Enforce Agency	Certificate of Compliance and Field Inspection Checklist
NRCC-LTI-02-E	Lighting - Indoor	Enforce Agency	Certificate of Compliance - Lighting Controls Credit Worksheet
NRCC-LTI-03-E	Lighting - Indoor	Enforce Agency	Certificate of Compliance - Indoor Lighting Power Allowance
NRCC-LTI-04-E	Lighting - Indoor	Enforce Agency	Certificate of Compliance - Tailored Method Worksheet
NRCC-LTI-05-E	Lighting - Indoor	Enforce Agency	Certificate of Compliance - Line Voltage Track Lighting Worksheet
NRCC-LTO-01-E	Lighting - Outdoor	Enforce Agency	Certificate of Compliance - Outdoor Lighting

Good News! Simplified forms

HVAC Change-out

- One page CF1R for HVAC alterations.
- Climate Zones 1 and 3-7 ALT-02-E
- Climate Zones 2 and 8-15 ALT-03-E

STATE OF CALIFORNIA ALTERATIONS - HVAC CEC-OP1R-ALT-03-E (Revised 06/13)		CALIFORNIA ENERGY COMMISSION	
CERTIFICATE OF COMPLIANCE		CF1R-ALT-03-E	
Alterations - HVAC CZ 1, 3 to 7 and 16 (formerly CF-1R-ALT-HVAC)		(Page 1 of 1)	
Site Address:		Enforcement Agency:	Date Prepared:
Permit#:			
Equipment Type	Equipment Efficiency	New: Ducting, Plenums, Linest Required R-value	Cond/Uned Floor Area (sq. ft.)
<input type="checkbox"/> Packaged System	<input type="checkbox"/> AFUE	<input type="checkbox"/> R-6 (CZ 1-3-7)±	Served by system
<input type="checkbox"/> Split System	<input type="checkbox"/> COP	<input type="checkbox"/> R-8 ¹ (CZ 16) Ducts	
<input type="checkbox"/> Furnace	<input type="checkbox"/> SEER	<input type="checkbox"/> R-6 (all CZ's) Plenums	Setback (if not already present, must be installed)
	<input type="checkbox"/> EER	<input type="checkbox"/> R-5 or R7.5 Linest ²	
<p>HERS VERIFICATION SUMMARY Listed below are Four HVAC Alteration Options. The installer determines the work to be completed and matches it to one of the options below. All forms to be registered (no hand filled forms allowed). Copy of forms to be left on site for final inspection.</p>			
<input type="checkbox"/> 1. HVAC Changeout/Repair Can include new ducting		Required Compliance Documents to be left on site for Final:	
All Equipment, Condenser Unit, Evaporator Coil, Air Handler/Furnace		CF1R-ALT-02-E CF2R: MECH-01, MECH-20-HERS CF3R: MECH-20-HERS	
Installer Requirement: Duct leakage (≤15% or ≤10% to outside, or seal all accessible leaks) Exempted from duct leakage testing if:		<input type="checkbox"/> Duct system registered with HERS provider as previously sealed, or <input type="checkbox"/> 2. There is less than 40 linear feet of duct in unconditioned space, or <input type="checkbox"/> 3. Existing duct systems are constructed, insulated or sealed with asbestos (list manufacture date of building _____)	
<input type="checkbox"/> 2. New HVAC System		Required Compliance Documents to be left on site for Final:	
All new equipment and All New Ducts ²		CF1R-ALT-02-E CF2R-MECH-01, MECH-20-HERS, MECH-22-HERS, MECH-(23 or 24)-HERS CF3R-MECH-20-HERS, MECH-22-HERS, MECH-(23 or 24)-HERS ²	
Installer Requirement: Duct leakage ≤6%, Fan Efficacy (15W/CFM), Air Flow ≥ 350 CFM/ton (or Standards Table 150.0-C / D alternative)			
<input type="checkbox"/> 3. All New Ducts with Replacement		Required Compliance Documents to be left on site for Final:	
Includes replacing or installing All New Ducts ² and one or more of the following: Condenser Unit, Evaporator Coil, Furnace		CF1R-ALT-02-E CF2R-MECH-01, MECH-20-HERS, MECH-(23 or 24)-HERS CF3R-MECH-20-HERS, MECH-(23 or 24)-HERS	
Installer Requirement: Duct leakage ≤6%, Air Flow ≥ 350 CFM/ton (or Standards Table 150.0-C / D alternative) <input type="checkbox"/> Exempted from duct leakage testing if existing duct systems are constructed, insulated or sealed with asbestos.			
<input type="checkbox"/> 4. New Ducting over 40 feet		Required Compliance Documents to be left on site for Final:	
Adding or replacing ducts in unconditioned space but less than All New Ducts ²		CF1R-ALT-02-E CF2R: MECH-20-HERS CF3R: MECH-20-HERS	
Installer Required to: Duct leakage (≤15% or ≤10% to outside, or seal all accessible leaks) <input type="checkbox"/> Exempted from duct leakage testing if existing duct systems are constructed, insulated or sealed with asbestos.			
<p>¹All new ducting R-8 required when more than 40 ft installed and R-6 when less than 40 ft installed. This includes in walls, between floors etc.</p> <p>²A New Duct system is when the duct system is constructed of at least 75 percent new duct material, and up to 25 percent may consist of reused parts from the dwelling unit's existing duct system (e.g., registers, grilles, boots, air handler, plenums, duct material).</p> <p>³R-5 (1" thick insulation) for linest¹ and less. R-7.5 (1.5" thick insulation) for linest¹ over 1 inch. Most mfg will require Suction line Diameter with insulation as the following 1.5-2T-2½", 2.5-3T-2½", 3.5 to 4T-2½", 5T-4½"</p>			
Contractor (Documentation Author's /Responsible Designer's Declaration Statement)			
I certify the following under penalty of perjury, under the laws of the State of California:			
<ol style="list-style-type: none"> The information provided on this Certificate of Compliance is true and correct. I am eligible under Division 3 of the California Business and Professions Code to accept responsibility for the information on this document. That the energy features and performance specifications for the design identified on this Certificate of Compliance conform to the requirements of Title 24, Parts 1 and 6 of the California Code of Regulations (CCR). That the energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the CCR. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application. 			
Responsible Designer Name:	Responsible Designer Signature:	Date Signed:	License:
Company:	Address:	City/State/Zip:	Phone:

Good news! No forms required for minor projects

- **10-103 (a) 1 C** - For alterations to existing residential buildings for which HERS field verification is not required such as:
 - Water heater
 - Window replacements
 - Additions less than 300 square feet



The Most Useful Table in the Standards

TABLE 100-A

Covered Processes added to the code and table (Section 140.9)

- Computer Rooms
- Commercial Kitchens
- Kitchen Ventilation

TABLE 100.0-A APPLICATION OF STANDARDS

Occupancies	Application	Mandatory	Prescriptive	Performance	Additions/Alterations
General Provisions		100.0, 100.1, 100.2, 110.0, 110.10			
Nonresidential, High-Rise Residential, And Hotels/Motels	General	140.0	140.2	140.1	141.0
	Envelope (conditioned)	110.6, 110.7, 110.8, 120.7	140.3		
	Envelope (unconditioned process spaces)	N.A.	140.3(c)		
	HVAC (conditioned)	110.2, 110.5, 120.0-120.5, 120.8	140.4		
	Water Heating	110.3, 120.3, 120.8	140.5		
	Indoor Lighting (conditioned, process spaces)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6	N.A.	
	Indoor Lighting (unconditioned and parking garages)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6		
	Outdoor Lighting	110.9, 130.0, 130.2, 130.4	140.7		
	Building Electrical Power	130.5	N.A.		
	Pool and Spa Systems	110.4, 150.0(p)	N.A.		N.A.
Solar Ready Buildings	110.10	N.A.	N.A.	N.A.	
Covered Processes ¹	Envelope, Ventilation, Process Loads	110.2, 120.6, 120.8	140.9	140.1	120.6, 140.9
Signs	Indoor and Outdoor	130.0, 130.3	140.8	N.A.	141.0
Low-Rise Residential	General	150.0	150.1(a, c)	150.1(a, b)	150.2
	Envelope (conditioned)	110.6, 110.7, 110.8, 150.0(a-c, g, l)			
	HVAC (conditioned)	110.2, 110.5, 150.0(h, i, m, o)			
	Water Heating	110.3, 150.0(j, n)			
	Indoor Lighting (conditioned, unconditioned and parking garages)	110.9, 130.0, 150.0(k)	150.1(a, c)	150.1(a, b)	150.2
	Outdoor Lighting	110.9, 130.0, 150.0(k)			
	Pool and Spa Systems	110.4, 150.0(p)	N.A.	N.A.	N.A.
	Solar Ready Buildings	110.10	N.A.	N.A.	N.A.

¹ Nonresidential, high-rise and hotel/motel buildings that contain covered processes may conform to the applicable requirements of both occupancy types listed in this table.

Frequent Questions

- Refrigerant Charge on Mini-Split Systems
- Accurate CF6R Duct Testing Results
- Electric Water Heater
- SLA Compliance Requirements (HERS) / Building Envelope Sealing
- Compliance Requirements for Unpermitted Work
- Documentation Requirements for HVAC Sample Group (Untested)
- Electrical Resistance Heat
- Conditioning Enclosed Patio or Garage
- Screw Base Conversion Kits
- Insulating existing attic
- Replacement Windows
- High Efficacy Lighting in Kitchens
- Occupancy vs. Vacancy Switch in Bathroom
- Recirculation Pump Installation
- Whole house fan installation

Frequent Questions

Refrigerant Charge for Mini-split and Package systems

2008 Standards

- CF1R
- CF6R

2013 Standards

- CF1R
- CF2R (formerly CF6R)
- CF3R (formerly CF4R)
- Refrigerant charge verification required
- Weigh-in method requires HERS verification



Frequent Questions

Accurate CF6R Duct Testing Results

How many HVAC contractors own duct testing equipment?

Why is it important?

- Energy Efficiency
- Indoor Air Quality
- Health and Safety

INSTALLATION CERTIFICATE		CF-6R-MECH-21-HERS
Duct Leakage Test - Existing Duct System (Page 1 of 2)		
Site Address: 2221 Fortuna Ct., Davis	Enforcement Agency: Davis	Permit Number: 10-792
Enter the Duct System Name or Identification/Tag: System 1		
Enter the Duct System Location or Area Served: Whole House		
<i>Note: Submit one Installation Certificate for each duct system that must demonstrate compliance in the dwelling.</i>		
<i>This installation certificate is required for compliance for alterations and additions in existing dwellings to space conditioning systems and duct systems.</i>		
<i>Note: For existing dwellings, a completely new or replacement duct system can also include existing parts of the original duct system (e.g., register boots, air handler, coil, plenums, etc.) if those parts are accessible and they can be sealed. For a completely new or replacement duct system installed in an existing dwelling, use the Installation Certificate titled "Duct Leakage Test - Completely New or Replacement Duct System."</i>		
Duct Leakage Diagnostic Test - Existing Duct System		
Select one compliance method from the following four choices.		
<input checked="" type="checkbox"/> Option 1. Measured leakage less than 15% of Fan Airflow.		
<input type="checkbox"/> Option 2. Measured leakage to outside less than 10% of Fan Airflow.		
<input type="checkbox"/> Option 3. Reduce leakage by 60% or more, and conduct smoke test to seal all accessible leaks.		
<input type="checkbox"/> Option 4. Fix all accessible leaks using smoke test, and HERS rater must verify.		
<i>Note: (Option 1 must be attempted before utilizing Option 4)</i>		
Determine nominal Fan Airflow using one of the following three calculation methods.		
<input checked="" type="checkbox"/> Cooling system method: Size of condenser in Tons 4 _____ x 400 = 1600 _____ CFM		
<input type="checkbox"/> Heating system method: 21.7 x _____ Heating Output Capacity (kBtu/h) = _____ CFM		
<input type="checkbox"/> Measured system airflow using RA3.3 airflow test procedures: _____ CFM		
Option 1 used then:		
Allowed leakage = Fan Airflow 1600 _____ x 0.15 = 240 _____ CFM		
Actual leakage = 236 _____ CFM		
Pass if Actual leakage is less than Allowed leakage <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		
Option 2 used then:		
Allowed leakage = Fan Airflow _____ x 0.10 = _____ CFM		
Actual leakage to outside = _____ CFM		
Pass if Actual leakage to outside is less than Allowed leakage <input type="checkbox"/> Pass <input type="checkbox"/> Fail		
Option 3 used then:		
Initial leakage prior to start of work = _____ CFM		
Final leakage after sealing all accessible leaks using smoke test = _____ CFM		
Initial leakage _____ - Final leakage _____ = Leakage reduction _____ CFM		
(Leakage reduction _____ / Initial leakage _____) x 100% = % Reduction _____		
Pass if % Reduction \geq 60% <input type="checkbox"/> Pass <input type="checkbox"/> Fail		
Option 4 used then:		
All accessible leaks repaired using smoke test. HERS rater must verify (No sampling).		
Pass if all accessible leaks have been sealed using Smoke Test <input type="checkbox"/> Pass <input type="checkbox"/> Fail		
Registration Number: _____		Registration Date/Time: _____ HERS Provider: CalCerts
2008 Residential Compliance Forms		August 2009



Frequent Questions

Owner wants an Electric Water Heater because of Carbon Monoxide concerns.

Coming in 2016



Frequent Questions

Specified Leakage Area (2008) Compliance Requirements (HERS)

- Checklist is not an acceptable substitution for testing.
- All homes utilizing the SLA credit shall be tested.

Building Envelope Sealing (2103)



Frequent Questions

Compliance Requirements for Unpermitted Work


- Efficiency based on manufacture date.
- Duct Testing
- Refrigerant Charge
- CF1R
- CF6R (CF2R)
- CF4R (CF3R)



Frequent Questions

Documentation Requirements for HVAC Sample Group (Untested)

- All projects require CF4R (CF3R) regardless of whether they were tested or not.

