Issue 125 | January - March 2019

BLUEPRINT

CALIFORNIA ENERGY COMMISSION

EFFICIENCY DIVISION

IN THIS ISSUE

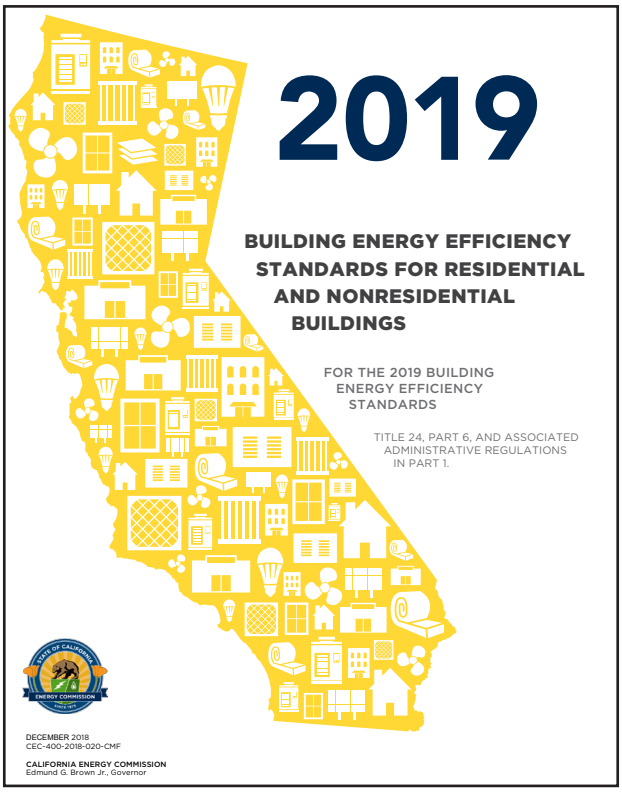
2019 ENERGY CODE TRAINING

Do you want to learn more about the *2019 Building Energy Efficiency Standards* (Energy Code)? The California Energy Commission's Building Standards Outreach and Education (O&E) Unit is available to provide training at no charge. The O&E Unit can provide sessions that range from one-hour general or topic specific presentations, to full-day sessions. We are an International Code Council (ICC) Preferred Provider, and can offer continuing education units for attendees. If you would like to schedule a training session at your location, email **Title24@energy.ca.gov**.

Are you looking for a webinar training to attend online? Consider the training options from our partner Energy Code Ace or a training offered by one of your local utilities. No matter which training option you choose, we want to make sure you are getting the information you need for the upcoming 2019 Energy Code.

The 2019 Energy Code documents are available **here.**

Subscribe to the Blueprint Newsletter for more information on the upcoming 2019 Energy Code requirements.



NEW VIDEOS FOR NONRESIDENTIAL HVAC PRESCRIPTIVE REQUIREMENTS

New educational videos are now available on the Online Resource Center (ORC). These videos provide an overview of the 2016 Energy Code prescriptive requirements for HVAC systems in nonresidential, high-rise residential, hotel and motel buildings. To view the videos listed below, please visit the **ORC.**

Prescriptive Requirements for Nonresidential Space Conditioning Systems

- Course 2A: Prescriptive Approach Overview
- Course 2BC: Size, Equipment Selection and Calculations
- Course 2D: Power Consumption of Fans
- Course 2EFN: Space Conditioning Systems Controls
- Course 2G: Electric Resistance Heating
- Course 2H: Heat Rejection Systems
- Course 2IJ: Water Chillers
- Course 2K: Hydronic System Measures
- Course 2L: Air Distribution Duct Leakage Sealing
- Course 2M: Fan Control
- Course 2O: Economizers
- Course 2P: Performance Approach Overview
- Course 2Q: Additions and Alterations

WHOLE HOUSE FAN COMPLIANCE FOR LOW-RISE RESIDENTIAL BUILDINGS

Installing and using a whole house fan (WHF) can be an effective way to cool a home through ventilation cooling. Ventilation cooling uses high volumes of outdoor air to cool the indoor space instead of air conditioning. **Section 150.1(c)12** of the 2016 Energy Code covers the prescriptive requirements for ventilation cooling. It requires the installation of a WHF in newly constructed single-family buildings in climate zones 8 through 14. These prescriptive requirements also apply to additions with greater than 1,000 ft^2 of conditioned floor area (CFA) to existing single-family buildings within the same climate zones.

To comply with the 2016 Energy Code, the following criteria for WHF installations must be met:

- Provide at least 1.5 cubic feet per minute (CFM) of air flow for each square foot of CFA by one or more WHFs; and
- Provide at least 1 ft^2 of attic vent free area for each 750 CFM of WHF air flow, or the manufacturer's specified attic vent free area, whichever is greater; and
- Provide the homeowner a one-page "How to Operate Your Whole House Fan" informational sheet; and
- WHFs must be listed in the Energy Commission's **Modernized Appliance Efficiency Database System** (MAEDbS).

For more information on these requirements, see **Section 4.7.10** of the 2016 Residential Compliance Manual.

Additionally, only the rated airflow values listed in the MAEDbS should be used to demonstrate WHF compliance. These values are determined by the test procedures in the Home Ventilating Institute's Publication 916 (HVI-916) in accordance with the requirements of Title 20, California Code of Regulations, **Section 1604(d)**, Table D-3.

Enforcement agencies can compare documented values on the Certificate of Installation form (CF2R-MCH-02-E) with those listed in MAEDbS to verify compliance. For assistance with searching MAEDbS, contact the Title 20 Compliance Assistance Call Center at (888) 838-1467 or e-mail **appliances@energy.ca.gov**.

Q&A

TOWNHOUSES VS. DUPLEXES

Is there any difference in classification between a duplex with stacked dwelling units and a duplex with side-by-side dwelling units in the 2016 Energy Code?

No. The Energy Code classifies all group R-3 occupancy buildings with any number of stories, including duplexes, as low-rise residential. The 2016 California Building Code (Title 24, Part 2) classifies buildings that do not contain more than two dwelling units as a group R-3 occupancy. The enforcement agency has the final authority on classifying the occupancy for all buildings.

Since a townhouse has shared walls and no shared ceilings or floors, are side-by-side duplexes also considered townhouses?

No. A duplex is not considered a townhouse. The 2016 Energy Code defines townhouses as having three or more attached dwelling units. Duplexes are only two units, which can be either stacked or side-by-side, while townhouses are only side-by-side.

Are all duplex buildings, regardless of the configuration or the number of habitable stories, modeled as two separate single-family low-rise buildings?

Yes. All duplexes are modeled as two separate single-family buildings using Energy Commission approved compliance software for residential buildings. For more on how to model low-rise residential buildings, see the CBECC-Res **2016 User Manual**.

Are low-rise residential townhouse dwelling units modeled as individual single-family buildings?

Yes. Low-rise residential townhouses are modeled as individual single-family units. For more on modeling low-rise residential buildings, see the CBECC-Res **2016 User Manual**.

Are high-rise residential townhouse buildings modeled as multi-family buildings?

Yes. High-rise residential townhouses are modeled as one multi-family building using Energy Commission approved compliance software for nonresidential buildings. For more on how to model high-rise residential buildings, see the CBECC-Com **2016 User Manual**.

FOR MORE INFORMATION

Online Resource Center:
https://www.energy.ca.gov/title24/orc/

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Compliance Software:
http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html

The Energy Commission welcomes your feedback on Blueprint. Please contact the editor at: **Title24@energy.ca.gov**

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- Peter Strait
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Need Help? Energy Standards Hotline
(800) 772-3300 (toll-free in CA)
Title24@energy.ca.gov

CEC-400-2019-004

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1516 Ninth St, MS-37
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DATE • TIME	LOCATION	INSTRUCTOR	REGISTRATION
Residential Standards for Plans Examiners and Building Inspectors ✪			
February 19 • 8:30 - 4:30	Glendale	Bruce Cheney	sce.com/energycenters
February 28 • 8:30 - 4:30	Ventura	Bruce Cheney	sce.com/energycenters
March 6 • 8:30 - 4:30	San Diego	Bruce Cheney	seminars.sdge.com
May 1 • 8:30 - 4:30	San Diego	Bruce Cheney	seminars.sdge.com
September 4 • 8:30 - 4:30	San Diego	Bruce Cheney	seminars.sdge.com
October 15 • 8:30 - 4:30	San Diego	Bruce Cheney	seminars.sdge.com
November 28 • 8:30 - 4:30	San Diego	Bruce Cheney	seminars.sdge.com
Nonresidential Standards for Plans Examiners and Building Inspectors ✪			
February 21 • 8:30 - 4:30	San Diego	Bruce Cheney	seminars.sdge.com
February 27 • 8:30 - 4:30	Glendale	Bruce Cheney	sce.com/energycenters
March 14 • 8:30 - 4:30	Oxnard	Bruce Cheney	sce.com/energycenters
April 23 • 8:30 - 4:30	San Diego	Bruce Cheney	seminars.sdge.com
August 28 • 8:30 - 4:30	San Diego	Bruce Cheney	seminars.sdge.com
October 8 • 8:30 - 4:30	San Diego	Bruce Cheney	seminars.sdge.com
Standards & Technology for Nonresidential Lighting ✪			
March 20 • 8:30 - 4:30	San Diego	Gina Rodda	seminars.sdge.com
Nonresidential Standards for Architects ✪ ▪			
March 19 • 8:30 - 4:30	San Diego	Gina Rodda	seminars.sdge.com
Nonresidential Standards for Small Commercial AC Quality Installation Contractors ✪			
March 27 • 11:30 - 12:45	El Cajon	Bruce Cheney	858-254-1189
Residential Standards for AC Quality Installation Contractors ✪			
March 20 • 11:30 - 12:45	El Cajon	Bruce Cheney	858-254-1189
Where We're Headed With the Residential Standards ✪			
March 12 • 11:30 - 12:45	San Diego	Martyn Dodd	seminars.sdge.com
June 4 • 11:30 - 12:45	San Diego	Martyn Dodd	seminars.sdge.com
October 1 • 11:30 - 12:45	San Diego	Martyn Dodd	seminars.sdge.com
November 20 • 11:30 - 12:45	San Diego	Martyn Dodd	seminars.sdge.com
Where We're Headed With the Nonresidential Standards ✪			
March 12 • 8:30 - 10:45	San Diego	Martyn Dodd	seminars.sdge.com
June 4 • 8:30 - 10:45	San Diego	Martyn Dodd	seminars.sdge.com
October 1 • 8:30 - 10:45	San Diego	Martyn Dodd	seminars.sdge.com
November 20 • 8:30 - 10:45	San Diego	Martyn Dodd	seminars.sdge.com
Nonresidential CEA Exam Preparation Workshop ✪			
February 22 • 8:30 - 4:30	Stockton	Brian Selby	pge.com/energyclasses
March 1 • 8:30 - 4:30	Irwindale	Brian Selby	sce.com/energycenters
April 25 • 8:30 - 4:30	Pacific Grove	Gina Rodda	cabec.org
Residential CEA Exam Preparation Workshop ✪			
February 28 • 8:30 - 4:30	Irwindale	Brian Selby	sce.com/energycenters
April 25 • 8:30 - 4:30	Pacific Grove	Brian Selby	cabec.org

Software Training

DATE • TIME	LOCATION	INSTRUCTOR	REGISTRATION
Beginning EnergyPro - Residential ✪			
March 13 • 1:00 - 4:00	San Diego	Martyn Dodd	seminars.sdge.com
October 2 • 8:30 - 12:00	San Diego	Martyn Dodd	seminars.sdge.com
Advanced EnergyPro - Residential ✪			
June 5 • 1:00 - 4:00	San Diego	Martyn Dodd	seminars.sdge.com
Beginning EnergyPro - Nonresidential ✪			
March 13 • 8:30 - 12:00	San Diego	Martyn Dodd	seminars.sdge.com
October 2 • 8:30 - 12:00	San Diego	Martyn Dodd	seminars.sdge.com
Advanced EnergyPro - Nonresidential ✪			
June 5 • 8:30 - 12:00	San Diego	Martyn Dodd	seminars.sdge.com
CBECC-COM Software for the 2016 Title 24 Energy Code – Introduction and Simplified (2D) Geometry ✪			
May 7 • 8:30 - 4:30	Irwindale	Gus Wirth	sce.com/energycenters
November 6 • 8:30 - 4:30	Irwindale	Gus Wirth	sce.com/energycenters

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Introduction to Nonresidential Modeling ✪		
March 11 • 9:00 - 12:00	Online	Martyn Dodd
May 24 • 9:00 - 12:00		
July 15 • 9:00 - 12:00		
November 25 • 9:00 - 12:00		
Introduction to Residential Modeling ✪		
April 8 • 9:00 - 12:00	Online	Martyn Dodd
September 9 • 9:00 - 12:00		
October 28 • 9:00 - 12:00		

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Nonresidential Modeling ✪		
March 5 - 7 • 9:00 - 12:00	Online	Martyn Dodd & Ted Tiffany
May 14 - 16 • 9:00 - 12:00		
September 10 - 12 • 9:00 - 12:00		
October 29 - 31 • 9:00 - 12:00		
Nonresidential Standards for Energy Consultants ✪		
March 26 - 28 • 9:00 - 12:00	Online	Brian Selby
June 18 - 20 • 9:00 - 12:00		
August 20 - 22 • 9:00 - 12:00		
October 15 - 17 • 9:00 - 12:00		
Residential Modeling ✪		
April 16 - 18 • 9:00 - 12:00	Online	Martyn Dodd & Ted Tiffany
June 11 - 13 • 9:00 - 12:00		
October 8 -10 • 9:00 - 12:00		
December 3 - 5 • 9:00 - 12:00		
Residential Standards for Energy Consultants ✪		
July 16 - 18 • 9:00 - 12:00	Online	Brian Selby
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- Residential Standards for Ventilation ✪
- Residential Standards & Technology for Building Envelope ✪
- Residential Standards & Technology for Solar Systems ✪
- Residential Standards & Technology for Heating, Ventilation & Air Conditioning ✪
- Residential Standards & Technology for Water Heating ✪
- Nonresidential Lighting Wheel
- Nonresidential Standards & Technology for Indoor Lighting Mandatory Measures ✪
- Nonresidential Standards & Technology for Indoor Lighting Prescriptive Compliance ✪
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Analyzing the CF1R ✪		
April 19 • 9:00 - 12:00	Online	Martyn Dodd
September 27 • 9:00 - 12:00		
December 6 • 9:00 - 12:00		
October 15 • 9:00 - 12:00		
Residential Envelope and Solar Systems ✪		
May 13 • 9:00 - 12:00	Online	Luke Morton
August 5 • 9:00 - 12:00		
October 7 • 9:00 - 12:00		
December 9 • 9:00 - 12:00		
Residential Mechanical Systems ✪		
April 1 • 9:00 - 12:00	Online	Chandra Apperson
June 3 • 9:00 - 12:00		
August 19 • 9:00 - 12:00		
Novenber 18 • 9:00 - 12:00		
Residential Modeling Tips ✪		
February 22 • 9:00 - 12:00	Online	Martyn Dodd
May 6 • 9:00 - 12:00		
August 12 • 9:00 - 12:00		
October 21 • 9:00 - 12:00		

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DATE • TIME	LOCATION	INSTRUCTOR
2019 Title 24: Where We're Headed With the Nonresidential Standards		
May 17 • 9:00 - 11:30	Online	Martyn Dodd
September 13 • 9:00 - 11:30		
December 3 • 9:00 - 11:30		
2019 Title 24: Where We're Headed With the Residential Standards		
May 17 • 1:00 - 2:30	Online	Martyn Dodd
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- Decoding CBECC-Com: Let's Talk about the New NRCC-PRF Form
- Decoding CBECC-Com: Let's Talk Energy Pro and Nonresidential 2D Modeling
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- Decoding Comfort: Let's Talk HVAC Impacts on Residential Comfort
- Decoding CXR: Let's Talk Nonresidential Commissioning Under Title 24, Part 6
- Decoding Electrical Distribution: Let's Talk Title 24, Part 6 Section 130.5
- Decoding Forms: Let's Talk Res & Nonres 2013 Energy Compliance Forms
- Decoding HERS: Let's Talk Res & Nonres HERS Measures
- Decoding Multifamily: Let's Talk Low Rise and High Rise Multifamily
- Decoding QII: Let's Talk HERS Quality Insulation Installation
- Decoding Recovery: Let's Talk Residential Rebuilding
- Decoding Renewables: Let's Talk PV, Solar & Energy Compliance
- Decoding Residential Compliance: Let's Talk About Design to Construction
- Decoding Residential Lighting: Let's Talk Title 24, Part 6 Requirements

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Our new Title 20 Appliance Efficiency curriculum focuses on the essentials industry professionals and consumers need to know to use the California Energy Commission's Modernized Appliance Efficiency Database System (MAEDBS). Access our video trainings on the following topics at:

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- Title 20 Essentials: Making the Most of On-Demand Video Training
- Title 20 Essentials: Why Certification Matters
- Title 20 Essentials: Using MAEDBS for Manufacturers
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- Code & Coffee: Nonresidential Lighting - Indoor Lighting Wheel Overview
- Coffee & Code with Brian – Residential Modeling: Accessory Dwelling Units (ADU), Part 1: Newly Conditioned Detached ADU
- Code & Coffee with Brian: Residential Modeling – Accessory Dwelling Units (ADU), Part 2: Newly Conditioned Attached ADU
- Code & Coffee: Residential Modeling – Existing + Addition + Alteration Project
- Code & Coffee: Residential Modeling – Townhome Project
- Code & Coffee: Residential Modeling – Townhome Project, Part 2
- Code & Coffee: Residential Modeling – Two-story Simple New Construction Project

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Issue 124 | October - December 2018

BLUEPRINT

CALIFORNIA ENERGY COMMISSION
EFFICIENCY DIVISION

IN THIS ISSUE

CENTER OF GLASS CALCULATIONS FOR LOW-RISE RESIDENTIAL BUILDINGS

Center of glass calculations have a limited application in low-rise residential projects and require extra documentation to support the calculated values. The process for using this approach is described in Reference Appendices Nonresidential Appendix **NA6** (NA6).

Low-rise residential center of glass calculations can only be used for a total site-built window area of up to 250 ft^2 or 5 percent of the conditioned floor area (CFA), whichever is greater, per NA6. Site-built fenestration is defined in **Section 100.1** of the *2016 Building Energy Efficiency Standards* (Energy Code) as fenestration designed using factory cut pieces manufactured with the intention of being assembled at the construction site. This is not to be confused with field-fabricated fenestration, which is entirely built in the field. The U-factor and solar heat gain coefficient (SHGC) of site-built fenestration products may either be rated by the National Fenestration Rating Council (NFRC), come from the default values listed in the tables in **Section 110.6**, or be calculated using NA6.

NA6.5 includes a comprehensive list for the builder and installer to follow to ensure: the energy consultant is given the proper information for the manufacturer and type of glass; accurate documentation is provided to the enforcement agency; and that the correct product is installed. The manufacturer's literature should be submitted with the certificate of compliance documentation and worksheets.

To calculate the U-factor and SHGC, use Equations NA6-1, NA6-2, and Table NA6-5 to determine the values and create a default label for each window.

Equation NA6-1

U-factor = C1 + (C2 x Center of Glass U-factor)

Equation NA6-2

SHGC = 0.08 + (0.86 x Center of glass SHGC)

Table NA6-5 – U-factor Coefficients

Product Type	Frame Type	C_1	C_2
Site-built vertical fenestration	Metal	0.311	0.872
	Metal thermal break	0.202	0.867
	Non-metal	0.202	0.867
Skylights with a curb	Metal	0.711	1.065
	Metal Thermal Break	0.437	1.229
	Non-Metal	0.437	1.229
Skylights with no curb	Metal	0.195	0.882
	Metal thermal break	0.310	0.878
	Non-metal	0.310	0.878

For the performance method, the values needed for center of glass calculations depend on the compliance software used. For CBECC-Res or Right-Energy, use Equations NA6-1 and NA6-2, and Table NA6-5 to determine the values to input into the software.

Alternatively, EnergyPro allows an input for center of glass values, and the calculations from NA6 are incorporated into the software. The CF1R-PRF-01-E form will list the adjusted values being modeled by EnergyPro. Note that the modeled center of glass efficiencies of site-built fenestration products could result in a compliance penalty, and the mandatory requirement in **Section 150.0(q)** of a maximum 0.58 U-factor cannot be traded off.

When using the prescriptive method, start with either the CF1R-NCB, CF1R-ALT, or CF1R-ADD form, and then include the CF1R-ENV-02 and CF1R-ENV-03 form if using an area weighted average or shading to comply. These forms along with the default labels will document if the fenestration meets the prescriptive requirements per **Section 150.1**.

When the enforcement agency receives the certificate of compliance documentation, the plan checker confirms:

1. The U-factor and SHGC values are on the plans and forms.
2. The center of glass values of the fenestration product on the manufacturer's documentation.
3. The area limits (greater of 250 ft^2 or 5 percent of CFA).

The building inspector later verifies the installed fenestration efficiency values match the compliance documentation and the actual area of site-built fenestration does not exceed the allowed limit.

RESIDENTIAL REPLACEMENT WINDOW INSULATION

For residential replacement and retrofit windows, the 2016 Energy Code require insulation to be installed between the new fenestration product and the rough opening. When retrofit windows are installed into existing frames, a new void is created that did not previously exist. The rough opening in a window retrofit is the inside-to-inside dimensions of the existing frame, commonly referred to as the pocket.

The fenestration product manufacturer's installation specifications should be followed when installing retrofit windows. The space between the new window and rough opening shall be completely filled with insulation and the cavity must be airtight. See Figure 1. When batt insulation is used, it should be cut to size and placed properly around the fenestration product. Stuffing of the insulation is not permitted. Low expanding foam may be used to fill the gaps and voids when allowed by the manufacturer.

For more on the installation requirements for retrofit windows, see the **CF2R** installation forms.

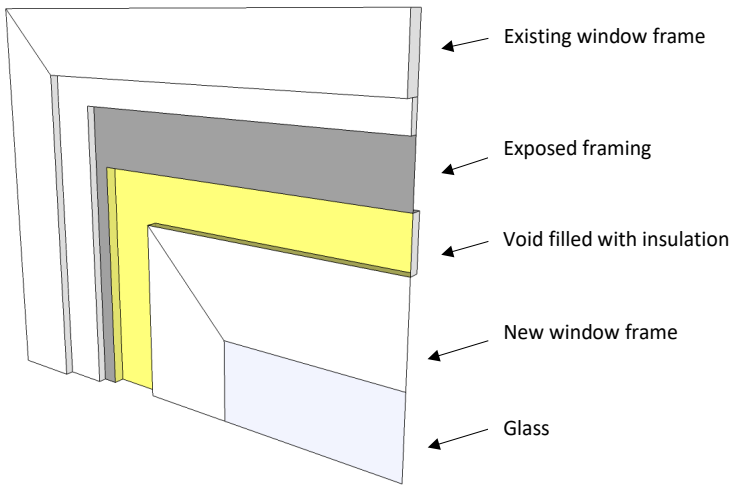

Figure 1 - Retrofit window insulation

NEW VIDEOS FOR NONRESIDENTIAL HVAC MANDATORY REQUIREMENTS

New educational videos are available at the **Online Resource Center** (ORC). These videos review the 2016 Energy Code mandatory requirements for HVAC in nonresidential, high-rise residential, and hotel and motel buildings.

Mandatory Requirements for Nonresidential Space Conditioning Systems

- Course 1A: Introduction - Mandatory, Prescriptive and Performance Requirements: Understanding the Differences
- Course 1B: Requirements for Ventilation
- Course 1C: Required Controls for Space Conditioning Systems
- Course 1D: Requirements for Pipe Insulation
- Course 1E: Requirements for Air Distribution System Ducts and Plenums
- Course 1F: Required Nonresidential Mechanical System Acceptance

TOWNHOUSE CLASSIFICATIONS

Historically, the low-rise residential requirements of the Energy Code have been applied to townhouses as single-family dwellings with an R-3 building occupancy classification, regardless of the number of stories. However, due to changes in the California Building Code, the high-rise residential requirements of the Energy Code may apply to taller townhouses. Title 24, Part 2 and 2.5, classify townhouses three or less stories above grade, with a separate means of egress, as occupancy group R-3, and townhouses more than three stories as occupancy group R-2.

The Energy Code defines a low-rise residential building as a building, other than a hotel or motel, that is occupancy group R-2, multifamily with three or less habitable stories; or occupancy group R-3, single family; or an occupancy group U building, located on a residential site. A high-rise residential building is defined as a building, other than a hotel or motel, occupancy group R-2 or R-4, with four or more habitable stories. High-rise residential buildings must meet the Energy Code requirements for nonresidential buildings, and dwelling units within the building must meet the low-rise residential Energy Code requirements for water-heating and lighting.

Determining whether a townhouse will need to meet the low-rise residential or high-rise residential requirements of the Energy Code depends on how the townhouse is classified by the enforcement agency and the number of habitable stories. If the townhouse is classified as R-3, the low-rise residential standards will apply. If the townhouse is classified as R-2 and has four or more habitable stories, the high-rise residential standards will apply. If the townhouse is classified as R-2 and has three or less habitable stories, the low-rise residential standards will apply.

Figure 2 - Occupancy Group R-2 Townhouses

Q&A

TOWNHOUSES: HIGH-RISE OR LOW-RISE

Townhouses with four conditioned stories above grade that have an R-2 group occupancy will be constructed, but one story is an entry landing with stairs. Are these townhouses classified as low-rise residential or high-rise residential buildings?

This is low-rise residential. This is an R-2 group occupancy with three habitable stories or less. See Figure 2. A habitable story is defined as space in which humans may work or live in reasonable comfort with 50 percent or more of its volume is above grade. Additionally, habitable space is defined as space for living, sleeping, eating, or cooking. Bathrooms, toilets, hallways, storage areas, closets, utility rooms, and similar areas are not considered habitable space. A conditioned story with only an entry landing and stairs is not considered a habitable story.

If there are multiple R-2 group occupancy townhouses in one building and only one of them is four stories, is the entire building a four story, high-rise residential building or is each unit looked at individually?

This is high-rise residential. This building is an R-2 group occupancy with four or more habitable stories. Any townhouses that are attached and sharing common walls, and that consist of one structure are considered to be one building. A building with an R-2 group occupancy that has four or more habitable stories is considered a high-rise residential building.

A project consists of townhouses that are broken up into two levels that are connected by an unconditioned, sometimes exterior, walkway. The project description labels these townhouses as having four stories, but only three are habitable. Would the townhouses in this project be considered high-rise residential buildings?

No. These townhouses will be considered low-rise residential buildings. It is up to the enforcement agency to determine the building group occupancy. Regardless of an R-2 or R-3 group classification, these townhouses have three habitable stories and will be considered low-rise residential buildings.

Townhouses that are all R-2 group occupancy will be built into a steep hillside with more than four stories above the grade plane, however only three stories are habitable space. See Figure 3. Are these townhouses low-rise residential buildings?

Yes. Buildings with an R-2 group occupancy and three habitable stories or less will be classified as low-rise residential buildings.

For more information see, the **Energy Code for Townhomes** presentation on the ORC.

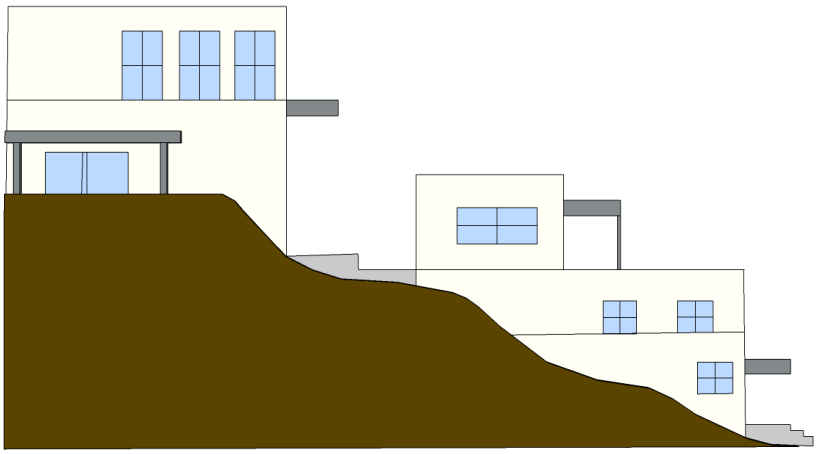

Figure 3 - Townhouses built into steep hillside

NATURAL GAS AND WATER HEATER INSTALLATION IN ADUs

I am converting a detached garage into an accessory dwelling unit (ADU). Natural gas is connected to the existing home but not the detached garage. Is natural gas considered available to the ADU?

It depends on the method used to document compliance. If using the **addition alone** prescriptive or performance compliance pathway, then it assumes no natural gas is available. If using the **existing plus addition plus alteration** method to document compliance, since the existing building has natural gas available, the addition does as well. For clarification, **Section 100.1** of the 2019 Energy Code now defines natural gas availability as:

> *"...For additions and alterations, natural gas is available if a gas service line is connected to the existing building."*

I am converting an attached garage into an ADU. Natural gas is connected to the building. Can I prescriptively install a heat pump water heater?

No. Per **Section 150.2(a)1Di** when complying prescriptively, a gas water heater that meets the requirements of **Section 150.1(c)8** must be installed.

However, when using the performance method to document compliance, **Section 150.2(a)1Div** allows installation of any water heater as long as the proposed energy budget is equal or less than the standard energy budget. In the performance method the standard water heating energy budget is based on **Section 150.1(c)8Ai.**

I am converting a detached garage into an ADU. Natural gas is not connected to the garage. Can I prescriptively install a heat pump water heater?

Yes. **Section 150.2(a)1Dii** allows for an electric water heater to be installed. Note that a heat pump water heater is a very efficient type of electric water heater to install.

CONCRETE WALL INSULATION

I have a low-rise residential building with concrete walls. Do the mandatory wall insulation requirements of Section 150.0(c) apply to concrete and mass walls?

No. The 2016 Energy Code does not have mandatory insulation requirements for concrete or mass walls for low-rise residential buildings. This includes concrete stem walls. However, there are prescriptive requirements in **§150.1(c)1B** of the 2016 Energy Code for insulating concrete and mass walls.

APPROVED POOL PUMPS

Can I issue a final permit for a pool pump that does not appear in the Energy Commission's Modernized Appliance Efficiency Database System (MAEDBS) approved list?

Yes, if the pool pump appears on the MAEDBS archived list. Per **Section 150.0(p)1A** all pool pumps and pump motors installed shall be listed in the Energy Commission's directory of certified equipment.

Due to a change in federal law, the Energy Commission moved all pool pumps certified prior to February 5, 2018, from the MAEDBS approved list to the archived list.

Code officials should review both the approved list and archived list on MAEDBS. Pool pumps appearing on either list are permissible to be installed in California. For more information see the pool pump **FAQ**.

How do I find the archived list for residential pool pumps on MAEDBS?

Under the search feature in **MAEDBS** click on the appliance type tab. In the category, select pool products, in the appliance type select residential pool pumps. Figure 4. Next, under the appliance status tab, select archived, then click the search button and the list will populate. Figure 5.

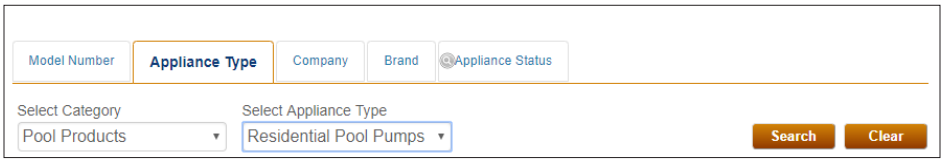

Figure 4 - MAEDBS Appliance Type Tab

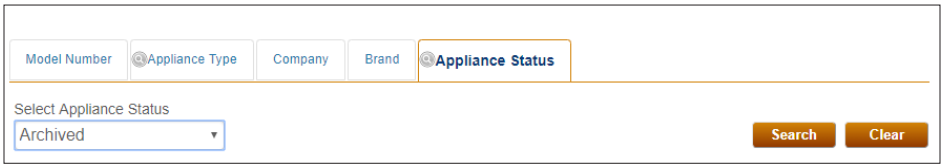

Figure 5 - MAEDBS Appliance Status Tab

FOR MORE INFORMATION

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Compliance Software:
http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html

The California Energy Commission welcomes your feedback on Blueprint. Please contact Amie Brousseau at: Title24@energy.ca.gov

EDITOR

Amie Brousseau

SPECIAL THANKS

- Andrea Bailey
- Chris Olvera
- Christopher Meyer
- Danny Tam
- Dee Anne Ross
- Javier Perez
- Jose Perez
- Payam Bozorgchami
- Peter Strait
- Todd Ferris

Need Help? Energy Standards Hotline
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Title24@energy.ca.gov

Building Standards Office
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CEC-400-2019-002

New Tool to Help You Decode Title 24 and Title 20 Now Available

Energy Code Ace has launched a new tool to help you comply with California's building and appliance energy standards. The new **Q&Ace** is an online tool that easily finds answers to many of the most-asked questions about Title 24, Part 6 and Title 20. Its knowledge base is a compilation of questions and answers found in various California Energy Commission publications, as well as those Energy Code Ace fields through its site and training courses - and will be updated on an ongoing basis. It allows you to:

- Type in a question or key words
- Explore the Top 6 Topics
- Use Filters to focus answer choices
- Submit a question

Try It Today!

Issue 123 | April - September 2018

BLUEPRINT

CALIFORNIA ENERGY COMMISSION

EFFICIENCY DIVISION

IN THIS ISSUE

2019 ENERGY CODE ADOPTED!

The California Energy Commission (Energy Commission) adopted the *2019 Building Energy Efficiency Standards* (Energy Code).

The 2019 Energy Code goes into effect January 1, 2020. Homes built under this Code will use about 53 percent less energy than those under the 2016 Code. Nonresidential buildings are estimated to use about 30 percent less.

Low-Rise Residential Highlights

PV Systems - For the first time, photovoltaic (PV) systems will be required prescriptively for newly constructed low-rise residential buildings, per **Section 150.1(c)14.** There are several exceptions which may allow a reduction in the size of the PV system required.