CERTIFICATE OF FIELD VERIFICATION AND DIAGNOSTIC TESTING		CF-4R-MECH-25
Refrigerant Charge Verification - Standard Measurement Procedure (Page 5 of 5)		
Site Address: 1514 Magellan, Davis, CA 95616	Enforcement Agency: City of Davis	Permit Number: 10-2147
Standard Charge Measurement Summary: System shall pass both refrigerant charge criteria, metering device criteria (if applicable), and minimum cooling coil airflow criteria based on measurements taken concurrently during system operation. If corrective actions were taken, all applicable verification criteria must be re-measured and/or recalculated.		
System Name or Identification/Tag		
System meets all refrigerant charge and airflow requirements. Enter Pass or Fail		
 CHEERS		
DECLARATION STATEMENT <ul style="list-style-type: none">• I certify under penalty of perjury, under the laws of the State of California, the information provided on this form is true and correct.• I am the certified HERS rater who performed the verification services identified and reported on this certificate (responsible rater).• The installed feature, material, component, or manufactured device requiring HERS verification <input type="checkbox"/> is identified on this certificate (the installation) complies with the applicable requirements in the California Residential Code, Title 24, Part 9.4.2, RAZ and RA3 and the requirements specified on the Certificate(s) of Compliance (CF-1R) approved by the local enforcement agency.• The information reported on applicable sections of the Installation Certificate (IC-6R) signed and submitted by the person(s) responsible for the installation conforms to the requirements specified on the Certificate(s) of Compliance (CF-1R) approved by the enforcement agency.		
Builder or Installer Information as shown on the Installation Certificate (CF-6R)		
Company Name: (Installing Subcontractor or General Contractor or Builder/Owner) Blake's Heating and Air		
Responsible Person's Name: Mark Blake	CSLB License: 299969	
HERS Provider Data Registry Information		
Sample Group # (if applicable): Blake's Group 25	<input type="checkbox"/> tested/verified dwelling	<input checked="" type="checkbox"/> not-tested/verified dwelling in a HERS sample group
HERS Rater Information		
HERS Rater Company Name: Amaro Construction Services		
Responsible Rater's Name: Allen Amaro	Responsible Rater's Signature: Allen Amaro (Signature on File)	
Responsible Rater's Certification Number w/ this HERS Provider: CCNAA292394	Date Signed: 9/10/2010	

Registration Number: 110-E82939F1-0198-1-MECH25 Registration Date/Time: 09/10/2010 18:46 HERS Provider: CHEERS

Frequent Questions

Electrical Resistance Heat

- Exception allows electric resistance heat with conditions:



STATE OF CALIFORNIA

RESIDENTIAL ALTERATIONS

CEC- CF-1R-ALT (Revised 03/10)

CALIFORNIA ENERGY COMMISSION



Prescriptive Certificate of Compliance: Residential		CF-1R-ALT
<i>Residential Alterations</i>		(Page 5 of 7)
Project Name:	Climate Zone #	# of Stories

HVAC SYSTEMS - HEATING					
Heating Equipment Type and Capacity ^{1,2,3}	Minimum Efficiency (AFUE or HSPF)	Distribution Type and Location ⁴	Duct or Piping Insulation R-Value	Thermostat Type	Configuration (Central, Split, Space, Package or Hydronic)

1. Indicate Heating Type (Central Furnace, Wall Furnace, Heat pump, Boiler, Electric Resistance, etc.)
 2. Electric resistance heating is allowed only in Component Package C, or except where electric heating is supplemental (i.e., if total capacity ≤ 2 KW or 7,000 Btu/hr electric heating is controlled by a time-limiting device not exceeding 30 minutes). See §151(b)3 exception.
 3. Refer to the HERS Verification section on Page 4 of the CF-1R-ALT Form for additional requirements and check applicable boxes.
 4. Indicate Type or Location (Ducts, Hydronic in Floor, Radiators, etc.)

Frequent Questions

Electrical Resistance Heat

- Capacity not to exceed 2kW or 7,000 Btu/hr and
- Controlled by a time-limiting device not exceeding 30 minutes.

Note: If using an overhang for south-facing glazing, the glazing must be fully shaded at solar noon on August 21 and substantially exposed to direct sunlight at solar noon on December 21 (see Residential Manual, Chapter 3)

12. Comments: Any notes regarding location, unique conditions, or attachments.

- Total Proposed Fenestration Area: Is the total sum of column 6 of all fenestration area listed in both this form and building plans.
- Maximum Allowed Fenestration Area: Row b. Auto-complete from Table H.03.; CFA x 0.20, 0.05 (for west facing orientation) in specific zones.
- Compliance requires that Total Proposed Fenestration Area, Row a., must be less than or equal to row b., otherwise the proposed fenestration areas must be reduced to meet the Maximum Allowed Fenestration Row b..
- If exterior shading devices are used to meet the prescriptive SHGC requirements (as indicated by a value in column I.11), indicate the SHGC calculated on form CF-1R-ENV-03 and attach the form for each window with an exterior shading device.

J: SPACE CONDITIONING SYSTEMS – HEATING/COOLING/DUCTS

- Heating system type: Indicate heating system type as furnace, central heat pump, boiler, hydronic, wood heat, wall furnace, room heat pump, or electric resistance if it meets the exception. An exception to Section 150.1(c)6 allows electric resistance heating only when it is supplemental to another system, as indicated by a capacity of < 2 kW or 7,000 Btu/hr, and a time-limiting control device that allows it to be operated for 30-minutes at a time.
- Heating efficiency: For central gas heating systems, the minimum efficiency required by the appliance efficiency standards is 78% AFUE. Heat pumps have an HSPF of 7.7 or higher. Other appliance types will have different efficiency levels (e.g., a gas wall furnace may have a minimum requirement of 73% AFUE or lower, depending on the size and type). Any gas heating appliance (or heat pump) sold in California is acceptable. The only electric heating appliance allowed is a heat pump.

If a new system is installed complete the following section.

- Alteration type: Select "New" if a new system will serve the addition alone, or "Replace" if a new system is being installed to condition the existing and new space.
- Area to be heated/cooled (ft²): Indicate the conditioned floor area that the system will be heating and/or cooling.
- Heating system type: Type includes furnace, central heat pump, boiler, hydronic, wood heat, wall furnace, room heater, room heat pump, or electric resistance (if it meets the exception). An exception to Section 150.1(c)6 allows electric resistance heating only when it is supplemental to another system, as indicated by a capacity of < 2 kW or 7,000 Btu/hr, and has a time-limiting control device that allows it to be operated for 30-minutes at a time.
- Heating efficiency: For central gas heating systems, the minimum efficiency required by the appliance efficiency standards is 78% AFUE. Heat pumps have an HSPF of 7.7 or higher. Other appliance types will have different efficiency levels (e.g., a gas wall furnace may have a minimum requirement of 73% AFUE or lower, depending on the size and type). Any gas heating appliance (or heat pump) sold in California is acceptable. The only electric heating appliance allowed is a heat pump.
- Cooling System Type: Indicate cooling system type or specify "no cooling." Categories include central air split system, central air package system, heat pump, room air or room heat pump, mini-split heat pump, or no cooling.
- Cooling efficiency: For central cooling systems, the minimum efficiency required by the appliance efficiency standards is 13 SEER. Other appliance types will have different efficiency levels (e.g., a room air conditioner may have a minimum requirement of 9 EER (when an appliance standard is an EER this is considered equivalent to an SEER). Any cooling appliance sold in California is acceptable.
- Thermostat type: Select a setback thermostat or an Energy Management System (EMS) for most systems, or N/A if exempt. Controls for most systems can be by a device that allows a person to program up to 4 temperature setpoints within 24 hours. See Section P.1 for more information and for a list of systems that do not have to meet the setback thermostat requirements.
- Comments: Any notes regarding location or unique conditions.

NOTE: Ventilation Cooling or a whole house fan (a prescriptive requirement in climate zones 8-14) is not required for additions less than or equal to 1,000 ft². Other mandatory requirements still apply.

K. DUCT SYSTEMS

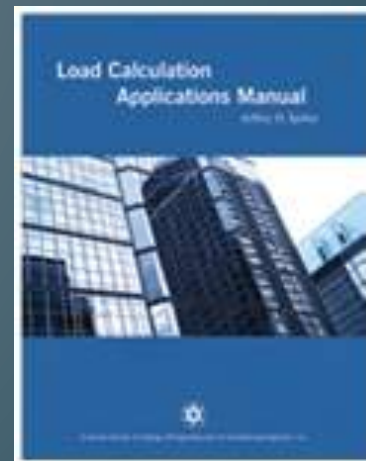
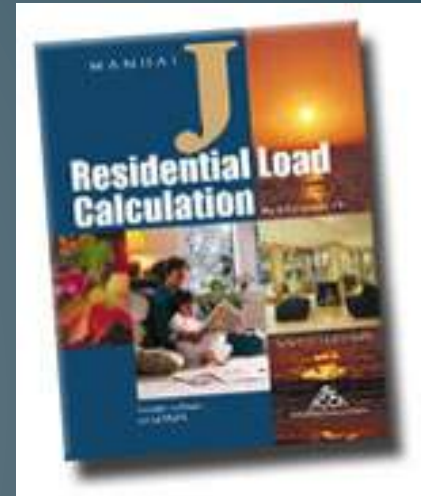
If an existing heating/cooling system is being extended to serve the addition, if less than 40 feet of new or replacement duct work is installed in either unconditioned or indirectly conditioned space (such as an attic or crawlspace) then no duct requirements are triggered. If that is the case only mandatory requirements apply. If prescriptive duct requirements are triggered, Exception 5 to Section 150.2(a) requires the existing duct

Frequent Questions

Building heating and cooling loads shall be determined using an approved method.

“Like for like” does not require calculation of heating and cooling loads.

150.0 Mandatory Features only applies to new construction.



Frequent Questions

Installing a gas fireplace or conditioning (heat or cooling) an enclosed patio or garage.

- Conditioning the space triggers envelope compliance.



Frequent Questions

Screw Base Conversion Kits

- Screw base equals low efficacy
- Change for 2016



Frequent Questions

Replacement Windows

2008 Standards

- U-Factor .40
- SHGC .40

2013 Standards

- U-Factor .32
- SHGC .25



Frequent Questions

Permit required to insulate an existing attic?

- Minimum R-30 except CZ 1 and 16 R-38.
- Existing recessed cans
- Combustion air openings
- Existing appliance vents
- Attic ventilation



Frequent Questions

High Efficacy Lighting in Kitchens

- 2- 60 watt low efficacy, 120 watts total.
- 5-26 watt fluorescent 130 watts total.

Owner wants to install 5 LED luminaires (60 watts total)

- Fluorescent 26 watts each
- LED 12 watts each



Frequent Questions

Occupancy vs. Vacancy Switch

- Residential Occupancy sensor- auto on and auto off.
- Residential Vacancy sensor – manual on and auto off.



Frequent Questions

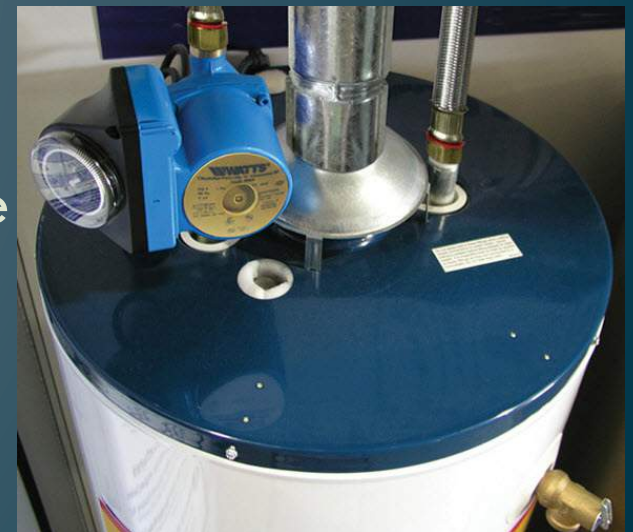
Recirculation Pump Installation (retrofit)

2008 Standards:

- Remote pump OK
- Recirculation system requires all pipes to be insulated (typically impractical).

2103 Standards

- Both pumps OK
- Exception allows only exposed pipes to be insulated



Frequent Questions

Whole House Fan Installation

A whole house fan should not be installed if a natural draft or fan assisted gas appliance located inside the combustion appliance zone or attic without providing an interlock device.



Community Development and Sustainability Department

23 Russell Boulevard, Suite 2 Davis, California 95616
Phone: (530)757-5610 Fax: (530)757-5960 TDD: (530)757-5666
Website: <http://community-development.cityofdavis.org/>
Email: cdswet@cityofdavis.org

WHOLE HOUSE FAN

The City of Davis has adopted the 2010 California Green Building Standards Code (CALGreen) which applies to all construction including additions and remodels. (Ordinance 2370 §, 2010)

The installation of a whole house fan can be accomplished when the following steps are followed:

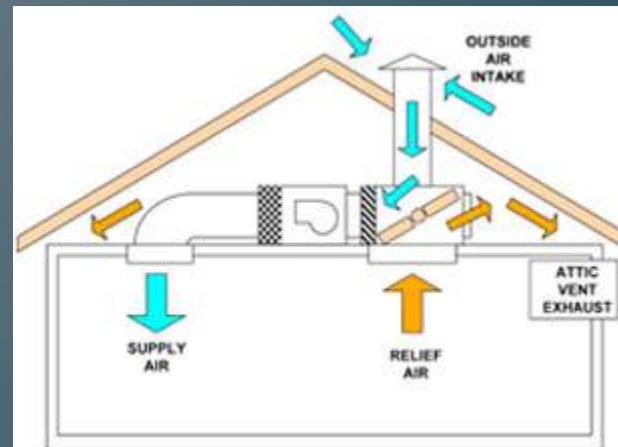
1. Prior to installing a fan, survey your home to determine if gas appliances are in your attic or within the home. A whole house fan should not be installed if your home has a gas appliance located inside the home (exception direct vent appliances).
2. If you determine that a whole house fan will not conflict with the operation of any gas fired appliance, you may install your fan. (If existing gas appliances conflict, see item 4 below)
3. Provide the installation instructions for the fan at time of inspection.
4. When you have conflicts with other gas appliances and you want to go ahead with the installation, you have three options:
 - 1) Enclose the gas appliances and obtain combustion air from an outside source (within house);
 - 2) Duct the whole house fan directly to the exterior (only if the appliance is located in the attic); or
 - 3) Provide an interlock device that allows only one of the appliances (fan or gas appliance) to be on at a time (within attic).