Quality Insulation Installation - Quality insulation installation becomes a prescriptive requirement in **Section 150.1(c)1E.**

All Electric Homes - A prescriptive pathway for an all electric home is introduced in **Section 150.1**.

Nonresidential, High-Rise Residential, and Hotel/Motel Highlights

Hospitals - For the first time, Occupancy Group I - Institutional (excluding I-3 and I-4) will have to meet the Energy Code for newly constructed buildings. The inclusion of Occupancy Group I is introduced in **Section 100.0(a)**. Additions and alterations to Occupancy Group I buildings do not have to comply.

MERV 13 Air Filters - New mandatory ventilation requirements are introduced in **Section 120.1**. Specified mechanical systems will be required to have minimum efficiency reporting value (MERV) 13 air filters. Air class and recirculation limits introduced based on occupancy categories.

LEDs - Lighting power density will be based on the energy consumption of LEDs instead of linear fluorescent lamps. This change to **Section 140.6**. results in largest energy savings in the 2019 Energy Code.

The **2019 Energy Code** is available for review. More information on the 2019 Energy Code is available in the **frequently asked questions**, infographics for **residential** and **nonresidential** buildings, and **news release**.

MODELING ADUs

The Energy Commission recently updated its software, CBECC-Res, to make it easier to model accessory dwelling units (ADUs). CBECC-Res 2016.3.1 allows users to model wall extensions using the prescriptive exception. Existing wood-framed walls can be modeled without a penalty for not having continuous insulation as long as the siding is not removed. This new version also allows detached additions that do not have a connecting surface to be modeled.

Would you like more information on modeling ADUs? Several resources are available:

- **Frequently Asked Questions About CBECC-Res**
- Energy Code Ace's
  - Code and Coffee with Brian - Residential Modeling: Accessory Dwelling Units (ADU), **Part 1: Newly Conditioned Detached ADU**
  - Code and Coffee with Brian - Residential Modeling: Accessory Dwelling Units (ADU), **Part 2: Newly Conditioned Detached ADU**
  - Decoding ADUs: **Let's Talk Recent Changes**

NONRESIDENTIAL

Including high-rise residential & hotel/motel projects

ACCEPTANCE TESTING For the 2016 Energy Standards

CALIFORNIA ENERGY COMMISSION

When is acceptance testing required?

- Acceptance testing is mandatory for certain nonresidential lighting, mechanical, fenestration, covered processes, and controls.
- Acceptance testing applies when regulated systems or controls are installed in newly constructed buildings, additions, and alterations.
- Any acceptance testing that is required will be specified on the NRCC(s).

Who can conduct acceptance testing?

- Only a lighting **Acceptance Test Technician (ATT)** certified by an ATT Certification Provider (ATTCP) may perform testing for indoor and outdoor lighting systems and controls.
- The builder, contractor, engineer, or commissioning agent may perform testing for HVAC, fenestration, covered processes, and controls.
- A mechanical ATT certified by an ATTCP will be required to perform testing for HVAC systems and controls when the industry thresholds in § 10-103.2 are met.

How do I find an ATT?

- ATTCPs approved by the Energy Commission maintain a directory of certified ATTs on their respective websites (provided on back of this card).
- Search filters, like name and county, are available to make finding an ATT in your area easier.

CERTIFIED MECHANICAL ATTs

The Energy Commission has approved four organizations to train and certify mechanical acceptance test technicians for the 2016 Energy Code. These organizations are:

- **California State Pipe Trades Council** (CSPTC)
- **National Energy Management Institute Committee** (NEMIC)
- **National Environmental Balancing Bureau** (NEBB)
- **Refrigeration Service Engineers Society** (RSES)

At this time, mechanical acceptance testing is not required to be performed by a certified acceptance test technician. Testing by a certified technician will be required when the Energy Commission has confirmed that at least 300 technicians have been certified and are available throughout California.

For more information, visit the **Acceptance Test Technician Certification Provider Program** web page.

Q&A

ADUs

I am converting a garage to an ADU. The walls of the garage are being extended to increase the floor area. What are the insulation requirements for the extended walls?

These walls are treated as wall extensions. Wall extensions can meet the insulation requirements based on the existing dimensions of the walls being extended. This is as described in Sections **150.2(a)1Ai** and **150.2(a)1Bi**, and requires R-15 in 2x4 framing and R-19 in 2x6 framing.

For more on what is considered a wall extension, see *Blueprint* **Issue 118**.

I am converting a detached garage into a pool house. This is not an ADU. Is this considered a newly constructed building or an addition?

This is an addition. This follows the same requirements for detached garages converted to ADUs as described in *Blueprint* **Issue 122.**

NATIVE AMERICAN RESERVATIONS

Are buildings on Native American reservations required to meet the Energy Code?

No. Like buildings on federal land, buildings on Native American reservations are not required to meet the Energy Code.

GAS LIGHTING

Is gas lighting regulated by the Energy Code?

No. Gas lighting, whether for residential or nonresidential buildings, is not regulated by the Energy Code.

BUILT-IN WATER HEATER ISOLATION VALVES

I'm installing an instantaneous water heater that has built-in isolation valves and service ports. These valves and ports allow for the water heater to be flushed as part of regular maintenance. Am I required to install isolation valves as described in Section 110.3(c)7?

No. The built-in isolation valves and ports meet the intent of the Energy Code.

FOR MORE INFORMATION

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Compliance Software:
http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html

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2016 ENERGY CODE

Title 24 Part 6 Essentials

Nonresidential Standards Plans Examiners & Building Inspectors

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Energy Code Ace is pleased to announce the launch of our New & Improved course

Now more focused on what we heard you say you need in a training:

- **More doing, less talking**
- **More how-tos, less content heavy**
- **More strategic, less overwhelming**

This new & improved course will help you:

- **Use Your Limited Time Strategically:**
  - Identify "essential" Plans Examiner and Building Inspector review tasks associated with top energy savings, and describe how review strategy shifts based on project type (Performance vs Prescriptive; New vs Additions and Alterations).
- **Understand What's Crucial:**
  - Identify nonresidential construction's "top seven" areas of typical greatest impact on energy savings.
- **Leverage Available Resources:**
  - Use given Plans Examiner and Building Inspector Checklists to guide review, and identify where checklist line items correspond to compliance documentation, Plan Set drawings and observed on-site conditions.
- **Develop a Flexible Review Strategy:**
  - Use Plans Examiner and Building Inspector Checklists and task prioritization strategies to perform a plan check or building inspection that is appropriate given your available time, realities on the job and goals of Title 24, Part 6.
- **Focus on Communication:**
  - Practice ways to address non-compliance, as well as methods for communicating effectively, during plan check and building inspection phases.

Register today for one of our upcoming classes!

✪ denotes ICC PREFERRED EDUCATION PROVIDER

DATE • TIME	LOCATION	INSTRUCTOR	REGISTRATION
Nonresidential Standards for Plans Examiners and Building Inspectors ✪			
August 28 • 8:30 - 4:30	Glendale	Bruce Cheney	sce.com/energycenters
September 18 • 8:30 - 4:30	San Diego	Bruce Cheney	seminars.sdge.com
September 27 • 8:30 - 4:30	Tulare	Bruce Cheney	sce.com/energycenters
October 23 • 8:30 - 4:30	Santa Ana	Bruce Cheney	sce.com/energycenters
October 24 • 8:30 - 4:30	El Centro	Bruce Cheney	sce.com/energycenters
November 7 • 8:30 - 4:30	San Diego	Bruce Cheney	seminars.sdge.com

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Issue 122 | January - March 2018

BLUEPRINT

California Energy Commission
Efficiency Division

In This Issue

CBECC-Res FAQs Updated

Do you have questions about CBECC-Res, the free residential compliance software from the California Energy Commission (Energy Commission)? The Commission publishes **Frequently Asked Questions (FAQs) about CBECC-Res** that addresses hot topics related to the software. The FAQs were recently updated and include seven new questions and answers.

Fewer and Simpler Nonresidential Forms

One of the Energy Commission's goals is to reduce the number of compliance documents (forms). The 47 prescriptive nonresidential certificates of compliance (NRCC) are being cut to 10 forms. There will be one form for each building component – lighting, envelope, mechanical, etc. This lessens confusion about when to use which form.

These simplified forms incorporate dynamic features. Each form follows a similar format and offers similar features, simplifying completion and review.

Five **dynamic forms** have already been posted for:

- Electrical Power Distribution
- Indoor Lighting
- Outdoor Lighting
- Sign Lighting
- Solar Ready

The five forms that will be posted in the future are for:

- Commissioning
- Covered Processes
- Envelope
- Mechanical
- Water Heating

These forms are available for use now! Enforcement agencies may continue to use the static forms at their discretion. When the *2019 Building Energy Efficiency Standards* (Energy Code) is implemented, these 10 reformatted NRCC forms will be the only prescriptive nonresidential forms used.

Simplified 2016 Power Distribution and Solar Ready Forms

Two simplified forms are now available to document compliance with the nonresidential electrical power distribution (ELC) and solar ready (SRA) requirements. These forms simplify the compliance process for everyone involved including the contractor, plans examiner, and building department. They are project specific and expand and contract based on the project scope – reducing the total number of pages of forms for most projects.

New features include:

- One signature block
- Table C – Compliance Results give a quick check of the inputs on the first page and will indicate if the project "COMPLIES"
- User selections limit drop-down menus and table options to guide users toward compliant designs
- Hyperlinks to the Energy Code

The new **NRCC-ELC-E** and **NRCC-SRA-E** are available now.

Enforcement agencies may continue to use the static forms at their discretion.

Thank You, LBO and City of Chico!

The Energy Commission sends a big THANK YOU to the Local Building Officials (LBO) and the City of Chico. LBO worked with the Energy Commission to organize a series of seven classes on the 2016 Energy Code. The classes covered residential envelope, the benefits of modeling, nonresidential lighting, and more.

The City of Chico hosted and promoted these free classes. Attendees included building officials, building department staff, contractors, designers, and energy consultants. Several of these classes provided students with free International Code Council (ICC) Preferred Provider continuing education units.

Is your jurisdiction interested in hosting Energy Code classes? If so, contact the **hotline** for more information.

Covered Processes Quick Reference Guide Available

Do you know when compliance with the Energy Code is triggered for covered processes? The Energy Commission has released the **Covered Processes Quick Reference Guide**. This handy guide tells you when compliance is required, what equipment is covered, and if acceptance testing must be completed.

Rebuilding After Disasters

The Energy Commission gets a lot of questions about which code cycle must be met when rebuilding after a disaster. Per **Section 100.0(a)2**, the code that is in effect on the date you apply for a building permit is the code that must be met. Any building permit application submitted on or after January 1, 2017, must meet the 2016 Energy Code.

For more information, please see Energy Code Ace's ***Recover and Rebuild*** fact sheet.

Presentations Posted

Seven 2016 Energy Code presentations are available for download from the **Online Resource Center**.

The information in these presentations include:

- Covered Processes
- Envelope
  - Cool Roofs
  - Residential
- HVAC
  - Nonresidential
- Lighting
  - Nonresidential
  - Residential
- Water Heating
  - Residential

Regulatory Advisory

The Energy Commission has issued a **regulatory advisory** regarding manufactured fenestration (windows, skylights, and glass doors) labels. There are only two types of acceptable labels – National Fenestration Rating Council (NFRC) labels, or labels that use default values. The advisory reviews labeling requirements and provides samples of acceptable labels, per the requirements of Sections **10-111** and **110.6**.

Accessory Dwelling Units

Accessory dwelling units (ADUs) are most commonly defined as secondary dwelling units on residential lots. They can be used to house family (also known also as granny or in-law units), visitors, or even as rental properties to supplement income. ADUs, like all other residential structures in California, are subject to the Energy Code.

In most instances, when complying with the 2016 Energy Code, ADUs are considered **additions**. Additions are changes to a building that increase conditioned floor area and conditioned volume. The only scenario where an ADU would be considered a **newly constructed building** is if it was a new structure and shared no common walls with the existing building. This means that for compliance with the Energy Code, attached ADUs, as well as converted existing structures, are considered additions.

This issue of *Blueprint* includes frequently asked questions about ADUs. For more information on ADUs, visit the California Department of Housing and Community Development's **website**.

Q&A

Accessory Dwelling Units

When an existing attached unconditioned structure (like a garage) is converted to an ADU, is it an addition or a newly constructed building?

This is an addition. See Figure 1 for an illustration of this example.

Figure 1 - Existing house, attached garage being converted to an ADU

When an ADU is built new sharing a common wall with the existing house, is it an addition or a newly constructed building?

This is an addition. See Figure 2 for an illustration of this example.

Figure 2 - Existing house, newly constructed attached ADU

When an existing detached unconditioned structure (like a garage) is converted to an ADU, is it an addition or a newly constructed building?

This is an addition. See Figure 3 for an illustration of this example.

Figure 3 - Existing house, detached garage being converted to an ADU

When an ADU is built new and is detached from the existing house, is it an addition or a newly constructed building?

This is a newly constructed building. This building would need to meet the requirements as a new building. See Figure 4 for an illustration of this example.

Figure 4 - Existing house, newly constructed detached ADU

When an existing unconditioned structure (like a garage) is converted to an ADU, what requirements do the existing walls need to meet?

These walls are treated as "wall extensions," and can meet the insulation requirements based on their existing dimensions, as described in Sections **150.2(a)1Ai** and **150.2(a)1Bii**. This requires R-15 in 2x4 framing, and R-19 in 2x6 framing.

Do the whole building ventilation requirements apply to ADUs that are additions?

The whole building ventilation requirements apply to additions that are greater than 1,000 square feet. While not required, it is recommended that the whole building ventilation requirements be met for new dwelling units. All other applicable ventilation requirements must be met. For example, if a bathroom or kitchen is part of the addition, the local exhaust requirements for those spaces must be met. More on local exhaust requirements can be found in **Section 4.6.5** of the *2016 Residential Compliance Manual*.

Residential Performance Modeling and HERS Verification

I'm modeling a residential addition. The project includes quality insulation installation (QII), which requires home energy rating system (HERS) verification. Existing heating, ventilation, and air conditioning (HVAC) equipment will be used and less than 40 feet of ducting will be added.

My project only requires HERS verification for QII. Why does the HERS Feature Summary on my certificate of compliance (CF1R) state:

- **Refrigerant charge verification required if a refrigerant containing component is altered**
- **Duct sealing required if a duct system component, plenum, or air-handling unit is altered**

These two statements do not indicate that these verifications are required. They are meant to remind the builder that additional HERS verifications may be required depending on the scope of the project.

Some scopes are not covered in the performance report. For example, an air conditioner compressor is moved to a new location to accommodate an addition. This typically requires the replacement of portions of the refrigerant line or the installation of a new section of line. In some cases, an entirely new refrigerant line is installed. Per the requirements of **Section 150.2(b)1Fiib,** the alteration of a refrigerant containing component, in climate zones 2 and 8-15, triggers refrigerant charge verification. The needed verification is identified on the certificate of installation (CF2R-MCH-01-E).

For more information on residential modeling, visit your software vendor's **FAQ** web page.

LED Trim Kits

Does an LED trim kit, like the one in Figure 5, need to be tested for elevated temperature and marked JA8-2016-E?

No. LED trim kits do not need to be tested for elevated temperature or marked JA8-2016-E. LED trim kits (also called solid state lighting [SSL] downlight retrofit kits) are classified as luminaires, even though they are inserted into existing housing (can). When LEDs are inseparable from the kit, the kit is tested as a luminaire. The elevated temperature test does not apply to luminaires. The Energy Code classifies these kits as luminaires.

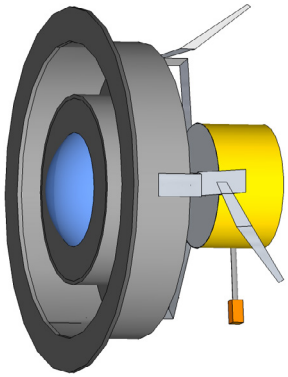

Figure 5 - LED trim kit

For reference, the 2016 Energy Code defines an **inseparable SSL luminaire** as:

> *"A luminaire featuring solid state lighting components such as LEDs and driver components which cannot be easily removed or replaced by the end user, thus requiring replacement of the entire luminaire. Removal of solid state lighting components may require the cutting of wires, use of a soldering iron, or damage to or destruction of the luminaire."*

Insulating Refrigerant Lines

Do refrigerant lines, also referred to as suction lines, for low-rise residential mini-splits have to meet the ¾" insulation requirement in TABLE 120.3-A?

Yes. Suction line insulation for all residential HVAC systems, including mini-splits, must meet the ¾" thickness requirement.

For More Information

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Compliance Software:
http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html

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03/01/2018

Title 24 Part 6 Essentials Training Courses *Currently Scheduled for 2018*

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March 1 • 8:30 - 4:30	San Diego	Bruce Cheney	sdge.com/eic/seminar
March 15 • 8:30 - 4:30	San Francisco	Marina Chavez	pge.com/energyclasses
March 20 • 8:30 - 4:30	Stockton	Marina Chavez	pge.com/energyclasses
March 21 • 8:30 - 4:30	Malibu	Bruce Cheney	barbie@aae-hers.com
March 28 • 8:30 - 4:30	Folsom	Brian Selby	pge.com/energyclasses
April 3 • 8:30 - 4:30	San Jose	Marina Chavez	pge.com/energyclasses
April 18 • 8:30 - 4:30	Fresno	Marina Chavez	pge.com/energyclasses
May 22 • 8:30 - 4:30	San Diego	Bruce Cheney	sdge.com/eic/seminar
May 25 • 8:30 - 4:30	Napa	Brian Selby	pge.com/energyclasses
September 6 • 8:30 - 4:30	San Diego	Bruce Cheney	sdge.com/eic/seminar
November 28 • 8:30 - 4:30	San Diego	Bruce Cheney	sdge.com/eic/seminar
Nonresidential Standards for Plans Examiners and Building Inspectors ✪			
March 6 • 8:30 - 4:30	Newport Beach	Bruce Cheney	barbie@aae-hers.com
March 9 • 8:30 - 4:30	Santa Rosa	Brian Selby	pge.com/energyclasses
March 12 • 8:30 - 4:30	Watsonville	Brian Selby	pge.com/energyclasses
March 15 • 8:30 - 4:30	Folsom	Brian Selby	pge.com/energyclasses
April 6 • 8:30 - 4:30	Stockton	Brian Selby	pge.com/energyclasses
April 9 • 8:30 - 4:30	Fresno	Brian Belby	pge.com/energyclasses
May 3 • 8:30 - 4:30	San Diego	Bruce Cheney	sdge.com/eic/seminar
May 3 • 8:30 - 4:30	San Jose	Marina Chavez	pge.com/energyclasses
May 22 • 8:30 - 4:30	San Francisco	Gina Rodda	pge.com/energyclasses
May 28 • 8:30 - 4:30	Napa	Brian Selby	pge.com/energyclasses
September 18 • 8:30 - 4:30	San Diego	Bruce Cheney	sdge.com/eic/seminar
November 7 • 8:30 - 4:30	San Diego	Bruce Cheney	sdge.com/eic/seminar
Standards & Technology for Residential Lighting ✪			
April 24 • 9:00 - 11:00	Stockton	Gina Rodda	pge.com/energyclasses
April 26 • 9:00 - 11:00	San Francisco	Gina Rodda	pge.com/energyclasses
Standards & Technology for Nonresidential Lighting ✪			
March 22 • 8:30 - 4:30	San Francisco	Gina Rodda	pge.com/energyclasses
May 24 • 8:30 - 4:30	San Jose	Gina Rodda	pge.com/energyclasses
Nonresidential Standards for Architects ✪ ■			
March 13 • 8:30 - 4:30	San Francisco	Martyn Dodd	pge.com/energyclasses
April 17 • 8:30 - 4:30	Fresno	Marina Chavez	pge.com/energyclasses
June 26 • 8:30 - 4:30	San Jose	Gina Rodda	pge.com/energyclasses
June 27 • 8:30 - 4:30	San Francisco	Gina Rodda	pge.com/energyclasses

Software Training

DATE • TIME	LOCATION	INSTRUCTOR	REGISTRATION
EnergyPro 7 Software for 2016 Title 24 Residential Compliance - Introduction ✪			
March 15 • 8:30 - 12:00	San Francisco	Martyn Dodd	pge.com/energyclasses
August 16 • 8:30 - 12:00	San Francisco	Martyn Dodd	pge.com/energyclasses
November 1 • 8:30 - 12:00	San Francisco	Martyn Dodd	pge.com/energyclasses
EnergyPro 7 Software for 2016 Title 24 Residential Compliance - Intermediate/Advanced ✪			
March 15 • 1:00 - 4:30	San Francisco	Martyn Dodd	pge.com/energyclasses
August 16 • 1:00 - 4:30	San Francisco	Martyn Dodd	pge.com/energyclasses
November 1 • 1:00 - 4:30	San Francisco	Martyn Dodd	pge.com/energyclasses
EnergyPro 7 Software for 2016 Title 24 Nonresidential Compliance - Introduction ✪			
March 14 • 8:30 - 12:00	San Francisco	Martyn Dodd	pge.com/energyclasses
August 15 • 8:30 - 12:00	San Francisco	Martyn Dodd	pge.com/energyclasses
October 31 • 8:30 - 12:00	San Francisco	Martyn Dodd	pge.com/energyclasses
EnergyPro 7 Software for 2016 Title 24 Nonresidential Compliance - Intermediate/Advanced ✪			
March 14 • 1:00 - 4:30	San Francisco	Martyn Dodd	pge.com/energyclasses
August 15 • 1:00 - 4:30	San Francisco	Martyn Dodd	pge.com/energyclasses
October 31 • 1:00 - 4:30	San Francisco	Martyn Dodd	pge.com/energyclasses

Ace Training Mini Virtual Classroom™

Delivered online in real-time by an instructor.
Check EnergyCodeAce.com for registration information.

DATE • TIME	LOCATION	INSTRUCTOR
Introduction to Nonresidential Modeling		
March 5 • 9:00 - 12:00	Online	Martyn Dodd
May 21 • 9:00 - 12:00		
July 2 • 9:00 - 12:00		
October 29 • 9:00 - 12:00		
Introduction to Residential Modeling		
February 12 • 9:00 - 12:00	Online	Martyn Dodd
May 14 • 9:00 - 12:00		
August 20 • 9:00 - 12:00		
October 8 • 9:00 - 12:00		

Ace Training Virtual Classroom™

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Nonresidential Standards for Energy Consultants		
March 6 - 8 • 9:00 - 12:00	Online	Brian Selby
May 29 - 31 • 9:00 - 12:00		Martyn Dodd
August 7 - 9 • 9:00 - 12:00		Brian Selby
Nonresidential Modeling		
Febuary 6 - 8 • 9:00 - 12:00	Online	Martyn Dodd
May 24 - 24 • 9:00 - 12:00		
July 17 - 19 • 9:00 - 12:00		
October 23 - 25 • 9:00 - 12:00		
Residential Standards for Energy Consultants		
April 3-5 • 9:00 - 12:00	Online	Brian Selby
July 10 - 12 • 9:00 - 12:00		
September 18 - 20 • 9:00 - 12:00		
October 16 -18 • 9:00 - 12:00		
Residential Modeling		
July 31 - August 2 • 9:00 - 12:00	Online	Martyn Dodd
October 9 - 11 • 9:00 - 12:00		
December 11 - 13 • 9:00 - 12:00		

Ace Training Vorkshop™

Virtual workshops: "roll-up-your-sleeves" interactive sessions delivered online in real-time by an instructor. Check EnergyCodeAce.com for registration information.

Analyzing the CF1R		
March 19 • 9:00 - 12:00	Online	Martyn Dodd
April 16 • 9:00 - 12:00		
July 9 • 9:00 - 12:00		
October 15 • 9:00 - 12:00		
Residential Envelope and Solar Systems		
April 6 • 9:00 - 12:00	Online	Luke Morton
June 19 • 9:00 - 12:00		
August 14 • 9:00 - 12:00		
October 2 • 9:00 - 12:00		
November 5 • 9:00 - 12:00		
Residential Mechanical Systems		
February 28 • 9:00 - 12:00	Online	Brian Selby
April 23 • 9:00 - 12:00		Chandra Apperson
July 23 • 9:00 - 12:00		
September 6 • 9:00 - 12:00		
November 6 • 9:00 - 12:00		
Residential Modeling Tips		
March 9 • 9:00 - 12:00	Online	Martyn Dodd
June 21 • 9:00 - 12:00		
August 6 • 9:00 - 12:00		
December 4 • 9:00 - 12:00		

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Delivered online in real-time by an instructor.
Check EnergyCodeAce.com for information and register at pge.com/energyclasses.

DATE • TIME	LOCATION	INSTRUCTOR
2019 Title 24: Where We're Headed With the Nonresidential Standards		
March 30 • 9:00 - 11:30	Online	Martyn Dodd
September 14 • 9:00 - 11:30		
December 7 • 9:00 - 11:30		
2019 Title 24: Where We're Headed With the Residential Standards		
March 30 • 1:00 - 2:30	Online	Martyn Dodd
September 14 • 1:00 - 2:30		
December 20 • 1:00 - 2:30		

Ace Training Online Self-Study™

- Dynamic Nonresidential Compliance Forms
- Residential & Nonresidential Energy Efficiency Concepts
- Residential & Nonresidential HERS
- Residential Standards for AC Quality Installation Contractors
- Residential Standards for Indoor Lighting
- Residential Standards for Ventilation
- Residential Standards & Technology for Building Envelope
- Residential Standards & Technology for Solar Systems
- Residential Standards & Technology for Heating, Ventilation & Air Conditioning
- Residential Standards & Technology for Water Heating
- Nonresidential Lighting Wheel
- Nonresidential Standards for Indoor Lighting Mandatory Measures
- Nonresidential Standards for Indoor Lighting Prescriptive Compliance
- Title 20 Essentials: The Water-Energy Nexus

Take them whenever and wherever you like, at your own pace. Visit EnergyCodeAce.com

Ace Title 20 Training On-Demand Video™

Our new Title 20 Appliance Efficiency curriculum focuses on the essentials industry professionals and consumers need to know to use the California Energy Commission's Modernized Appliance Efficiency Database System (MAEDBS). Access our video trainings on the following topics at:

energycodeace.com/content/title-20-ondemand

- Title 20 Essentials: Making the Most of On-Demand Video Training
- Title 20 Essentials: Why Certification Matters
- Title 20 Essentials: Using MAEDBS for Manufacturers
- Title 20 Essentials: Using MAEDBS for Third Party Certifiers
- Title 20 Essentials: Using MAEDBS for Test Laboratories
- Title 20 Essentials: California Appliance Standards for Retailers, Distributors, Contractors, and Importers

Ace Training Decoding Talks™

Facilitated online discussion forums for building department personnel and other industry professionals.
Go to EnergyCodeAce.com for upcoming topics, dates, times and to view recorded past events.

Issue 121 | October - December 2017

BLUEPRINT

California Energy Commission
Efficiency Division

In This Issue

IAPMO-R&T Approved

The California Energy Commission (Energy Commission) has **approved** the International Association of Plumbing and Mechanical Officials, Research and Testing (IAPMO-R&T) to certify and rate solar water-heating systems and collectors.

IAPMO-RT maintains a list of products they have certified on their **website**.

Section 150.0(n)3 of the *2016 Building Energy Efficiency Standards* (Energy Code) requires solar water-heating systems and collectors to be certified and rated.

New Fact Sheet

The Energy Commission has developed a **Computer Rooms & Data Centers** fact sheet. This fact sheet summarizes the requirements in **Section 140.9(a)**.

New 2016 NRCC-LTO-E and NRCC-LTS-E

The new **NRCC-LTO-E** and **NRCC-LTS-E** are available. The NRCC-LTO-01-E through NRCC-LTO-04-E and NRCC-LTS-01-E were incorporated into two compliance documents (forms).

The new forms can be used for any nonresidential outdoor or sign lighting projects complying with the Energy Code.

These forms are project specific and expand based on the project scope.

Some of the new features include:

- One signature block
- Table C - Compliance Results gives a quick check of the inputs on the first page and will indicate if the project "COMPLIES"
- User selections limit drop-down menus and table options to guide users toward compliant designs
- Hyperlinks to the Energy Code

Enforcement agencies may continue to use the static forms at their discretion.

Appliance Efficiency Regulations for State Regulated Lamps

Effective January 1, 2018, general service LED lamps and small-diameter directional lamps will be regulated by the Title 20 Appliance Efficiency Regulations (Appliance Standards). State regulated LED lamps with screw base or GU-24 base, including LED retrofit kits designed for recessed can housings, must meet the requirements of the Appliance Standards to be sold or offered for sale in California.

What does this mean with regards to the Energy Code?

Only general service LED lamps and small-diameter directional lamps that are listed in the **appliance database** may be installed, per the requirements in **Section 110.1**. These lamps may also need to meet the 2016 Reference Joint Appendix JA8 (JA8) requirements per **Sections 110.9(e)** and **150.0(k)1A**.

What is the difference between the JA8 and state regulated lamp requirements?

For more information on the differences between the JA8 and state regulated lamp requirements, please review the article "**Title 24's JA8 and Title 20's State Regulated Lamp Requirements"** in *Blueprint,* Issue 117.

Separation of Electrical Circuits

The requirements for separation of electrical circuits (disaggregation of electrical circuits) have been simplified in the 2016 Energy Code. The 2013 Energy Code prescribed specific methods of separating electrical loads. The 2016 Energy Code allows any approach that provides the ability to measure the separate loads of the building.

2016 Energy Code vs. 2013 Energy Code

Section 130.5(b) of the 2013 Energy Code specifically required separate panelboards or subpanels for each load type. This design approach allows for measuring each electrical load at the feeder to the panelboard or subpanel using a current transformer (CT). See Figure 1 for an example of this design approach.

Another method for meeting the requirements is installing a complete metering and measurement system that measures each load type according to the requirements in Section 130.5(b). This method goes beyond the requirements of the Energy Code. Section 130.5(b) requires separation of electrical circuits to provide the capability to monitor individual loads at a later time. It does not require that meters and associated equipment such as CT's to be installed.

The 2016 Energy Code does not require a specific method or design approach for ensuring separation of electrical loads. Any design approach that provides the ability to measure separate loads according to **Section 130.5(b)** may be used.

For example, the system can be designed so that one panel contains multiple load types. Each branch circuit serves a single load type. This allows for measurement of separate loads at each branch circuit. See Figure 2 for an example of this design approach.

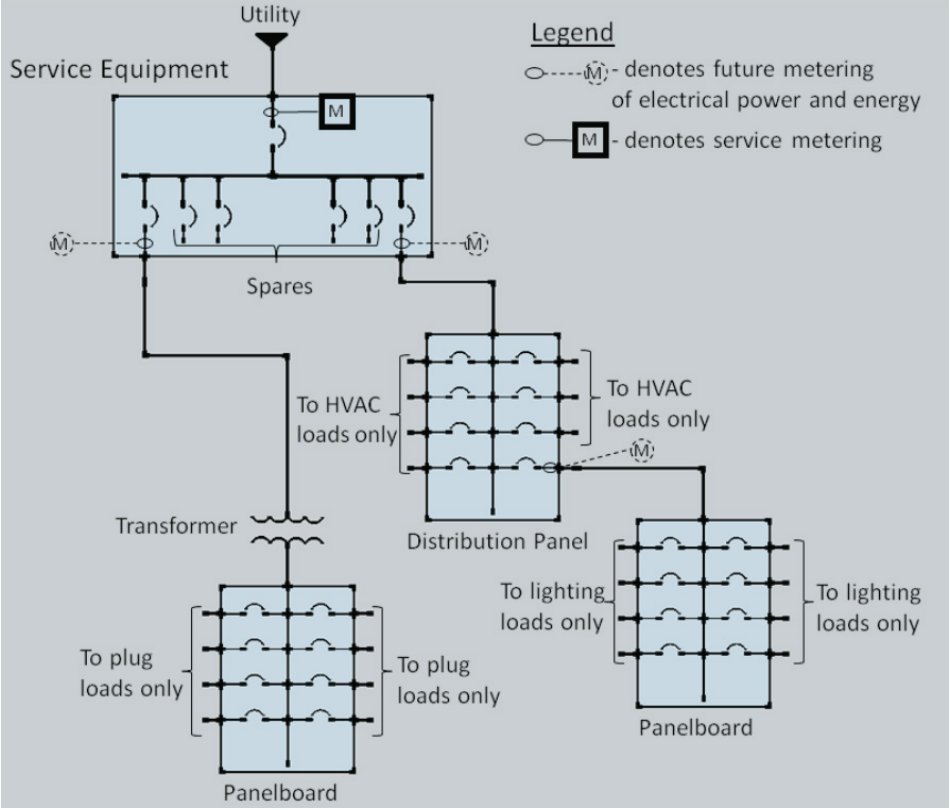

Figure 1 - Loads separated by panelboards and subpanels

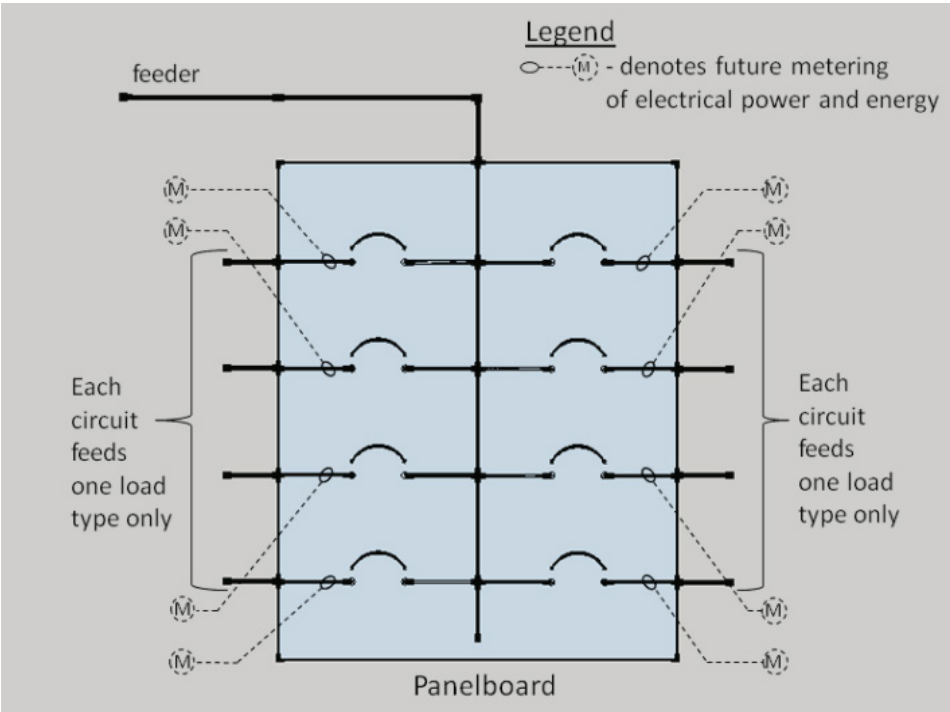

Figure 2 - Loads separated by individual branch circuits

Why Separate Electrical Circuits?