Residential



Residential - Prescriptive Measures

- Night Ventilation – Whole house fan as a minimum; allows Smart Vents and Night Breeze as alternatives in CZs 8-14. (Section 150.1(c)12)



WHOLE HOUSE FAN COMAPARISON

Manufacturer	Model	cfm	watts	cfm/watt	cost	insulation	dBA
Airscape	1.7 WHF	1712	157	10.9	\$ 869.00	R7	55
		1000	78	12.8			44
Airscape	2.5 WHFe	2536	197	12.9	\$ 1,329.00	R10	50
		1530	44	34.8			37
Airscape	4.4 WHFe	4410	699	6.3	\$ 1,649.00	R10	50
		2132	102	20.9			32.5
Tamarack	HV 1000	1150	78	14.8	\$ 579.00	R38	Not Reported
Tamarack	HV 1600	1150	140	8.2	\$ 859.00	R38	Not Reported
		1600	140	11.4			
Quiet Cool	QCES 1250	1265	36	35.1	\$ 660.00	R4.2	44
Quiet Cool	QCES 2000	2035	88.8	22.9	\$ 920.00	R4.2	46
Quiet Cool	QCES 2850	2850	177.6	16	\$ 1,100.00	R4.2	48
Master Flow	4500*	4500	276	16.3	\$ 234.00	None	Not Reported
Master Flow	6000*	6000	480	12.5	\$ 298.00	None	Not Reported
Master Flow	1600*	1600	348	4.6	\$ 438.00	Not Reported	Not Reported

* Does not comply with the California Green Building Standards Code (not insulated to R.4)

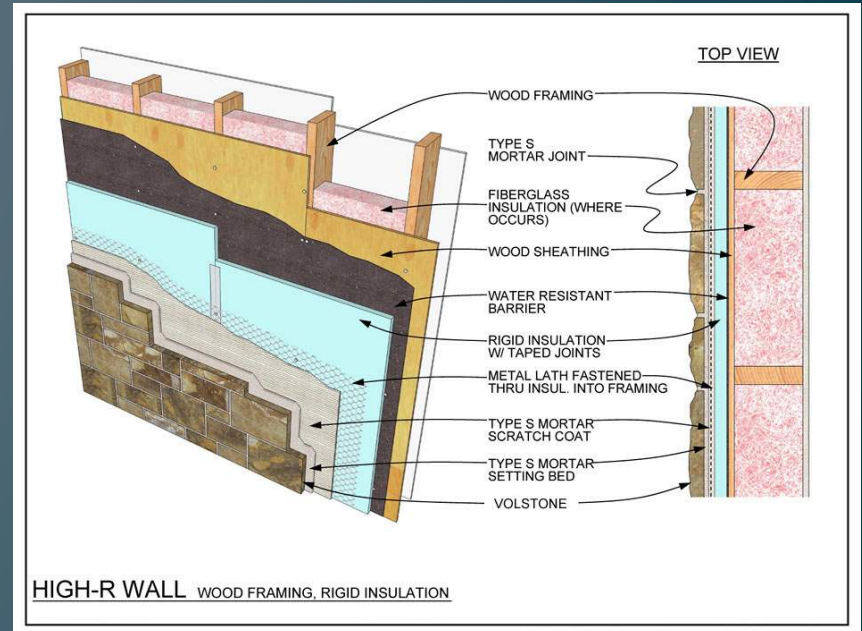
Residential - Prescriptive Measures

- Adding the Radiant Barrier requirements in CZs 3, and 5-7. (**Section 150.1(c)2**)
- All climate zones except 1 and 16
- High performance attics in 2016



Residential - Prescriptive Measures

- Increase wall insulation to R15+4 in all CZs (Section 150.1(c)1B)
- More to come in 2016



Residential -Mandatory Requirements

A building with a controlled ventilation or unvented crawlspace may omit raised floor insulation if:

- The foundation walls are insulated and
- A Class I or Class II vapor retarder is placed over the entire floor of the crawlspace; and
- **Controlled Crawl Space ventilation**
 - Drainage
 - Ground Water and Soils
 - Ventilation
 - Foam Plastic Insulating Materials
 - Direct Earth Contact
 - Fire Safety
 - Vapor retarder



Residential -Mandatory Requirements

- Hot water pipe insulation - Requires insulation on pipes $\frac{3}{4}$ inch and larger. (Section 150.0(j)2Aii and Section 150.0(j)4)

TABLE 120.3-A PIPE INSULATION THICKNESS

FLUID TEMPERATURE RANGE (°F)	CONDUCTIVITY RANGE (in Btu-inch per hour per square foot per °F)	INSULATION MEAN RATING TEMPERATURE (°F)	NOMINAL PIPE DIAMETER (in inches)				
			< 1	1 to <1.5	1.5 to < 4	4 to < 8	8 and larger
			INSULATION THICKNESS REQUIRED (in inches)				
Space heating, Hot Water systems (steam, steam condensate and hot water) and Service Water Heating Systems							
Above 350	0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350	0.29-0.31	200	3.0	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140	0.22-0.28	100	1.0	1.5	1.5	1.5	1.5
Space cooling systems (chilled water, refrigerant and brine)							
40-60	0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
Below 40	0.20-0.26	50	1.0	1.5	1.5	1.5	1.5

Domestic Hot Water Systems

All domestic hot water system piping conditions listed below, whether buried or unburied, must be insulated per TABLE 120.3-A

- i. The first 5 feet (1.5 meters) of hot and cold water pipes from the storage tank.
- ii. All piping with a nominal diameter of 3/4 inch (19 millimeter) or larger.
- iii. All piping associated with a domestic hot water recirculation system regardless of the pipe diameter.
- iv. Piping from the heating source to storage tank or between tanks.
- v. Piping buried below grade..
- vi. All hot water pipes from the heating source to the kitchen fixtures.

All domestic hot water pipes that are buried below grade must be installed in a water proof and non-crushable casing or sleeve that allows for installation, removal, and replacement of the enclosed pipe and insulation.

Water Heating System.

Systems using gas or propane water heaters to serve individual dwelling units shall include the following components:

- A. A 120V electrical receptacle that is within 3 feet from the water heater and accessible to the water heater with no obstructions; and
- B. 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; and
- C. A condensate drain that is no more than 2 inches higher than the base of the installed water heater, and allows natural draining without pump assistance, and
- D. A gas supply line with a capacity of at least 200,000 Btu/hr.

Residential -Mandatory Requirements

- Lighting – Improving and clarifying the mandatory lighting requirements for all residential buildings including kitchens, bathrooms, dining rooms, utility rooms, garages, hall ways, bedrooms, and outdoor lighting. (Section 150.0(k))

TABLE 150.0-A CLASSIFICATION OF HIGH EFFICACY AND LOW EFFICACY LIGHT SOURCES

High Efficacy Light Sources	Low Efficacy Light Sources
Luminaires manufactured, designed and rated for use with only lighting technologies in this column shall be classified as high efficacy:	Luminaires manufactured, designed or rated for use with any of the lighting technologies in this column shall be classified as low efficacy:
<ol style="list-style-type: none"> Pin-based linear or compact fluorescent lamps with electronic ballasts. Compact fluorescent lamps \geq 13 watts shall have 4 pins for compliance with the electronic ballast requirements in Section 150.0(k)1D. Pulse-start metal halide lamps. High pressure sodium lamps. GU-24 sockets rated for LED lamps. GU-24 sockets rated for compact fluorescent lamps. Luminaires using LED light sources which have been certified to the Commission as high efficacy in accordance with Reference Joint Appendix JAS. Luminaire housings rated by the manufacturer for use with only LED light engines. Induction lamps. <p>Note: Adaptors which convert an incandescent lamp holder to a high-efficacy luminaire shall not be used to classify a luminaire as high efficacy.</p>	<ol style="list-style-type: none"> Line-voltage lamp holders (sockets) capable of operating incandescent lamps of any type. Low-voltage lamp holders capable of operating incandescent lamps of any type. High efficacy lamps installed in low-efficacy luminaires, including screw base compact fluorescent and screw base LED lamps. Mercury vapor lamps. Track lighting or other flexible lighting system which allows the addition or relocation of luminaires without altering the wiring of the system. Luminaires using LED light sources which have not been certified to the Commission as high efficacy. Lighting systems that have modular components that allow conversion between high-efficacy and low-efficacy lighting without changing the luminaires' housing or wiring. Electrical boxes finished with a blank cover or where no electrical equipment has been installed, and where the electrical box can be used for a luminaire or a surface mounted ceiling fan.

TABLE 150.0-B MINIMUM REQUIREMENTS FOR OTHER LIGHT SOURCES TO QUALIFY AS HIGH EFFICACY

Use this table to determine luminaire efficacy only for lighting systems not listed in TABLE 150.0-A	
Luminaire Power Rating	Minimum Luminaire Efficacy to Qualify as High Efficacy
5 watts or less	30 lumens per watt
over 5 watts to 15 watts	45 lumens per watt
over 15 watts to 40 watts	60 lumens per watt
over 40 watts	90 lumens per watt
Note: Determine minimum luminaire efficacy using the system initial rated lumens divided by the luminaire total rated system input power.	

Lighting Kitchen

- A minimum of 50 percent of the total rated wattage of permanently installed lighting in kitchens shall be high efficacy.
- Permanently installed lighting that is internal to cabinets shall use no more than 20 watts of power per linear foot



Lighting Bathrooms

Lighting installed in bathrooms shall meet the following requirements:

- A minimum of one high efficacy luminaire shall be installed in each bathroom and
- All other lighting installed in each bathroom shall be high efficacy or controlled by vacancy sensors.



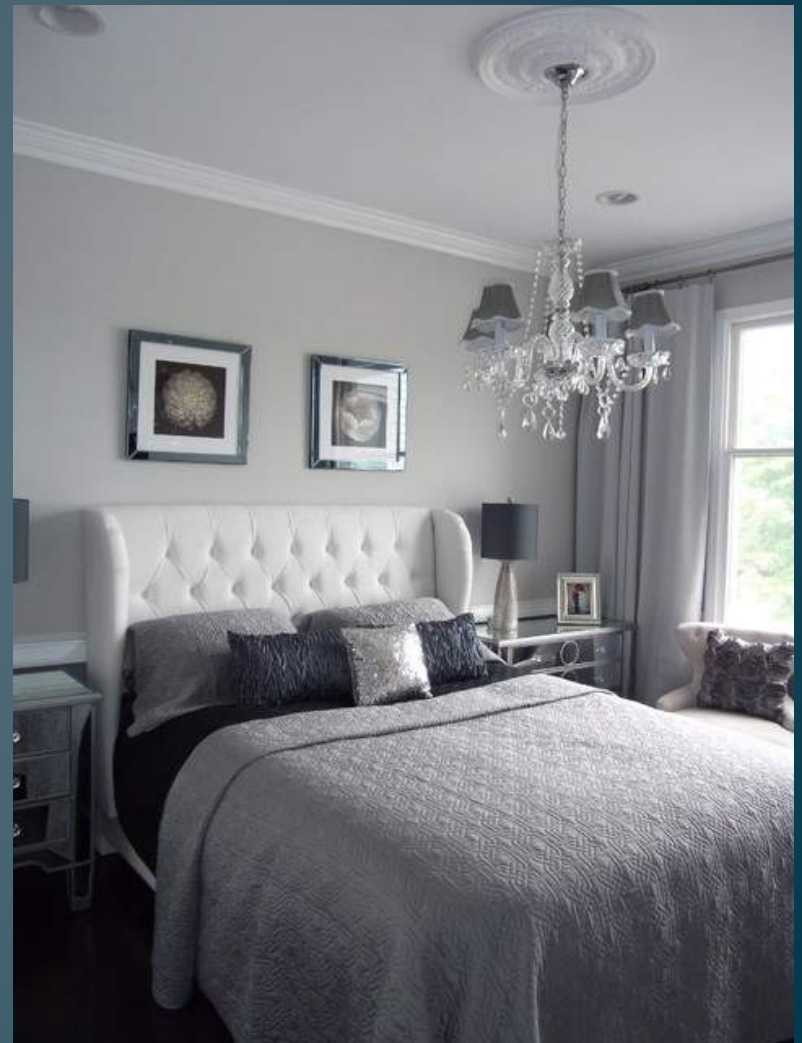
Lighting in Garages, Laundry Rooms, and Utility Rooms

- Shall be high efficacy luminaires *and* controlled by vacancy sensors.



Lighting other than in Kitchens, Bathrooms, Garages, Laundry Rooms, and Utility Rooms

Shall be high efficacy, or shall be controlled by either dimmers or vacancy sensors.



Residential Outdoor Lighting

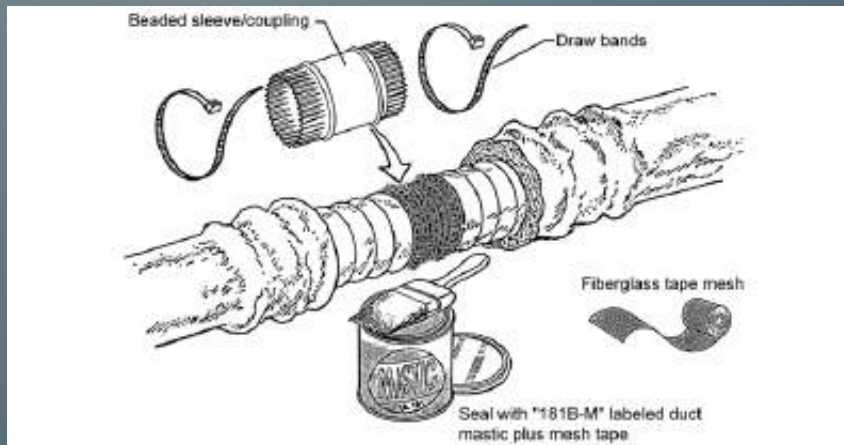
Shall be high efficacy, or may be low efficacy if it meets all of the following:

- i. Controlled by a manual ON and OFF switch
- ii. Controlled by a motion sensor
- iii. Controlled by one of the following methods:
 - Photocontrol
 - Astronomical time clock
 - Energy management control system



Residential -Mandatory Requirements

- Duct sealing in all CZs.
(Section 150.0(m)11)



Residential -Mandatory Requirements

New System

- 6 % leakage

Existing System

- 15% leakage
- 10% leakage to the exterior
- Seal all accessible leaks (use theatrical smoke)
- No more 60% improvement

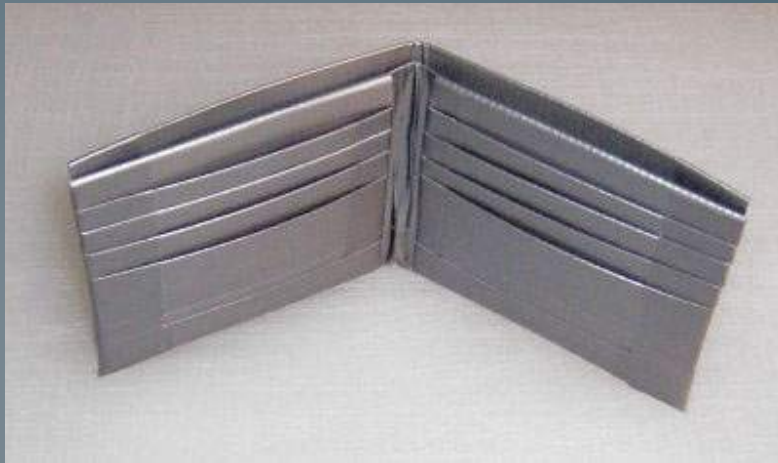


Residential -Mandatory Requirements

- Joints and seams of duct systems and their components shall not be sealed with cloth back rubber adhesive duct tapes unless such tape is used in combination with mastic and drawbands.



Appropriate uses for cloth back duct tape



Appropriate uses for cloth back duct tape (cont.)



Residential -Mandatory Requirements

- Return duct design or fan power and airflow testing (Residential HVAC Quality Installation Improvements).
(Section 150.0(m)13)



Performance or Prescriptive

Airflow across coil

- 350 cfm per ton

Fan watt draw

- \leq .58 watts per cfm

OR

Use Table 150.0 C & D

TABLE 150.0-C: Return Duct Sizing for Single Return Duct Systems

Return duct length shall not exceed 30 feet and shall contain no more than 180 degrees of bend. If the total bending exceeds 90 degrees, one bend shall be a metal elbow.
Return grille devices shall be labeled in accordance with the requirements in Section 150.0(m)12A to disclose the grille's design airflow rate and a maximum allowable clean-filter pressure drop of 12.5 Pa (0.05 inches water) for the air filter media as rated in accordance with AHRI Standard 680 for the design airflow rate for the return grille.

System Nominal Cooling Capacity (Ton)*	Minimum Return Duct Diameter (inch)	Minimum Total Return Filter Grille Gross Area (inch ²)
1.5	16	500
2.0	18	600
2.5	20	800

*Not applicable to systems with nominal cooling capacity greater than 2.5 tons or less than 1.5 tons

TABLE 150.0-D: Return Duct Sizing for Multiple Return Duct Systems

Each return duct length shall not exceed 30 feet and shall contain no more than 180 degrees of bend. If the total bending exceeds 90 degrees, one bend shall be a metal elbow.
Return grille devices shall be labeled in accordance with the requirements in Section 150.0(m)12A to disclose the grille's design airflow rate and a maximum allowable clean-filter pressure drop of 12.5 Pa (0.05 inches water) for the air filter media as rated in accordance with AHRI Standard 680 for the design airflow rate for the return grille.

System Nominal Cooling Capacity (Ton)*	Return Duct 1 Minimum Diameter (inch)	Return Duct 2 Minimum Diameter (inch)	Minimum Total Return Filter Grille Gross Area (inch ²)
1.5	12	10	500
2.0	14	12	600
2.5	14	14	800
3.0	16	14	900
3.5	16	16	1000
4.0	18	18	1200
5.0	20	20	1500

*Not applicable to systems with nominal cooling capacity greater than 5.0 tons or less than 1.5 tons.

Problems with low air flow

- Low airflow can cause frost on the coil further restricting airflow
- Insufficient airflow will not allow phase change from liquid to vapor
- Liquid refrigerant in compressor will result in damage to compressor



Minimum Efficiencies

Table 4-6 – Minimum Cooling Efficiencies for Central Air Conditioners and Heat Pumps

Appliance	Type	SEER Eff Before 1/1/2015	SEER Eff 1/1/2015	EER Eff 1/1/2015
Central Air Conditioners	Split System <45,000 Btuh	13.0	14	12.2
	Split System ≥45,000 Btuh	13	14	11.7
	Single Package	13.0	14	11.0
Central Air Source Heat Pumps	Split System	13.0	14	NR
	Single Package	13.0	14	NR
Space Constrained Air Conditioner	Split System	12	12	NR
	Single Package	12	12	NR
Space Constrained Heat Pump	Split System	12	12	NR
	Single Package	12	12	NR
Through-The-Wall Air Conditioner	Split System	10.9	10.9	NR
	Single Package	10.6	10.6	NR
Through-The-Wall Heat Pump	Split System	10.9	10.9	NR
	Single Package	10.6	10.6	NR
Small Duct, High Velocity Air Conditioner	All	13	13	NR
Small Duct, High Velocity Heat Pump	All	13	13	NR

Source: California Appliance Efficiency Regulations Table C-2 Title-20

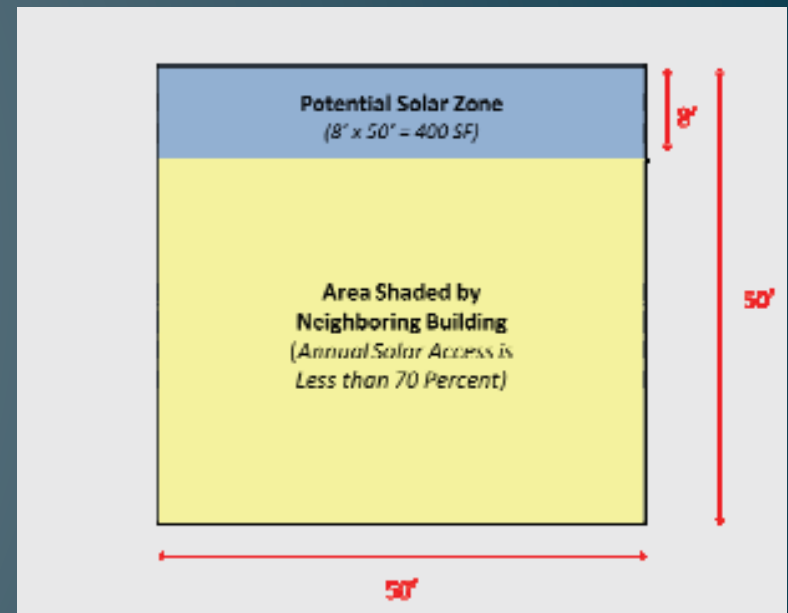
NR = No Requirement

Table 4-1 – Minimum Efficiency for Gas and Oil-Fired Central Furnaces

Appliance	Rated Input (Btu/hr)	Minimum Efficiency (%)		
		AFUE Effective Before 1/1/15	AFUE Effective 1/1/15	Thermal Efficiency
Weatherized gas central furnaces with single phase electrical supply	< 225,000	78	78	—
Non-weatherized gas and oil central furnaces with single phase electrical supply	< 225,000	80	80	—
Weatherized oil central furnaces with single phase electrical supply	< 225,000	78	78	—
Non-weatherized oil central furnaces with single phase electrical supply	< 225,000	83	83	—
Gas central furnaces	≥ 225,000	—	—	80
Oil central furnaces	≥ 225,000	—	—	81

Residential -Mandatory Requirements

- Solar Ready Measure – 250 square feet of solar ready zone on single family roofs.
(Section 150.0(r))
- 7 exceptions to the requirement and one exception to exception 7



Residential - Compliance Options

- Solar Photovoltaic can be used as a compliance option to comply under the performance path.



Residential - Compliance Options

Occupant Controlled Smart
Thermostat as a tradeoff
against the solar ready zone.

110.10(b)1A EXCEPTION 6)

- Single family residences with a solar zone no less than 150 square feet and
- All thermostats are capable of receiving and responding to Demand Response Signals



Ventilation Cooling

Single family homes shall comply with the Whole House Fan (WHF) requirements shown in TABLE 150.1-A. When a WHF is required, comply with Subsections below:

A. Air Flow CFM is at least 2 CFM/ft² of floor area and

B. 1 square foot of attic vent free area for each 375 CFM and

C. Provide homeowners with a one page “How to operate your whole house fan” informational sheet.



Residential - Additions and Alterations

- Simplified rules for both the prescriptive and performance paths for additions, alterations, and existing plus additions plus alterations. (**Section 150.2(a) and (b)**)

Exceptions for:

- ASHRAE 62.2 Whole house ventilation
- Roofing requirements
- Insulating inaccessible piping
- Ducting
- Ventilation Cooling
- Fenestration

Residential items to get on the plans

- Water Heater requirements
- No dryer duct within 5' of HVAC condenser
- Energy Code Measures for additions less than 300 sq. ft.
- Whole house fan venting and interlock requirements
- Lighting requirements
- Return duct and grill sizing
- Below grade hot water pipes installed in sleeve

Non-Residential Buildings



Acceptance Testing

Building Envelope

Mechanical Systems

Lighting Control

Outdoor Lighting Controls

Sign Lighting

Refrigerated Warehouse Refrigeration System

Commercial Kitchen Exhaust System

Parking Garage Ventilation System

Compressed Air System

Acceptance Testing Technicians

Industry Certification Threshold.

Acceptance Test Technician and Employer certification requirements shall take effect when the Energy Commission finds that each of the following conditions are met:

- There shall be no less than 300 Acceptance Test Technicians certified to perform the acceptance tests
- The Certification Provider(s) shall provide reasonable access to certification for technicians representing the majority of the affected industry groups

Lighting Control Acceptance Forms

STATE OF CALIFORNIA
DEMAND RESPONSIVE LIGHTING CONTROL ACCEPTANCE DOCUMENT
 CEC-NRCA-LTI-04-A (Revised 06/13) CALIFORNIA ENERGY COMMISSION NRCA-LTI-04-A
 (Page 1 of 5)

CERTIFICATE OF ACCEPTANCE
 Demand Responsive Lighting Control Acceptance Document

Project Name: _____ Enforcement Agency: _____ Permit Number: _____
 Project Address: _____ City: _____ Zip Code: _____

Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance. Enforcement Agency Use: Checked by/Date _____

Demand Responsive Lighting Control

Intent: Test the reduction in lighting power due to the demand responsive lighting control as per Sections 110.9(a), 130.1(e) and 130.5(e).

NA7.6.7.2 Acceptance tests for Demand Responsive Lighting Controls in accordance with Section 130.1(e)

1	Instrumentation to perform test includes, but not limited to:
	a. Hand-held amperage and voltage meter
	b. Power meter
	c. Light meter

2 Construction Inspection

Verify the demand responsive control is capable of receiving a demand response signal directly or indirectly through another device and that it complies with the requirements in Section 130.5(e).

130.5(e) Demand responsive controls and equipment shall be capable of receiving and automatically responding to at least one standards based messaging protocol which enables demand and automatically after receiving a demand response signal.
 DEMAND RESPONSE SIGNAL is a signal sent by the local utility, Independent System Operator (ISO), or designated curtailment service provider or aggregator, to a customer, indicating a price or a request to modify electricity consumption, for a limited time period.

Definition

If the demand response signal is received from another device (such as an EMCS), that system must itself be capable of receiving a demand response signal from a utility meter or other external source.

NA7.6.7.2 Functional Test

<input checked="" type="checkbox"/>	1	Use either Method 1 (illuminance measurement) or Method 2 (power input measurement) to perform the functional test.
<input checked="" type="checkbox"/>	2	Test building-wide reduction in lighting power to at least 15% below the maximum total lighting power, as calculated on an area-weighted basis (measured in illuminance or power). However, any single space must not reduce the combined illuminance from daylight and electric light to less than 50% of the design illuminance.
<input checked="" type="checkbox"/>	3	For buildings with up to seven (7) enclosed spaces requiring demand responsive lighting controls, all spaces shall be tested.
<input checked="" type="checkbox"/>	4	For buildings with more than seven (7) enclosed spaces requiring demand responsive lighting controls, sampling may be done on additional spaces with similar lighting systems. If the first enclosed space with a demand responsive lighting control in the sample group passes the acceptance test, the remaining building spaces in the sample group also pass. If the first enclosed space with a demand responsive lighting control in the sample group fails the acceptance test the rest of the enclosed spaces in that group must be tested.
<input checked="" type="checkbox"/>	5	If any tested demand responsive lighting control system fails it shall be repaired, replaced or adjusted until it passes the test.

Method 1: Illuminance Measurement.
 In each space, select one location for illuminance measurement. The chosen location must not be in a primary or secondary skylit or sidelit area, and when placed at the location, the illuminance meter must not have a direct view of a window or skylight. If this is not possible, perform the test at a time and location at which daylight illuminance provides less than half of the design illuminance. Mark each location to ensure that the illuminance meter can be accurately located.