The purpose of separating electrical circuits is to set up a backbone for monitoring the contributions of separate loads to the overall energy use of the building. By designing the electrical power distribution system with separation of electrical loads in mind, energy monitoring can be readily setup and implemented without significant physical changes to the electrical installations. Monitoring the electrical energy usage of each load type provides valuable energy usage information to better understand how much energy has been used by each building system. Analyzing this energy information can help facilitate energy efficiency measures to improve building energy performance.

Conclusion

The 2016 Energy Code provides more flexibility for designing electrical power distribution systems. Whereas the 2013 Code required specific design approaches, the 2016 Code allows any design approach that provides the capability to separately monitor electrical load types according to **Section 130.5(b)**. **Chapter 8** of the *2016 Nonresidential Compliance Manual* provides a few examples, which show design approaches that may be used to meet code requirements.

Q&A

Residential Attic Insulation

When installing roof insulation in a residential attic, does the insulation need to be installed on the entire roof, including areas over unconditioned space?

It depends. The insulation should be installed at the roof either above or below the roof deck in one of the following ways:

1. If the attic is an open or undivided space, then the entire roof should be insulated. This includes portions of the roof over an unconditioned space such as a garage. This is illustrated in Figure 3.
2. If the attic has a continuous air barrier separating the attic over unconditioned space from the attic over conditioned space, then only the portions of the roof over conditioned space should be insulated. It is recommended, but not required, that the air barrier is also insulated. This is illustrated in Figure 4.

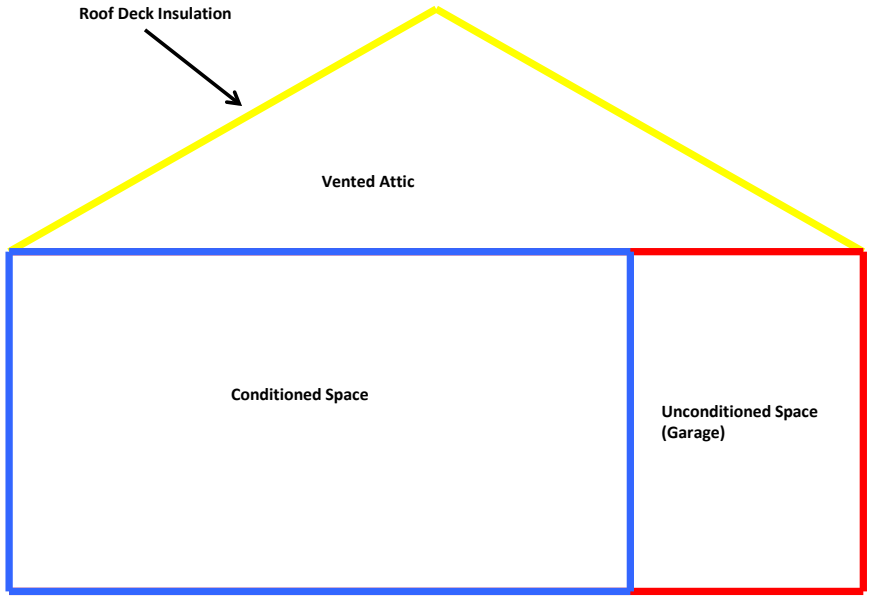

Figure 3 - House with attic insulation extending over conditioned and unconditioned spaces

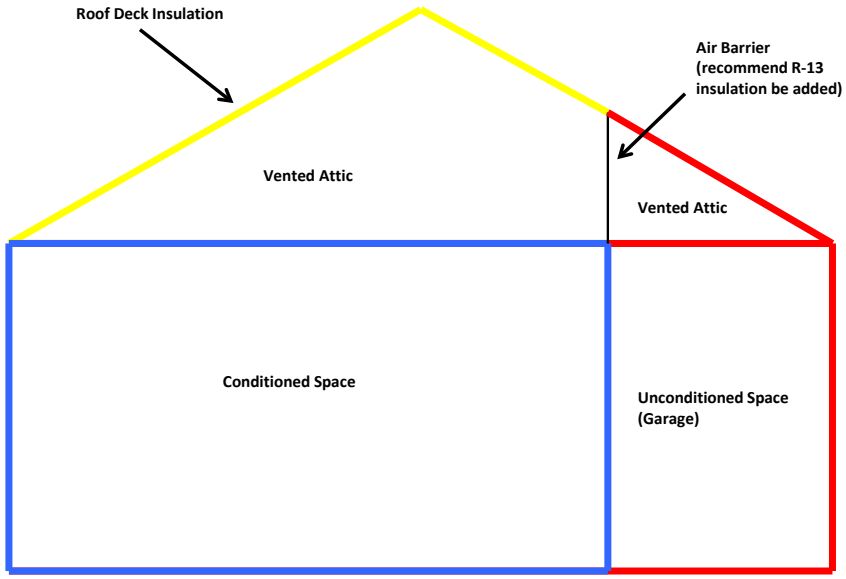

Figure 4 - House with attic insulation extending over conditioned space, attic over conditioned and unconditioned space separated by an air barrier

Pipe Insulation

I am installing a space-conditioning system that uses heated refrigerant for space heating. Should the pipes filled with the heated refrigerant be insulated?

Yes. All pipes carrying refrigerant should be insulated. In this case, insulation is necessary to prevent the refrigerant from losing heat. By reducing heat loss, the equipment does not use extra energy reheating the refrigerant.

Changes are proposed to Sections **120.3** and **150.0(j)2B** of the 2019 Energy Code to require piping for refrigerant to be insulated regardless of the refrigerant being cooled or heated.

I am installing a new solar water-heating system at my house. Which pipes and components of this system need to be insulated?

All of the following must be insulated:

» All new domestic hot water piping (California Plumbing Code, **Section 609.11**)

» Existing accessible piping (**Section 150.2(b)1Gi**)

» Piping from the heating source to the storage tank (**Section 150.0(j)2Aiv**)

» First five feet of cold water piping at the storage tank (**Section 150.0(j)2Ai**)

» Unfired storage tanks (**Section 150.0(j)1**)

Solar water-heating system collector loop piping should be insulated to reduce heat loss. Changes are proposed to **Section 150.0(j)2B** of the 2019 Energy Code to require this piping to be insulated.

If insulation is installed outside of conditioned space, it must be protected from sunlight, moisture, equipment maintenance, and wind per **Section 150.0(j)3**.

See Figure 5 for an example of an insulated solar water-heating system.

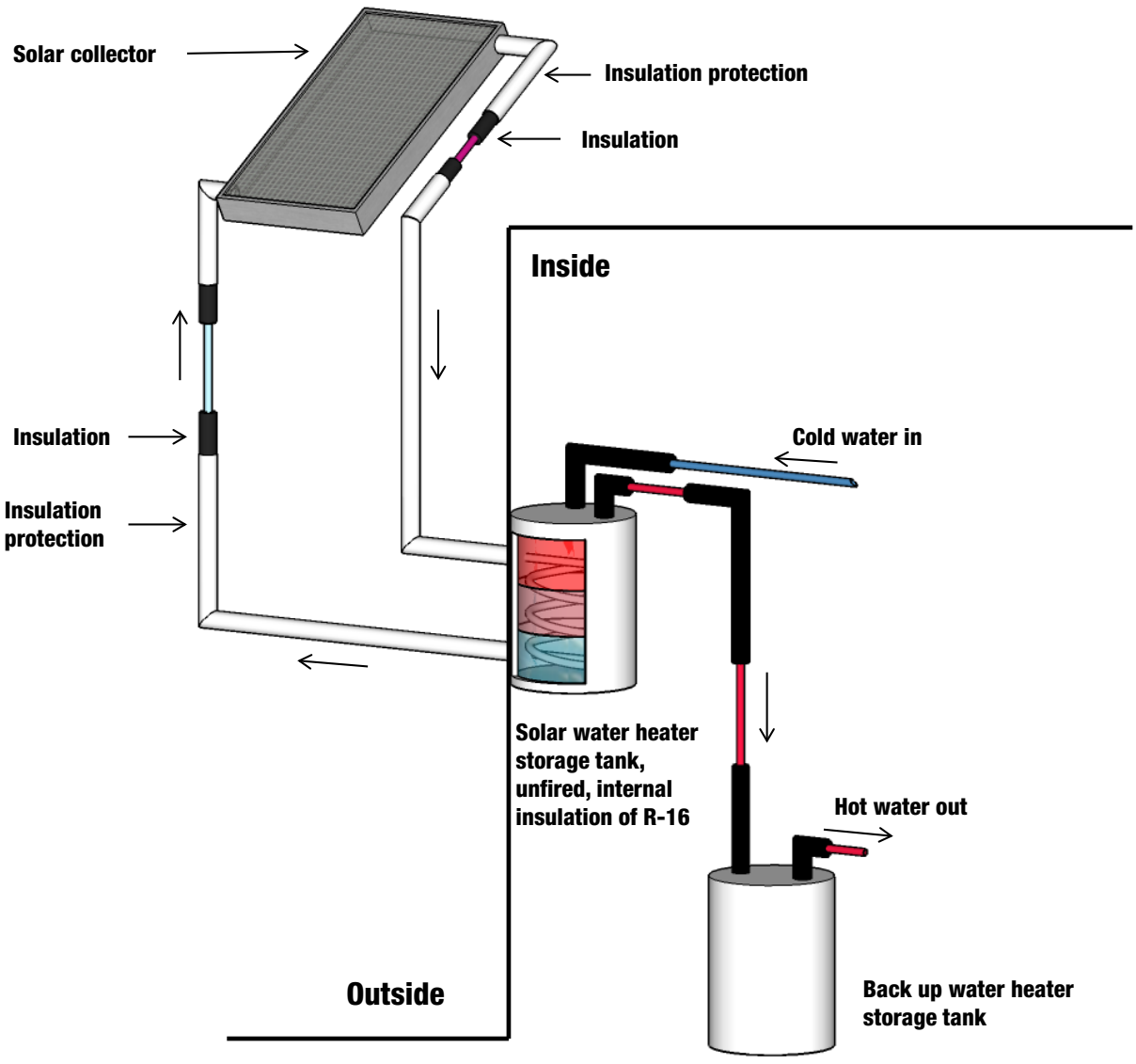

Figure 5 - Solar water-heating system with pipe insulation and insulation protection. Cutouts in insulation and insulation protection are for demonstration purposes only. Where insulation is required, it must be continuous (exceptions may apply).

ENERGY STANDARDS HOTLINE

Available to help with Energy Standards (Title 24, Part 6) questions.

EMAIL

title24@energy.ca.gov

CALL

800-772-3300
Toll free in CA

916-654-5106
Outside CA

HOURS

8 a.m.–12 p.m. and
1 p.m.– 4:30 p.m.

For More Information

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Compliance Software:
http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html

The California Energy Commission welcomes your feedback on Blueprint. Please contact Andrea Bailey at:
Title24@energy.ca.gov

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BLUEPRINT

California Energy Commission
Efficiency Division

In This Issue

New 2016 NRCC-LTI-E!

The new lighting **certificate of compliance (NRCC-LTI-E)** is available now! The NRCC-LTI-01-E through NRCC-LTI-06-E were incorporated into one compliance document (form). Six forms down to one!

The new NRCC-LTI-E can be used for any prescriptive nonresidential indoor lighting project complying with the *2016 Building Energy Efficiency Standards* (Energy Standards). The NRCC-LTI-E is project specific and expands based on the project scope.

Some key features of the NRCC-LTI-E include:

- Major decrease in the amount of pages required to show compliance
- One signature block
- Hyperlinks to the Energy Standards

This form is beneficial to many people:

Enforcement Agencies - Plans Examiners

- Table C - Compliance Results gives a quick check of the inputs on the first page and will indicate if the project "COMPLIES." See the example in Figure 1.
- Table D - Exceptional Conditions auto-generates comments. For example, it will say an exception has been applied or that track lighting is included.
- Table H - Indoor Lighting Controls is split into "Building Level" and "Area Level" controls and shows how compliance is achieved.
- Tables T and U - Both tables automatically indicate the required installation and acceptance forms, eliminating guesswork.

Lighting Designers and Energy Consultants

- All calculations and transfer of numbers are automatic, limiting the chance for errors.
- User selections limit drop-down menus and table options to guide users toward compliant designs.
- No more wondering which lighting forms to submit. There is just one compliance form for all prescriptive nonresidential indoor lighting projects.
- All tables hyperlink to applicable sections of the Energy Standards to limit confusion about what requirements are being documented.

A completed **NRCC-LTI-E sample** is available for review.

Enforcement agencies may continue to use the NRCC-LTI-01-E through NRCC-LTI-06-E at their discretion.

"COMPLIES with Exceptional Conditions" refer to Table D for guidance.

Watts)				Actual Lighting Power per §140.6(a) (Watts)					Compliance Results
		05		06	07	08		09	10
					Adjustments				
3	=	**Total Allowed** (Watts)	≥	Total Designed (Watts)	Portable Lighting §140.6(a) (-)	PAF Control Credits §140.6(a)2 (-)	=	**Total Actual** (Watts) *Includes Adjustments	**05 Must be ≥ 09** §140.6
L)				(See Table F)	(See Table J)	(See Table R)			
	=	**8,365**	≥	6,740	36		=	**6,704**	**COMPLIES**
	=		≥				=		
Controls Compliance (See Table H for Details)								**COMPLIES with Exceptional Conditions**	
Rated Power Reduction Compliance (See Table S for Details)								**Not Applicable**	

Figure 1 - An example from Table C of the new NRCC-LTI-E. At the right, we see that the project "COMPLIES" with the lighting power requirements. For controls compliance, the project "COMPLIES with Exceptional Conditions." We also see that rated power reduction compliance is "Not Applicable" to this project.

New Lighting Videos and Fact Sheets!

New educational videos and fact sheets are available at the **Online Resource Center** (ORC). These videos and fact sheets address the 2016 Energy Standards lighting requirements for residential and nonresidential buildings.

Residential

Videos: High Efficacy Lighting for Residential Applications

- Module 1: Overview of High Efficacy Lighting
- Module 2: High Efficacy Luminaires
- Module 3: Joint Appendix JA8 Performance Requirements
- Module 4: Efficacy Requirements Applied

Fact Sheet: High Efficacy Lighting for Residential Applications

Nonresidential

Videos: Lighting Controls Acceptance Testing

- Module 1: Introduction to Acceptance Testing
- Module 2: Acceptance Testing Requirements
- Module 3: Compliance Process
- Module 4: Certification & Training

Fact Sheet: Lighting Controls Acceptance Testing

Videos: Nonresidential Lighting Alterations and Additions

- Module 1: Overview Indoor Lighting Alterations
- Module 2: Indoor Lighting Alterations Compliance Process
- Module 3: Outdoor Lighting Alterations

Fact Sheet: Lighting Alterations

Videos: Nonresidential Lighting Controls

- Module 1: Introduction to Lighting Control Systems
- Module 2: Area Controls
- Module 3: Multi-Level Lighting Controls
- Module 4: Shut-OFF Controls
- Module 5: Automatic Daylighting Controls
- Module 6: Demand Responsive Controls
- Module 7: Outdoor Lighting Controls for Nonresidential Buildings

Fact Sheet: Indoor Shut-OFF Controls

2016 Acceptance Forms From CALCTP and NLCAA

California Advanced Lighting Controls Training Program (CALCTP) and the National Lighting Contractors Association of America (NLCAA) have been approved to provide their own acceptance forms (NRCAs) for their technicians. These forms follow the format, order, and content of the Energy Commission's forms.

All lighting NRCAs should be completed electronically and bear either CALCTP's or NLCAA's logo.

Enforcement agencies should only accept CALCTP's or NLCAA's acceptance forms. These include:

- Lighting Control (NRCA-LTI-02-A)
- Automatic Daylighting Control (NRCA-LTI-03-A)
- Demand Responsive Lighting Control (NRCA-LTI-04-A)
- Institutional Tuning PAF (NRCA-LTI-05-A)
- Outdoor Lighting Control (NRCA-LTO-02-A)

CALCTP and NLCAA are both lighting controls acceptance test technician certification providers (ATTCPs). ATTCPs are approved by the Energy Commission to train, certify, and oversee acceptance test technicians (ATTs). These technicians complete the NRCAs.

Section 10-103(a) allows the Executive Director to approve alternative forms such as CALCTP's and NLCAA's.

For more information, please visit the **ATTCP program** web page.

2019 CBECC-Res Research Version Now Available!

CBECC-Res 2019.0.4, a research version of the compliance software, is available for download.

This software is for users who wish to model projects using the 2019 Energy Standards. This version uses the draft 2019 Energy Standards. Results from this version cannot be used for compliance. The results are subject to change as the development of the 2019 Energy Standards continues.

Features in this version include:

- Improved compliance and summary results screen
- Insulation values accept decimal input, along with additional compressed insulation selections
- Target design energy design rating (EDR) score tool
- Battery storage option
- Selectable photovoltaic (PV) system size limiter

The **Quick Start Guide** summarizes major changes in CBECC-Res 2019.0.4 compared to previous versions of CBECC-Res.

Technical support

If you need general help with the software, please check the **CBECC-Res FAQs** and the user manual available in the software. For additional assistance, please contact:

cbecc.res@gmail.com
If you send the .ribd file, be sure to include the CBECC-Res version number.

Uniform Energy Factors for Water Heaters

The energy efficiency for water heaters will now be reported as uniform energy factor (UEF). This is a result of updates made to the federal testing requirements for water heaters. UEF allows consumers to more accurately compare the efficiency of different types of water heaters.

The **Water Heater Efficiency Guide** has been updated to reflect the minimum required UEF.

Q&A

Water Heater Types

What is the difference between consumer and residential-duty commercial (RDC) water heaters?

The difference is the input rating. Consumer water heaters have a lower input rating than RDC water heaters.

For example, consumer gas-fired storage water heaters have an input rating of 75,000 Btu/h or less. RDC gas-fired storage water heaters have an input rating greater than 75,000 Btu/h, but not exceeding 105,000 Btu/h.

RDC water heaters are commercial water heaters that have features that are suited for residential uses.

Want to know more? See **Section 5.2** of the *2016 Residential Compliance Manual*.

For More Information

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Compliance Software:
http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html

The California Energy Commission welcomes your feedback on Blueprint. Please contact Andrea Bailey at:
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- Veronica Martinez

Issue 119 | April – June 2017

BLUEPRINT

California Energy Commission
Efficiency Division

In This Issue

Tubular LED Lamps and the 2016 Energy Standards

The *2016 Building Energy Efficiency Standards* (Energy Standards) allows tubular light emitting diode (TLED) lamps to replace linear fluorescent lamps in existing luminaires. The power of luminaires with TLED lamps is determined according to **Section 130.0(c)6** and depends on whether the luminaire uses a fluorescent ballast or LED driver.

TLED Lamp with Fluorescent Ballast

If a fluorescent ballast powers the TLED lamp, luminaire power is determined according to the operating input wattage of the lamp and ballast combination per **Section 130.0(c)6A.**

Reference Nonresidential Appendix NA8 (NA8) has tables of lamp and ballast combinations. These tables provide an alternate method for determining luminaire power for any lamp and ballast combination specifically listed in NA8.

To determine luminaire power where fluorescent ballasts are used with TLED lamps, find the matching ballast and type/length of linear or U-shaped fluorescent lamp and use the value given in the table. If more than one value applies, use the smallest appropriate value.

TLED Lamp with LED Driver

If an LED driver powers the TLED lamp, luminaire power is determined according to the maximum input wattage of the driver per **Section 130.0(c)6B**.

Examples:

For a two-lamp luminaire with 4-foot TLED lamps and fluorescent ballast, the lowest wattage in **Table NA8-3** corresponds to two-lamp F32T8/30ES, EE reduced output ballast at 45 watts. Therefore, luminaire power is 45 watts.

For a three-lamp luminaire with 3-foot TLED lamps and fluorescent ballast, the lowest fluorescent wattage in **Table NA8-3** corresponds to three-lamp F25T8, electronic reduced output ballast at 59 watts. Therefore, luminaire power is 59 watts.

For a two-lamp luminaire with 4-foot TLED lamps and LED driver, the manufacturer rated input wattage of the driver is 30 watts. Therefore, luminaire power is 30 watts.

HVAC Videos Now Available!

Educational videos are now available on the Online Resource Center (ORC). These videos support the 2016 Energy Standards for heating, ventilation, and air-conditioning (HVAC) requirements in low-rise residential buildings. To view the videos listed below, please visit the **ORC**.

- Course 1: Introduction - Mandatory, Prescriptive, and Performance Requirements - Understanding the Differences
- Course 2: What's New in 2016
- Course 3: Mandatory Measures for Heating and Cooling Systems
- Course 4: Automatic Setback Thermostats
- Course 5: Mandatory Measures for Air Distribution Systems
- Course 6: Indoor Air Quality and Mechanical Ventilation
- Course 7: Prescriptive Method of Compliance
- Course 8: Performance Method of Compliance
- Course 9: HVAC Alterations and Changeouts

High Performance Attics and Batt Insulation Below the Roof Deck

The 2016 Energy Standards introduced prescriptive high performance attic requirements for low-rise residential buildings in **Section 150.1(c)1A**. The high performance attic requirements are satisfied in one of two ways:

1. By insulating the roof and attic floor of a vented attic.
2. By bringing the HVAC system inside the conditioned space and insulating the attic floor of a vented attic.

In a scenario where insulation is placed at the roof and attic floor, insulation can be installed at the roof level either above or below the roof deck. When installed below the roof deck, insulation can be in the form of blown-in netted insulation, spray polyurethane foam, or batt insulation, among others.

When no air space is provided between the roofing product and the roof deck, like with asphalt shingles, the prescriptive requirement for insulation installed below the roof deck is R-18 in climate zones 4 and 8 through 16. When batt insulation thickness exceeds the depth of the roof framing members, full width batts should be used to prevent sagging. Batts must also be supported with straps when specified by the manufacturer's instructions. Compression at the straps is assumed and is acceptable. Below deck batt or blanket insulation must be installed in a manner that does not obstruct eave, ridge, or eyebrow vents to allow for adequate attic ventilation. The required net free ventilation area of all eave and roof vents must be maintained. Eave vent baffles should also be installed to prevent air movement under or into the batt. See Figures 1 and 2 for examples of this type of assembly.

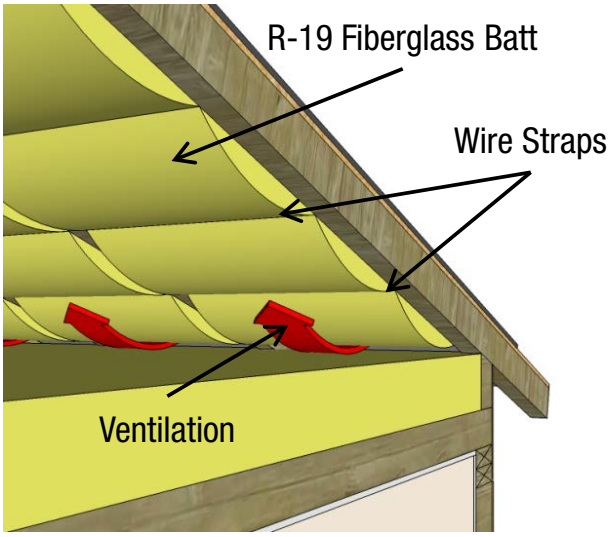

Figure 2 - Angled, three dimensional view of roof assembly with below roof deck insulation secured at regular intervals.

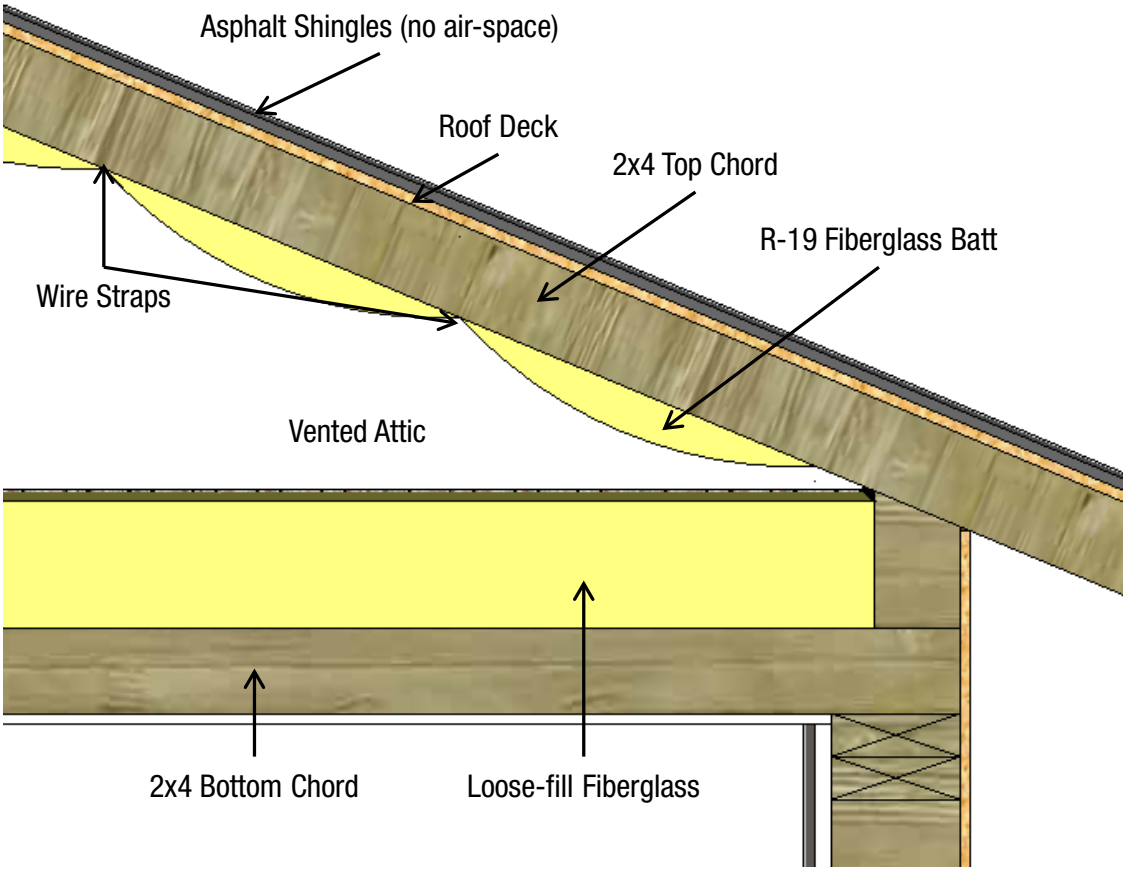

Figure 1 - Side view of roof assembly with below roof deck insulation secured at regular intervals.

Electrical Power Distribution Systems

The applicability of electrical power distribution (EPD) system requirements to additions and alterations has been updated in the 2016 Energy Standards. The separation of electrical circuit and controlled receptacle requirements are now only applicable to entirely new or complete replacements of EPD systems per **Sections 141.0(a)**, **141.0(b)2P**, and **141.0(b)3.** This update was made to facilitate compliance with the EPD system requirements for additions and alterations.

The "entire EPD system" includes the service equipment and all EPD equipment downstream from the service equipment. The 2016 Energy Standards defines **service equipment** as:

> *"The necessary equipment, usually consisting of a circuit breaker(s) or switch(es) and fuse(s) and their accessories, connected to the load end of service conductors to a building or other structure, or an otherwise designated area, and intended to constitute the main control and cut-off of the supply."*

Additions to or partial replacements of existing EPD systems no longer trigger the separation of circuit or controlled receptacle requirements under the 2016 Energy Standards.

New Resources Added to the Online Resource Center!

Energy Code Ace resources for the 2016 Energy Standards are available on the **ORC**. Checklists, fact sheets, trigger sheets, and application guides have been added for:

- Commissioning
- Electrical Power Distribution
- Lighting
- HVAC
- Solar Ready
- And more

The ORC is the central location for Energy Standards educational resources.

Q&A

Tubular LED Lamps

Is there a definition for TLEDs and are there requirements that apply specifically to these products?

No. TLED products are not defined nor handled differently from other LED retrofit approaches. LED retrofit options for fluorescent luminaires include products that use the existing lamp holders. They also include products that are installed in existing fluorescent troffers that do not make use of the lamp holders.

How are LED retrofits for fluorescent luminaires rated and classified? Are they rated differently if they are part of an addition, alteration, or repair?

LED retrofits are rated and classified according to **Section 130.0(c)** whether they are a new installation, addition, alteration, or repair. The classification is based on the permanently installed components of the luminaire, not the lamps. If the retrofit is made up of LED lamps that use existing fluorescent ballasts for power, then the luminaire will be classified under **Section 130.0(c)6A**. If the retrofit is made up of LED lamps paired with a driver, then the luminaire will be classified under **Section 130.0(c)6B**. Luminaires with LED light engines are classified under **Section 130.0(c)9**.

I'm considering a lamp changeout of an existing lighting system. There will be no alterations to the wiring or lighting system other than installing new lamps (I am just replacing tubular fluorescent lamps with tubular LED lamps). Does this trigger 2016 Energy Standard requirements?

No. However, if lamps and ballasts are replaced, or if you bypass the ballast and use a driver, the project may trigger luminaire component modification requirements in **Section 141.0(b)2J**.

I'm considering replacing tubular fluorescent lamps with TLED lamps as part of a larger lighting system alteration. What method can I use to determine the luminaire power for these luminaires?

To comply with **Section 130.0(c)6**, NA8 can be used to determine luminaire power where fluorescent ballasts are used with TLED lamps. Find the matching ballast and type/length of linear or U-shaped fluorescent lamp, and use the value given in the table. If more than one value applies, use the smallest appropriate value.

Electrical Power Distribution Systems

Would an alteration of a branch circuit trigger the separation of circuit requirements of Section 141.0(b)2Pii?

No. Since this alteration is not a complete replacement of the existing EPD system, the separation of electrical circuit requirements do not apply.

Would adding a new panel to an existing electrical power distribution system trigger the separation of circuit requirements of Section 141.0(b)2Pii?

No. Adding one panel does not constitute a complete replacement of an EPD system.

I have a retail tenant improvement. We are stripping the entire space of all panels and electrical wiring, including the service equipment. Does this alteration trigger the separation of circuit requirements of Section 141.0(b)2Pii?

Yes. This is a complete replacement of the EPD system.

Would adding receptacles to an existing office trigger the controlled receptacle requirements of Section 141.0(b)2Piv?

No. Because the entire EPD system is not being replaced, the controlled receptacle requirements are not applicable.

I have a retail tenant improvement. We are stripping the entire space of all panels and electrical wiring, including the service equipment. Does this alteration trigger the controlled receptacle requirements of Section 141.0(b)2Piv?

Yes. This is a complete replacement of the EPD system.

My project includes an addition of office space to an existing building. If I have an existing service to which no modification is being done, are controlled receptacles required for the new office space?

No. Because the entire EPD system is not being replaced, the controlled receptacle requirements are not applicable.

For More Information

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Compliance Software:
http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html

The California Energy Commission welcomes your feedback on Blueprint. Please contact Andrea Bailey at:
Title24@energy.ca.gov

EDITOR

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SPECIAL THANKS

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» Chris Olvera
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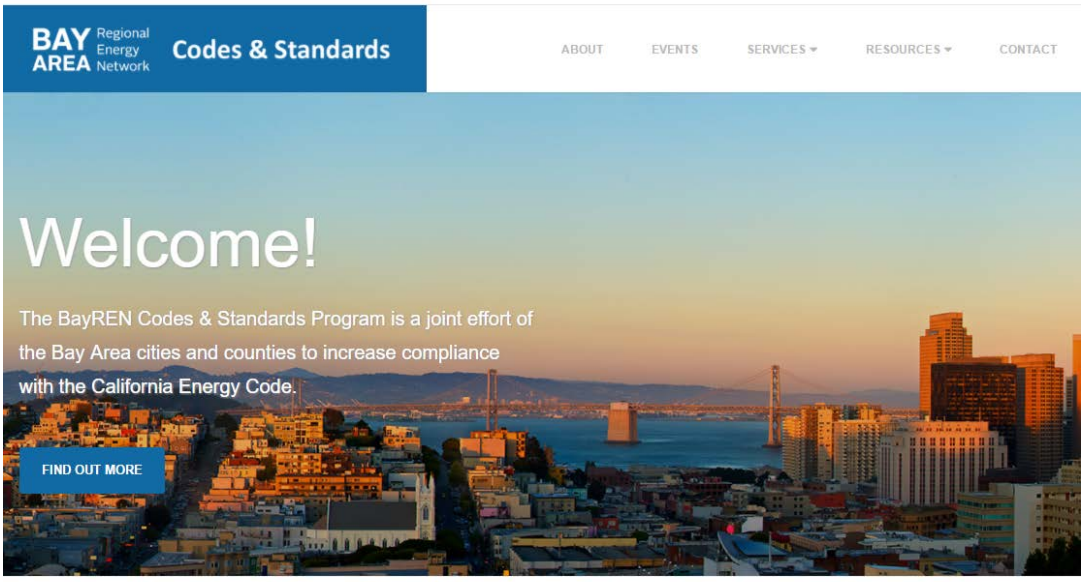
» Todd Ferris

"Bay Area communities working together for a sustainable energy future."