Step 1: Full output test

	Space number						
	1	2	3	4	5	6	7
a. Using the manual switches/dimmers in each space, set the lighting system to design full output. Note that the lighting in areas with photocontrols or occupancy/vacancy sensors							

CA Building Energy Efficiency Standards - 2013 Nonresidential Compliance June 2013

CERTIFICATE OF ACCEPTANCE— DATA FIELD DEFINITIONS AND CALCULATIONS NRCA-LTI-03-A
 Automatic Daylighting Control Acceptance Document (Page 2 of 9)

5 Separate Controls of Luminaires in Daylit Zones:

Are luminaires controlled by automatic daylighting controls only in daylit zones: (Y/N)

Separately circuited for daylit zones by windows and daylit zones under skylights: (Y/N)

6 Daylighting control device certification

Daylighting control has been certified in accordance with §110.9: (Y/N)

Construction Inspection PASS/FAIL. If all responses on this Construction Inspection page are complete and all Yes/No questions have a Yes (Y) response, the tests PASS; If any responses on this page are incomplete OR there are any no (N) responses, the tests FAIL

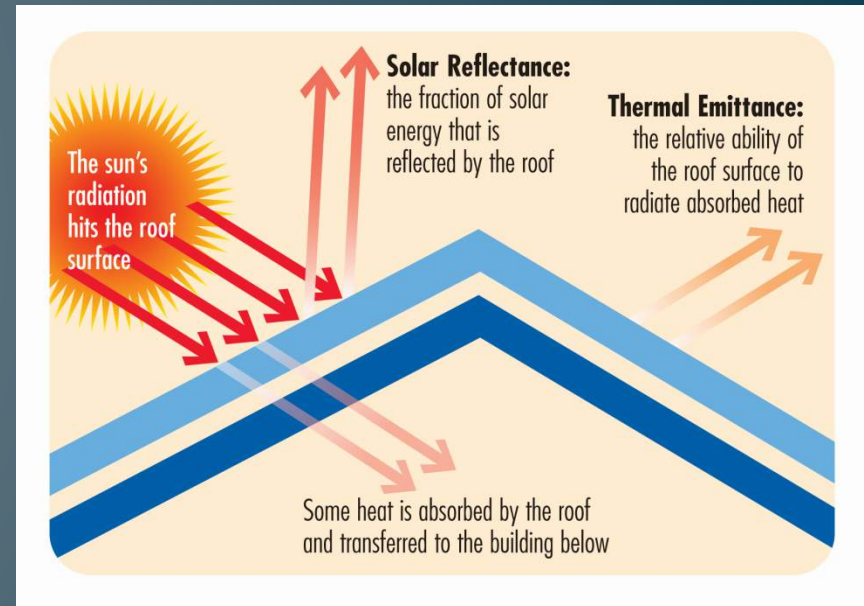
II. Functional Performance Testing – Continuous Dimming Systems NA-7.6.2.2
Power estimation using amp-meter measurement, or alternate option – watt-meter measurement

Complete all tests on page 3 of 10 (No Daylight Test, Full Daylight Test, and Partial Daylight Test) and fill out Pass/Fail section on Page 4 of 10.

Applicable Control System	System Information		
	A	B	C
a. Control Loop Type: Open Loop or Closed Loop? (O or C)			
b. Indicate if Mandatory control - M (required for skylit zone or primary sidelit zone with installed general lighting power > 120 W); or Voluntary -V (M, V)			
c. If automatic daylighting controls are mandatory, are all general lighting luminaires in daylit zones controlled by automatic daylight controls? (Y/N)			
d. Documented general lighting design footcandles. (Enter footcandle value or "Unknown" (U))			
e. Power estimation method. Measured Amps Multiplied by Volts, Volt-Amps (VA), alternate option is Measured Watts (W)			
Step 1: Identify Reference Location (location where minimum daylight illuminance is measured in zone served by the controlled lighting.)			
f. Method Used: Illuminance or Distance? (I or D)			
Override daylight control system and drive electric lights to highest light level for the following:			
g. Highest light level fc – enter measured footcandles (fc) from controlled electric lighting (does not include daylight illuminance)			
h. Full load Highest light level power. Enter measured Amps times Volts, Volt-Amps (VA) or measured Watts.			
i. Indicate whether this is Full Output (FO), or Task Tuned (Lumen Maintenance) (TT)			
Step 2: No Daylight Test controls enabled & daylight less than 1 fc at reference location			
j. Method Used: Night time manual measurement (Night), Night Time Illuminance Logging (Log), Cover Fenestration (CF), Cover Open Loop Photosensor (COLP)			
k. Reference Illuminance (footcandles) as measured at Reference Location (see Step 1). Enter footcandles			
l. Enter Y if either of the following statements are true: [Reference illuminance (line j)] / [Highest light level fc (line g)] > 70% when line i = FO? 90%? or [Reference illuminance (line j)] / [design footcandles (line d)] > 80%? (Y/N)			
Step 3: Full Daylight Test conducted when daylight greater than reference illuminance (line j)			
m. Enter measured Amps Multiplied by Volts, Volt-Amps (VA) or measured Watts (W).			
n. System power reduction enter [1 – (line m)/(line h)] enter as percent.			
o. Is System Power Reduction (line m) > 65% when line i = FO, or > 56% when line i = TT (Y/N)			
p. With uncontrolled lights also on, no lamps are dimmed outside of daylit zone by same control mechanism or formula (Y/N)			
q. Dimmed lamps have stable output (no perceptible visual flicker) (Y/N)			

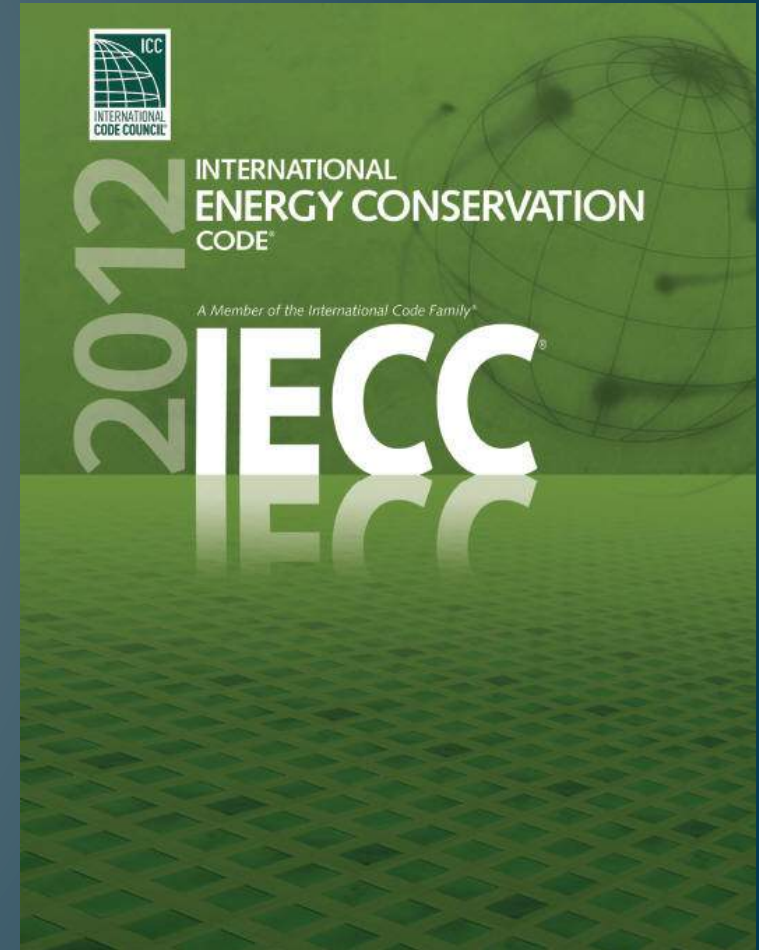
Solar reflectance/ Thermal emittance

- Both solar reflectance and thermal emittance are measured from 0 to 1; the higher the value, the "cooler" the roof.
- **Solar reflectance:** The fraction of solar energy that is reflected by the roof surface.
- **Thermal emittance:** The fraction of thermal energy that is emitted from the roof surface



Air Barrier/Leakage Rates

- All joints, penetrations and other openings in the building envelope that are potential sources of air leakage shall be caulked, gasketed, weather stripped, or otherwise sealed to limit infiltration and exfiltration. **(110.7)**
- Consistent with air leakage requirements in IECC. **(140.3(a)9B)**



Air Barrier/Leakage Rates (Materials)

Buildings shall have a continuous air barrier that is designed and constructed to control air leakage into, and out of, the building's conditioned space.

The air barrier shall be sealed at all joints for its entire length and shall be composed of *materials* that have an air permeance not exceeding 0.004 cfm/ft², at 75 Pascal's.

TABLE 140.3-A MATERIALS DEEMED TO COMPLY WITH SECTION 140.3(a)9A

	MATERIALS AND THICKNESS		MATERIALS AND THICKNESS
1	Plywood – min. 3/8 inches thickness	9	Built up roofing membrane
2	Oriented strand board – min. 3/8 inches thickness	10	Modified bituminous roof membrane
3	Extruded polystyrene insulation board – min. ½ inches thickness	11	Fully adhered single-ply roof membrane
4	Foil-back polyisocyanurate insulation board – min. ½ inches thickness	12	A Portland cement or Portland sand parge, or a gypsum plaster, each with min. 5/8-inches thickness
5	Closed cell spray foam with a minimum density of 2.0 pcf and a min. 2.0 inches thickness	13	Cast-in-place concrete, or-precaster concrete
6	Open cell spray foam with a density no less than 0.4 pcf and no greater than 1.5 pcf, and a min. 5½ inches thickness	14	Fully grouted concrete block masonry
7	Exterior or interior gypsum board min. 1/2 inches thickness	15	Sheet steel or sheet aluminum
8	Cement board – min. 1/2 inches-thickness	---	-----

Air Barrier/Leakage Rates (Assemblies)

- *Assemblies of materials and components* that have an average air leakage not exceeding 0.04 cfm/ft², under a pressure differential of 0.3 in. w.g (1.57 psf) (0.2 L/m² at 75 pa), when tested in accordance with ASTM E2357, ASTM E1677, ASTM E1680, or ASTM E283; or
- **EXCEPTION to Section 140.3(a)9B:** The following materials shall be deemed to comply with Section 140.3(a)9B if all joints are sealed and all of the materials are installed as air barriers in accordance with the manufacturer's instructions:
 - i. Concrete masonry walls that have at least two coatings of paint or at least two coatings of sealer coating.
 - ii. Concrete masonry walls with integral rigid board insulation.
 - iii. Structurally Insulated Panels.
 - iv. Portland cement or Portland sand parge, or stucco, or a gypsum plaster, each with min. 1/2 inches thickness

Air Barrier/Leakage Rates (Performance)

The entire building has an air leakage rate not exceeding 0.40 cfm/ft² at a pressure differential of 0.3 in w.g. (1.57 psf) (2.0 L/ m² at 75 pa), when the entire building is tested, after completion of construction.



Fenestration

Increased fenestration requirements to reduce solar gains and increase visual light transmittance for daylighting; 0.36 U-factor, 0.25 SHGC, VT 0.42 for fixed windows.
(Section 140.3(a)5B,C & D)



Fenestration.

Vertical Windows shall:

- Have a west-facing area no greater than 40 % of the gross west-facing wall area, or 6 feet x the west-facing display perimeter, whichever is greater and
A total area no greater than
- 40 % of the gross wall area, or 6 feet x the display perimeter, whichever is greater; and
- Area weighted U-factor per Tables 140.3 B, C or D



Tables 140.3 B,C and D

CONTINUED: TABLE 140.3-B – PRESCRIPTIVE ENVELOPE CRITERIA FOR NONRESIDENTIAL BUILDINGS (INCLUDING RELOCATABLE PUBLIC SCHOOL BUILDINGS WHERE MANUFACTURER CERTIFIES USE ONLY IN SPECIFIC CLIMATE ZONE; NOT INCLUDING HIGH-RISE RESIDENTIAL BUILDINGS AND GUEST ROOMS OF HOTEL/MOTEL BUILDINGS)

		All Climate Zones						
			Fixed Window	Operable Window	Curtainwall or Storefront	Glazed Doors		
Envelope	Fenestration	Vertical	Area-Weighted Performance Rating	Max U-factor	0.36	0.46	0.41	0.45
				Max RSHGC	0.25	0.22	0.26	0.23
		Area-Weighted Performance Rating	Min VT	0.42	0.32	0.46	0.17	
		Maximum WWR%	40%					
Skylights			Glass, Curb Mounted	Glass, Deck Mounted	Plastic, Curb Mounted			
	Area-Weighted Performance Rating	Max U-factor	0.58	0.46	0.88			
		Max SHGC	0.25	0.25	NR			
	Area-Weighted Performance Rating	Min VT	0.49	0.49	0.64			
	Maximum SRR%	5%						

Insulation

Added mandatory minimum wall and roof insulation requirements. **(Section 110.8(e) & (f))**

- In contact with roof
- No openings between roof and ceiling
- Not on top of suspended ceiling



Insulation

Demising walls require R-13 insulation between studs

Similar to CALGreen which requires STC of 40



Lighting Controls

Lighting control devices moving from Title 24 to Title 20

Lighting control systems shall now be acceptance tested for Title 24.

(Section 110.9(b) & Section 130.4(a))

STATE OF CALIFORNIA AUTOMATIC DAYLIGHTING CONTROL ACCEPTANCE DOCUMENT CED-NRCA-LTI-03-A (Revised 06/13)			CALIFORNIA ENERGY COMMISSION
CERTIFICATE OF ACCEPTANCE Lighting Control Acceptance Document		NRCA-LTI-02-A (Page 1 of 6)	
Project Name:	Enforcement Agency:	Permit Number:	
Project Address:	City:	Zip Code:	
Note: For more than 3 spaces attach additional sets of pages 2 through 5, as required.		Enforcement Agency Use: Checked by/Date	
Automatic Shut-off Controls: Automatic Time Switch Control and Occupant Sensor			
Intent: Lights are turned off or set to a lower level when not needed per Section 110.9(a) & 130.1(c).			
Guidance This acceptance test form must be filled out for all newly-installed lighting control systems of the following types: I. Automatic Time Switch Controls II. Occupancy Sensors III. Partial-OFF occupancy sensors IV. Partial-ON occupancy sensors (only if used to claim a Power Adjustment Factor) V. Occupancy Sensors serving small zones in large open plan offices (only if used to claim a Power Adjustment Factor) For automatic daylighting controls use acceptance test form NRCA-LTI-03-A; for demand responsive lighting controls, use acceptance test form NRCA-LTI-04-A. The tests on this certificate are required by Section 140.6(a)2 and 130.4(a) of the Building Energy Efficiency Standards 2013. The tests themselves are described in Sections 140.6(a)2 and in Reference Appendix NA7.6.			
A. Construction Inspection Fill out Section A to cover spaces 1 through 3 that are functionally tested under Section B. Make as many copies of pages 2-5 as are required to test all spaces in the building, and attach to page 1. Instruments needed to perform tests include, but are not limited to: hand-held amperage meter, power meter, or light meter			
1	Automatic Time Switch Controls Construction Inspection—confirm for all listed in Section B		
	a.	All automatic time switch controls are programmed for (check all):	
	<input checked="" type="checkbox"/>	Weekdays	
	<input checked="" type="checkbox"/>	Weekend	
	<input checked="" type="checkbox"/>	Holidays	
	b.	Document for the owner automatic time switch programming (check all):	
	<input checked="" type="checkbox"/>	Weekdays settings	
	<input checked="" type="checkbox"/>	Weekend settings	
	<input checked="" type="checkbox"/>	Holidays settings	
	<input checked="" type="checkbox"/>	Set-up settings	
	<input checked="" type="checkbox"/>	Preference program setting	
	<input checked="" type="checkbox"/>	Verify the correct time and date is properly set in the time switch	
	<input checked="" type="checkbox"/>	Verify the battery is installed and energized	
	<input checked="" type="checkbox"/>	Override time limit is no more than 2 hours	
	<input checked="" type="checkbox"/>	Occupant Sensors and Automatic Time Switch Controls have been certified to the Energy Commission in accordance with the applicable provision in Section 110.9 of the Standards, and model numbers for all such controls are listed on the Commission database as Certified Appliance and Control Devices	
2	Occupancy Sensor Construction Inspection—confirm for all listed in Section B		

Lighting Controls (Indoor)

- Advanced multi-level lighting controls
- Increasing from one intermediate level to three intermediate levels or continuous dimming)
- Controls to allow precise and non-interruptive adjustment of lighting to match the available daylighting
- Provide dimming and demand response function throughout the building. (**Section 130.1(b) & Section 130.1(a) 2C**)

Lighting Controls (Indoor)

Separately Switched Lighting Systems 131(a):

Area Controls General Lighting shall be separately switched from all other lighting in a space

Floor and wall display, window display, and case display lighting shall be switched separately



Lighting Controls (Indoor)

All interior Lighting shall turn off automatically when space is unoccupied using:

- Occupancy sensor
- Automatic time switch
- Other signal device
- Separate controls per floor
- Separate controls per 5000 sqft
- Separate controls for display lighting



Lighting Controls (Indoor)

- All spaces shall have Occupancy Sensors
- All spaces shall have local switches
- All fixtures shall have dimming ballasts



Lighting Controls (Indoor)

Occupancy sensors must be installed in the following areas to shut off the lighting:

- Offices less than 250 sq.ft.
- Multipurpose rooms less than 1000 sq. ft.
- Classrooms any size
- Conference rooms any size
- Controls must allow the lights to be manually shut off in compliance with 130.1(a) regardless of the sensors status

Automatic Lighting Controls Warehouse and Libraries

Require the installation of occupancy sensors in warehouse aisle ways and open spaces, and library stack aisles.

(Section 130.1(c)6A & B)

Reduce lighting by at least 50% when the space is not occupied.



Hotels and Multifamily Building Corridors

Require the installation of occupancy sensors in corridors and stairwells in lodging and multifamily buildings.

Reduce lighting by at least 50% when the space is not occupied.

Capable of turning the lighting fully on and automatically activated from path of egress
(Section 130.1(c)6C)



Lighting Controls (Parking Garage)

Occupancy sensor capable of reducing power at least one step between 20% and 50% and fully ON activated from designated egress paths.

Automatic daylighting controls required



Lighting Controls (Hotels)

Hotel and motel guest rooms shall be controlled so that lights are off within 30 minutes of being vacated using

- *Occupancy Sensors*
- *Automatic Controls or*
- *Captive Card key*
- *Exemption for 1 high efficacy luminaire separately switched and within 6' of the door.*



Retrofit Lighting

- Retrofits will be required to comply with the Standards
- EXEMPT:
 - Spaces in which less than 10% of the lighting is being changed out.
 - Buildings in which fewer than 40 ballasts are being replaced



Demand Response

Lighting power in buildings larger than 10,000 sq. ft. shall be capable of automatic reduction to a minimum of 15% below installed lighting power.
(Section 130.1(e))



Sign Lighting, Indoors

- All indoor signs to be controlled by automatic or astronomical switch control



Sign Lighting, Outdoors

- Photocontrol in addition to automatic or astronomical switch controls.
- If on night and day, then 65% reduction of power at night.
- Ability to reduce power 30% when receiving a demand response signal.



Lighting Acceptance Testing

- Shut Off Controls
- Automatic Daylighting Controls
- Demand Responsive Controls
- Outdoor Lighting

STATE OF CALIFORNIA AUTOMATIC DAYLIGHTING CONTROL ACCEPTANCE DOCUMENT REQ. NRCA-LTI-03-A (Revised 06/13)			CALIFORNIA ENERGY COMMISSION NRCA-LTI-02-A (Page 1 of 6)		
CERTIFICATE OF ACCEPTANCE Lighting Control Acceptance Document			Enforcement Agency Use: Checked by/Date		
Project Name:	Enforcement Agency:	Permit Number:			
Project Address:	City:	Zip Code:			
Note: For more than 3 spaces attach additional sets of pages 2 through 5, as required.			Enforcement Agency Use: Checked by/Date		
Automatic Shut-off Controls: Automatic Time Switch Control and Occupant Sensor					
Intent: Lights are turned off or set to a lower level when not needed per Section 110.9(a) & 130.1(c).					
Guidance This acceptance test form must be filled out for all newly-installed lighting control systems of the following types:					
I. Automatic Time Switch Controls					
II. Occupancy Sensors					
III. Partial-OFF occupancy sensors					
IV. Partial-ON occupancy sensors (only if used to claim a Power Adjustment Factor)					
V. Occupancy Sensors serving small zones in large open plan offices (only if used to claim a Power Adjustment Factor)					
For automatic daylighting controls use acceptance test form NRCA-LTI-03-A; for demand responsive lighting controls, use acceptance test form NRCA-LTI-04-A. The tests on this certificate are required by Section 140.6(a)2 and 130.4(a) of the Building Energy Efficiency Standards 2013. The tests themselves are described in Sections 140.6(a)2 and in Reference Appendix NA7.6.					
A. Construction Inspection					
Fill out Section A to cover spaces 1 through 3 that are functionally tested under Section B. Make as many copies of pages 2-5 as are required to test all spaces in the building, and attach to page 1.					
Instruments needed to perform tests include, but are not limited to: hand-held amperage meter, power meter, or light meter					
1	Automatic Time Switch Controls Construction Inspection—confirm for all listed in Section B				
	a.	All automatic time switch controls are programmed for (check all):			
	<input type="checkbox"/>	Weekdays			
	<input type="checkbox"/>	Weekend			
	<input type="checkbox"/>	Holidays			
	b.	Document for the owner automatic time switch programming (check all):			
	<input type="checkbox"/>	Weekdays settings			
	<input type="checkbox"/>	Weekend settings			
	<input type="checkbox"/>	Holidays settings			
	<input type="checkbox"/>	Set-up settings			
	<input type="checkbox"/>	Preference program setting			
	<input type="checkbox"/>	Verify the correct time and date is properly set in the time switch			
	<input type="checkbox"/>	Verify the battery is installed and energized			
	<input type="checkbox"/>	Override time limit is no more than 2 hours			
	<input type="checkbox"/>	Occupant Sensors and Automatic Time Switch Controls have been certified to the Energy Commission in accordance with the applicable provision in Section 110.9 of the Standards, and model numbers for all such controls are listed on the Commission database as Certified Appliance and Control Devices			
2	Occupancy Sensor Construction Inspection—confirm for all listed in Section B				

Outdoor Lighting

Photocontrol or astronomical time switch.

Outdoor lighting independently controlled

<24' mounting height:

- Motion sensors
- Capable of reducing power
- Auto ON when occupied
- No more than 1500 watts controlled together

(Section 130.2(c)3B)

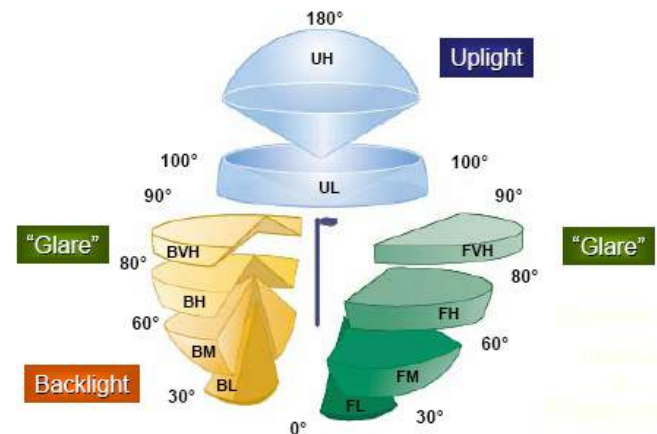


Outdoor Lighting

Existing outdoor lighting cutoff (shielding) requirements, changed to the new IES standard: Backlight, Uplight, Glare (BUG) requirements. (Section 130.2(b))



The LCS System



Outdoor Lighting (CALGreen)

**TABLE 5.106.8
MAXIMUM ALLOWABLE BACKLIGHT, UPLIGHT AND GLARE (BUG) RATINGS^{1,2}**

ALLOWABLE RATING	LIGHTING ZONE 1	LIGHTING ZONE 2	LIGHTING ZONE 3	LIGHTING ZONE 4
Maximum Allowable Backlight Rating³				
Luminaire greater than 2 mounting heights (MH) from property line	No Limit	No Limit	No Limit	No Limit
Luminaire back hemisphere is 1 – 2 MH from property line	B2	B3	B4	B4
Luminaire back hemisphere is 0.5 – 1 MH from property line	B1	B2	B3	B3
Luminaire back hemisphere is less than 0.5 MH from property line	B0	B0	B1	B2
Maximum Allowable Uplight Rating				
For area lighting ⁴	U0	U0	U0	U0
For all other outdoor lighting, including decorative luminaires	U1	U2	U3	U4
Maximum Allowable Glare Rating⁵				
Luminaire greater than 2 MH from property line	G1	G2	G3	G4
Luminaire front hemisphere is 1 – 2 MH from property line	G0	G1	G1	G2
Luminaire front hemisphere is 0.5 – 1 MH from property line	G0	G0	G1	G1
Luminaire back hemisphere is less than 0.5 MH from property line	G0	G0	G0	G1

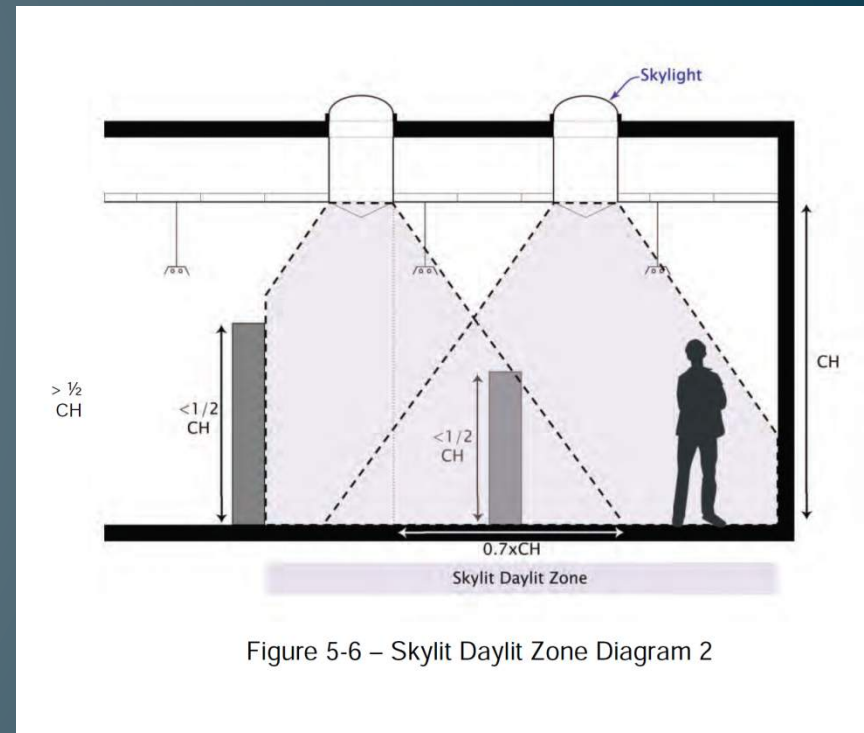
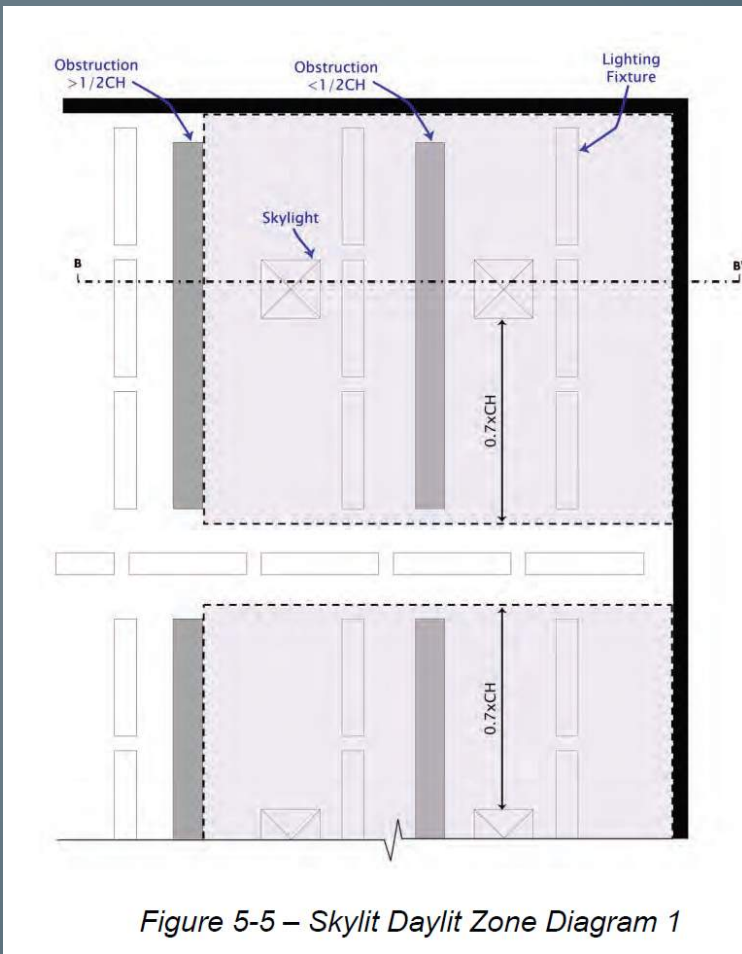
1. IESNA Lighting Zones 0 and 5 are not applicable; refer to Lighting Zones as defined in the *California Energy Code* and Chapter 10 of the *California Administrative Code*.
2. For property lines that abut public walkways, bikeways, plazas and parking lots, the property line may be considered to be 5 feet beyond the actual property line for purpose of determining compliance with this section. For property lines that abut public roadways and public transit corridors, the property line may be considered to be the centerline of the public roadway or public transit corridor for the purpose of determining compliance with this section.
3. If the nearest property line is less than or equal to two mounting heights from the back hemisphere of the luminaire distribution, the applicable reduced Backlight rating shall be met.
4. General lighting luminaires in areas such as outdoor parking, sales or storage lots shall meet these reduced ratings. Decorative luminaires located in these areas shall meet *U-value* limits for "all other outdoor lighting".
5. If the nearest property line is less than or equal to two mounting heights from the front hemisphere of the luminaire distribution, the applicable reduced Glare rating shall be met.