BayREN Codes & Standards

The BayREN Codes & Standards Program is a joint effort of the Bay Area cities and counties to increase compliance with the California Energy Code.



Visit the new BayREN Codes & Standards website!
www.bayrencodes.org

Trainings

BayREN offers ICC certified trainings designed to help local building department staff and building professionals perform Energy Code compliance and enforcement best practices.

- **Title 24, Part 6, On-Demand Trainings:** BayREN now offers three online training courses designed to educate in key aspects of code compliance and enforcement at no cost.
- Participate in one of our on-demand trainings today, **http://www.bayrencodes.org/services/trainings/**

Courses are ICC approved for 0.1 CEUs

BAY AREA Regional Energy Network

Regional Forums

Regional Forums bring together state and local government policy makers and implementers, building department staff, architects, energy consultants and other stakeholders to network and learn about Bay Area energy code, energy efficiency, and zero net energy policies and programs. Remote attendance is available for all our forums. Recent forum topics include:

- **Local Mandatory Solar Ordinance as a Pathway for New Residential ZNE Construction**
  This forum focused on the CEC's Model Local Solar Ordinance for residential new construction. Expert speakers provided a technical review of the model ordinance, cost-effectiveness study and resources available to local governments in navigating the adoption process.
- **Household Electrification as a Pathway to On-Site ZNE**
  This workshop helped local governments address misconceptions and answer questions about 2016 Title 24, Part 6 (Energy Code) implications for designing new, or applying deep energy retrofits for all-electric low-residential buildings.
- To view recordings of past forums and to register for upcoming forums, visit **www.bayrencodes.org/events/**

Resources

BayREN provides various resources for local sustainability, building and facility departments.

- **Municipal ZNE Resources:** BayREN has created a Municipal Zero Net Energy Resources and Templates Packet that provides policy analysis and template language to help jurisdictions take early action toward the State's ZNE goals.
- **Customized Permit Guides:** BayREN offers eight permit guides that can be customized with jurisdiction-specific branding. Permit guides offer an effective, easy to implement, and no-cost solution to customer questions about energy reviews by busy building departments.
- All resources are available for download, visit **www.bayrencodes.org/resources/**

For more information:

Email: codes@bayren.org
Website: www.bayrencodes.org

The California Statewide Codes & Standards Program

Here to help you meet the requirements of Title 24, Part 6 and Title 20

We offer FREE

- Trainings
- Tools
- Resources

All designed to improve compliance with California's building and appliance energy efficiency standards and lock in long-term energy savings.

Energy Code Ace™

HELPING YOU PLAY YOUR CARDS RIGHT

EnergyCodeAce.com

Classes added frequently
Please check **EnergyCodeAce.com/training** for all our up-to-date offerings

Register for a scheduled FREE class or contact us at **energycodeace.com/content/training-request/** to bring a training to a location of your choice!

6/28/2017

Title 24 Part 6 Essentials Training Courses

Currently Scheduled for 2017

Ace Training Traditional Classroom™

✪ denotes ICC PREFERRED EDUCATION PROVIDER

DATE • TIME	LOCATION	INSTRUCTOR	REGISTRATION LINK
Residential Standards for Plans Examiners and Building Inspectors ✪			
July 12 • 8:30 - 4:30	Tulare	Bruce Cheney	sce.com/energycenters
July 13 • 8:30 - 4:30	Downey	Bruce Cheney	seminars.socalgas.com
July 13 • 8:30 - 4:30	San Jose	Marina Chaves	goo.gl/t1bvX5
July 12 • 8:30 - 4:00	San Diego	Bruce Cheney	sdge.com/eic/seminar
July 28 • 8:30 - 4:30	Napa	Brian Selby	goo.gl/3hAe9h
August 3 • 8:30 - 4:30	Santa Barbara	Bruce Cheney	sce.com/energycenters
August 17 • 8:30 - 4:30	Jackson	Marina Chaves	pge.com/energyclasses
August 30 • 8:30 - 4:30	Stockton	Marina Chaves	pge.com/energyclasses
Nonresidential Standards for Plans Examiners and Building Inspectors ✪			
July 19 • 8:30 - 4:00	San Diego	Bruce Cheney	sdge.com/eic/seminar
July 26 • 8:30 - 4:30	Tulare	Bruce Cheney	sce.com/energycenters
July 27 • 8:30 - 4:30	Downey	Bruce Cheney	seminars.socalgas.com
August 11 • 8:30 - 4:30	Napa	Brian Selby	pge.com/energyclasses
August 17 • 8:30 - 4:30	Santa Barbara	Bruce Cheney	sce.com/energycenters
September 27 • 8:30 - 4:30	El Centro	Bruce Cheney	sce.com/energycenters
Residential Standards for Energy Consultants ✪			
September 7 • 8:30 - 4:00	San Diego	Bruce Cheney	sdge.com/eic/seminar
Nonresidential Standards for Energy Consultants ✪			
September 6 • 8:30 - 4:00	San Diego	Bruce Cheney	sdge.com/eic/seminar
Standards & Technology for Residential Lighting ✪			
August 3 • 8:30 - 4:00	San Diego	Gina Rodda	sdge.com/eic/seminar
August 22 • 8:30 - 12:00	Irwindale	Nicole Graeber	sce.com/energycenters
Standards & Technology for Retail Lighting ✪			
August 1 • 8:30 - 4:30	San Jose	Nicole Graeber	goo.gl/Ms2jlb
Standards & Technology for Office Lighting ✪			
July 11 • 8:30 - 4:30	San Jose	Nicole Graeber	goo.gl/sDfYLR
August 2 • 8:30 - 4:00	San Diego	Gina Rodda	sdge.com/eic/seminar
August 21 • 8:30 - 4:30	Irwindale	Nicole Graeber	sce.com/energycenters
Nonresidental Standards for Architects ✪			
September 19 • 8:30 - 4:00	San Diego	Gina Rodda	sdge.com/eic/seminar
Title 24: Where We're Headed with the 2016 Standards ✪			
July 18 • 8:30 - 12:30	Irvine	Martyn Dodd	sce.com/energycenters

Ace Training Virtual Classroom™

Delivered online in real-time by an instructor. Classes are delivered in 3 parts, 1 each day in a series.

DATE • TIME	LOCATION	INSTRUCTOR
Residential Standards for Energy Consultants ✪		
July 25 - 27 • 9:00 - 12:00	Online	Brian Selby
September 12 - 14 • 9:00 - 12:00		
October 17 - 19 • 9:00 - 12:00		
December 5 - 7 • 9:00 - 12:00		
Nonresidential Standards for Energy Consultants ✪		
July 18 - 20 • 9:00 - 12:00	Online	Brian Selby
August 8 - 10 • 9:00 - 12:00		
October 3 - • 9:00 - 12:00		
October 31 - November 2 • 9:00 - 12:00		
December 12 - 14 • 9:00 - 12:00		
Residential Modeling ✪		
August 8 - 10 • 9:00 - 12:00	Online	Martyn Dodd & Ted Tiffany
August 29 - 31 • 9:00 - 12:00		
October 10 - 12 • 9:00 - 12:00		
November 7 - 9 • 9:00 - 12:00		
Nonresidential Modeling ✪		
July 11 - 13 • 9:00 - 12:00	Online	Martyn Dodd & Ted Tiffany
August 15 - 17 • 9:00 - 12:00		
September 19 - 21 • 9:00 - 12:00		
October 24 - 26 • 9:00 - 12:00		
November 14 - 16 • 9:00 - 12:00		

Ace Training Online Self-Study™

- Residential Standards for AC Quality Installation Contractors ✪
- Residential Standards for Indoor Lighting ✪
- Residential Standards for Ventilation ✪
- Nonresidential Standards for Indoor Lighting Mandatory Measures ✪
- Nonresidential Standards for Indoor Lighting Prescriptive Compliance ✪
- Title 20 Essentials: The Water-Energy Nexus

Take them whenever and wherever you like, at your own pace. Visit EnergyCodeAce.com

Ace Title20 Training On-Demand Video™

Our new Title 20 Appliance Efficiency curriculum focuses on the essentials industry professionals and consumers need to know to use the California Energy Commission's Modernized Appliance Efficiency Database System (MAEDBS). Access our video trainings on the following topics at:

energycodeace.com/content/title-20-ondemand

- Title 20 Essentials: Making the Most of On-Demand Video Training
- Title 20 Essentials: Why Certification Matters
- Title 20 Essentials: Using MAEDBS for Manufacturers
- Title 20 Essentials: Using MAEDBS for Third Party Certifiers
- Title 20 Essentials: Using MAEDBS for Test Laboratories
- Title 20 Essentials: California Appliance Standards for Retailers, Distributors, Contractors, and Importers

Ace Training Decoding Talks™

Facilitated online discussion forums for building department personnel and other industry professionals.
Go to EnergyCodeAce.com for upcoming topics, dates, times and to view recorded past events.

Software Training

DATE • TIME	LOCATION	INSTRUCTOR	REGISTRATION LINK
Beginning EnergyPro Residential ✪			
September 14 • 8:30 - 12:00	San Francisco	Martyn Dodd	pge.com/energyclasses
December 13 • 12:30 - 4:00	San Francisco		pge.com/energyclasses
Beginning EnergyPro Nonresidential ✪			
September 13 • 8:30 - 12:00	San Francisco	Martyn Dodd	pge.com/energyclasses
December 12 • 8:30 - 12:00	San Francisco		pge.com/energyclasses
Advanced EnergyPro Residential ✪			
July 19 • 1:00 - 4:30	Irwindale	Martyn Dodd	sce.com/energycenters
September 14 • 1:00 - 4:30	San Francisco		pge.com/energyclasses
December 13 • 1:00 - 4:30	San Francisco		pge.com/energyclasses
Advanced EnergyPro Nonresidential ✪			
July 19 • 8:30 - 12:00	Irwindale	Martyn Dodd	sce.com/energycenters
September 13 • 1:00 - 4:30	San Francisco		pge.com/energyclasses
December 12 • 1:00 - 4:30	San Francisco		pge.com/energyclasses

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Issue 118 | January – March 2017

BLUEPRINT

California Energy Commission
Efficiency Division

In This Issue

2019 Energy Standards Development

Even though the *2016 Building Energy Efficiency Standards* (Energy Standards) just took effect, planning for the 2019 Energy Standards is already in progress. The Statewide Utility Codes and Standards Team (Utility Team) is a group of representatives from publicly and privately owned utilities that supports the California Energy Commission (Energy Commission) with revising the Energy Standards. The goal is to achieve energy savings through reasonable and cost-effective changes to the Energy Standards.

The evaluation by the Utility Team is one part of the 2019 Energy Standards development process. The Energy Commission will be hosting workshops to propose and evaluate additional requirements including residential photovoltaics (PV).

The **proposed requirements** being evaluated by the Utility Team for the 2019 Energy Standards affect:

- Nonresidential lighting
- Residential and nonresidential heating, ventilation, and air conditioning (HVAC)
- Residential and nonresidential indoor air quality and ventilation
- Residential and nonresidential demand response
- Residential water heating
- Residential and nonresidential envelope
- Process

The Utility Team is hosting a series of **webinars** throughout March. Each webinar covers a specific topic related to the proposed changes. Public participation is welcome and encouraged. These webinars provide an opportunity to share input on the proposed recommendations to the Energy Commission. The **agendas and presentations** for each webinar are posted. **Sign up** for an invite to attend the webinars and to stay informed about the utility-sponsored outreach process.

For more information, contact the Utility Team at:
Email: **info@title24stakeholders.com**

2016 Energy Standards are in Effect

The 2016 Energy Standards went into effect on January 1, 2017. Permit applications submitted on or after this date must meet the requirements of the 2016 Energy Standards.

Many great resources are available to help with implementation, including:

- **Online Resource Center**
- **Energy Standards Hotline**
- **Quick Linked TABLE 100.0-A**
- **2016 Residential and Nonresidential Compliance Manuals**
- **2016 Compliance Software**
- **2016 Low-Rise Residential Mandatory Measures Summary**

2016 Compliance Software

The Energy Commission has approved several compliance software programs for the 2016 Energy Standards.

For residential buildings, the following programs are approved:

» CBECC-Res

» EnergyPro

» Right-Energy Title 24

For nonresidential buildings, the following programs are approved:

» CBECC-Com

» EnergyPro

» IES Virtual Environment

The list of approved software versions and their corresponding approval and expiration dates is available on the **compliance software** web page.

Open Source Software

CBECC software is now open source. This makes all of the source code of one of the world's most advanced building modeling software programs available to the public for free. Other entities can now alter the source code to help meet their energy efficiency goals.

CBECC software is a free computer program developed by the Energy Commission. This software is used to demonstrate compliance with the Energy Standards.

The open source project is available at:
https://github.com/CBECC-software/cbecc

2016 HERS Providers

The Energy Commission has approved CalCERTS and CHEERS as Home Energy Rating System (HERS) providers for the 2016 Energy Standards.

CalCERTS, Inc. is approved to train and certify HERS raters for:

» Field verification and diagnostic testing for newly constructed and additions to residential buildings.

» Field verification and diagnostic testing for alterations of residential and nonresidential buildings.

» California whole-house home energy ratings.

CalCERTS may be reached at:

Email: **info@calcerts.com**

Phone: (877) 437-7787

CHEERS is approved to train and certify HERS raters for:

» Field verification and diagnostic testing for newly constructed and additions to residential buildings.

» Field verification and diagnostic testing for alterations of residential buildings.

CHEERS may be reached at:

Email: **info@CHEERS.org**

Phone: (800) 424-3377

HERS providers are approved based upon several factors, including their ability to:

» Train and certify HERS raters.

» Create and maintain a registry and database.

» Provide ongoing access to their registry and database for Energy Commission staff.

» Create a quality assurance program and conduct quality assurance inspections on their HERS raters' work.

» Report annually to the Energy Commission as required by Title 20.

For more information, please visit the **HERS program** web page.

2016 HERS Reference Card Now Available

The Energy Commission has released the **2016 HERS reference card**. This card is designed to help quickly identify when HERS verification is required and how to find approved providers. A preview of the new HERS card is provided in Figure 1.

2016 Compliance Document Upgrades

The **2016 compliance documents** for residential projects that do not require HERS verification have been upgraded. Some of the new features include:

» Improved compatibility with free PDF viewers

» Saving has been enabled

» **Digital signatures** have been incorporated

The selection of documents for projects that do not require HERS verification has also been expanded. These documents were previously only available through a HERS registry. The newly available documents include:

» Pool and spa heating systems

» Solar water heating systems

» Whole house fans

These documents do not have watermarks and do not require registration with a HERS provider.

NOTE: All compliance documents for a project must be registered with a HERS provider if HERS verification is required or modeled for compliance credit.

Lighting ATTCP Training Approved for the 2016 Energy Standards

The Energy Commission has approved the California Advanced Lighting Controls Training Program's (CALCTP) nonresidential lighting controls Acceptance Test Technician Certification Provider (ATTCP) application updates for the 2016 Energy Standards. CALCTP can now train, certify, and recertify lighting controls acceptance test technicians (ATTs) and their employers under the 2016 Energy Standards.

For more information, visit the **ATTCP** web page.

Training Opportunities

Did you know that the utilities provide free Energy Standards training? These opportunities are available throughout the state. Training schedules are now conveniently listed on the Energy Commission's **Utility Sponsored Training Schedules** web page.

Training sessions are offered in a variety of formats, including in person, live webinar, and on demand. It is likely there is a session that fits your schedule.

Be sure to check back often as schedules are updated regularly.

NOTE: Opportunities offered by investor-owned utilities are listed jointly through Energy Code Ace. Opportunities provided through publicly owned utilities are listed individually.

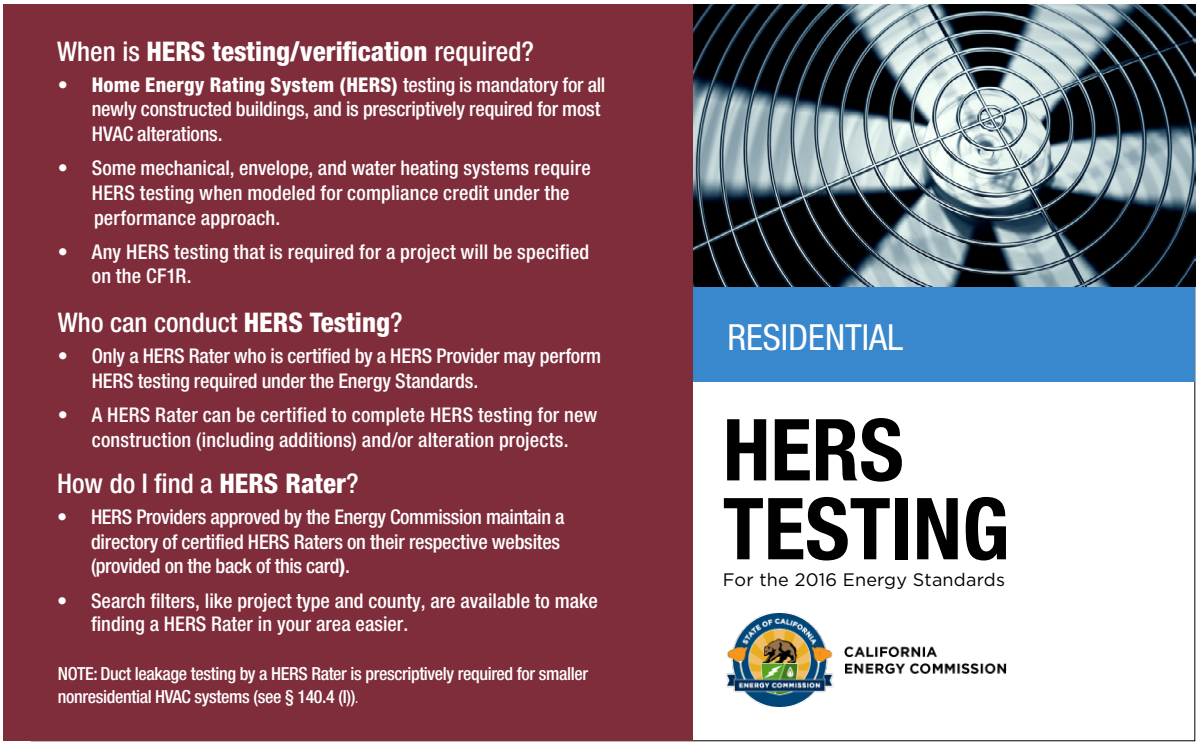

Figure 1 - 2016 HERS Reference Card

Q&A

Sun Rooms

The *2016 California Residential Code* (CRC) introduced sunroom categories. One of these sunrooms, a Category IV, is conditioned but non-habitable. Are Category IV sunrooms subject to the requirements of the Energy Standards?

Yes. **Section 100.0(c)1** requires all conditioned space in a story to comply with the Energy Standards. The requirements of the Energy Standards apply regardless of the space being habitable or non-habitable.

Section R301.2.1.1.1 of the CRC defines Category IV sunrooms as:

> *"A thermally isolated sunroom with enclosed walls. The sunroom is designed to be heated or cooled by a separate temperature control or system and is thermally isolated from the primary structure..."*

Category IV sunrooms are **directly conditioned** if they are provided with mechanical heating exceeding 10 Btu/hr-ft^2 or mechanical cooling exceeding 5 Btu/hr-ft^2. Sunrooms meeting this definition must meet all applicable requirements, including:

- Envelope
- Lighting
- Mechanical
- Solar ready
- Water heating

Buildings and Spaces Used for Commercial Plant Growth

Are buildings and spaces used for commercial plant growth regulated by the Energy Standards?

Yes. These buildings and spaces are within the scope of the Energy Standards, and the nonresidential requirements apply.

What requirements must be met if the building or space used for commercial plant growth is conditioned?

Directly and **indirectly conditioned** spaces must meet all applicable requirements, including:

- Envelope
- Lighting
- Power distribution
- Mechanical
- Solar ready
- Water heating

Are buildings or spaces used for commercial plant growth that use only an evaporative cooler (swamp cooler) for space conditioning subject to any requirements of the Energy Standards?

Yes. These buildings and spaces must meet all of the applicable requirements for unconditioned nonresidential buildings, which primarily consists of lighting and power distribution requirements. Cooling of a space by direct or indirect evaporation of water alone is not considered **mechanical cooling**.

Do grow lights in buildings and spaces used for commercial plant growth have to meet the prescriptive lighting power allowance requirements of Section 140.6?

Yes. **Section 140.6(a)** requires the total watts of all permanent and portable lighting systems be used to calculate the actual indoor lighting power. However, **Section 140.6(a)3G** excludes the lighting wattage of grow lights if they are controlled by a multi-level astronomical time-switch control. The multi-level astronomical time-switch control must be listed in the **Appliance Efficiency Database**.

Grow lights are still subject to the applicable mandatory indoor lighting requirements, including:

- General lighting (**Section 130.0**)
- Indoor lighting controls (**Section 130.1**)
- Acceptance testing and installation certificates (**Section 130.4**)

ENERGY STANDARDS HOTLINE

Available to help with Energy Standards (Title 24, Part 6) questions.

EMAIL
title24@energy.ca.gov

CALL
800-772-3300
Toll free in CA

916-654-5106
Outside CA

HOURS
8 a.m.–12 p.m. and 1 p.m.– 4:30 p.m.

Wall Extensions in Low Rise Residential Additions

The 2016 Energy Standards allow for the extension of existing wood-framed walls in additions to retain the dimensions of existing walls. What is considered a wall extension as described in Sections 150.2(a)1Ai and 150.2(a)1Bii?

Figures 2 through 4 are examples of common ways new walls are connected to existing walls.

In Figures 2 and 3, the new wall extends out straight from an existing wall. These are considered wall extensions. The new walls in Figures 2 and 3 are 2x4 framing, and are only required to have R-15 cavity insulation. If the existing wall had 2x6 framing, the new wall would also have 2x6 framing and would require R-19 cavity insulation (not shown).

In Figure 4, the new wall is perpendicular to the existing wall. This is not a wall extension, and is subject to the prescriptive insulation requirements of **Section 150.1(c)1B**. In most cases, this will require 2x6 framing with both cavity and continuous insulation.

NOTE: The figures show horizontal wall extensions. These requirements are also applicable to vertical wall extensions such as a second floor addition.

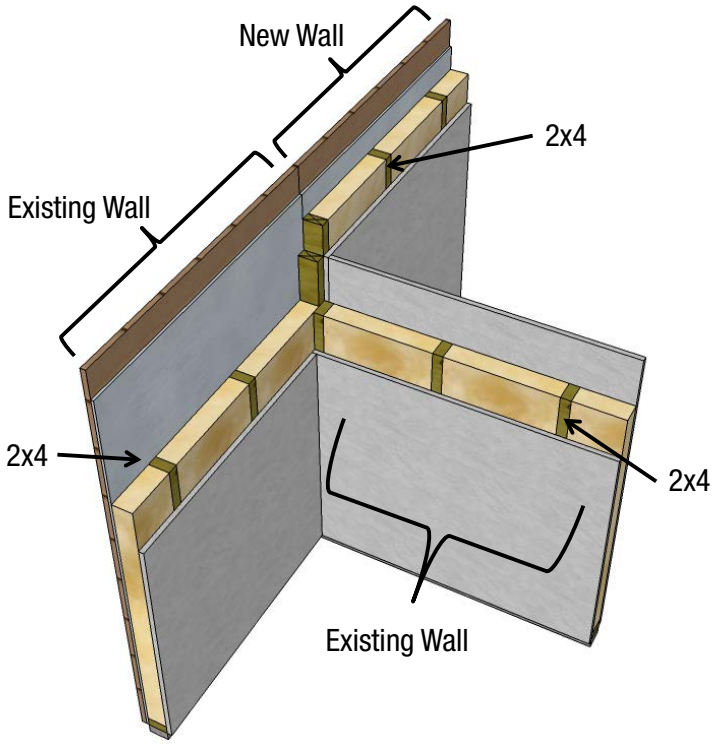

Figure 3 - The new wall extends out straight from one of the existing walls.

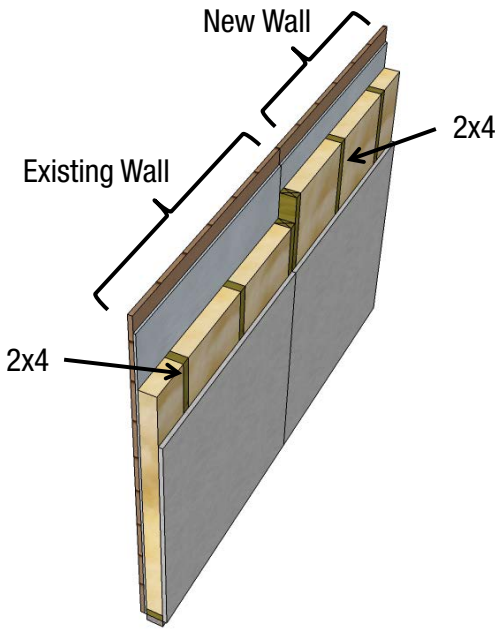

Figure 2 - The new wall extends out straight from the existing wall.

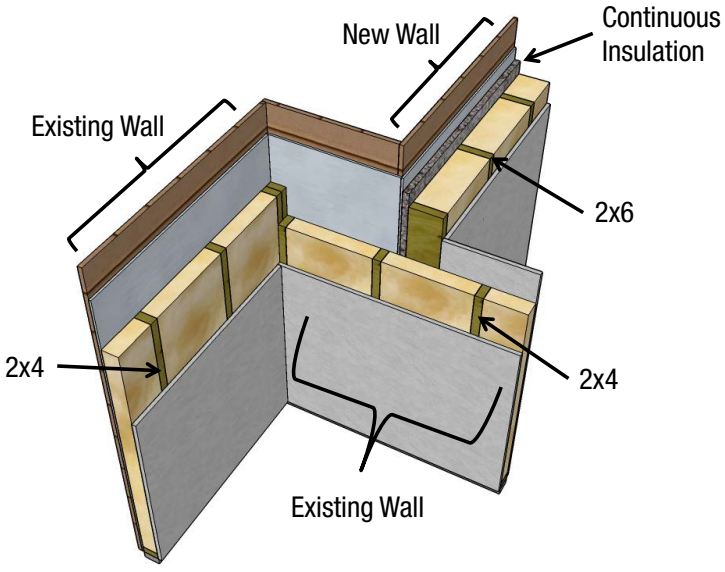

Figure 4 - The new wall extends out perpendicularly from the existing wall.

Residential Compliance Documents

Are residential compliance documents always required to be registered with a HERS provider?

No. All compliance documents must be registered only if HERS verification is required or modeled for compliance credit.

Examples of prescriptive projects that do not require registered compliance documents include:

» Roof surface replacements

» Water heater replacements

» Window replacements

» Non-ducted wall furnace replacements

Compliance documents for these types of projects are available without watermarks.

Do all residential projects require compliance documents?

No. **Sections 10-103(a)1C** and **10-103(a)3C** state that enforcement agencies may, at their discretion, choose not to require compliance documents for prescriptive residential alteration projects that do not require HERS verification. Prescriptive additions less than 300 ft^2, which do not require HERS verification, may also be exempted from submitting compliance documents.

For More Information

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Compliance Software:
http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html

The California Energy Commission welcomes your feedback on Blueprint. Please contact Andrea Bailey at:
Title24@energy.ca.gov

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CEC-400-2017-004

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Happy New Year from Energy Code Ace!

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- **Fact Sheets** - Check out our 28 "quick reference" summaries of key requirements, forms, definitions and resources for implementing Title 24, Part 6.
- **Trigger Sheets** – These handy table-format quick references offer component-by-component summaries of sections of Title 24, Part 6 "triggered" based on project scope.
- **Checklists** – Our easy-to-use residential and nonresidential checklists for Building Inspectors and Plans Examiners offer step-by-step guidance for plans checks and field inspections.

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Classroom and online training covering the new Standards include the popular *Title 24, Part 6 Essentials* series full-day classes and the shorter courses on *Title 24: Where We're Headed with the 2016 Standards*. The site's library of recorded Decoding Talks includes a number focused on helping industry professionals understand and comply with the 2016 Standards.

Use the filters to find the perfect class to help you "decode" the California building and appliance energy efficiency standards.

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- **Forms Ace**™ - A web-based tool that aids in determining which compliance forms are applicable to your specific project
- **Reference Ace**™ - Helps you navigate the Standards using key word search capabilities, hyperlinked tables and related sections
- **Installation Ace**™ - A "field guide" providing photos and text to assist you in identifying proper installation techniques

---

Visit www.EnergyCodeAce.com to find out how we can help you play your cards right by complying with California's building and appliance energy efficiency standards.
And while you're there, register so we can keep you updated about our new offerings, and Title 20 and Title 24, Part 6 news.

This program is funded by California utility customers under the auspices of the California Public Utilities Commission and in support of the California Energy Commission.

Issue 117 | November – December 2016

BLUEPRINT

California Energy Commission
Efficiency Division

The Lighting Issue

Title 24's JA8 and Title 20's State Regulated Lamp Requirements

JA8 Requirements for High Efficacy Lighting

The ***2016 Reference Joint Appendix JA8*** (JA8) specifies minimum performance and quality requirements for high efficacy light sources. Effective January 1, 2017, certain high efficacy light sources must be JA8 certified before they can be installed in residential buildings for compliance with the *2016 Building Energy Efficiency Standards* (Energy Standards). Light sources that must be JA8 certified are listed in the right-hand column of **Table 1**.

Other light sources, such as pin based compact fluorescent lamps (CFL), linear fluorescents, high intensity discharge lamps (HID), and outdoor solid state lighting (SSL) luminaires do not necessarily need to be JA8 certified. These light sources are listed in the left-hand column of **Table 1**.

JA8 certified light sources must undergo thorough testing at an accredited testing laboratory[1] to ensure that the light sources meet all JA8 performance requirements. Some of the metrics tested include:

» Color rendering index (CRI)

» Correlated color temperature (CCT)

» Dimming

» Elevated temperature

» Flicker

» Lifetime

» Light source efficacy

JA8 certification ensures that installed light sources provide high quality, energy efficient, and long lasting illumination. This certification also helps to avoid issues such as delayed start, audible noise, flickering, overheating, or other problems associated with lighting technologies. JA8 certified light sources are required to have a JA8-2016 or JA8-2016-E[2] marking to indicate that the light source is certified to the California Energy Commission (Energy Commission). Additionally, JA8 light sources must be listed in the Energy Commission's **Modernized Appliance Efficiency Database System (MAEDBS)**.

[1] The light source under test shall be tested at a testing laboratory participating in the ISO/IEC 17025, by the National Voluntary Laboratory Accreditation Program (NVLAP) or other laboratory accreditation body operating in accordance with ISO/IEC 17011 and produced under an ongoing inspection program carried out by a Type A inspection body in accordance with ISO/IEC 17020.

2016 JA8 High Efficacy Light Sources Certification Process

Certification of high efficacy light sources is completed by the manufacturer or a designated third party certifier. The manufacturer or third party certifier submits light source products for testing at an accredited testing laboratory. The laboratory must conduct light source testing in accordance to the methods described in JA8. If the light source meets all JA8 requirements, product and testing data must be recorded on the **data certification forms** and submitted to the Energy Commission for certification. After the product is certified, the light source product information will be added to MAEDBS.

Appliance Efficiency Regulations for State Regulated Lamps

Effective January 1, 2018, general service LED lamps and small diameter directional lamps will be regulated by the Title 20 Appliance Efficiency Regulations (Appliance Standards). State regulated LED lamps[3] with screw base or GU-24 base, including LED retrofit kits designed for recessed can housings, must meet the requirements of the Appliance Standards to be sold or offered for sale in California.

[2] JA8-2016-E indicates that the light source meets all JA8 requirements and has additionally passed the elevated temperature test for use in ceiling recessed downlights and enclosed luminaires.

[3] "State-regulated Light Emitting Diode (LED) lamp" means a lamp capable of producing light with Duv between -0.012 and 0.012, and that has an E12, E17, E26, or GU-24 base, including LED lamps that are designed for retrofit within existing recessed can housings that contain one of the preceding bases. State-regulated LED lamp does not include a lamp with a brightness of more than 2,600 lumens or a lamp that cannot produce light with a correlated color temperature between 2200 K and 7000 K.

Table 1 - High Efficacy Light Sources	
No JA8 Certification Required	JA8 Certification Required
» Pin-based linear or compact fluorescent light sources using electronic ballasts » Pulse-start metal halide » High pressure sodium » GU-24 sockets containing light sources other than LEDs[a,b] » Luminaires with hardwired high frequency generator and induction lamp » Inseparable SSL luminaires that are installed outdoors » Inseparable SSL luminaires containing colored light sources that are installed to provide decorative lighting	» All light sources in ceiling recessed downlight luminaires[c] » All light sources installed in enclosed luminaires » GU-24 sockets containing LED lamps » All screw base luminaires » Inseparable SSL luminaires installed indoors » Any light source not listed in this table

a. GU-24 sockets containing light sources such as compact fluorescent lamps and induction lamps.

b. California Title 20 **Section 1605.3(k)4** does not allow incandescent sources to have a GU-24 base.

c. Ceiling recessed downlight luminaires cannot have screw base sockets, regardless of the lamp type, as described in **Section 150.0(k)1C**.

State regulated LED lamp regulations set minimum performance requirements which include:

» Chromaticity

» Color consistency

» CRI

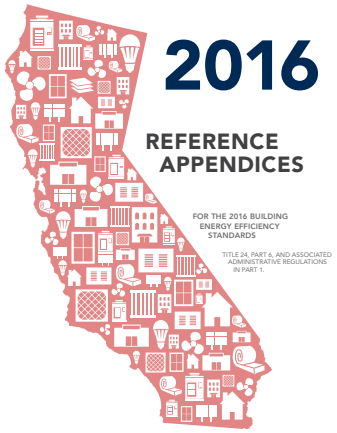
» Lifetime

» Light source efficacy

State regulated small diameter directional lamps[4] are non-tubular directional lamps with a diameter less than or equal to 2.25 inches with an ANSI ANSLG C81.61-2009 compliant pin base or E26 base.