Skylit Daylit Zones and Primary Sidlit Daylit Zones

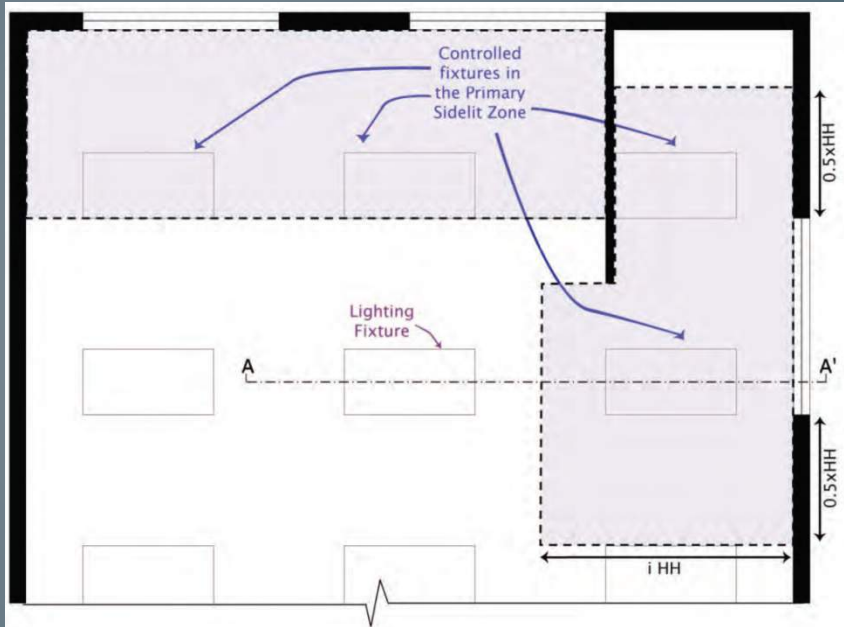
- Controlled independently by automatic daylighting controls
- Zones shown on plans
- Skylit and Sidelit Zones controlled separately.
- Multilevel lighting per Table 130.1 A.
- 65% min of full power when lighting is 150% of design



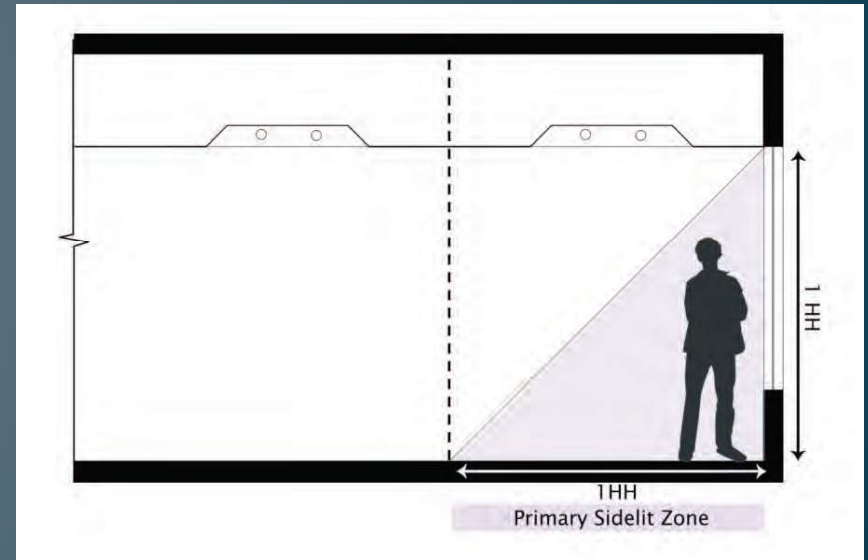
Skylit Zones



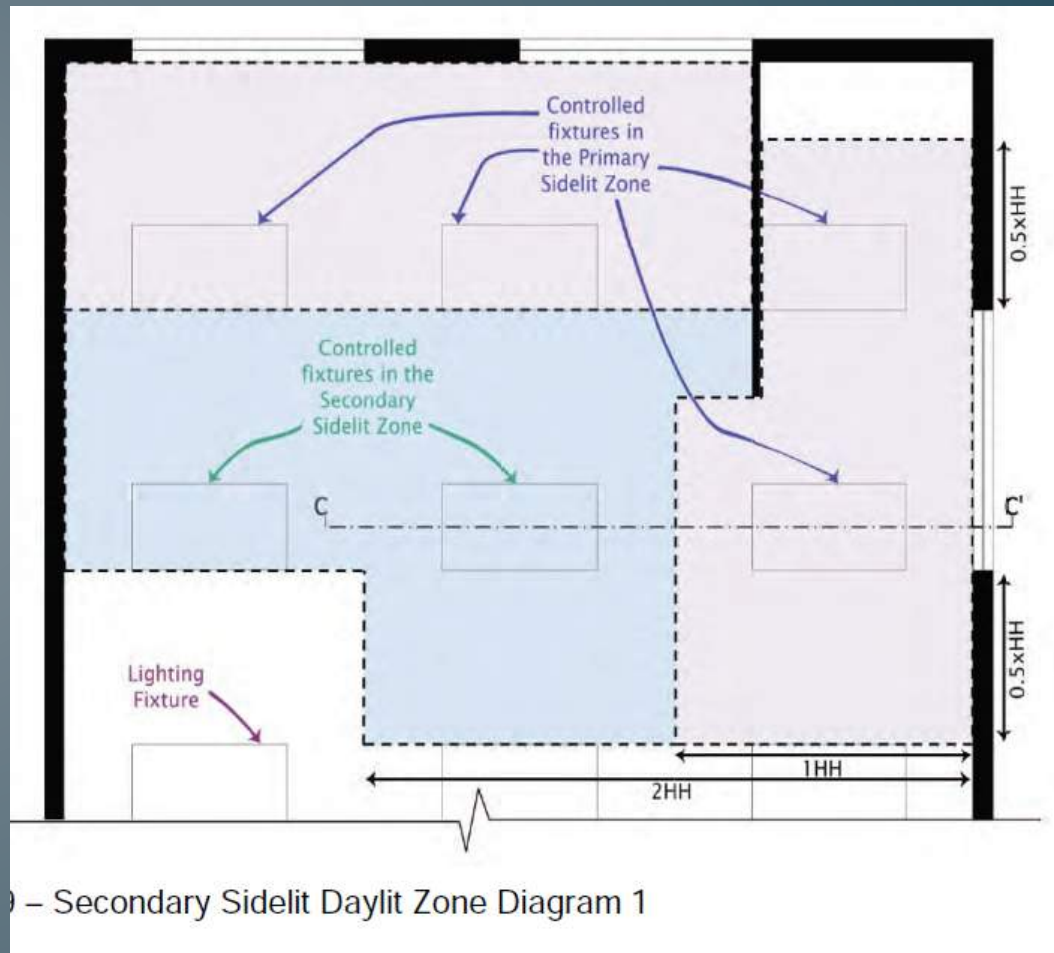
Primary Sidelit Zones



- Primary Sidelit Daylit Zone Diagram 1



Secondary Sidelit Zones



– Secondary Sidelit Daylit Zone Diagram 1

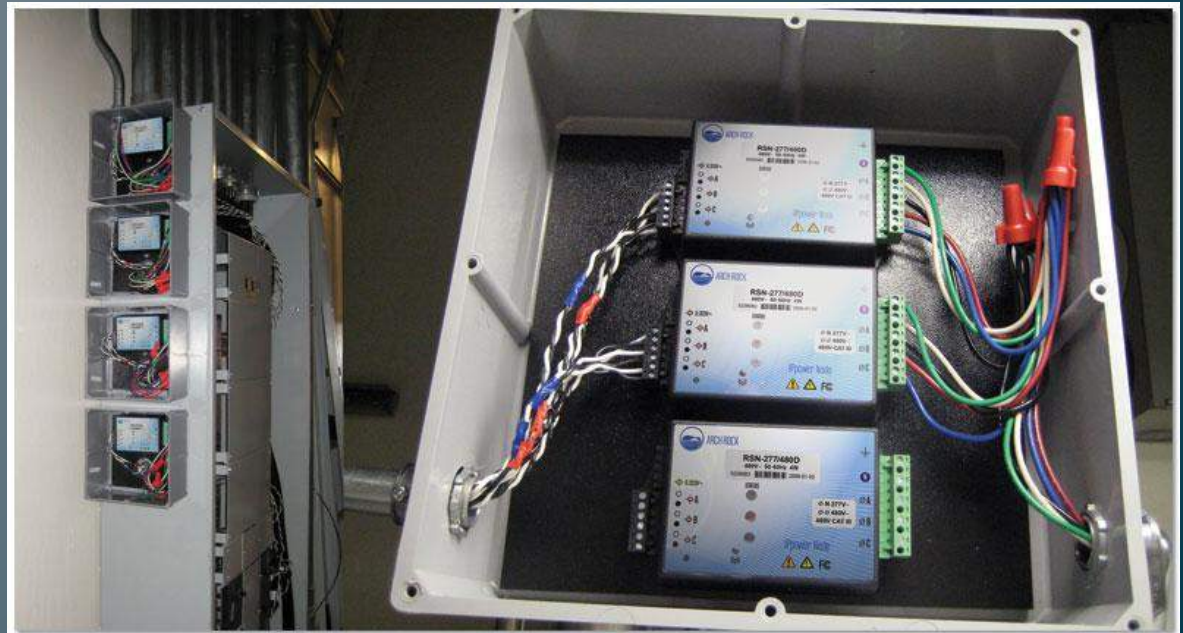
Energy Management Control System (EMCS)

An EMCS may be installed to comply with the requirements of lighting controls if it meets the following minimum requirements:

- A. Provides all applicable functionality for each specific lighting control or system; and
- B. Complies with all applicable Lighting Control Installation Requirements; and
- C. Complies with all applicable application requirements for each specific lighting control or system for which it is installed.

Disaggregation of Electrical Circuits

- Power systems designed to permit disaggregation of electrical energy uses.



120 volt circuit controls

- Controlled and uncontrolled receptacles provided in each:
 - Office
 - Copy room
 - Lobby
 - Kitchenette in office
 - Conference room
 - Hotel and Motel guest rooms

Receptacle Control

130.5(d)

Controlled receptacles and uncontrolled receptacles shall be provided in each private office, open office space, reception lobby, conference room, kitchen, and copy room



Permanently Marked!

Plug-ins not allowed!

Demand Responsive Controls and Equipment

Added requirements for demand responsive controls and equipment.

- Capable of receiving and automatically responding to messaging protocols to enable demand response.

Section 130.5(e)

Fan Control

Packaged units down to 6 tons must be VAV with the ability to modulate cooling capacity to 20% of maximum.

Economizers must also be able to modulate cooling capacity to match VAV units. (**Section 140.4(c) & (e)**)



Integrated Economizers

Cooling systems over 54,000 btu/hr shall include:

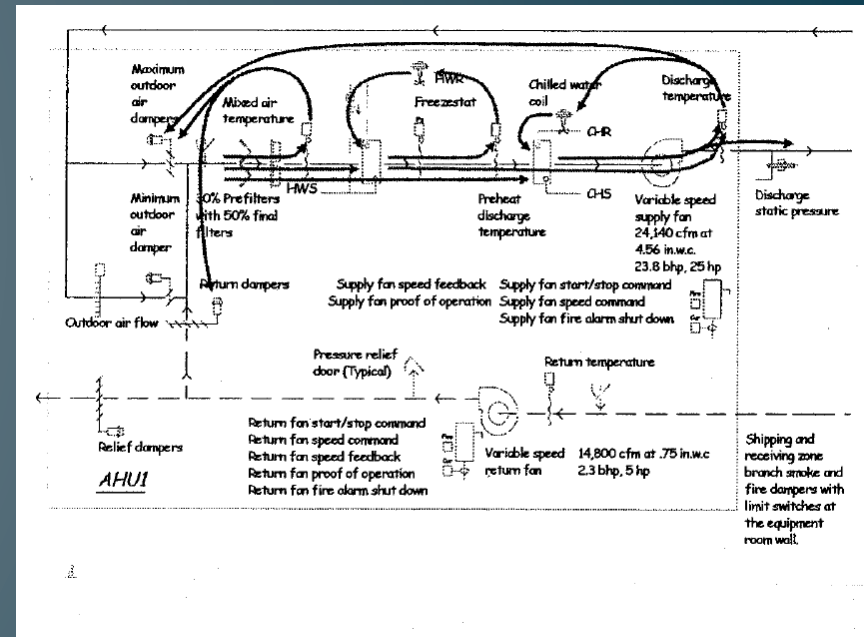
- Economizers must also be capable to modulate outside air and return air dampers to provide 100% of supply air; or
- Water economizer capable of providing 100% of cooling load.