"State-regulated small diameter directional lamp" means a directional lamp that meets all of the following criteria: 1. Capable of operating at 12 volts, 24 volts, or 120 volts; 2. Has an ANSI ANSLG C81.61-2009 (R2014) compliant pin base or E26 base; 3. Is a non-tubular directional lamp with a diameter of less than or equal to 2.25 inches; 4. Has a lumen output of less than or equal to 850 lumens, or has a wattage of 75 watts or less; and 5. Has a rated life greater than 300 hours.

State-regulated small diameter directional lamp includes incandescent filament, LED, and any other lighting technology that falls within this definition. State-regulated small diameter directional lamp does not include directional lamps with an E26 base that utilize LED and are covered under the definition of state-regulated LED lamps.



Small diameter directional lamp regulations set minimum performance requirements which include:

» Lifetime

» Light source efficacy

State regulated LED and small diameter direction lamps must undergo testing at an Energy Commission approved testing laboratory and be certified and listed in MAEDBS in order to be sold or offered for sale in California.

Reference Joint Appendix JA8 High Efficacy Light Sources versus State Regulated Lamp Requirements

The JA8 high efficacy light source requirements differ from the new state regulated lamp requirements. JA8 regulates light sources, including LED and small diameter directional lamps, installed in residential buildings. The Appliance Standards regulate lamps sold or offered for sale in California. LED and small diameter directional lamps may be subject to both the JA8 requirements and the Appliance Standards.

For example, in residential lighting projects, LED lamps must be JA8 certified to be installed for compliance with the high-efficacy light source requirements in the 2016 Energy Standards. This does not mean that all LED lamps must be JA8 certified. A homeowner can purchase and install any LED lamp, including LED lamps which are not JA8 certified, into their existing lighting fixture. However, if installing lighting fixtures with LED lamps in newly constructed buildings or alterations, the installed LED lamps must be JA8 certified. Compliance with this requirement is verified by the enforcement agency at final inspection of the building.

State regulated LED and small diameter directional lamps manufactured on or after January 1, 2018, must meet all performance and quality requirements of the Appliance Standards. This means that all state regulated LED and small diameter directional lamps must be certified to the Energy Commission and listed in MAEDBS. LED and small diameter directional lamps which are JA8 certified must meet the Appliance Standards for state regulated lamps if manufactured on or after this date. State regulated lamps manufactured on or after January 1, 2018, and that do not appear in MAEDBS cannot be legally sold in California. The Energy Commission's **Office of Compliance Assistance and Enforcement** works with manufacturers, distributors, and retailers to ensure these requirements are met.

JA8 and the Appliance Standards specify testing of similar performance and quality metrics for LED and small diameter directional lamps. However, there are differences between the requirements.

For example, JA8 specifies a minimum CRI of 90, while the Appliance Standards specify a minimum CRI of 82 for LED lamps. Both require the CRI to be tested. LED lamps which meet the Appliance Standards do not necessarily meet the JA8 high efficacy light source requirements.

Performance requirements for small diameter directional lamps also differ between JA8 and the Appliance Standards. For example, JA8 specifies a minimum luminous efficacy of 45 lumens per watt for small diameter directional lamps. The Appliance Standards specify a minimum luminous efficacy of 80 lumens per watt or have a minimum luminous efficacy of 70 lumens per watt or greater and a minimum compliance score of 165 or greater, where compliance is calculated as the sum of the luminous efficacy and CRI. Small diameter directional lamps which meet the JA8 high efficacy light source requirements do not necessarily meet the Appliance Standards.

Table 2 shows some of the key differences between JA8 and the state regulated LED lamp requirements.

2016 Prescriptive Indoor Lighting Alteration Options

Sections 141.0(b)2I and **141.0(b)2J** of the 2016 Energy Standards provide three prescriptive compliance options for nonresidential entire luminaire replacements and luminaire component modifications.

Option 1

Install lighting up to the **allowance** for new nonresidential buildings and install the applicable controls for new nonresidential buildings. These controls include:

- Manual area
- Multi-level
- Shut-off
- Automatic daylight
- Demand responsive

Table 2 - Key Differences

Parameter	Title 24 - JA8 (2016)	Title 20 (2016)	
Lamp Type	All Residential (Except Night Lights)	General Service LED Lamps (Tier 1)	Small Diameter Directional Lamps
Effective Date	January 1, 2017	January 1, 2018	January 1, 2018
Base Type	All (Except Night Lights)	E12, E17, E26 and GU-24	ANSI ANSLG C81.61-2009 or E26
Power Factor	≥ 0.9	≥ 0.7	No requirement
Start Time	≤ 0.5 sec	No requirement	No requirement
Lifetime	≥ 15,000 hours	≥ 10,000 hours	≥ 25,000 hours
Dimming	Down to 10 percent	No requirement	No requirement
Efficacy	≥ 45 lm/W	≥ 68 lm/W and *((2.3 x CRI) + lm/W) ≥ 282*	≥ 80 lm/W or ≥ 70 lm/W and *(lm/W + CRI)≥ 165*
CCT	Inseparable ≤ 4000 K Separable ≤ 3000 K	No requirement	No requirement
Chromaticity	-0.0033 ≤ Duv ≤ 0.0033	ANSI C78.377-2015 compliant	No requirement
CRI	≥ 90	≥ 82	No requirement
R1-R8	No requirement	≥ 72	No requirement
R9	≥ 50	No requirement	No requirement

Option 2

Install lighting up to 85 percent of the allowance for new nonresidential buildings and install a reduced set of controls. These controls include:

» Manual area

» Two-level

» Shut-off

Daylight, demand responsive, and full multi-level controls are not required.

Option 3

Install lighting that has a 50 or 35 percent lower rated power than the previously installed lighting and install a reduced set of controls. These controls include:

» Manual area

» Shut-off

Office, hotel, and retail spaces must achieve a 50 percent reduction in rated power. All other spaces must achieve a 35 percent reduction.

Please see **Table 3** for a side-by-side comparison of the three options.

It is important to note that the only difference in control requirements between Options 2 and 3 is that the former requires two-level controls. These controls are already present in many buildings.

Options for different spaces:

Spaces where walls or ceilings will be added, removed, or replaced

For these projects, Option 1 or 2 must be used. Per **Section 141.0(b)2Iii,** Option 3 is not allowed for projects where walls or ceilings will be added, removed, or replaced.

Spaces where the lighting is already using an efficient technology

Options 1 and 2 are most appropriate. To reduce the rated power of an efficient lighting system by 50 or 35 percent may be very difficult or impossible. This makes Option 3 an unlikely choice.

Spaces where the lighting has not been updated for a significant amount of time

Option 3 works well for these types of projects. It may be easy to meet or exceed the 50 or 35 percent rated power reduction by replacing old and inefficient systems with new lighting technology.

Spaces where wiring can be easily accessed, where wiring will be replaced, or where wireless controls are being installed

Option 2 could be used by installing the required controls. These controls can be inexpensive. If a higher power allowance is needed, Option 1 can be used by installing the appropriate controls. Option 3 could be used if the new lighting system has a 50 or 35 percent lower rated power than the previously installed lighting.

Spaces where two-level or multi-level controls are already installed

In these spaces, Option 2 provides a lighting power allowance as it is not dependent on the power use of the existing lighting. If the space already has full multi-level and daylighting controls, Option 1 provides an even higher power allowance. Again, Option 3 could be used if the new lighting system has a 50 or 35 percent lower rated power than the previously installed lighting.

More information about the nonresidential lighting alteration requirements can be found in **Sections 141.0(b)2I-L** of the 2016 Energy Standards and **Sections 5.9.4** and **5.9.5** of the *2016 Nonresidential Compliance Manual*.

Table 3 - Control Requirements for Lighting Alterations

Applicable Section 130.1 Control requirements:	Resulting lighting power, compared to the lighting power allowance specified in **Section 140.6(c)2**, Area Category Method		Option 3 Lighting power is reduced by 35/50% compared to existing
	Option 1 Lighting power is > 85% to 100% of allowance	Option 2 Lighting power is ≤ 85% of allowance	
Sections 130.1(a)1, 2, and 3 Area Controls	Yes	Yes	Yes
Section 130.1(b) Multi-Level Lighting Controls – only for alterations to general lighting of enclosed spaces 100 square feet or larger with a connected lighting load that exceeds 0.5 watts per ft^2	Yes	For each enclosed space, minimum one step between 30-70 percent of lighting power regardless of luminaire type, or meet **Section 130.1(b**)	Not Required
Section 130.1(c) Shut-Off Controls	Yes	Yes	Yes[1]
Section 130.1(d) Automatic Daylight Controls	Yes	Not Required	Not Required
Section 130.1(e) Demand Responsive Controls – only for alterations > 10,000 ft^2 in a single building, where the alteration also changes the area of the space, or changes the occupancy type of the space, or increases the lighting power	Yes	Not Required	Not Required

[1] As bi-level controls are not required for this option, partial-off controls are not required to be installed in place of "full off" automatic shutoff controls for library book stack aisles, corridors and stairwells (see **Sections 141.0(b)2Iii** and **Jii**).

Q&A

What are the effective dates for compliance with the JA8 high efficacy light source requirements and the Appliance Standards state regulated LED lamp requirements?

» January 1, 2017, for JA8 high efficacy light sources installed in residential new construction.

» January 1, 2018, for certification of state regulated LED and small diameter directional lamps manufactured for sale in California.

Do LED lamps need to be JA8 certified?

Yes, if the LED lamp is installed in lighting projects that require compliance with the residential high efficacy light source requirements of the 2016 Energy Standards. For example, if screw base luminaires are installed in a newly constructed residential building or in an alteration or addition to a residential building, the installed LED lamps must be JA8 certified. LED lamps do not need to be JA8 certified when replacing or installing lamps in existing luminaires.

Do LED lamps need to be certified to the Energy Commission per the Appliance Standards?

Yes. All state regulated LED and small diameter directional lamps manufactured on or after January 1, 2018, must be certified per the Appliance Standards and listed in MAEDBS to be legally sold or offered for sale in California. Manufacturers can voluntarily certify state regulated LED lamps before January 1, 2018.

Do JA8 certified high efficacy LED lamps need to also be certified per the Appliance Standards?

On or after January 1, 2018, JA8 certified high efficacy LED lamps must also be certified per the Appliance Standards as state regulated LED lamps. Requirements for JA8 and for state regulated LED lamps differ. JA8 certification does not necessarily indicate compliance with the Appliance Standards for state regulated LED lamps or vice versa.

How do I certify a light source to JA8?

Certification to the Energy Commission is completed by the manufacturer of the light source or a designated third party certifier. The light source must be tested at an accredited testing laboratory in accordance with the testing specifications in JA8. The resulting test data must be recorded and submitted to the Energy Commission. Once the Energy Commission has confirmed that data submitted complies with JA8, the light source product information will be listed in MAEDBS.

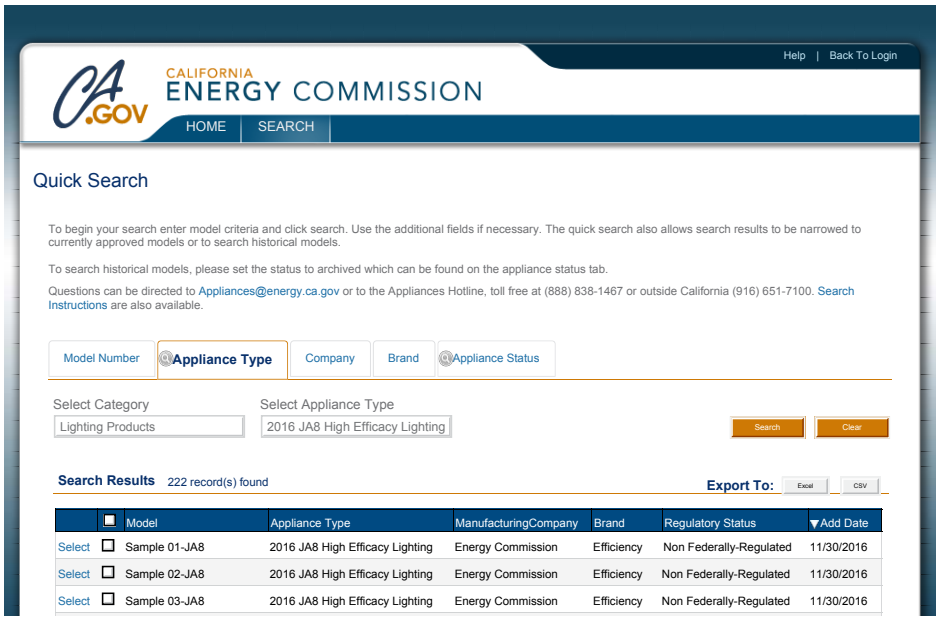
For more information on JA8 certification, please review the **Residential Lighting - JA8 Compliance for Test Laboratories** fact sheet.

Do I, as a manufacturer, have to ship my luminaire with a JA8 certified high efficacy light source?

No. The 2016 Energy Standards do not require luminaires to be prepackaged with a JA8 certified high efficacy light source.

NOTE: **Section 1605.3(n)(3)(A)4** of the Appliance Standards requires portable luminaires[4] with E12, E17, or E26 screw base sockets to be prepackaged and sold together with one screw based compact fluorescent lamp or screw based LED lamp for each screw based socket on the portable luminaire. This requirement applies to portable luminaires only. Screw based lamps used in portable luminaires do not need to be JA8 certified.

[4] "Portable luminaire" means a luminaire that has a flexible cord and an attachment plug for connection to a nominal 120-volt, 15- or 20-ampere branch circuit; that allows the user to relocate the luminaire without any rewiring; that are typically controlled with a switch located on the luminaire itself or on the power cord; and that are intended for use in accordance with the National Electrical Code, ANSI/NFPA 70-2002.



If my product has a lamp shade, do I have to test my product with it on or off?

It depends. If the shade can be removed by the end user, then the light source can be tested without the shade. If the end user does not have the option to remove the shade, the product must be tested with the shade.

How do I know if an LED lamp is JA8 Certified?

Certified light sources are required to have a mark to identify compliance with the JA8 high efficacy light source requirements. JA8 certified LED lamps must be marked with either JA8-2016 or JA8-2016-E. A listing of all JA8 certified LED lamps can be found in MAEDBS.

What happens to light source products that are on the shelf after the effective date that may comply with the 2016 Energy Standards JA8 high efficacy light source requirements but aren't marked with JA8-2016 or JA8-2016-E?

Light sources that must be JA8 certified and that do not have the JA8-2016 or JA8-2016-E marking may not be installed for compliance with the 2016 high efficacy light source requirements on or after January 1, 2017.

Can I install a recessed downlight trim kit with a screw base adaptor?

No. Recessed downlight trim kits in ceilings cannot contain screw base sockets per **Section 150.0(k)1Cv** of the 2016 Energy Standards. The trim kit should be hardwired or connected via quick connector. If the trim kit contains a screw base socket adaptor, the screw base can be removed and the trim kit can be installed as described above.

Are the light sources required to be dimmable?

JA8 high efficacy light sources must be dimmable to a minimum of 10 percent of the light source output per **Joint Reference Appendix JA8.4.6**:

> *"The light source shall be dimmable down to 10 percent light output where 100 percent full light output is defined as operating the light source at the maximum setting provided by the control."*

Are high efficacy lighting requirements applicable to nonresidential buildings and spaces?

No, high efficacy lighting requirements apply only to residential buildings and spaces.

For More Information

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Computer Compliance Programs:
http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html

The California Energy Commission welcomes your feedback on Blueprint. Please contact Andrea Bailey at:
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BLUEPRINT

California Energy Commission
Efficiency Division

In This Issue

Are You Ready for January 1, 2017?

The *2016 Building Energy Efficiency Standards* (Energy Standards) go into effect January 1, 2017. Many great resources are already available to help with implementation, including:

- **2016 Residential** and **Nonresidential Compliance Manuals**
- **2016 Compliance Software**
- **2016 Mandatory Measures Summary**
- **Online Resource Center**

2016 Mandatory Measures Summary Now Available

The California Energy Commission (Energy Commission) has just released the **2016 Low-Rise Residential Mandatory Measures Summary**. The Mandatory Measures Summary is a tool designed to quickly identify mandatory measures at the design phase. This tool is not a compliance document and is not required to be registered with a Home Energy Rating System (HERS) provider. Designers may incorporate this summary into building plans to specify the mandatory measures.

New Project Status Report Available!

The Energy Commission has developed the Project Status Report for residential compliance documents. This report summarizes the status of all compliance documents for a given project, including the Certificates of Compliance (CF1R), Installation (CF2R), and Verification (CF3R). The Project Status Report is available for any project that is registered with an approved HERS Provider.

Enforcement agencies can access the Project Status Report directly through the HERS registries. This provides enforcement agencies the opportunity, at their discretion, to verify the completion of the CF1R, CF2R, and CF3R documents via the web. To determine if a project is ready for a final inspection, both the "Overall" and "HERS Compliance Documents'" status should be marked "complete." If the project is marked complete, this indicates that all of the compliance documents have been completed and signed. Currently, CalCERTS and CHEERS registries have this report available.

Alternatively, this report, like all compliance documents, can be printed for submittal. Enforcement agencies can request that applicants submit a printed report for final inspection. This tool can reduce the amount of documents submitted to the enforcement agency, and assist with compliance verification.

CalCERTS and CHEERS contact information is as follows:

CalCERTS may be reached at:
Phone: (877) 437-7787
Email: **Tech@calcerts.com**
Website: **www.calcerts.com**

CHEERS may be reached at:
Phone: (800) 424-3377
Email: **adminsupport@CHEERS.org**
Website: **www.CHEERS.org**

ENERGY STANDARDS HOTLINE

Available to help with Energy Standards (Title 24, Part 6) questions.

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916-654-5106
Outside CA

HOURS
8 a.m.–12 p.m. and
1 p.m.– 4:30 p.m.

Dynamic Compliance Documents for 2016 Residential Non-HERS Projects

Five dynamic compliance documents are now available for some of the most common residential addition and alteration projects that do not require HERS verification. Contractors and homeowners may use these new CF1Rs and CF2Rs to demonstrate compliance with the 2016 Energy Standards. Many projects will need only three printed pages because they contain only project-specific information. The dynamic features include:

» Embedded instructions – hover over the cells or blue question mark icons to view them.

» Only the necessary tables are generated based on selections made in Table A.

» The ability to add or delete table rows as needed.

These **dynamic compliance documents** are available for download.

Residential Early Adopters

Builders who would like to demonstrate compliance for residential buildings according to the 2016 Energy Standards, before the January 1, 2017, effective date, may do so at the enforcement agency's discretion. Enforcement agencies allowing early adoption should:

» Accept, review, and approve plans and unregistered CF1Rs until a HERS Provider is approved for the 2016 Energy Standards by the Energy Commission.

» Ensure that the residential **computer compliance software** used is approved by the Energy Commission for demonstrating compliance with the 2016 Energy Standards.

» Confirm that CF1Rs are registered before a permit is finaled or a Certificate of Occupancy is issued.

NOTE: All compliance documents for a project must be registered, as appropriate, once a HERS provider data registry is approved for the 2016 Energy Standards.

Master Plan Permit Applications

When builders submit permit applications to an enforcement agency for new residential subdivisions, they often have multiple model homes or "master plan" designs to which all homes in the project will be built. CF1Rs are submitted with the permit application to demonstrate compliance with the Energy Standards.

When registered CF1Rs for new residential subdivisions are submitted to and approved by the enforcement agency, builders can continue to pull permits for all the homes in the subdivision under the approved "master plan" design using the approved CF1Rs, provided the approved "master plan" designs have not been changed.

If one or more of the "master plan" designs have changed, the affected homes will require new CF1Rs with the new permit application. CF1Rs must be generated using a version of the computer compliance software approved for the new permit application date. New CF1Rs are only required for plans that are changed.

Online Resource Center

The new **Online Resource Center (ORC)** is a central location for Energy Standards educational materials. The ORC offers quick access to:

- 2016, 2013, and archived Energy Standards home pages
- A list of topic specific Energy Standards materials
- Acceptance Test Technician Certification Provider (ATTCP) and HERS resources
- Approved compliance software resources
- Blueprint newsletters
- California climate zone information
- Energy Code Ace and other external education providers
- Training and event schedules

The ORC also organizes the following resources by topic:

- Checklists
- Fact Sheets
- Guides
- Presentations
- Trigger Sheets

The layout of the new ORC is shown in Figure 1.

Lighting ATTCP Training Approved for 2016

On September 14, 2016, the Energy Commission approved the National Lighting Contractors Association of America's (NLCAA) nonresidential lighting controls ATTCP application updates for the 2016 Energy Standards. NLCAA can now train, certify, and recertify lighting acceptance test technicians (ATTs) and their employers under the 2016 Energy Standards.

For more information, please visit: **http://energy.ca.gov/title24/attcp/**.

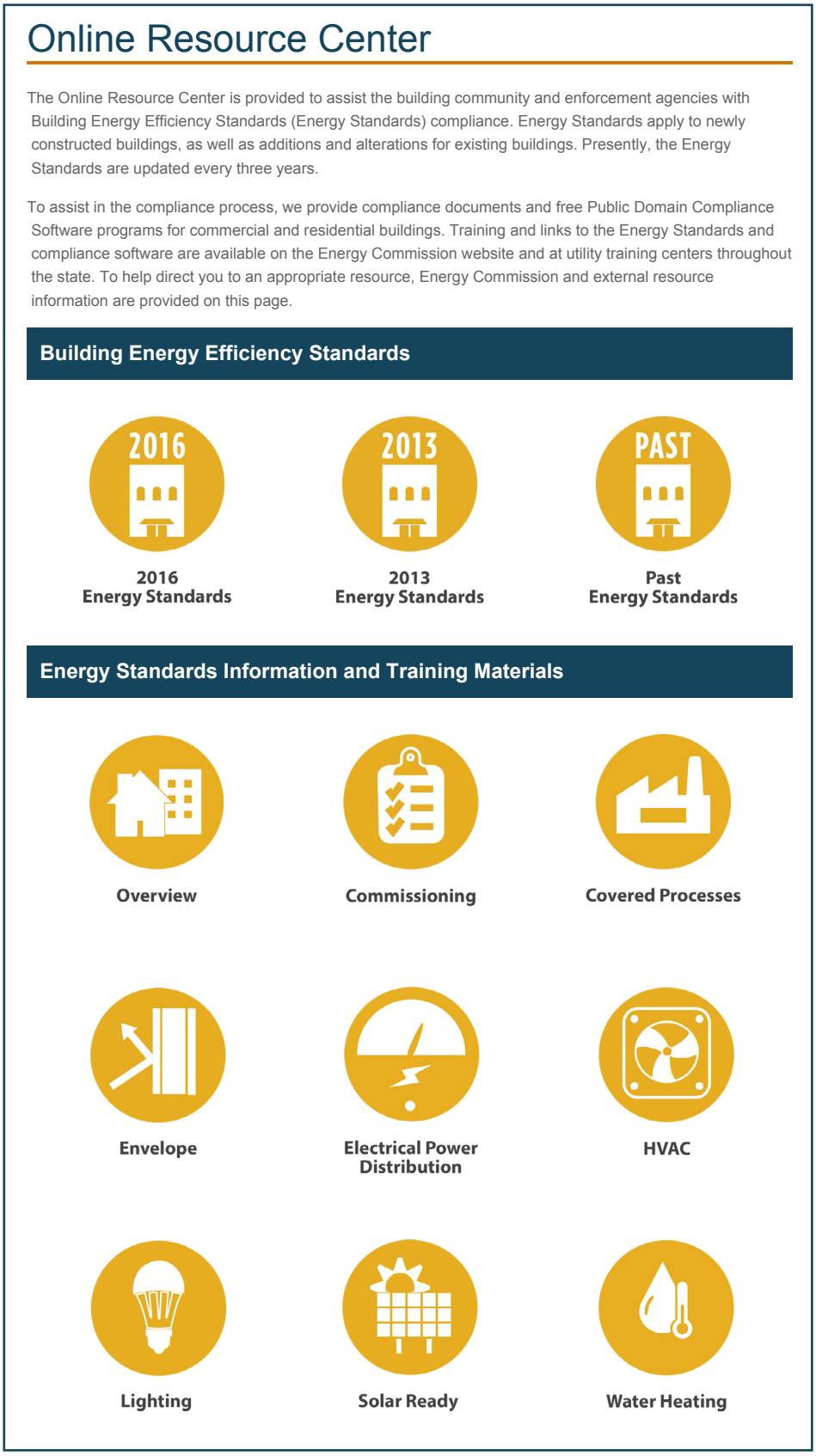

Figure 1 - Layout of the New Online Resource Center

2016 High Efficacy Requirements for Ceiling Recessed and Enclosed Luminaires

The 2016 Energy Standards require that all lighting in residential buildings, high-rise residential dwelling units, and hotel and motel guest rooms be high efficacy. This is a significant change from the 2013 Energy Standards which allows low efficacy light sources in some instances, provided additional controls are installed.

Classification of High Efficacy Light Sources

Under the 2016 Energy Standards, residential lighting can be classified as high efficacy through two methods which are presented in Table 1 below. Light sources listed in the left-hand column of Table 1 are automatically classified as high efficacy and may be installed without meeting any additional requirements. Light sources shown in the right-hand column of Table 1 must be certified as meeting the performance requirements in **Reference Joint Appendix JA8** before they can be installed.

Ceiling Recessed Downlights and Enclosed Luminaires

The 2016 Energy Standards also introduced new requirements for recessed downlight luminaires in ceilings and enclosed luminaires. All light sources installed in ceiling recessed downlight luminaires and **enclosed luminaires** must be JA8 certified. Additionally, light sources installed in ceiling recessed downlights and enclosed luminaires must pass the elevated temperature test to ensure that they work properly in these types of luminaires. This means that light sources that are automatically classified as high efficacy (left-hand column of Table 1), for instance pin-based CFLs, must be JA8 certified to be installed in ceiling recessed downlights and enclosed luminaires.

Controls for Luminaires with JA8 Certified Light Sources

Section 150.0(k)2K requires that all luminaires with JA8 certified light sources must be controlled by a dimmer or vacancy sensor. Because recessed downlight luminaires and enclosed luminaires are required to have JA8 certified light sources installed, they must also be controlled by a dimmer or vacancy sensor.

In summary, the 2016 Energy Standards require ALL light sources installed in residential buildings, high-rise residential dwelling units, and hotel and motel guest rooms to be high efficacy. Per Table 1, certain light sources are automatically classified as high efficacy, while others must be JA8 certified to be classified as high efficacy. All light sources, including light sources which are automatically classified as high efficacy, installed in ceiling recessed downlight luminaires and enclosed luminaires must be JA8 certified and pass the elevated temperature test. Additionally, all ceiling recessed downlights and enclosed luminaires must be controlled by a dimmer or vacancy sensor.

Table 1 - High Efficacy Light Sources

High Efficacy Light Sources	
No JA8 Certification Required	JA8 Certification Required
» Pin-based linear or compact fluorescent light sources using electronic ballasts » Pulse-start metal halide » High pressure sodium » GU-24 sockets containing light sources other than LEDs[a,b] » Luminaires with hardwired high frequency generator and induction lamp » Inseparable SSL luminaires that are installed outdoors » Inseparable SSL luminaires containing colored light sources that are installed to provide decorative lighting	» All light sources in ceiling recessed downlight[c] » All light sources in enclosed luminaires » GU-24 sockets containing LED light sources » Any light source not listed in this table

a. GU-24 sockets containing light sources such as compact fluorescent lamps and induction lamps.

b. California Title 20 **Section 1605.3(k)4** does not allow incandescent sources to have a GU-24 base.

c. Ceiling recessed downlight luminaires must not have screw base sockets regardless of the lamp type as described in **Section 150.0(k)1C**.

Deep-Dimming Fluorescent Lamp Ballast Efficiency Standards

The 2013 and 2016 Energy Standards require multi-level lighting controls for non-residential lighting systems. Fluorescent lighting systems can meet the multi-level lighting control requirements of **Section 130.1** by using deep-dimming fluorescent lamp ballasts. These ballasts allow lamps to be dimmed to or below 50 percent of full light output. Dimming ballasts can reduce energy consumption significantly by providing the ability to control the amount of light in the space based on occupant needs.

Deep-dimming fluorescent lamp ballasts manufactured on or after July 1, 2016, are regulated by the Appliance Efficiency Regulations (Title 20). These **new regulations** require deep-dimming fluorescent lamp ballasts to meet certain efficiency requirements and to be listed in the **Appliance Efficiency Database**. These regulations apply only to fluorescent lamp ballasts designed to operate the following fluorescent lamps:

- One to four T5 four-foot linear
- One to four T8 four-foot linear
- U-shape

Questions regarding the new efficiency requirements may be directed to the **Title 20 Call Center**.

Overlapping Requirements for Residential Hot Water Pipe Insulation

The 2016 Energy Standards and California Plumbing Code both have requirements for insulating residential domestic hot water pipes. These requirements differ slightly.

Section 1.1.7.3 of the California Building Code states,

> *"When the requirements of this code conflict with the requirements of any other part of the California Building Standards Code, Title 24, the most restrictive requirements shall prevail."*

Section 150.0(j)2A of the Energy Standards requires all hot water system piping, which meet the conditions below, to be insulated according to **TABLE 120.3-A**:

i. The first 5 feet (1.5 meters) of hot and cold water pipes from the storage tank

ii. All hot water 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

Section 609.11 of the 2016 Plumbing Code states,

> *"Insulation of domestic hot water piping shall be in accordance with Section 609.11.1 and Section 609.11.2.*
>
> *"609.11.1 Insulation Requirements. Domestic hot water piping shall be insulated.*
>
> *"609.11.2 Pipe Insulation Wall Thickness. Hot water pipe insulation shall have a minimum wall thickness of not less than the diameter of the pipe for a pipe up to 2 inches (50mm) in diameter. Insulation wall thickness shall be not less than 2 inches (51 mm) for a pipe of 2 inches (50 mm) or more in diameter."*

New Mechanical ATTCP

On September 14, 2016, the Energy Commission approved the California State Pipe Trades Council (CSPTC) as a mechanical ATTCP.

This gives CSPTC the authority to train, certify, and oversee mechanical ATTs and their employers. CSPTC will train and certify ATTs to perform all 17 mechanical acceptance tests required in the 2013 Energy Standards.

For more information, please visit: **http://energy.ca.gov/title24/attcp/**.

ATTCP and HERS Reference Cards Now Available

The Energy Commission has just released **ATTCP** and **HERS** reference cards. These cards are designed to quickly identify when acceptance testing or HERS verification is required and how to find approved providers. A preview of the ATTCP and HERS cards are provided below in Figures 2 and 3, respectively.

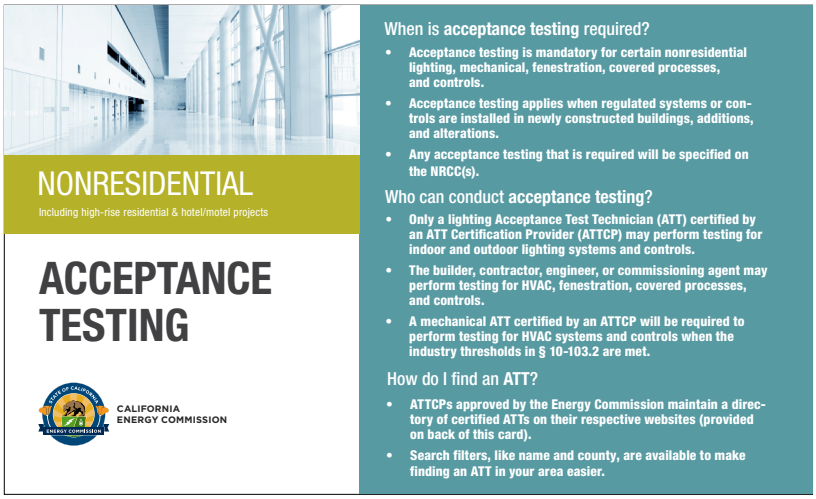

Figure 2 - ATTCP Reference Card Preview

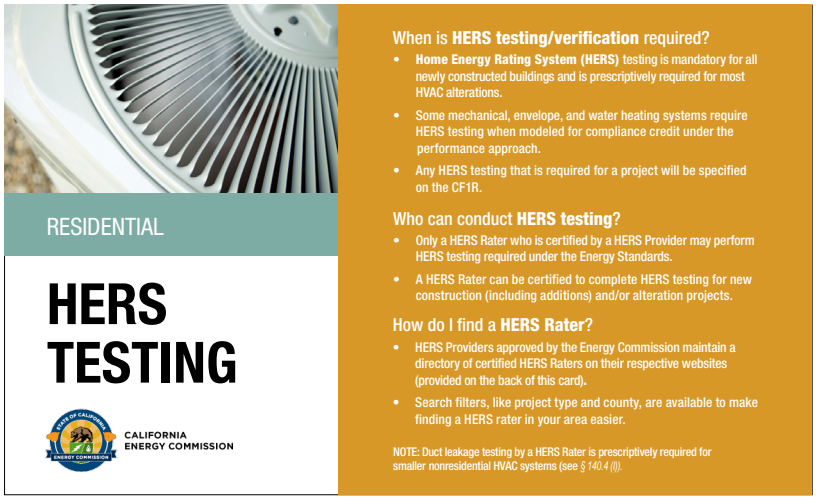

Figure 3 - HERS Reference Card Preview

Q&A

2016 Nonresidential Lighting Alterations

I have two rooms, each with 15 altered luminaires. The luminaires in each room will have new separate controls (e.g. occupancy sensor). Exception 4 to Section 141.0(b)2I states,

> **"Acceptance testing requirements of Section 130.4 are not required for alterations where lighting controls are added to control 20 or fewer luminaires."**

Since the controls will each be controlling 15 luminaires, is this project exempt from the acceptance testing requirements?

No. The 20 controlled-luminaire threshold is specific to the project. Since the controls are installed to control more than 20 luminaires for the project, the acceptance testing requirements are applicable.

2016 Residential Water Heating Options

It takes a long time for hot water to reach my master bathroom. To reduce the wait time for hot water, can I prescriptively install a second water heater closer to my master bathroom?

Yes. Per **Section 150.2(b)1Giid,** the Energy Commission used the performance compliance approach and determined that an additional natural gas or propane instantaneous water heater uses no more energy than the standard design system, and can be installed prescriptively. If an additional storage or electric instantaneous water heater is added, the performance compliance approach must be used. The information in the "Residential Water Heating Options" article in ***Blueprint*** **Issue 113** is still applicable to the 2016 Energy Standards.

For More Information

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Computer Compliance Programs:
http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html

The California Energy Commission welcomes your feedback on Blueprint. Please contact Andrea Bailey at:
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Issue 115 | July – August 2016

BLUEPRINT

California Energy Commission
Efficiency Division

In This Issue

New 2013 Home Energy Rating System Provider

The California Energy Commission (Energy Commission) has approved ConSol Home Energy Efficiency Rating Services (CHEERS) as a Home Energy Rating System (HERS) Provider under the *2013 Building Energy Efficiency Standards* (Energy Standards).

CHEERS is authorized to train and certify HERS raters for field verification and diagnostic testing for newly constructed, additions, and alterations to residential buildings.

CHEERS may be reached at:
Phone: (800) 424-3377
Email: **info@CHEERS.org**
Website: **www.CHEERS.org**

For a complete list of approved HERS Providers, please visit: **http://www.energy.ca.gov/HERS/providers.html**.

Easy Navigation of the 2016 Energy Standards and Compliance Manuals

Navigating the electronic versions of the 2016 Energy Standards and compliance manuals just got easier.

2016 Energy Standards

Section references throughout the **2016 Energy Standards** are now linked to quickly take you to that section. These links work on both the downloaded and web based versions.

TABLE 100.0-A, which directs you to the appropriate section based on building and project type, is now available for download **separately** from the Energy Standards. To use the links in the downloaded version you must be connected to the internet.

2016 Compliance Manuals

The 2016 **Residential** and **Nonresidential** Compliance Manuals have also been updated to include links to the chapters. These links work on both the downloaded and web based versions.

Air-to-Water Heat Pump Systems Efficiency Data

Starting July 1, 2016, air-to-water heat pump systems must be listed in the **Appliance Efficiency Database**. An independent list of manufacturer certified air-to-water heat pump systems will no longer be maintained. This reduces the number of sources needed to locate efficiency data.

These systems can be used to provide space conditioning, water heating, or both. Modeling of these systems for compliance credit remains the same.

Air-to-water heat pump systems are not regulated for efficiency. Manufacturers must test and list these products in the **Appliance Efficiency Database**. To locate these systems in the database select *Appliance Search*, followed by *Appliance Type*. For *Category* select Central Heat Pumps and for *Appliance Type* select Heat Pump Water Heating Packages.

HVAC Labeling Requirements

To increase heating, ventilation, and air conditioning (HVAC) system efficiency, **Section 150.0(m)12D** requires manufacturers to label air filter media. Per **Section 150.0(m)12**, this labeling requirement applies to mechanical systems that supply air to an occupiable space through ductwork exceeding 10 feet in length and through a thermal conditioning component. Evaporative coolers are exempt from this requirement.

Air filter labeling was introduced in the 2013 Energy Standards and is required by Title 20 for air filters manufactured on or after July 1, 2016.

Air filter labels must now show filter efficiency and static pressure drop ratings. The filter efficiency rating tells how well a filter removes particulate from the air. The static pressure drop rating shows the filter's impact on airflow through the HVAC system.

A sample label is provided below in Figure 1. **Label information** will vary depending on the test method used.

Section 150.0(m)12Aiv requires permanent labels at all air filter locations that are legible to a person replacing the air filters. Consumers can use this information to choose the appropriate air filter for their HVAC system.

Q&A

Pipe Insulation in Exterior Walls

I'm having the hot water pipes for my new home installed within the insulation of the exterior walls. Do I have to separately insulate the hot water pipes if the pipes are surrounded by wall insulation?

Not necessarily. **Section RA4.4.1(e)** of the *2013 Reference Residential Appendices* states:

> *"Pipe insulation may be omitted where hot water distribution piping is buried within attic, crawlspace or wall insulation, as described below:*
>
> *"In attics and crawlspaces the insulation shall completely surround the pipe with at least 1 inch of insulation and the pipe shall be completely covered with at least 4 inches of insulation further away from the conditioned space.*
>
> *"In walls, the insulation must completely surround the pipe with at least 1 inch of insulation. If burial within the insulation does not meet these specifications, then this exception does not apply, and the section of pipe not meeting the specifications must be insulated as specified in **Section 150.0(j)**."*

Figure 1 - Sample Air Filter Label

MERV	(µM)	0.30-1.0	1.0-3.0	3.0-10	Airflow Rate (CFM)	600	900	1200	1500	2000*	*Max
12	PSE (%)	80	90	95	Initial Resistance (IWC)	0.05	0.10	0.17	0.21	0.24	Rated Airflow

Additionally, hot water pipes do not have to be insulated in walls if the project meets all quality insulation installation (QII) requirements. **Exception 4** to Section 150.0(j)2 states:

> *"Piping installed in interior or exterior walls shall not be required to have pipe insulation if all of the requirements are met for compliance with Quality Insulation Installation (QII) as specified in the Reference Residential Appendix **RA3.5**."*

Hot water pipes must be insulated according to **Section 150.0(j)2** if the above conditions cannot be met.

These requirements also apply to the 2016 Energy Standards.

Solar Ready Requirements for Single Family Homes in Subdivisions

When did the solar ready requirements become effective?

July 1, 2014, the effective date of the 2013 Energy Standards.

NOTE: **Section 110.10(a)1** references the date January 1, 2014. This was the tentative effective date of the 2013 Energy Standards. The actual effective date was July 1, 2014.

Do the solar ready requirements apply to all single family homes?

No. The solar ready requirements only apply to newly constructed homes in subdivisions with ten or more single family residences. These requirements do not apply to alterations or additions to single family homes.

When are the solar ready requirements applied to subdivisions?

Tentative subdivision maps of 10 or more single family homes, which are deemed complete by the enforcement agency on or after July 1, 2014, must meet the solar ready requirements.

Why are single family homes in subdivisions required to be solar ready?

The solar ready requirements of **Section 110.10** make future installation of photovoltaic (PV) and solar water heating systems easier and less expensive.

Solar ready homes are built with a designated *solar zone* on the roof or overhang and an electrical service panel capable of accommodating PV and solar water heating systems. The *solar zone* is free of shade, penetrations, and obstructions, and is oriented for optimal solar access.

Do the solar ready requirements apply to subdivisions that are built-out in phases?

Yes, if the tentative subdivision map for 10 or more single family homes was deemed complete on or after July 1, 2014.

What if the original tentative subdivision map expired?

If a new tentative subdivision map for 10 or more single family homes is deemed complete July 1, 2014, or later, the homes included in the new map must comply with the solar ready requirements.

Homes built before the expiration of a map approved before July 1, 2014, are not required to meet the solar ready requirements.

How does the enforcement agency verify compliance with the solar ready requirements?

The enforcement agency verifies compliance by reviewing the information on the solar ready compliance documents (**CF1R-SRA-01-E** and **CF1R-SRA-02-E**). These documents, along with the building plans and permit application(s), are submitted to the enforcement agency by the builder.

Are there changes to the solar ready requirements in the 2016 Energy Standards?

The solar ready requirements for single family homes in subdivisions of 10 homes or more still applies in the 2016 Energy Standards. **Section 110.10(a)1**, however, no longer includes a specific complete map application date. The complete map application date of July 1, 2014, still applies.

In addition, some of the solar zone exceptions changed.

For More Information

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Computer Compliance Programs:
http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html

The California Energy Commission welcomes your feedback on Blueprint. Please contact Andrea Bailey at:
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Need Help? Energy Standards Hotline
(800) 772-3300 (toll-free in CA)
Title24@energy.ca.gov

Appliances and Outreach and Education Office
1516 Ninth St, MS-25
Sacramento, CA 95814-5512
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CEC-400-2016-TBD

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7/8/2016

Title 24 Part 6 Essentials Training Courses

Currently Scheduled for 2016

Ace Training Traditional Classroom™

Classes scheduled after July 1 will focus on the 2016 Standards.

DATE • TIME	LOCATION	INSTRUCTOR	REGISTRATION LINK
Residential Standards for Plans Examiners and Building Inspectors			
July 12 • 8:30 - 4:30	Long Beach	Bruce Cheney	sce.com/workshops
July 13 • 8:30 - 4:30	Hermosa Beach	Bruce Cheney	sce.com/workshops
July 26 • 8:30 - 4:30	Burbank	Bruce Cheney	sce.com/workshops
July 27 • 8:30 - 4:30	Santa Ana	Bruce Cheney	sce.com/workshops
July 29 • 8:30 - 4:30	Jackson	Gina Rodda	goo.gl/PEZusW
August 2 • 8:30 - 4:30	Beverly Hills	Bruce Cheney	sce.com/workshops
August 2 • 8:30 - 4:30	Mariposa	Brian Selby	goo.gl/PN4gPR
August 3 • 8:30 - 4:30	Rancho Cucamonga	Bruce Cheney	sce.com/workshops
August 4 • 8:30 - 4:30	Eureka	Brian Selby	goo.gl/PN4gPR
August 9 • 8:30 - 4:30	Concord	Gina Rodda	goo.gl/PHzMvF
August 9 • 8:30 - 4:30	Victorville	Bruce Cheney	sce.com/workshops
August 10 • 8:30 - 4:30	Irvine	Bruce Cheney	sce.com/workshops
August 11 • 8:30 - 4:30	Fremont	Gina Rodda	goo.gl/9mXPg7
August 11 • 8:30 - 4:30	Malibu	Bruce Cheney	sce.com/workshops
August 23 • 8:30 - 4:30	Long Beach	Bruce Cheney	sce.com/workshops
August 25 • 8:30 - 4:30	San Francisco	Gina Rodda	goo.gl/irFpq7
September 6 • 8:30 - 4:30	Fontana	Bruce Cheney	sce.com/workshops
September 6 • 8:30 - 4:30	San Jose	Gina Rodda	goo.gl/FJLwmF
September 7 • 8:30 - 4:30	Palm Desert	Bruce Cheney	sce.com/workshops
September 14 • 8:30 - 4:30	Temecula	Bruce Cheney	sce.com/workshops
September 28 • 8:30 - 4:30	Nevada City	Brian Selby	goo.gl/XWVoAQ
October 24 • 8:30 - 4:30	Folsom	Brian Selby	goo.gl/Ndd9lK
November 8 • 8:30 - 4:30	Santa Rosa	Gina Rodda	goo.gl/R6mhZO
Nonresidential Standards for Plans Examiners and Building Inspectors			
July 19 • 8:30 - 4:30	Long Beach	Bruce Cheney	sce.com/workshops
July 20 • 8:30 - 4:30	Rancho Cucamonga	Bruce Cheney	sce.com/workshops
August 16 • 8:30 - 4:30	Burbank	Bruce Cheney	sce.com/workshops
August 17 • 8:30 - 4:30	Hermosa Beach	Bruce Cheney	sce.com/workshops
August 24 • 8:30 - 4:30	Fremont	Gina Rodda	goo.gl/y2f0Bs
August 24 • 8:30 - 4:30	Santa Ana	Bruce Cheney	sce.com/workshops
August 30 • 8:30 - 4:30	Beverly Hills	Bruce Cheney	sce.com/workshops
August 30 • 8:30 - 4:30	Concord	Gina Rodda	goo.gl/bjCDeU
August 31 • 8:30 - 4:30	Irvine	Bruce Cheney	sce.com/workshops
August 31 • 8:30 - 4:30	San Francisco	Gina Rodda	goo.gl/gkGJbl
September 1 • 8:30 - 4:30	Eureka	Brian Selby	goo.gl/aXu8k2
September 13 • 8:30 - 4:30	Long Beach	Bruce Cheney	sce.com/workshops
September 20 • 8:30 - 4:30	Fontana	Bruce Cheney	sce.com/workshops
September 21 • 8:30 - 4:30	Palm Desert	Bruce Cheney	sce.com/workshops
September 27 • 8:30 - 4:30	Victorville	Bruce Cheney	sce.com/workshops
September 28 • 8:30 - 4:30	Temecula	Bruce Cheney	sce.com/workshops
September 29 • 8:30 - 4:30	San Jose	Gina Rodda	goo.gl/6rsrVZ
October 18 • 8:30 - 4:30	Santa Rosa	Gina Rodda	goo.gl/Hjs2lG
October 31 • 8:30 - 4:30	Folsom	Brian Selby	goo.gl/InY4q5
Residential Standards for Energy Consultants			
August 25 • 8:30 - 4:30	Irwindale	Martyn Dodd	sce.com/workshops
Standards & Technology for Residential Lighting			
July 21 • 8:30 - 3:30	Irwindale	Nicole Graeber	sce.com/workshops
Standards & Technology for Office Lighting			
July 20 • 8:30 - 3:30	Irwindale	Nicole Graeber	sce.com/workshops
July 27 • 8:30 - 4:30	San Francisco	Nicole Graeber	goo.gl/KRqESb
Standards & Technology for Retail Lighting			
July 26 • 8:30 - 4:30	San Francisco	Nicole Graeber	ggoo.gl/d2jhAP
Title 24: Where We're Headed with the 2016 Standards			
July 28 • 8:30 - 12:30	Beverly Hills	Martyn Dodd	sce.com/workshops
August 26 • 8:30 - 12:30	Irwindale	Martyn Dodd	sce.com/workshops
September 15 • 8:30 - 12:30	Ventura	Martyn Dodd	sce.com/workshops
September 30 • 8:30 - 12:30	Irwindale	Martyn Dodd	sce.com/workshops

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DATE • TIME	LOCATION	INSTRUCTOR
Residential Standards for Energy Consultants		
July 26 - 28 • 9:00 - 12:00	Online	Brian Selby
October 25 - 27 • 9:00 - 12:00	Online	
November 15 - 17 • 9:00 - 12:00	Online	
Nonresidential Standards for Energy Consultants		
August 16 - 18 • 9:00 - 12:00	Online	Brian Selby
September 20 - 22 • 9:00 - 12:00	Online	
November 8 - 10 • 9:00 - 12:00	Online	
Residential Modeling		
July 19 - 21 • 9:00 - 12:00	Online	Martyn Dodd & Demian Vonder Kuhlen
October 4 - 6 • 9:00 - 12:00	Online	
Nonresidential Modeling		
August 9 - 11 • 9:00 - 12:00	Online	Martyn Dodd & Demian Vonder Kuhlen
October 18 - 20 • 9:00 - 12:00	Online	

Ace Training Online Self-Study™

- Residential Standards for AC Quality Installation Contractors
- Residential Standards for Indoor Lighting
- Residential Standards for Ventilation
- Nonresidential Standards for Indoor Lighting Mandatory Measures
- Nonresidential Standards for Indoor Lighting Prescriptive Compliance

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Ace Training Webinar™

DATE • TIME	LOCATION	INSTRUCTOR	REGISTRATION LINK
2016 Title 24: Where We're Headed With the Residential Standards			
August 18 • 1:00 - 2:30	Online	Martyn Dodd	pge.com/energyclasses
September 13 • 1:00 - 2:30	Online		
November 7 • 1:00 - 2:30	Online		
December 9 • 1:00 - 2:30	Online		
2016 Title 24: Where We're Headed With the Nonresidential Standards			
August 18 • 9:00 - 11:30	Online	Martyn Dodd	pge.com/energyclasses
September 13 • 9:00 - 11:30	Online		
November 7 • 9:00 - 11:30	Online		
December 9 • 9:00 - 11:30	Online		

Ace Title 20 Training On-Demand Video™

Our new Title 20 Appliance Efficiency curriculum focuses on the essentials industry professionals and consumers need to know to use the California Energy Commission's Modernized Appliance Efficiency Database System (MAEDBS). Access our video trainings on the following topics at:

energycodeace.com/content/title-20-ondemand

- Title 20 Essentials: Making the Most of On-Demand Video Training
- Title 20 Essentials: Why Certification Matters
- Title 20 Essentials: Using MAEDBS for Manufacturers
- Title 20 Essentials: Using MAEDBS for Third Party Certifiers
- Title 20 Essentials: Using MAEDBS for Test Laboratories
- Title 20 Essentials: California Appliance Standards for Retailers, Distributors, Contractors, and Importers

Software Training

DATE • TIME	LOCATION	INSTRUCTOR	REGISTRATION LINK
Beginning EnergyPro 7 Nonresidential			
September 29 • 8:30 - 12:00	Irwindale	Martyn Dodd	sce.com/workshops
Beginning EnergyPro 7 Residential			
September 29 • 12:30 - 4:00	Irwindale	Martyn Dodd	sce.com/workshops
Advanced EnergyPro 7 Nonresidential			
July 27 • 8:30 - 12:00	Irwindale	Martyn Dodd	sce.com/workshops
September 14 • 8:30 - 12:00	Irwindale	Martyn Dodd	sce.com/workshops
Advanced EnergyPro 7 Residential			
July 27• 12:30 - 4:00	Irwindale	Martyn Dodd	sce.com/workshops
September 14 • 12:30 - 4:00	Irwindale	Martyn Dodd	sce.com/workshops
IESVE Software Training for Title 24 Compliance for Nonresidential Buildings			
July 20 • 9:00 - 5:00	San Francisco	Liam Buckley	pge.com/energyclasses
August 18 • 8:30 - 4:30	Irwindale	Liam Buckley	sce.com/workshops
November 1 • 9:00 - 5:00	San Francisco	Liam Buckley	pge.com/energyclasses

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Issue 114 | May – June 2016

BLUEPRINT

California Energy Commission
Efficiency Division

In This Issue

New 2013 Lighting Alteration Compliance Option

On April 13, 2016, the California Energy Commission (Energy Commission) approved a new lighting alteration compliance option. This new option can be used to comply with **Section 141.0(b)2I** of the *2013 Building Energy Efficiency Standards* (Energy Standards). This compliance option went into effect immediately.

To qualify for this 2013 compliance option, the lighting power of the existing luminaires to be replaced or modified must be reduced by the following percentages:

1. At least 50 percent in hotel, office, and retail spaces; or
2. At least 35 percent in all other spaces.

Spaces that satisfy these reduction of power criteria are subject only to the following control requirements:

1. The applicable manual area control requirements of **Section 130.1(a);** and
2. The applicable automatic shut-off control requirements of **Section 130.1(c)1 through 5**.

The primary difference between the current requirements and this new compliance option is that the multi-level lighting control requirements are not applicable if the criteria above are met.

All other requirements and exceptions in the 2013 Energy Standards remain in place.

To use this compliance option, complete the **2016 NRCC-LTI-06-E** (Certificate of Compliance) to document the existing lighting power and to calculate the allowed lighting power. The calculated value must then be entered into the **2013 NRCC-LTI-01-E** (Certificate of Compliance), Table C, Row 6.

NOTE: This compliance option is only applicable to spaces which are not undergoing changes in area to the enclosed space, like moving interior walls.

For additional information on this compliance option, please see **Table 1**. The **staff analysis** is available for review.

New All-in-One Certificates of Compliance for 2013 Nonresidential Lighting Projects

Two convenient Certificates of Compliance for indoor and outdoor nonresidential lighting projects are now available. The Energy Commission compiled five indoor lighting certificates to create the new NRCC-LTI certificate. The three outdoor lighting certificates were also compiled, creating the new NRCC-LTO certificate. These compiled certificates are especially useful for projects requiring the most frequently used certificates.

The compiled NRCC-LTI certificate includes:

- Indoor Lighting (NRCC-LTI-01-E)
- Lighting Controls (NRCC-LTI-02-E)
- Power Allowance (NRCC-LTI-03-E)
- Tailored Method (NRCC-LTI-04-E)
- Line Voltage Track Lighting Worksheet (NRCC-LTI-05-E)

The compiled NRCC-LTO certificate includes:

» Outdoor Lighting (NRCC-LTO-01-E)

» Outdoor Lighting Controls (NRCC-LTO-02-E)

» Power Allowances (NRCC-LTO-03-E)

The compiled certificates also include these user-friendly features:

» Autofills referenced values (For example – Section C on LTI-01 is populated with the Allowed Lighting Power from LTI-03)

» Specifies and adds tables for unconditioned spaces

» Adds and deletes rows - Dynamic and expandable tables

» Automatically provides allowed W/ft^2 from TABLES 140.6-B and C, based on the type of building or primary function area selection

» Performs mathematical functions

Links to both certificates are located on the **Compiled Lighting Documents** webpage. The original certificates are available in the **archive**. For full functionality, use a current version of Adobe or another PDF viewer. Additional **troubleshooting** information is available.

Porous Inner Core Flex Duct

Interpretation of Section 150.0(m)10

The Energy Commission was asked to determine if porous inner core flex duct, with a non-porous layer between the inner core and outer jacket (see Figure 1), was compliant with **Section 150.0(m)10** of the Energy Standards.

Using the authority under Section 10-107(b), the Executive Director issued an **interpretation**, stating,

> *"Flexible ducts having a non-porous layer between the porous inner core and the outer vapor barrier satisfies the intent of Section 150.0(m)10."*

Section 150.0(m)10 prohibits the use of porous inner core flex duct. This exclusion was first introduced in the 2005 Energy Standards. The prohibition was based on the perception that the outer jacket was the only air barrier. The presence of only one air barrier increases the potential for leakage during installation and throughout the life of the duct system. In an effort to minimize this risk, the porous inner core flex duct prohibition was adopted.

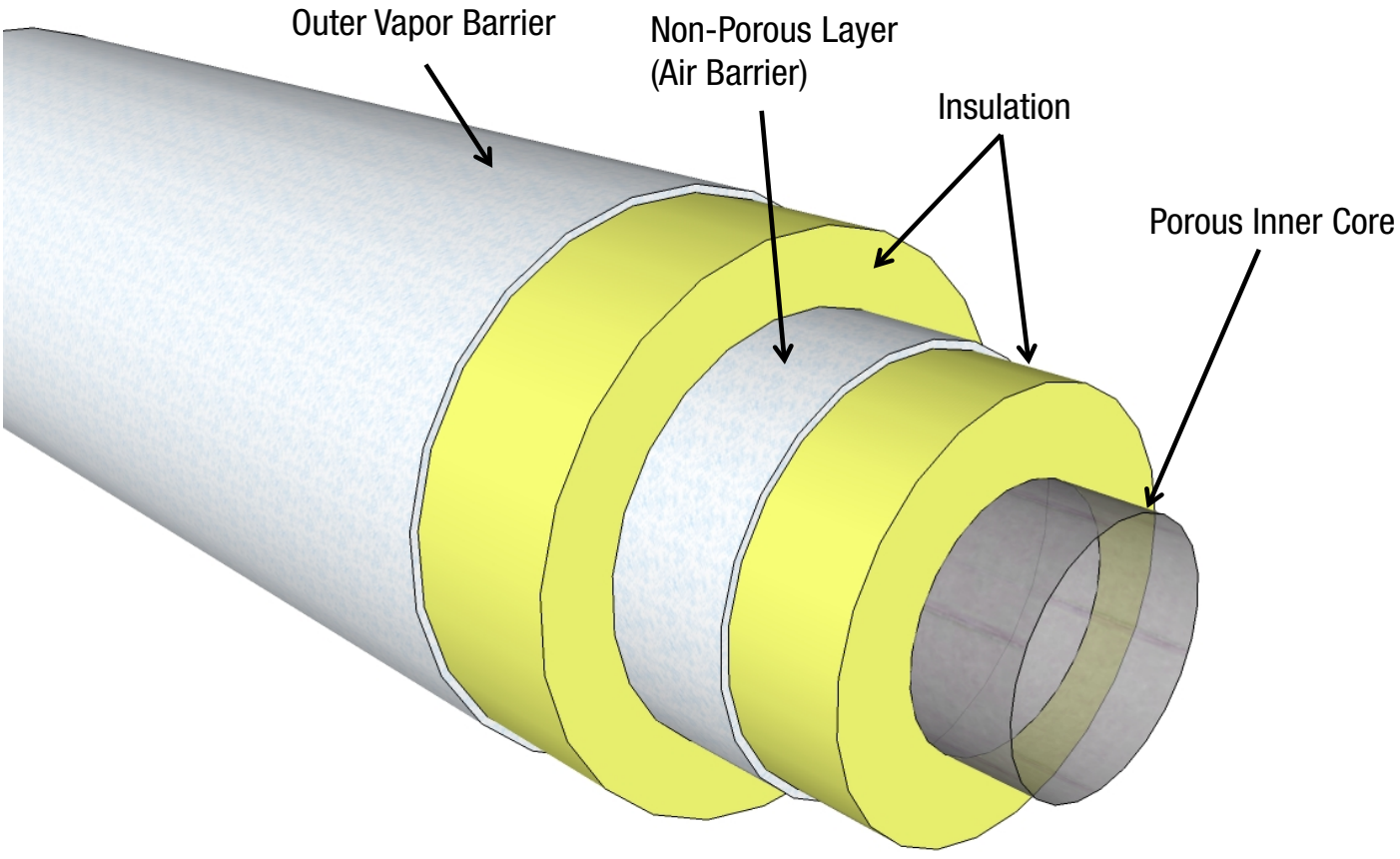

Figure 1 - Porous inner core flex duct with non-porous layer.

Labeling of Products Used for Compliance with the Energy Standards

The Energy Commission and the State of California do not endorse, favor, or recommend any particular product or service. It is illegal for a manufacturer to use either entity's seal anywhere, including products, packaging, marketing materials, and websites. **Section 17533.6** of the California Business and Professions Code states,

> *"It is unlawful for any person, firm, corporation, or association that is a nongovernmental entity to use a seal, emblem, insignia, trade or brand name, or any other term, symbol, or content that reasonably could be interpreted or construed as implying any federal, state, or local government, military veteran entity, or military or veteran service organization connection, approval, or endorsement of any product or service, including, but not limited to, any financial product, goods, or services, by any means, including, but not limited to, a mailing, electronic message, Internet Web site, periodical, or television commercial disseminated in this state, unless the nongovernmental entity has an expressed connection with, or the approval or endorsement of, a federal, state, or local government, military veteran entity, or military or veteran service organization."*

The Energy Commission does not certify products. Manufacturers certify their products to the Energy Commission. A product which has been certified by ENERGY STAR® does not automatically comply with the Energy Standards. It is inappropriate to place a "Title 24" or "Title 24-Compliant" label on a product. This applies even if the product is certified to the Energy Commission and is listed in the **Appliance Efficiency Database**.

The following are examples of acceptable statements that may be included on a product label or other marketing materials:

- Can be used to comply with 2016 Title 24, Part 6 high efficacy luminaire requirements.
- Can be used to comply with 2016 Title 24, Part 6 airtight requirements.
- Can be used to comply with 2016 Title 24, Part 6 dimmer control device requirements.
- Can be used to comply with 2016 Title 24, Part 6 cool roof requirements.

Please direct questions about product statements to the **Energy Standards Hotline**.

If you have a question about the use of the Energy Commission seal, please review the **Terms of Use** or contact the Media and Public Communications Office at 916-654-4989.

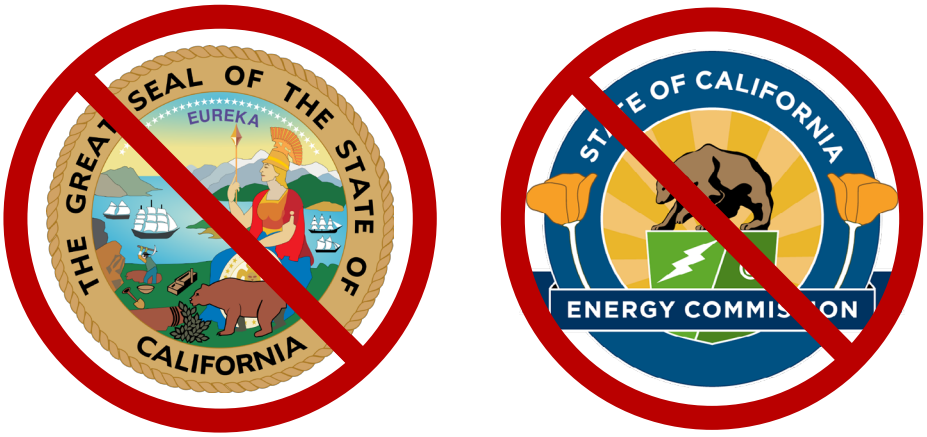

Figure 2 - The State of California and Energy Commission seals must never be placed on a manufacturer's product.

Q&A

Water Heater Replacement - Propane to Electric

I currently have a propane water heater installed at my house. I want to replace it with an electric water heater. Can I do this prescriptively?

Yes, as long as natural gas is not connected to the building. Propane is not considered natural gas. **Section 150.2(b)1Gii** states the following regarding replacement water heaters,

> *"If no natural gas is connected to the building, an electric water heater that has an energy factor equal to or greater than required under the Appliance Efficiency Regulations. For storage type water heaters, the capacity shall not exceed 60 gallons."*

This also applies for replacement water heaters under **Section 150.2(b)1Giib** of the 2016 Energy Standards, which states,

> *"If no natural gas is connected to the building, an electric water heater that meets the requirements of Section 110.1 and 110.3. For electric resistance storage type water heaters, the capacity shall not exceed 60 gallons."*

It is important to note that under the 2016 Energy Standards, the tank capacity limit does not apply to heat pump water heaters.

Electrical Power Distribution and Guest Rooms

Do any of the electrical power distribution system requirements of Section 130.5 apply to high-rise residential and hotel/motel guest rooms?

Only the controlled receptacle requirements of **Section 130.5(d)5** are applicable to high rise residential and hotel/motel guest rooms.

To add clarity, **Section 130.0(b)4** of the 2016 Energy Standards was updated to reflect this.

Lighting Alteration Compliance Option

Are projects which fall under the 2013 lighting alteration compliance option subject to the partial-off requirements of Section 130.1(c)6 and 7?

No. Since the multi-level control requirements are not applicable to these projects, the partial-off requirements are also not applicable (see **Table 1**).

NOTE: In these scenarios, spaces that would have otherwise been subject to the partial-off requirements are still subject to the automatic shut-off control requirements of **Section 130.1(c)1 through 4**.

If I am using the new compliance option for my lighting alteration project, is acceptance testing required?

Yes, acceptance testing is required for lighting alterations where controls are installed to comply with the 2013 Energy Standards. There are no exceptions under the 2013 Energy Standards.

Under the new compliance option, when are requirements triggered for lighting system alterations?

The same triggers or thresholds apply to the new compliance option. For a lighting system alteration defined in **Section 141.0(b)2Iii**, requirements are triggered when 10 percent or more of the existing luminaires in the enclosed space are altered.

Under the new compliance option, when are requirements triggered for luminaire modifications-in-place?

The same triggers or thresholds apply to the new compliance option. For a luminaire modification-in-place, as defined in **Section 141.0(b)2Iiii**, requirements are triggered when 40 or more luminaires are modified in a building space within a twelve month period, and 10 percent or more of the existing luminaires in an enclosed space are modified.

For additional information on luminaire modifications-in-place, see **Blueprint Issue 107**.

Table 1: Control Requirements for Luminaire Alterations

Applicable Section 130.1 control requirements	Resulting lighting power, compared to the lighting power allowance in Section 140.6(c)2, Area Category Method		
	EXISTING OPTION 1 Lighting power density is > 85% of allowance	EXISTING OPTION 2 Lighting power density is ≤ 85% of allowance	NEW OPTION Existing lighting power is reduced by 50/35%
Section 130.1(a)1, 2, and 3 Area Controls	Yes	Yes	Yes
Section 130.1(b) Multi-Level Lighting Controls – only for alterations to general lighting of enclosed spaces 100 square feet or larger with a connected lighting load that exceeds 0.5 watts per square foot	Yes	Two level lighting control for each altered luminaire, with at least one step between 30-70 percent of lighting power regardless of luminaire type, or meet Section 130.1(b)	Not Required
Section 130.1(c) Shut-Off Controls	Yes	Yes	[1]Yes
Section 130.1(d) Automatic Daylight Controls	Yes	Not Required	Not Required
Section 130.1(e) Demand Responsive Controls – only for alterations where the area of all altered enclosed spaces is greater than 10,000 square feet in a single building, where the alteration also changes the area of the space, the occupancy type of the space, or increases the lighting power	Yes	Not Required	Not Required

[1] Since two level lighting controls are not required for this option, partial-off controls are not required to be installed in place of "full off" automatic shutoff controls.

Under the new compliance option, does the 50/35 percent reduction in lighting power apply to the enclosed space?

No. The power reduction applies only to the luminaires being replaced or modified. The replaced or modified luminaires must have at least a 50 percent (office, hotel, retail) or 35 percent (all other spaces) lower rated power at full lighting output compared to the original luminaires.

I want to replace the luminaires in the bathroom of my office building. To use this new option, must the lighting power of the luminaires in the bathroom be reduced by 50 or 35 percent?

Thirty five percent. A bathroom is included in *all other spaces*.

Roofing Projects and Solar Reflective Index

For a roofing project (residential or nonresidential), can I use the initial solar reflective index (SRI) value of a roofing product given by the Cool Roof Rating Council (CRRC) to meet the roofing product requirements of the 2013 Energy Standards?

No. **Section 110.8(i)3** of the 2013 Energy Standards requires the SRI to be calculated based on the aged solar reflectance value of the roofing product. The initial SRI value given by the CRRC only takes into account initial solar reflectance and initial thermal emittance.

To determine the SRI value of a roofing product for compliance with the Energy Standards, you have two options:

1. Use the Energy Commission **SRI calculator**; or
2. If available, use the aged SRI value given by the CRRC.

NOTE: When using the SRI calculator, the thermal emittance can be either the initial or 3-year aged value.

For More Information

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Computer Compliance Programs:
http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html

The California Energy Commission welcomes your feedback on Blueprint. Please contact Andrea Bailey at:
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BLUEPRINT

California Energy Commission
Efficiency Division

In This Issue

New Mechanical Acceptance Test Technician Certification Provider

On January 13, 2016, the California Energy Commission (Energy Commission) approved the National Environmental Balancing Bureau (NEBB), as a mechanical Acceptance Test Technician Certification Provider (ATTCP).