(Section 140.4 (e))



Space Conditioning Zone Controls

Each space –conditioning zone shall have controls that prevent the systems from reheating or recooling conditioned air. (Section 140.4(d))



Mechanical System Acceptance

Added acceptance tests for HVAC sensors and controls, including those for demand controlled ventilation. (Section 120.5(a))

STATE OF CALIFORNIA
**CONSTANT VOLUME SINGLE ZONE UNITARY (PACKAGED AND SPLIT)
AIR CONDITIONER AND HEAT PUMP SYSTEMS**
CEC-NRCA-MCH-03-A (Revised 06/13) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF ACCEPTANCE NRCA-MCH-03-A
Constant Volume Single Zone Unitary (Packaged and Split) Air Conditioner and Heat Pump Systems (Page 1 of 3)

Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:

Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance. Enforcement Agency Use: Checked by/Date

Construction Inspection

- Supporting documentation needed to perform test includes, but not limited to:
 - 2013 Building Energy Efficiency Standards Nonresidential Compliance Manual (NA7.5.2 Constant Volume, Single-zone, Unitary Air Conditioner and Heat Pumps Systems Acceptance At-A-Glance).
 - 2013 Building Energy Efficiency Standards Manual.
- Instrumentation to perform test includes, but not limited to:
 - None required
- Installation (check if applies):
 - Thermostat is located within the space-conditioning zone that is served by the HVAC system.
- Programming (check all those that apply):
 - Thermostat meets the temperature adjustment and dead band requirements of 2013 Building Energy Efficiency Standards Manual section 120.2(b).
 - Minimum heating setpoint: _____°F. Maximum cooling setpoint _____°F. Deadband: _____°F.
 - Occupied, unoccupied, and holiday schedules have been programmed per the facility's schedule.
 - Pre-occupancy purge has been programmed to meet the requirements of 2013 Building Energy Efficiency Standards Manual section 120.1(c):
 - Check method used to determine pre-occupancy purge:
 - Lesser of: conditioned floor area times ventilation rate from 2013 Building Energy Efficiency Standards: TABLE 120.1-A or 15cfm per person times the expected number of occupants.
 - 3 complete air changes.

Notes:

CA Building Energy Efficiency Standards - 2013 Nonresidential Compliance June 2013

Mechanical System Acceptance

1. Outdoor air ventilation systems
2. Constant volume, single zone unitary air conditioning and heat pump unit controls
3. Duct systems
4. Air economizers
5. Demand control ventilation systems required by Section 120.1(c)3
6. Supply fan variable flow controls
7. Hydronic system variable flow controls
8. Boiler or chillers that require isolation controls per Section 140.4(k)2 or 140.4(k)3
9. Hydronic systems with supply water temperature reset controls
10. Automatic demand shed controls
11. Fault Detection and Diagnostics (FDD) for Packaged Direct-Expansion Units
12. Automatic fault detection and diagnostics (FDD) for air handling units and zone terminal units
13. Distributed Energy Storage DX AC Systems
14. Thermal Energy Storage (TES) Systems
15. Supply air temperature reset controls
16. Water-cooled chillers served by cooling towers with condenser water reset controls
17. Energy Management Control System when installed

HVAC Motors

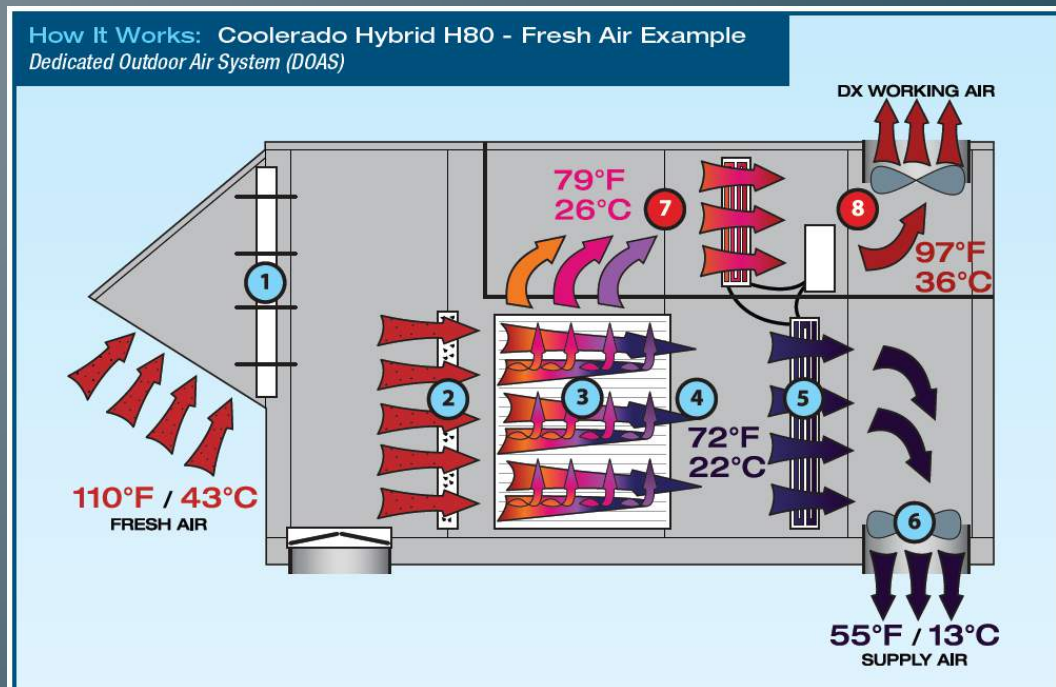
HVAC motors for fans that are less than 1 hp and more than 1/12 hp shall be electronically commutated motors (ECM) and have a minimum efficiency of 70%.

(Section 140.4(c)4)



Western Cooling Efficiency Challenge

Added credit for evaporative systems that meet the Western Cooling Efficiency Challenge (WCEC program to acknowledge high energy and water efficiency in evaporative systems). (Section 140.4)



Western Cooling Efficiency Challenge

HVAC manufacturers to develop climate-appropriate rooftop packaged air conditioning equipment that will reduce electrical demand and energy use in Western climates by at least 40% compared to DOE 2010 standards.



Mandatory Requirements for Commercial Refrigeration

Retail food stores with 8,000 square feet or more of conditioned area, and that utilize either refrigerated display cases, or walk-in coolers shall meet the requirements of Section 120.6(b).

- Condensers serving refrigeration systems
- Compressor Systems
- Refrigerated Display Cases
- Refrigeration Heat Recovery

Acceptance Testing Required

Mandatory Requirements for Refrigerated Warehouses

Refrigerated Warehouses $\geq 3,000$ square feet shall meet the requirements of Section 120.6(a).

- Exterior surfaces of refrigerated warehouses shall be insulated per TABLE 120.6-A.
- Electric resistance heat shall not be used for the purposes of underslab heating.
- High efficiency motors (ECM)
- Passageways between freezers and higher-temperature spaces, and passageways between coolers and nonrefrigerated spaces, shall have an infiltration barrier.

Acceptance Testing Required

TABLE 120.6-A REFRIGERATED WAREHOUSE INSULATION

SPACE	SURFACE	MINIMUM R-VALUE (°F hr-sf/Btu)
Freezers	Roof/Ceiling	R-40
	Wall	R-36
	Floor	R-35
	Floor with all heating from productive refrigeration capacity ¹	R-20
Coolers	Roof/Ceiling	R-28
	Wall	R-28

¹ All underslab heating is provided by a heat exchanger that provides refrigerant subcooling or other means that result in productive refrigeration capacity on the associated refrigerated system.

Prescriptive Requirements for Commercial Kitchens. (Section 140.9(b))

Kitchen Exhaust System:

- Replacement air requirements
- Flow Rates

Kitchen Ventilation:

- Limitations on conditioned air used for make-up air

Kitchen Exhaust System Acceptance Required

STATE OF CALIFORNIA COMMERCIAL KITCHEN REQUIREMENTS CEC-NRCC-PRC-03-E (Revised 06/13)		CALIFORNIA ENERGY COMMISSION NRCC-PRC-03-E (Page 1 of 2)	
CERTIFICATE OF COMPLIANCE Commercial Kitchen Requirements		Project Name: _____ Date Prepared: _____	
KITCHEN ROOM NUMBER ¹			
TOTAL INSTALLED TYPE I and II KITCHEN HOOD EXHAUST (CFM) ² :	VENTILATION COMPLIANCE METHOD:		
TOTAL BYPASS HOOD MUA (CFM) ³ :	Small Kitchens (≤5,000 CFM Type I and II Hood Exhaust)		
TOTAL TRANSFER AIR AIRFLOW (CFM) ⁴ :	140.9(b)2 A i or 140.9(b)2 A ii		
TOTAL MECHANICALLY HEATED OR COOLED MAKE UP AIR (CFM) ⁵ :	Large Kitchens (>5,000 CFM Type I and II Hood Exhaust)		
TOTAL AIR NEEDED FOR HEATING OR COOLING (CFM) ⁶ :	140.9(b)2Bi or 140.9(b)2Bii(a) or o 140.9(b)2Bii(b) or		
TOTAL EXHAUST AIR WITH DEMAND VENTILATION SYSTEMS ⁷ :	140.9(b)2Bii(c) or 140.9(b)2Bii(d)		
Equipment Tags and System Description ⁸			
PRESCRIPTIVE MEASURES	7-24 Sections	Reference to the Requirements in the Contract Documents⁹	
Bypass Hood Exhaust and MUA	140.9(b)1A		
Type I/II Hood Exhaust	140.9(b)1B, Table 140.9-A		
Mechanically heated or cooled make up air	140.9(b)2A		
Demand Ventilation Systems	140.9(b)2Bii		
Energy Recovery Systems	140.9(b)2Biii		
Tempered/Non Mechanical Cooling Air Systems	140.9(b)2Biv		
Notes:			
1. Fill in one form for each kitchen in the project.			
2. Enter the total installed type I and II kitchen hood exhaust airflow in cubic feet per minute (cfm).			
3. Enter the make-up air to bypass hoods (cfm).			
4. Enter the total transfer air (cfm).			
5. Enter the total mechanically cooled or heated make up air (cfm).			
6. Enter the maximum air needed for heating or cooling loads (cfm).			
7. Enter the design airflow (cfm) of exhaust with demand ventilation system controls			
8. Provide equipment tags (e.g., AHU 1 & 2 or Hoods 1 to 5) for all equipment that is covered by these requirements. Equipment that is similar in requirements and compliance can be grouped in a single column.			
9. Provide references to plans (i.e. Drawing Sheet Numbers) and/or specifications (including Section name/number and relevant paragraphs) where each requirement is specified. Enter "N/A" if the requirement is not applicable to this system. Explicitly list any exceptions used to avoid a requirement.			

Mandatory Requirements for Enclosed Parking Garages (Section 120.6(c))

Mechanical ventilation systems for enclosed parking garages with a design exhaust rate greater than or equal to 10,000 cfm shall conform to all of the following:

1. Modulate fan airflow rates to 50 percent or less of design capacity provided acceptable contaminant levels are maintained.
2. No more than 30 percent of design wattage at 50 percent of design airflow.
3. One CO sensor per 5,000 square feet
4. CO concentration at all sensors is maintained at 25 ppm or less at all times.
5. Ventilation rate at least 0.15 cfm/ft² when the garage is scheduled to be occupied.
6. Maintain the garage at negative or neutral pressure relative to other occupiable spaces
7. CO sensors shall be certified and calibrated and monitored
8. Meet the Acceptance Requirements for Code Compliance

Commissioning

Summary of Commissioning Requirements. The following items shall be completed:

- 1.Owner's or owner representative's project requirements;
- 2.Basis of design;
- 3.Design phase design review;
- 4.Commissioning measures shown in the construction documents;
- 5.Commissioning plan;
- 6.Functional performance testing;
- 7.Documentation and training; and
- 8.Commissioning report.

Owner's Project Requirements (Section 120.8(d))

Prior to the Design Phase, the energy-related expectations and requirements of the building shall be documented before the design phase of the project begins. This documentation shall include the following:

1. Energy efficiency goals;
2. Ventilation requirements;
3. Project program, including facility functions and hours of operation, and need for after hours operation; and
4. Equipment and systems expectations.

Design Review Kickoff

Certificate of Compliance (10-103)

- For all Nonresidential buildings, the Design Review Kickoff Certificate(s) of Compliance, and Construction Document Design Review Checklist Certificate(s) of Compliance shall be completed and signed by a licensed professional engineer.
- $< 10,000$ square feet, the licensed professional engineer may be the engineer of record.
- $\geq 10,000$ square feet but less than 50,000 square feet, the licensed professional engineer shall be a qualified in-house engineer or a third party engineer.
- $\geq 50,000$ square feet and all buildings with complex mechanical systems serving more than 10,000 square feet, the licensed professional engineer shall be a third party

Compliance Documents Central Repository

10-103

Beginning on January 1, 2015, contingent upon approval of data registry(s) by the Commission, all nonresidential buildings, high-rise residential buildings, and hotels and motels, the person(s) responsible for the Certificate(s) of Compliance shall submit the Certificate(s) for registration and retention to a data registry approved by the Commission. T

he submittals to the approved data registry shall be made electronically in accordance with the specifications in Reference Joint Appendix JA7.

What is coming in 2016?

- High Performance Attics
- Lighting
 - No more heaters to illuminate buildings
 - Think LED
- Advanced Wall Framing
 - Framing methods
 - Exterior foam
 - Windows
- Water Heating
 - Heat Pump Water Heaters
 - Tankless and Condensing Water Heaters
- Additional Compliance Options
 - Photovoltaic
 - More Flexibility using Component Package

Questions?

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