This gives NEBB the authority to train, certify, and oversee acceptance test technicians (ATTs) and their employers. NEBB will train and certify ATTs to perform all 17 mechanical acceptance tests required in the *2013 Building Energy Efficiency Standards* (Energy Standards).

The Conditions of Approval are available for review in the **Executive Director's recommendation**.

For more information, please visit: **http://energy.ca.gov/title24/attcp/**.

Small Duct High Velocity Space Conditioning Systems

Small duct high velocity (SDHV) systems may be used to comply with the Energy Standards. The following is a list of requirements with direction on how SDHV systems can comply with the low-rise residential requirements of the Energy Standards.

Mandatory Requirements

United States Department of Energy Standards:

SDHV systems manufactured on or after January 23, 2006, and before January 1, 2015, must have a minimum Seasonal Energy Efficiency Ratio (SEER) of 11, and a minimum Heating Seasonal Performance Factor (HSPF) of 6.8.

SDHV systems manufactured on or after January 1, 2015, must have a minimum SEER of 12, and a minimum HSPF of 7.2.

Energy Standards:

Section 150.0(m)13B - Single zone systems that use forced air ducts to supply cooled air to an occupiable space must either meet minimum airflow and fan efficacy requirements, or meet the return duct and grille sizing requirements of **TABLES 150.0-C or 150.0-D**.

NOTE: The return duct and grille sizing alternative will likely be the method chosen for compliance when installing a SDHV system.

Section 150.0(m)15 - Specific to systems with multiple thermostatically controlled zones, this section requires the same mandatory airflow and fan efficacy requirements as **Section 150.0(m)13B**. However, it does not have the same duct and grille sizing alternative. If such systems cannot satisfy the airflow and fan efficacy requirements of this section, compliance must be demonstrated via the performance approach.

The duct leakage and insulation requirements apply as with any other system.

Prescriptive Requirements

The refrigerant charge and duct insulation requirements apply as with any other system.

Performance Options

CBECC-Res Version 4b can model SDHV systems.

Refrigerant charge verification can also be modeled, as with any other cooling system.

Where applicable, compliance credits for buried ducts or deeply buried ducts can be taken.

Demand Responsive Controls for Additions and Alterations

For alterations, demand responsive controls are triggered when all of the following conditions are met:

1. Any number of existing luminaires are altered (**TABLE 141.0-E**).
2. There is a change in the area of the enclosed space, space type, or increase in lighting power (**TABLE 141.0-E**).
3. The area of all altered enclosed spaces is greater than 10,000 square feet, excluding spaces with a lighting power density of 0.5 watts per square foot or less (**Section 130.1(e)**).

Demand responsive control requirements apply only to the enclosed space(s) being altered as indicated on the building permit. The Energy Standards apply only to those portions of the systems being altered. These controls are not required if the area of all altered enclosed spaces is 10,000 square feet or less.

For example, an existing 15,000 square foot building is undergoing a 5,000 square foot lighting system alteration. Demand responsive controls are not required since the area of the altered enclosed space(s) is less than 10,000 square feet.

If the entire 15,000 square foot building is undergoing a lighting system alteration and there is no change in the area of the enclosed space(s), space type, or increase in lighting power, demand responsive controls are not required.

For additions, demand responsive control requirements are triggered when the area of the addition is greater than 10,000 square feet, excluding spaces with a lighting power density of 0.5 watts per square foot or less (Sections **141.0(a)1** and **130.1(e)**).

Continuing with additions, the demand responsive control requirements apply only to the enclosed space(s) being added as indicated on the building permit.

For example, a 5,000 square foot addition to a 15,000 square foot existing building does not trigger demand responsive control requirements.

Residential Water Heating Options

If it takes an extended period for hot water to get to a fixture, a common cost-effective solution is to install a demand recirculation system. These systems reduce both wait time and water waste (see **Section 5.3.2** of the *2013 Residential Compliance Manual* for more information). The installation of a manually controlled demand recirculation system that meets the requirements of **RA4.4.9** of the *2013 Reference Residential Appendices*, also meets the prescriptive alteration requirements of the Energy Standards. Per **Section 150.2(b)1Giv**, the Energy Commission used the performance compliance approach and determined that energy use is no more than the standard design system. Thus, manually controlled demand recirculation systems can be installed prescriptively for residential single dwelling unit alterations. Any other alteration to the hot water distribution system, such as timer or temperature control recirculation systems, must be analyzed using the performance compliance approach.

To decrease the wait time, another alternative is to install a second water heater near the fixture. Historically, adding a water heater to an existing building's water heating system required a performance run to demonstrate compliance. Again, using **Section 150.2(b)1Giv**, the Energy Commission used the performance compliance approach and determined that an additional natural gas or propane instantaneous water heater uses no more energy than the standard design system, and can be installed prescriptively. If an additional storage or electric instantaneous water heater is added, the performance compliance approach must be used.

EnergyPro Version 7.0

EnergyPro Version 7.0. has been approved as compliance software for the 2016 Energy Standards. The Energy Commission has reviewed and approved both the residential and nonresidential modules of EnergyPro Version 7.0. This version of EnergyPro allows users to evaluate the impacts of the 2016 Energy Standards on projects.

If applying for a permit before January 1, 2017, compliance software approved for the 2013 Energy Standards must be used. All approved software for the 2013 Energy Standards may be viewed at: **http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html**.

For a list of compliance software approved for the 2016 Energy Standards, please visit: **http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html**.

Alternative Path for Complying with Lighting Alteration Requirements

A **staff analysis** that considers allowing aspects of the 2016 nonresidential indoor lighting alteration requirements to be used for compliance with the 2013 Energy Standards is available for review. Public comments may be submitted until 5 p.m. on March 21, 2016.

For more information, please visit: **http://energy.ca.gov/title24/2008standards/special_case_appliance/#16-BSTD-01**.

Lighting Standards to Save Californians More Than $4 Billion in Electricity Costs

The Energy Commission adopted first-in-the-nation appliance standards for the next generation of light bulbs. The standards cover small-diameter directional lamps, often used in track lighting, and general purpose light-emitting diodes (LEDs) used to replace typical existing home lighting.

With these new standards, consumers will save more than $4 billion in aggregate over the first 13 years and conserve enough electricity to power all of the households in Santa Barbara and Ventura counties (about 400,000 average homes). Bulbs that meet the new standards are already available to consumers.

The adopted standards will save consumers money in both electricity and bulb replacement costs. For a $4 investment in the more efficient small-diameter directional lamps, the Energy Commission estimates consumers will save nearly $250 in reduced energy and bulb replacement costs when averaged over 11 years. The lifetime savings for general purpose LEDs range from $4.50 to $12 and will likely grow as purchase prices decline.

Small-diameter directional lamps

Small-diameter directional lamps are often used in track lighting at commercial sites, such as stores and museums. In California, nearly 16 million of these bulbs are in use. The standards cover bulbs with a diameter of 2.25 inches or less and will go into effect January 1, 2018. The standards include:

» A requirement that bulbs have either an efficacy greater than or equal to 80 lumens per watt or a color rendering index + Efficiency score of at least 165 with a minimum efficiency of at least 70 lumens per watt.

» A minimum lifetime of 25,000 hours for each product. LED bulbs are the only products that meet this lifetime standard. The adoption is expected to cause a transition to LEDs from less efficient technologies.

LEDs

The standards for general purpose LEDs include omnidirectional, directional, and decorative bulbs, as well as LEDs designed for retrofitting the covered socket types. LED bulbs consume less energy than other bulbs and have a longer lifespan, making the lifetime energy savings far greater than the incremental cost.

The standards for LEDs include efficiency and quality improvements which take effect January 1, 2018. Additional amendments to strengthen efficiency and limit power in standby mode take effect July 1, 2019. The standards include:

» A requirement for omnidirectional bulbs to produce a light distribution pattern that aligns with requirements adopted by the U.S. EPA ENERGY STAR® program for bulbs.

» A minimum lifetime requirement of 10,000 hours, equivalent to ten years in a typical home.

» Limitations on how distorted a particular color appears under the bulbs.

» A requirement that manufacturers meet minimum performance thresholds before making claims about dimmability or other qualities.

» A limit to the amount of power a connected LED can use in standby mode.

Q&A

Illuminated Areas

Section 140.7(d)1A, discusses calculating the illuminated hardscape area using the luminaire mounting height for outdoor lighting. Regarding the passage below, what does, "ten times the luminaire mounting height" refer to?

"In plan view of the site, determine the illuminated hardscape area, which is defined as any hardscape area that is within a square pattern around each luminaire or pole that is ten times the luminaire mounting height with the luminaire in the middle of the pattern, less any areas that are within a building, beyond the hardscape area, beyond property lines, or obstructed by a structure."

Ten times the luminaire mounting height refers to the sides of the square, centered around the pole of the luminaire.

First, consider the height at which the luminaire is mounted to the pole. In Figure 1, that height is 20 feet.

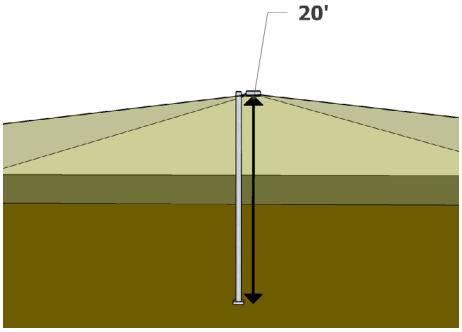

Figure 1 - Luminaire mounted to the pole at 20 feet.

Next, multiply the mounting height by 10, which yields 200 feet. Two hundred feet is "ten times the luminaire mounting height." A square, whose sides are 200 feet, is drawn with the pole in the center (Figure 2). The 200 feet by 200 feet square is the illuminated area.

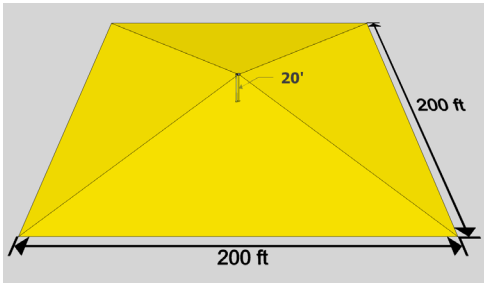

Figure 2 - Illuminated area centered around the luminaire.

Example 6-22 in Chapter 6 of the *2013 Nonresidential Compliance Manual* also explains how to determine the illuminated area.

Are there similar visual examples for determining skylit and sidelit daylit zones?

Skylit Daylit Zones

The skylit daylit zone is the area below the skylight, plus 0.7 times the average ceiling height, see **Section 130.1(d)1A**.

In Figure 3, the average ceiling height is 10 feet. The ceiling height is multiplied by 0.7, giving 7 feet (10 feet x 0.7 = 7 feet). Seven feet is then added to the rough opening of the skylight to give the skylit daylit zone.

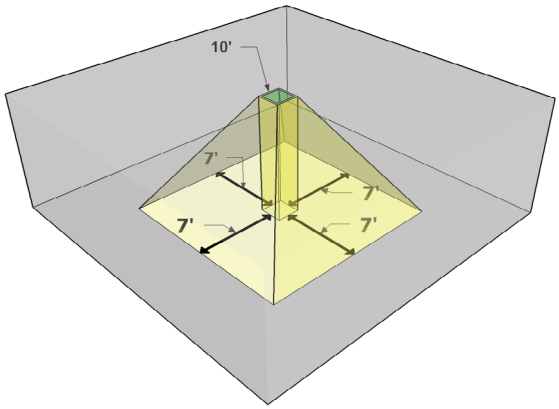

Figure 3 - Skylit daylit zone originates from the skylight and extends an additional 7 feet in this example.

Sidelit Daylit Zones

The sidelit daylit zone is the area directly adjacent to a vertical window, see Sections **130.1(d)1B** and **130.1(d)1C**.

To calculate the area of the sidelit daylit zone, determine the window head height by measuring from the floor to the top of the window frame (Figure 4). Then add 0.5 times the window head height to each side of the window, widthwise, to determine the width of the sidelit daylit zone. The primary sidelit daylit zone is then determined by extending one window head height from the window. The secondary sidelit zone is determined by extending two window head heights from the window.

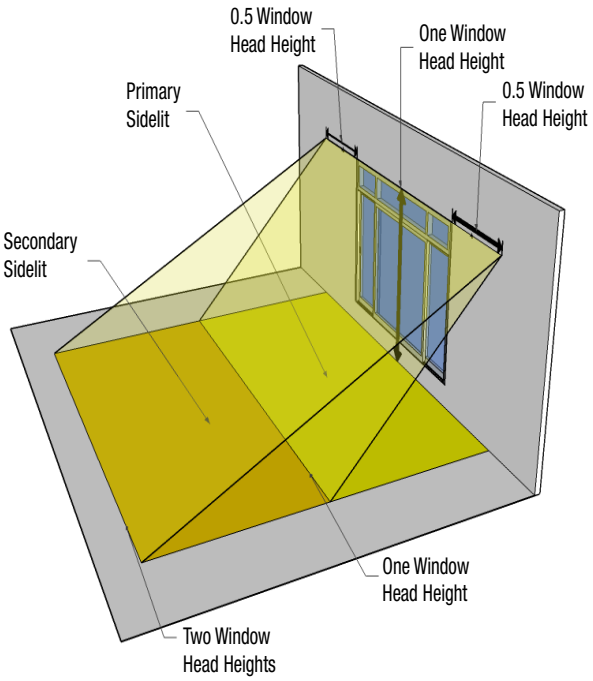

Figure 4 - Primary and secondary sidelit daylit zones.

Track Lighting Alterations

Does moving, replacing, or adding heads to an existing track lighting system trigger lighting alteration requirements?

No. Requirements may be triggered if the existing track is relocated.

If an existing track is relocated, are lighting system alteration requirements triggered?

Lighting system alterations are triggered when 10 percent or more of the existing luminaires in the enclosed space are altered, see **Section 141.0(b)2Iii**, and **TABLE 141.0-E**. For track lighting, each track head is counted as a single luminaire. To determine whether the 10 percent threshold is met, count the number of track heads that will be mounted to the relocated track and divide it by the number of existing luminaires in the space and then multiply by 100.

If a new track is added to the space, are lighting system alteration requirements triggered?

If the lighting power in the enclosed space increases, the enclosed space must meet the applicable requirements of Sections **110.9**, **130.0**, **130.1**, **130.4**, **140.3(c)**, **140.6, and 141.0(b)2Iv**.

Compliance Documents

If someone changes out a wall heater with the same size wall heater, do they need to fill out energy compliance documentation and if so which documents?

Sections **10-103(a)1C** and **10-103(a)3C** of the 2013 Energy Standards explain that enforcement agencies may, at their discretion, choose to not require compliance documents for residential alteration projects that do not require Home Energy Rating System (HERS) verification. A wall furnace replacement alone would not trigger HERS verification (duct leakage or refrigerant charge). It is at the discretion of the enforcement agency to require compliance documents for these projects.

If compliance documents are required for these types of projects, they are available at: **http://www.energy.ca.gov/title24/2013standards/res_compliance_forms/Alterations_and_Additions_Paper_Forms/**.

These all-inclusive compliance documents cover alterations to roofs, heating, ventilation and air conditioning (HVAC) systems, and water heating systems. The applicant completes only sections that are applicable to the project.

Townhouses and Duplexes

Are townhouses and duplexes treated as single family buildings when complying with the solar ready requirements of Section 110.10?

Townhouses and duplexes are classified under occupancy group R-3 in **Section 1.1.3.1.1 of** the *2013 California Residential Code***.** The 2013 Energy Standards define a single family residence as a building that is of occupancy group R-3. Therefore, townhouses and duplexes are treated as single family residences with each unit being treated separately.

Commissioning

I am constructing a mixed occupancy building. The lower story of the building is for commercial/retail use and is 5 percent of the conditioned floor area. The remaining stories are residential and are 95 percent of the conditioned floor area. Since the building is primarily residential, does it need to be commissioned?

Yes. However, the commissioning requirements of **Section 120.8** only apply to the nonresidential portions of the building. **Section 100.0(f)** requires the space for each occupancy to meet the applicable provisions of the Energy Standards for that occupancy.

NOTE: Commissioning applies to mechanically heated or cooled nonresidential portions of newly constructed mixed occupancy buildings, regardless of the percentage of nonresidential space.

Are the commissioning requirements applicable to additions and alterations under the 2016 Energy Standards?

No. The commissioning requirements of the 2016 Energy Standards are not applicable to additions or alterations. Changes to the 2016 Energy Standards clarify the language of **Section 120.8**, and do not alter the scope. Commissioning Q&As from **Blueprint Issue 107** are still applicable to the 2016 Energy Standards.

For More Information

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Computer Compliance Programs:
http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html

The California Energy Commission welcomes your feedback on Blueprint. Please contact Andrea Bailey at:
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February 24 • 8:30 - 4:30	Grass Valley	Brian Selby	goo.gl/umoyjU
March 4 • 8:30 - 4:30	Santa Barbara	Bruce Cheney	sce.com/workshops
March 10 • 8:30 - 4:30	Ventura	Bruce Cheney	sce.com/workshops
March 24 • 8:30 - 4:30	San Bernardino	Bruce Cheney	sce.com/workshops
March 30 • 8:30 - 4:30	Rancho Santa Margarita	Bruce Cheney	sce.com/workshops
May 24 • 8:30 - 4:30	Beverly Hills	Bruce Cheney	sce.com/workshops
June 8 • 8:30 - 4:30	Rancho Cucamonga	Bruce Cheney	sce.com/workshops
June 9 • 8:30 - 4:30	Irvine	Bruce Cheney	sce.com/workshops

2013 Residential Standards for Energy Consultants

March 17 • 8:30 - 4:30	Irwindale	Martyn Dodd	sce.com/workshops
May 19 • 8:30 - 4:30	San Francisco	Gina Rodda	goo.gl/GUKW4v

2013 Residential Standards for AC Quality Installation Contractors

March 2 • 8:30 - 2:30	Stockton	David Wylie	goo.gl/6TKyH0
May 10 • 8:30 • 2:30	Stockton	David Wylie	goo.gl/oXaNOV
June 7 • 8:30 • 2:30	Stockton	David Wylie	goo.gl/E05dT6

2013 Nonresidential Standards for Plans Examiners and Building Inspectors

March 23 • 8:30 - 4:30	Fontana	Bruce Cheney	sce.com/workshops
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May 24 • 8:30 - 4:30	Folsom	Brian Selby	goo.gl/adq9Qt
June 21 • 8:30 - 4:30	Irvine	Bruce Cheney	sce.com/workshops
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2013 Nonresidential Standards for Energy Consultants

March 2 • 8:30 - 4:30	Stockton	Gina Rodda	goo.gl/8w9eNC
April 26 • 8:30 - 4:30	Folsom	Brian Selby	goo.gl/uz3efT
May 18 • 8:30 - 4:30	San Francisco	Gina Rodda	goo.gl/0pLzUq

2013 Nonresidential Standards for Small Commercial AC Quality Installation Contractors

March 3 • 8:30 - 2:30	Stockton	David Wylie	goo.gl/XoTctA
June 8 • 8:30 - 2:30	Stockton	David Wylie	goo.gl/6Ykj8L

2013 Standards & Technology for Residential Lighting

May 25 • 8:30 - 4:30	Stockton	Nicole Graeber	goo.gl/LKAitR

2013 Standards & Technology for Office Lighting

July 27 • 8:30 - 4:30	San Francisco	Nicole Graeber	goo.gl/KRqESb

2013 Standards & Technology for Retail Lighting

July 26 • 8:30 - 4:30	San Francisco	Nicole Graeber	goo.gl/d2jhAP

NEW 2013 Nonresidential Standards Essentials for Architects

March 8 • 8:30 - 4:30	Irwindale	Martyn Dodd	sce.com/workshops
May 24 • 8:30 - 4:30	Irwindale	Martyn Dodd	sce.com/workshops

Title 24: Where We're Headed with the 2016 Standards

March 18 • 8:30 - 12:30	Irvine	Martyn Dodd	sce.com/workshops

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June 21 - 23 • 9:00 - 12:00	Online	
July 26 - 28 • 9:00 - 12:00	Online	
October 25 - 27 • 9:00 - 12:00	Online	
November 15 - 17 • 9:00 - 12:00	Online	
2013 Nonresidential Standards for Energy Consultants		
May 31 - June 2 • 9:00 - 12:00	Online	Brian Selby
August 16 - 18 • 9:00 - 12:00	Online	
September 20 - 22 • 9:00 - 12:00	Online	
2013 Residential Modeling		
April 12 - 14 • 9:00 - 12:00	Online	Brian Selby & Demian Vonder Kuhlen
June 14 - 16 • 9:00 - 12:00	Online	Martyn Dodd & Demian Vonder Kuhlen
July 19 - 21 • 9:00 - 12:00	Online	
October 4 - 6 • 9:00 - 12:00	Online	
2013 Nonresidential Modeling		
March 28 - 30 • 9:00 - 12:00	Online	Martyn Dodd & Demian Vonder Kuhlen
May 3 - 5 • 9:00 - 12:00	Online	
August 9 - 11 • 9:00 - 12:00	Online	
October 18 - 20 • 9:00 - 12:00	Online	

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Webinars			
2013 Title 24: Where We've Landed With the Nonresidential Standards			
March 23 • 9:00 - 11:30	Online	Martyn Dodd	pge.com/energyclasses
2013 Title 24: Where We've Landed With the Residential Standards			
March 23 • 1:00 - 2:30	Online	Martyn Dodd	pge.com/energyclasses
2016 Title 24: Where We're Headed With the Nonresidential Standards			
April 8 • 9:00 - 11:30	Online	Martyn Dodd	pge.com/energyclasses
2016 Title 24: Where We're Headed With the Residential Standards			
April 8 • 1:00 - 2:30	Online	Martyn Dodd	pge.com/energyclasses
Software Training			
Beginning EnergyPro 6 Nonresidential			
March 9 • 8:30 - 12:00	Irwindale	Martyn Dodd	sce.com/workshops
Beginning EnergyPro 6 Residential			
March 9 • 12:30 - 4:00	Irwindale	Martyn Dodd	sce.com/workshops
EnergyPro Software for 2013 Title 24 Nonresidential Compliance - Introduction			
May 10 • 8:30 - 12:00	San Francisco	Martyn Dodd	pge.com/energyclasses
EnergyPro Software for 2013 Title 24 Nonresidential Compliance - Intermediate/Advanced			
May 10 • 1:00 - 4:30	San Francisco	Martyn Dodd	pge.com/energyclasses
EnergyPro Software for 2013 Title 24 Residential Compliance - Introduction			
May 11 • 8:30 - 12:00	San Francisco	Martyn Dodd	pge.com/energyclasses
EnergyPro Software for 2013 Title 24 Residential Compliance - Intermediate/Advanced			
May 11 • 1:00 - 4:30	San Francisco	Martyn Dodd	pge.com/energyclasses
IESVE Software Training for 2013 Title 24 Compliance for Nonresidential Buildings			
May 18 • 9:00 - 5:00	San Francisco	Liam Buckley	pge.com/energyclasses
July 20 • 9:00 - 5:00	San Francisco	Liam Buckley	pge.com/energyclasses
November 1 • 9:00 - 5:00	San Francisco	Liam Buckley	pge.com/energyclasses

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Webinars				
2016 Title 24: Where We're Headed With the Nonresidential Standards				
April 8	9:00 – 11:30	Online	Martyn Dodd	pge.com/energyclasses
2016 Title 24: Where We're Headed With the Residential Standards				
April 8	1:00 – 2:30	Online	Martyn Dodd	pge.com/energyclasses

Ace Resources™

Our Fact Sheets offer "quick reference" summaries of key requirements, forms, definitions and resources for implementing Title 24, Part 6.

- Fact Sheet: What's New: 2016 Residential Code
- Fact Sheet: What's New: 2016 Nonresidential Code

Coming Soon:

More free 2016 training, tools and resources are in the works! Register with www.EnergyCodeAce.com to receive notices when new offerings are available.

This program is funded by California utility customers under the auspices of the California Public Utilities Commission and in support of the California Energy Commission.

Issue 112 | November 2015 – February 2016

BLUEPRINT

California Energy Commission
Efficiency Division

In This Issue

Decertification of Energy Analysis and Comfort Solutions

At the December 9, 2015, Business Meeting, the California Energy Commission (Energy Commission) approved the request of **Energy Analysis and Comfort Solutions, Inc.** (EACS) to be decertified as a Home Energy Rating System (HERS) Provider. With this approval, EACS is no longer a HERS Provider under the 2013 Building Energy Efficiency Standards (Energy Standards).

For a current list of approved HERS Providers, please visit: **http://www.energy.ca.gov/HERS/providers.html**.

New Computer Compliance Program Available

Simergy, offered by Digital Alchemy, Inc., was approved by the Energy Commission as a nonresidential computer compliance program for the 2013 Energy Standards. Simergy Version 2.0, which uses the detailed geometry three dimensional (3D) option of the CBECC-COM application program interface (API), is now available for use.

With this approval, there are now four software programs available to demonstrate performance compliance with the nonresidential requirements of the 2013 Energy Standards.

Technical support resources, expiration dates, and links to download all of the software programs approved for the 2013 Energy Standards are located at: **http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html**.

Filter Grille Area Requirements

When complying with the Alternative to **Section 150.0(m)13B**, the nominal size of the air filter media should be used to calculate the minimum total return filter grille gross area. If the air filter is not located at the filter grille, use the nominal size of the filter grille to determine the area. The calculated area must be equal to or greater than the values in **TABLES 150.0-C or D**.

Additionally, **TABLES 150.0-C and D** also require that:

1. Each return duct must be no longer than 30 feet.
2. Each return duct must not have more than 180 degrees of total bend.
3. If the total bending of a return duct is more than 90 degrees, one bend must be a metal elbow.
4. Return grille devices, which include the air filter and return grille locations, must be labeled in accordance with the requirements of **Section 150.0(m)12A**.
5. The label must state 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, as rated in accordance with AHRI Standard 680 for the design airflow rate for the return grille.

Please note that additional air filtration requirements of **Section 150.0(m)12** may apply.

Clarification of Letter to Building Industry

Procedure for Verifying Outside-Airflow Measurement When Using an Exhaust Fan with an Inlet Device

The following information provides guidance for taking outside airflow measurements when a ventilation system consists of only an exhaust fan and an inlet device. This information applies to the 2013 Energy Standards for nonresidential, high-rise residential, and hotel/motel buildings.

Per **Section 120.1,** outside air ventilation is required for spaces normally used for human occupancy. **Section 120.5(a)1** requires these systems to be tested in accordance with **NA7.5.1** of the Reference Nonresidential Appendices. Specific details for constant volume system outdoor air acceptance testing are provided in **NA7.5.1.2**.

Acceptance tests for outside airflow measurements on this ventilation system should be obtained at the inlet device, where the outside air enters the building space. A measurement at any other location, including the exhaust fan, does not provide accurate outside airflow measurements because infiltration from other areas of the building becomes part of the airflow measurement.

This procedure should be followed by January 1, 2016, for ventilation systems consisting of only an exhaust fan and inlet device. Permit applications submitted before this date may measure airflow at the exhaust fan during acceptance testing.

Updated 2013 Compliance Manuals Now Available

The Energy Commission has updated the 2013 Residential and Nonresidential Compliance Manuals, which provide Energy Standards instructions and reference information. The updates include language clarification, compliance applicability, and reference tables. Errata summary sheets are provided to identify specific updates by chapter and page.

To review or download the updated Compliance Manuals, please visit:

Residential Compliance Manual
http://www.energy.ca.gov/title24/2013standards/residential_manual.html

Nonresidential Compliance Manual
http://www.energy.ca.gov/title24/2013standards/nonresidential_manual.html

2016 Nonresidential Lighting Alteration Provisions Adopted

The nonresidential lighting alteration provisions of the 2016 Energy Standards were adopted November 12, 2015. These provisions allow for several cost effective approaches to lighting upgrades.

Compared to the 2013 nonresidential lighting alteration provisions, the newly adopted provisions are expected to save an additional 112 gigawatt hours of electricity per year. That is equivalent to the annual electricity use in about 16,000 homes.

To view the 2016 Energy Standards, which are effective January 1, 2017, please visit: **http://www.energy.ca.gov/2015publications/CEC-400-2015-037/CEC-400-2015-037-CMF.pdf**.

Tools for the 2016 Energy Standards Now Available

During the November 12, 2015, Business Meeting, several tools were approved that support the implementation of the 2016 Energy Standards. These tools, which are required by **Public Resources Code,** include: compliance manuals; Alternative Calculation Method (ACM) Reference Manuals; compliance software; and the Data Registry Requirements Manual.

Compliance Manuals

The **Residential** and **Nonresidential** Compliance Manuals are guidance documents designed to assist the building industry and enforcement agencies in complying with the Energy Standards. The manuals include helpful explanations of the regulatory language and provide question and answer scenarios, compliance documents, charts, and tables.

ACM Reference Manuals

The **Residential** and **Nonresidential** ACM Reference Manuals document the modeling methods to be used in the 2016 compliance software.

Compliance Software

The 2016 public domain compliance software, **CBECC-RES 2016.1.0** and **CBECC-COM 2016.1.0**, are used to demonstrate performance compliance with the 2016 Energy Standards.

Data Registry Requirements Manual

The **Data Registry Requirements Manual** provides detailed development guidance to data registry providers. Data registries enable users to register standardized compliance documents and data to demonstrate compliance with Title 24, Part 6.

These tools are available on the new 2016 Energy Standards webpage at: **http://www.energy.ca.gov/title24/2016standards/.**

Funding for Workforce Training

The Energy Commission approved grant funding to create a workforce trained in advanced technologies for making new and existing buildings more energy efficient. The California Homebuilding Foundation received nearly $4.5 million for training on the proper installation of high performance walls and attics in new home construction projects.

This funding will help ensure the workforce is ready for the new high performance attic and wall requirements in the 2016 Energy Standards.

Funding came from the Energy Commission's Electric Program Investment Charge (EPIC) Program, which develops, demonstrates, and brings to market technologies and best practices that support California's energy policy goals.

Q&A

Radiant Barriers

I want to reroof the steep-sloped roof at my house, which is in climate zone 12. However, I do not want to install a cool roof, as described in Section 150.2(b)1Hi. Can I install new solid roof decking, that has a radiant barrier laminated to the underside, over existing spaced (skipped) sheathing to meet Exception "e" to Section 150.2(b)1Hi?

No. A radiant barrier cannot be installed directly over skipped sheathing. The effectiveness of a radiant barrier is reduced when not provided with the minimum amount of airspace specified by the manufacturer.

Below are three acceptable methods to install radiant barriers below the roof deck above the rafters:

1. Install 1-inch thick spacers, vertically, the length of rafters, on top of the skipped sheathing. Then install the new solid roof decking with a laminated radiant barrier (Figure 1). There may be structural issues with the added weight to the roof assembly, so confirm with your enforcement agency prior to using this method.

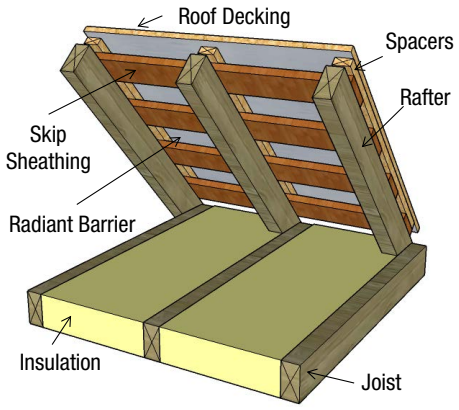

Figure 1 - Solid roof decking with radiant barrier laminated to underside installed over spacers and skipped sheathing.

2. Remove the existing skip sheathing, and install new solid roof decking with a laminated radiant barrier (Figure 2).

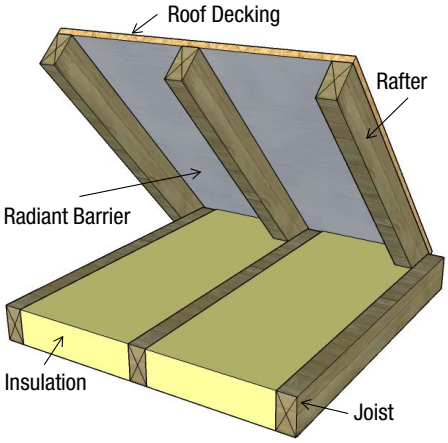

Figure 2 - Skipped sheathing removed, solid roof decking with radiant barrier laminated to the underside installed over rafters.

3. Remove the skipped sheathing, and drape the radiant barrier over the rafters. Then install the roof decking (Figure 3).

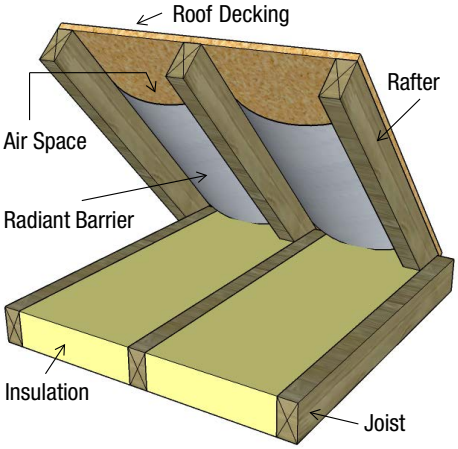

Figure 3 - Skipped sheathing removed, radiant barrier draped over the top of the rafters, solid roof decking installed over the radiant barrier.

I don't want to install a radiant barrier using the previously described methods. Are there other methods that can be used to install a radiant barrier?

Yes. Radiant barriers can also be installed below the roof deck between the rafters, or below the rafters. Below are two additional methods of radiant barrier installation that can be used to meet Exception "e" to **Section 150.2(b)1Hi.**

1. Span the radiant barrier between the rafters, and secure to each side (Figure 4).

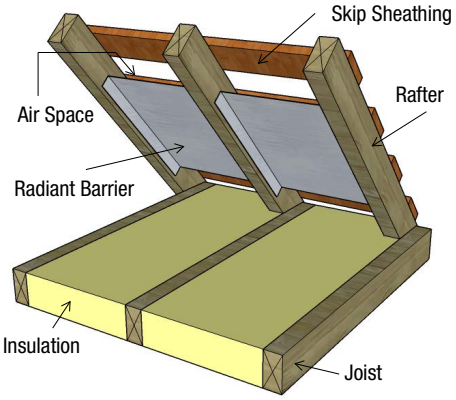

Figure 4 - The radiant barrier spans the rafters, and is attached to each side.

2. Secure the radiant barrier to the bottom surface of the rafter. Maintain a minimum air space of at least 1.5 inches between the top surface of the radiant barrier and the bottom of the roof decking (Figure 5).

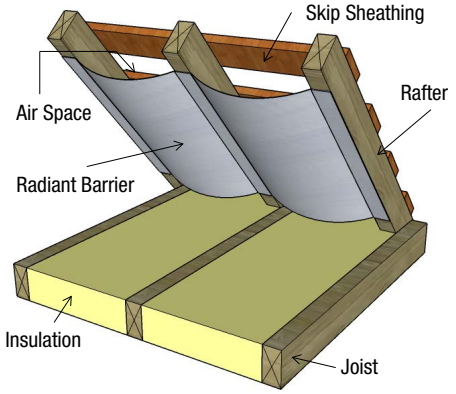

Figure 5 - The radiant barrier is attached to the bottom of the rafters. A minimum of 1.5 inches of airspace is provided.

Are there additional requirements for installing radiant barriers?

Yes. Additional requirements are provided in **Section 110.8(j)** of the Energy Standards, and **RA4.2.1** of the Reference Residential Appendices, which include:

» The radiant barrier must have an emittance of 0.05 or less.

» The radiant barrier must be tested in accordance with American Society of Testing and Materials (ASTM) C1371 or ASTM E408.

» The radiant barrier must be certified to the **Department of Consumer Affairs** as required by Title 24, Part 12, Chapter 12-13, Standards for Insulating Material.

» The radiant barrier must be installed in a permanent manner (e.g. stapled).

» The shiny side of the radiant barrier must face down toward the ceiling or attic floor (building interior).

» The radiant barrier must be installed to cover all gable end walls and other vertical surfaces in the attic.

» The attic must be ventilated according to **RA4.2.1.1**.

Are there other exceptions, besides installing a radiant barrier, to the cool roof requirements of Section 150.2(b)1Hi?

Yes. There are six additional exceptions to the cool roof requirements of **Section 150.2(b)1Hi** for steep-sloped roofs. These exceptions were reviewed in detail in **Blueprint Issue 107**.

Marking of Controlled Receptacles

Section 130.5(d)3 of the 2013 Energy Standards requires controlled receptacles to be permanently marked to differentiate them from uncontrolled receptacles. What are some acceptable methods of marking controlled receptacles?

Below are examples of acceptable methods of marking controlled receptacles.

2014 NEC Article 406.3 and ANSI/NEMA WD6-2012 Wiring Devices - Dimensional Specifications

Controlled receptacles can be marked as described in 2014 National Electric Code Article 406.3 and ANSI/NEMA WD6-2012 Wiring Devices – Dimensional Specifications.

Field markings

It is not advisable to use ink, applied in the field, as a permanent marking. There is no guarantee that the ink will remain as needed.

Ink can be permanently applied under factory conditions, directly to the face of the receptacle.

Labels

Labels can be used as long as they have high wear tolerance and strong adhesive. It is important for installers to apply labels according to manufacturers' instructions.

Different colored receptacles

There are conventions in some building sectors to use certain colors to designate emergency powered receptacle outlets.

The use of markings described previously could be sufficient to distinguish controlled receptacles from uncontrolled receptacles. The Energy Standards do not require the use of different colors to differentiate controlled receptacles from uncontrolled receptacles.

Below Grade Hot Water Pipe Insulation

All-in-one piping systems include pipes, insulation, and sleeves. These systems are certified by manufacturers for below slab installation, and are not considered removable. Can these all-in-one systems be used for below grade domestic hot water piping to meet the requirements of Section 150.0(j)2B?

Yes, as long as the thickness of the insulation meets the requirements of **Section 120.3,** and the casing is water proof and non-crushable.

Section 150.0(j)2B of the 2013 Energy Standards states,

> *"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."*

To add clarity, **Section 150.0(j)2B** of the 2016 Energy Standards was updated to,

> *"all domestic hot water pipes that are buried below grade must be installed in a water proof and non-crushable casing or sleeve."*

Air Conditioning System Changeouts

I'm changing out the air conditioning unit in my home. What are the minimum efficiency requirements for my replacement unit?

The Department of Energy (DOE) has set regional minimum Seasonal Energy Efficiency Ratio (SEER) and Energy Efficiency Ratio (EER) requirements that are effective based on the date a unit is installed. These requirements are applicable to split system and single package central air conditioners installed in California on or after January 1, 2015. If you are installing one of these types of units on or after this date, it must meet both the minimum SEER and EER requirements in the table below.

Please note that these regional standards apply to any unit manufactured on or after January 1, 2015, as well.

Can I install a heat pump with a SEER rating of 13?

Yes, as long as the heat pump was manufactured before January 1, 2015. It's important to note that the DOE's regional date of installation requirement is only applicable to split system and single package central air conditioners. All other heating, ventilation, and air conditioning (HVAC) minimum efficiency requirements are based only on the date of manufacture, not date of installation.

Split System and Single Package Central Air Conditioners

Product Class	Minimum SEER	Minimum EER
Split System with Cooling Capacity < 45,000 Btu/hour	14	12.2
Split System with Cooling Capacity ≥ 45,000 Btu/Hour	14	11.7
Single Package Systems	14	11.0

For the purposes of this clarification, the term "central air conditioner" means a product, other than a package terminal air conditioner, which:

1. Is powered by single phase electric current;
2. Is air-cooled;
3. Is rated below 65,000 Btu per hour; and
4. Is not contained within the same cabinet as a furnace the rated capacity of which is above 225,000 Btu per hour.

For More Information

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Computer Compliance Programs:
http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html

The California Energy Commission welcomes your feedback on Blueprint. Please contact Andrea Bailey at:
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» Suzie Chan
» Tav Commins
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Need Help? Energy Standards Hotline
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Title24@energy.ca.gov

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1516 Ninth St, MS-26
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CALIFORNIA ENERGY COMMISSION

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CEC-400-2015-046

Issue 111 | September – October 2015

BLUEPRINT

California Energy Commission
Efficiency Division

In This Issue

Water and Energy Saving Economizer Approved

During the September 9, 2015, Business Meeting, the California Energy Commission (Energy Commission) **approved** a new compliance option for economizers that save both water and energy. This approval allows pumped refrigerant based economizers to be used as an alternative to water-side economizers for computer rooms (covered process), which are also commonly known as data centers. The benefit of using economizers is that they allow air conditioning systems to provide cool air to a space without operating the mechanical cooling system when outside temperatures are sufficiently cool. This results in energy savings.

Prescriptively, **Sections 140.9(a)1A and B** of the 2013 Building Energy Efficiency Standards (Energy Standards) require that mechanical cooling equipment serving a computer room be equipped with an air-side or water-side economizer. The approval to use pumped refrigerant economizers is an alternative to the use of water-side economizers per Section 140.9(a)1B, and is specific to pumped refrigerant economizers installed in climate zones 1-9, 11-14, and 16. This approval does not affect the use of air-side economizers per **Section 140.9(a)1A**.

Pumped refrigerant economizers bypass the compressor, and pump refrigerant through the evaporator and condenser. The difference in energy consumption between the pump and compressor is where the energy savings occur. In a scenario where a water-side economizer would otherwise be installed, this alternative has the added benefit of conserving California's water.

A pumped refrigerant economizer was **modeled and compared** to a water-side economizer serving a computer room for all 16 climate zones in California. The results showed the pumped refrigerant economizer system used less energy based on the time dependent valuation (TDV) for 14 of the 16 climate zones while using no water. An evaluation of computer room locations in California indicates most computer rooms are located within the 14 climate zones approved for the use of pumped refrigerant economizers. By switching from a water-side economizer to a pumped refrigerant economizer, roughly 4,000,000 gallons of water can be saved each year for a computer room with a load of 1.2 megawatts.

Lighting Acceptance Test Technician Certification Provider Certificates of Acceptance

Enforcement agencies should only see lighting control Certificates of Acceptance (NRCA-LTI-02-A, NRCA-LTI-03-A, NRCA-LTI-04-A, and NRCA-LTO-02-A) that have a logo from one of the following approved Acceptance Test Technician Certification Providers (ATTCPs):

- **California Advanced Lighting Controls Training Program (CALCTP)**
- **National Lighting Contractors Association of America (NLCAA)**

Background

The goal of the ATTCP program is to provide training, certification, and oversight of technicians who perform the acceptance tests

required by the Energy Standards. ATTCPs are professional organizations who are required to provide:

» A training curriculum for technicians and their employers.

» Certification procedures.

» Complaint resolution, including disciplinary procedures.

» Quality assurance.

» Accountability measures.

Acceptance testing ensures that installed equipment, controls, and systems operate as required. ATTCPs monitor acceptance test employers and Acceptance Test Technicians (ATTs) who perform acceptance testing.

CALCTP and NLCAA have prepared Energy Commission approved Certificates of Acceptance (certificates). These certificates bear their respective association's logo, representing their accountability for the work of their certified ATTs. These certificates provide enforcement agencies the data necessary to verify compliance. Certificates submitted to enforcement agencies without the logo of an approved ATTCP may not have been prepared by a certified lighting controls ATT. Enforcement agencies should be suspicious of lighting control certificates that do not have an ATTCP logo. The Energy Commission will continue to provide lighting control Certificates of Acceptance, without ATTCP logos, for reference.

ATTCP Agreements

Lighting controls ATTs are required through technician agreements with thier ATTCP to use their electronic acceptance test system to record testing results and to generate Certificates of Acceptance. The ATTCPs use the electronic acceptance test system to track the completed work of ATTs and their employers for quality assurance purposes.

The Energy Commission considers this a temporary measure until a nonresidential data registry is approved and mandatory registration is required for all nonresidential compliance documents. To date, no application for a nonresidential data registry has been submitted for Energy Commission approval.

If you have any questions, please contact Joe Loyer at: (916) 654-4811 or **Joe.Loyer@energy.ca.gov**.

Nonresidential Computer Compliance Program Updates

EnergyPro

EnergyPro 7.7, using the simplified geometry two-dimensional (2D) option of the CBECC-COM application program interface (API), is approved as an alternative calculation method. This version can be used to demonstrate performance compliance with the nonresidential provisions of the Energy Standards.

EnergyPro 6.6 continues to be valid for demonstrating compliance with the nonresidential provisions of the Energy Standards. All permit applications submitted on or after August 17, 2015, which are modeled using EnergyPro, must use version 6.6 or 6.7.

Integrated Environmental Solutions

Integrated Environmental Solutions (IES) Virtual Environment (VE) 2015 Feature Pack 1, version 2015.1.0 is approved as an alternative calculation method to demonstrate performance compliance with the nonresidential provisions of the Energy Standards. This version uses the detailed geometry three-dimensional (3D) option of the CBECC-COM API.

IES VE 2014 Feature Pack 1, version 2014.1.0 and 2014 Feature Pack 2, version 2014.2.0.0 are expired. These versions may not be used to demonstrate compliance for permit applications submitted on or after on August 17, 2015.

Additional information on approved computer compliance programs can be viewed at: **http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html**.

Energy Standards Presentations

The Energy Commission has created eight Energy Standards presentations, which are now available on the Energy Commission's website at: **http://www.energy.ca.gov/title24/training/**.

The following presentations are available:

» Acceptance Testing

» Cool Roofs

» Envelope Overview

» Nonresidential Alterations Overview

» Nonresidential Compliance Documents

» Nonresidential Indoor Lighting

» Residential Alterations

» Solid Foundation of the Energy Standards

Q&A

Radiant Floor Heating Panels

If I install radiant floor heating panels on top of a slab floor, is the slab subject to the insulation requirements for heated slab floors in Section 110.8(g)?

A heating element installed on top of a slab floor does not meet the definition of a heated slab because the heating element is not embedded into the concrete. While it would be good practice to install rigid insulation between the floor sheathing and concrete to reduce the heat loss, there are no insulation requirements for this system or the slab per the Energy Standards.

Signatures for Residential Compliance Documents

Who signs compliance documents for residential building projects?

The documentation author and responsible person must sign the Certificates of Compliance (CF1R), Installation (CF2R), and Verification (CF3R). Each certificate has two signature blocks. The first is the declaration statement for the documentation author, and the second block is for the responsible person.

Does the California Business and Professions Code (B&P) address responsibility for compliance with the Energy Standards?

No. However, **Division 3** of the B&P and the **Contractor State License Board** (CSLB) restrict who can perform certain kinds of work on any construction-related project, usually requiring an appropriate professional license.

Who is the documentation author?

The documentation author is the person that completes the document. Their signature certifies that the information entered on the document is accurate and complete. There are no licensing or training requirements for a documentation author. The documentation author performs a service under the authority of the person with overall project responsibility. After the documentation author signs the document, it must be reviewed and signed by the responsible person.

Who is the responsible person?

The responsible person is the person who accepts responsibility for complying with the Energy Standards. The responsible person for each compliance document is listed below:

- CF1R: The responsible person, also referred to as the responsible designer, accepts responsibility for the building design.
- CF2R: The responsible person, also referred to as the responsible builder/installer, accepts responsibility for the construction or installation of features, materials, components, or manufactured devices regulated by the Energy Standards or Appliance Efficiency Regulations.
- CF3R: The responsible person, also referred to as the responsible rater or Home Energy Rating System (HERS) rater, accepts responsibility for performing field verification and diagnostic testing services.

Is the responsible designer for the CF1R required to be licensed?

Not always. The **B&P** allows unlicensed professionals to prepare design documentation for wood framed single family and multifamily (four units or less) dwellings that are two stories or less. In these cases, the builder may sign as the responsible person per **Section 2.4.3** of the 2013 Residential Compliance Manual.

For More Information

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Computer Compliance Programs:
http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html

The California Energy Commission welcomes your feedback on Blueprint. Please contact Andrea Bailey at:
Title24@energy.ca.gov

EDITOR

- Andrea Bailey

SPECIAL THANKS

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- Chris Olvera
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CEC-400-2015-031

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Title 24 Part 6 Essentials Training Courses

Currently Scheduled for 2015

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Residential Standards for Plans Examiners and Building Inspectors

DATE • TIME	LOCATION	INSTRUCTOR	REGISTRATION LINK
September 21 • 1:00 - 5:00 (pA)	San Luis Obispo	Brian Selby	goo.gl/25hUIN
September 22 • 8:30 - 12:30 (pB)	San Luis Obispo	Brian Selby	goo.gl/25hUIN
September 23 • 8:30 - 4:30	San Jose	Marina Chavez	goo.gl/N8cNex
October 15 • 8:30 - 4:30	San Bernadino	Bruce Cheney	sce.com/workshops
October 20 • 8:30 - 4:30	San Francisco	Marina Chavez	goo.gl/doPWKo
October 28 • 8:30 - 4:30	Folsom	Brian Selby	goo.gl/hUwpsV

Residential Standards for Energy Consultants

October 14 • 8:30 - 4:30	Irwindale	Martyn Dodd	sce.com/workshops

Residential Standards for AC Quality Installation Contractors

November 19 • 8:30 - 3:00	Irwindale	David Wylie	sce.com/workshops

Nonresidential Standards for Plans Examiners and Building Inspectors

October 1 • 8:30 - 4:30	Mammoth Lakes	Bruce Cheney	sce.com/workshops
October 19 • 1:00 - 5:00 (pA)	San Luis Obispo	Brian Selby	goo.gl/hxpG2p
October 20 • 8:30 - 12:30 (pB)	San Luis Obispo	Brian Selby	goo.gl/hxpG2p
October 29 • 8:30 - 4:30	Folsom	Brian Selby	goo.gl/a1StxW

Nonresidential Standards for Energy Consultants

October 29 • 8:30 - 2:30	Downey	Martyn Dodd	seminars.socalgas.com
November 19 • 8:30 - 4:30	Irwindale	Martyn Dodd	sce.com/workshops

Standards & Technology for Residential Lighting

October 8 • 8:30 - 3:30	Irwindale	Kelly Cunningham	sce.com/workshops
December 2 • 8:30 - 3:30	Irwindale	Kelly Cunningham	sce.com/workshops

Standards & Technology for Office Lighting

September 17 • 8:30 - 4:30	San Ramon	Kelly Cunningham	goo.gl/H5MlJv
October 7 • 8:30 - 3:30	Irwindale	Kelly Cunningham	sce.com/workshops
November 10 • 8:30 - 4:30	Folsom	Kelly Cunningham	goo.gl/xpZlbP
December 3 • 8:30 - 3:30	Irwindale	Kelly Cunningham	sce.com/workshops

Standards & Technology for Retail Lighting

October 21 • 8:30 - 4:30	San Francisco	Kelly Cunningham	goo.gl/CbEnR8

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- Residential Standards for AC Quality Installation Contractors
- Residential Standards for Indoor Lighting
- Residential Standards for Ventilation
- Residential Energy Efficiency Concepts
- Nonresidential Standards for Indoor Lighting Mandatory Measures
- Nonresidential Standards for Indoor Lighting Prescriptive Compliance
- Nonresidential Energy Efficiency Concepts

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Residential Standards for Energy Consultants

October 6 - 8 • 9:00 - 12:00	Online	TBD	Coming Soon

Nonresidential Standards for Energy Consultants

September 8 -10 • 9:00 - 12:00	Online	Brian Selby	bit.ly/1EiKjLs
December 15 - 17 • 9:00 - 12:00	Online	TBD	Coming Soon

Residential Modeling

November 10 - 12 • 9:00 - 12:00	Online	TBD	Coming Soon
December 8 - 10 • 9:00 - 12:00	Online	TBD	Coming Soon

Ace Training Decoding Talks™

Facilitated online discussion forums for building department personnel and other industry professionals.

Decoding CBECC-Com: Let's Talk IES and Nonresidential 3D Modeling, Part 2

October 6 • 9 :00 - 11:00 and 2:00– 4:00
October 7 • 9 :00 - 11:00 and 2:00– 4:00

Led by Gina Rodda with
Special Guest Liam Buckley of IES

Software Training

DATE • TIME	LOCATION	INSTRUCTOR	REGISTRATION LINK
Advanced EnergyPro 6.4 - Nonresidential			
September 17 • 8:30 - 12:00	Irwindale	Martyn Dodd	sce.com/workshops
November 4 • 8:30 - 12:00	Irwindale	Martyn Dodd	sce.com/workshops
Advanced EnergyPro 6.4 - Residential			
September 17 • 12:30 - 4:00	Irwindale	Martyn Dodd	sce.com/workshops
November 4 • 12:30 - 4:00	Irwindale	Martyn Dodd	sce.com/workshops
Beginning EnergyPro 6.4 - Nonresidential			
October 15 • 8:30 - 12:00	Irwindale	Martyn Dodd	sce.com/workshops
Beginning EnergyPro 6.4 - Residential			
October 15 • 12:30 - 4:00	Irwindale	Martyn Dodd	sce.com/workshops
CBECC-Com 2013 Title 24 Nonresidential Compliance Software Training - Detailed Geometry and Advanced Topics			
September 17 • 8:30 - 4:00	Irwindale	TBD	sce.com/workshops
October 8 • 8:30 - 4:00	Irwindale	TBD	sce.com/workshops
November 5 • 8:30 - 4:00	Irwindale	TBD	sce.com/workshops
CBECC-Com 2013 Title 24 Nonresidential Compliance Software Training - Introduction and Simplified Geometry			
September 16 • 8:30 - 4:00	Irwindale	TBD	sce.com/workshops
October 7 • 8:30 - 4:00	Irwindale	TBD	sce.com/workshops
November 4 • 8:30 - 4:00	Irwindale	TBD	sce.com/workshops
EnergyPro - Advanced			
October 28 • 1:00 - 4:30	Downey	Martyn Dodd	seminars.socalgas.com
EnergyPro - Envelope & Windows			
October 27 • 8:30 - 12:00	Downey	Martyn Dodd	seminars.socalgas.com
EnergyPro - Indoor & Outdoor Light			
October 27 • 1:00 - 4:30	Downey	Martyn Dodd	seminars.socalgas.com
EnergyPro - Mechanical			
October 28 • 8:30 - 12:00	Downey	Martyn Dodd	seminars.socalgas.com

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Issue 110 | July – August 2015

BLUEPRINT

California Energy Commission
Efficiency Division

In This Issue

2016 Energy Standards Approved

The California Energy Commission (Energy Commission) unanimously approved the 2016 Building Energy Efficiency Standards (Energy Standards), except the nonresidential lighting alterations language, at the June 10, 2015 Business Meeting. The 2016 Energy Standards will reduce energy costs, save consumers money, and increase comfort in new and upgraded homes and other buildings.

Single family homes built with the Energy Commission's 2016 Energy Standards will use about 28 percent less energy for lighting, heating, cooling, ventilation, and water heating than those built to the 2013 Energy Standards.

The 2016 Energy Standards, which take effect on January 1, 2017, focus on three key areas: updating residential requirements to move closer to California's zero net energy goals; updating nonresidential and high-rise residential requirements; and improving the clarity and consistency of existing regulations. Based on a 30-year mortgage, the Energy Commission estimates the 2016 Energy Standards will add about $11 per month for the average home, but will save consumers $31 on monthly heating, cooling, and lighting bills.

In addition to simplifying the language, other major improvements include:

Residential

- High performance attics: extra insulation at the roof deck in addition to ceiling insulation will reduce the attic temperature by 35 degrees or more on hot summer days.
- High performance walls: builders can choose from different wall assemblies to reduce heating and cooling needs in the home year round.
- Lighting: installation of high quality lighting with controls that nearly halve the energy required for lights in new homes.
- Water heating: installation of tankless water heaters that reduce energy use by about 35 percent.

Nonresidential

- Envelope: revision of envelope requirements for all nonresidential and high-rise residential buildings.
- Lighting: update power for lights to align with the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) standards. This allows for the installation of newer, more efficient luminaires which are widely available and commonly used for outdoor lighting applications.
- Elevators: require controls to shut off lights and fans when an elevator is empty. Installation of these controls enables communication with building energy management systems, allowing managers to tailor the building's energy demands and prevent waste.
- Escalators and moving walkways: require controls on escalators and moving walkways in transit areas to run at a lower, less energy-consuming speed when not in use.
- Windows and doors: require interlock controls that turn off cooling and heating systems if a door or window is left open for more than five minutes. This allows occupants to take advantage of outside temperatures and save on heating and cooling costs.

For more information about the 2016 Energy Standards, view the **frequently asked questions** and **infographic**.

Please note that Sections 141.0(b)2I, J, K, and L, related to nonresidential lighting alterations, were not adopted at the June 10, 2015 Business Meeting. Adoption of these sec-

tions is scheduled for consideration at the August 12, 2015 Business Meeting. For additional information on the adoption of these sections, please visit: **http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/#15day**.

Alpha Versions of CBECC 2016 Now Available

Alpha versions of both **CBECC-Res 2016** and **CBECC-Com 2016** are now available for download from their respective project websites. These versions incorporate the 2016 Energy Standards that were adopted at the June 10, 2015 Business Meeting.

These versions were released for research purposes only and allow interested parties to review the implementation of the 2016 Alternative Calculation Method (ACM) Residential and Nonresidential Reference Manuals for newly constructed buildings only. These alpha versions may not be used for compliance, and do not include analysis for existing, addition, or altered components.

CBECC-Res 2016

CBECC-Res 2016 includes the following features:

» 2016 time dependent value (TDV) energy use adjustment factors

» 2016 energy efficiency measures (opaque surfaces; windows; heating, ventilation, and air conditioning (HVAC) systems; and domestic hot water equipment)

» 2016 photovoltaic (PV) credit

If you need general help with the alpha version of CBECC-Res, please check the CBECC-Res **FAQ**, **Quick Start Guide** and **User Manual**. The Quick Start Guide and User Manual can also be accessed by clicking on the program's Help menu.

For technical assistance with the software, please email CBECC-Res support at: **cbecc.res@gmail.com**.

CBECC-Com

CBECC-Com 2016 includes the following features:

» 2016 time dependent value (TDV) energy use adjustment factors

» 2016 opaque envelope U-factor requirements

» 2016 lighting power densities to the space function data table

» 2016 changes to HVAC equipment design efficiency

» Changed baseline for non-recirculating residential water heating systems to instantaneous gas water heaters

» Correction of metal building roof U-factor based on changes to Reference Joint Appendix 4

For general help with the alpha version of CBECC-Com, please check the CBECC-Com **FAQ**. The Quick Start Guide and User Manual can be accessed by clicking on the program's Help menu.

For technical assistance with the software, please email CBECC-Com support at: **cbecc.com@gmail.com**.

CBECC-Com Version 3c

CBECC-Com Version 3c, with more than 40 updates, is now available for download. CBECC-Com is the public domain modeling software used by architects, building designers, energy consultants, and engineers to demonstrate performance compliance with the nonresidential requirements of the 2013 Energy Standards. In response to feedback from the building industry, Version 3c offers increased functionality. Some of the most important changes include:

» Updates to the minimum equipment efficiencies used to calculate the standard budget for certain A/C and heat pumps.

» New HVAC systems allow the fan to be cycled based on space temperature for high rise residential buildings with naturally ventilated spaces.

» Water heating calculations in high-rise residential designs allow for one system for each dwelling unit.

» Removed the mandatory U-factor check for existing assemblies.

» Revised PRF-01 report signature block to improve usability.

Options For Demonstrating Compliance

All permit applications submitted on or after August 17, 2015, which are modeled using CBECC-Com, must use Version 3b or Version 3c. Versions 3 and 3a of CBECC-Com will expire and may not be used for permit applications submitted on or after August 17, 2015.

Additional information regarding approved computer compliance programs can be viewed at: **http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html**.

Water Heater Energy Factor Reference Guide

The Energy Commission has developed a Minimum Water Heater Energy Factor Reference Guide. This guide serves as a tool to help quickly identify the minimum energy factor (EF) required for water heaters. This guide also includes the minimum EFs and other important information regarding the installation of heat pump water heaters for residential prescriptive alterations. The Minimum Water Heater Energy Factor Reference Guide is available at: **http://www.energy.ca.gov/title24/2013standards/documents/water_heater_efficiency_guide.pdf**.

CALCTP Lighting Controls Certificates of Acceptance

On June 10, 2015, the executive director of the Energy Commission approved the use of four third-party Certificates of Acceptance: NRCA-LTI-02-A; NRCA-LTI-03-A; NRCA-LTI-04-A; and NRCA-LTO-02-A. These Certificates of Acceptance were developed by the California Advance Lighting Controls Training Program (CALCTP), a Commission-approved Lighting Controls Acceptance Test Technician Certification Provider (ATTCP).

All enforcement agencies with the authority to issue building permits may accept these Certificates of Acceptance to verify compliance with the lighting control acceptance testing requirements of **Section 130.4** of the Energy Standards.

For more information on the ATTCP program, please visit the Energy Commission's website at: **http://energy.ca.gov/title24/attcp/**.

Q&A

Natural Ventilation

If a high-rise residential building has a space that is too large to comply with the natural ventilation outdoor air requirements, can the naturally ventilated area be deducted from the total area of the space, and the remaining space ventilation outdoor air requirements be fulfilled using mechanical ventilation?

It depends. Please see the two examples below.

Example 1: Given a 30'x30' high-rise residential dwelling space (Figure 1), if an operable wall opening to the outdoors (window) is used to comply with natural ventilation's 25' requirement, can the remaining space's outdoor air ventilation compliance requirement be fulfilled by mechanically ventilating the remaining 5'x30' space?

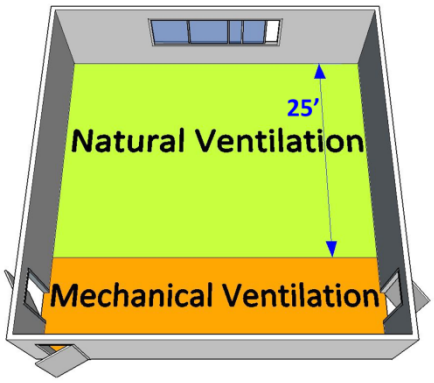

Figure 1 - 30'x30' space, no dividing wall

No. In this case, mechanical ventilation is required for the entire 30'x30' space.

Example 2: Continuing from the previous example, if the total space contains a room that can be closed off from the remainder of the space and there is a wall located at a maximum of 25' from the window, (Figure 2) can the remaining space be mechanically ventilated?

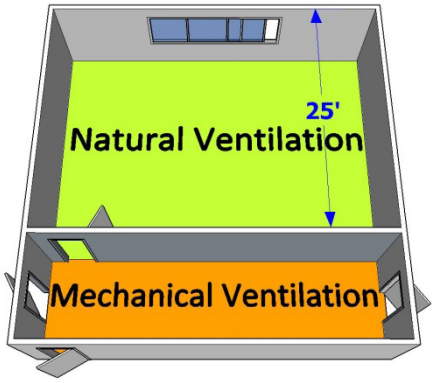

Figure 2 - 30'x30' space, with dividing wall

Yes. Two spaces exist, so two ventilation methods are not being used to ventilate the same space. One enclosed space is within the natural ventilation 25' compliance requirement for outdoor air. In the other space, mechanical ventilation can be used to fulfill the outdoor air compliance requirements.

Bypass Ducts

I am designing a zonally controlled central forced air system. Can the system include bypass ducts?

Yes. However, the performance compliance approach must be used to comply with **Section 150.1(c)13**.

When using performance compliance software, if I report that bypass ducts are used in a zonally controlled central forced air system, is there a compliance budget penalty?

Systems that use bypass ducts usually cannot meet the 350 cfm/ton requirement at the return grille in all zonal control modes, thus for single speed outdoor condensing unit systems, the compliance software makes available input values for system airflow rates of 150 cfm/ton or greater. When less than 350 cfm/ton is modeled, there is a compliance budget penalty applied that increases as the modeled airflow rate value decreases. There is no compliance budget penalty applied for a system that models at least 350 cfm/ton in all zonal control modes.

Heat Pump Water Heating Systems

I want to replace the storage gas water heater at my residence with a heat pump water heating system. Can I do this without having to use the performance compliance approach?

Yes. Heat pump water heating systems can be installed prescriptively for residential single dwelling unit alterations. Per **Section 150.2(b)1Giv**, the Energy Commission used the performance compliance approach to determine the minimum EF needed to be able to prescriptively replace an existing water heater with a heat pump water heating system. Because the performance compliance approach was used, the EF is climate zone dependent. Heat pump water heating systems that meet the minimum required EFs can replace an existing water heater regardless of the original fuel type (natural gas, liquefied petroleum gas, or electric).

Please view the **Minimum Water Heater Energy Factor Reference Guide** to determine the minimum EF needed for each climate zone.

For More Information

Acceptance Test Technician Certification Provider Program:
http://www.energy.ca.gov/title24/attcp/

Approved Computer Compliance Programs:
http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html

Home Energy Rating System:
http://www.energy.ca.gov/HERS/

The California Energy Commission welcomes your feedback on Blueprint. Please contact Andrea Bailey at: Title24@energy.ca.gov.

SPECIAL THANKS

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CEC-400-2015-023

CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY DIVISION

Issue 109 May - June 2015

In This Issue

CBECC-Res 2013 Version 4

At the May 13, 2015 California Energy Commission (Energy Commission) Business Meeting, CBECC-Res 2013 Version 4, was approved to be used to demonstrate performance compliance with the residential provisions of the 2013 Building Energy Efficiency Standards (Energy Standards).

New features include:

- Improved compliance processing speed;
- Dedicated boilers for hydronic space heating;
- Refrigerant charge test for ductless (mini-split) heat pumps;
- Notes for documentation and notes to be printed on the CF1R;
- Insulated roof tile systems modeling; and
- Ducts located in specific types of attics.

Version 4 also corrects several software bugs and reporting errors primarily relating to:

- Additions and alterations modeling and HERS reporting issues;
- HERS reporting errors for mini-splits and for ductwork under certain conditions; and
- Water heating assumptions for ground source heat pumps.

All permit applications submitted on or after August 1, 2015, which use CBECC-Res to demonstrate compliance, must use CBECC-Res 2013 Version 4.

For additional information on approved computer compliance programs, please visit: http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html.

New HVAC Ambassador Program

The Contractors State License Board (CSLB) has recently launched a new initiative focused on heating ventilation and air conditioning (HVAC) system installations across the state. The HVAC Ambassador Program offers and promotes information on the proper steps for installation of an HVAC system for C-20 contractors. The program is also useful for consumers interested in knowing more about obtaining competitive contractor bids and any required work permits for their HVAC project. Licensed contractors can educate consumers, with forms supported by the CSLB, about the advantages and risks of having permitted versus unpermitted work done. The HVAC Ambassador Program webpage contains sample letters and checklists that protect

both contractors and consumers.

To review or download the HVAC Ambassador Program packet, please visit: http://www.cslb.ca.gov/Contractors/HVAC Ambassador Program.aspx.

The Energy Commission also offers free resources regarding HVAC changeout work. Interested parties can print and distribute information that promotes code compliance and proper installation of HVAC systems at: http://www.energy.ca.gov/title24/2013standards/changeout/.

NLCAA Lighting Controls Certificates of Acceptance

On February 25, 2015, the Energy Commission authorized Rob Oglesby, the Executive Director of the Energy Commission, to approve, under Section 10-103(a)4A of the Energy Standards, alternative Certificate of Acceptance compliance documentation developed by Commission-approved Acceptance Test Technician Certification Providers (ATTCP), that conform to the format, informational order, and content of Certificates of Acceptance previously approved by the Energy Commission.

On March 11, 2015, the Executive Director of the Energy Commission, approved the use of four third-party Certificate of Acceptance compliance documents; NRCA-LTI-02, NRCA-LTI-03, NRCA-LTI-04 and NRCA-LTO-02, developed by the National Lighting Contractors Association of America (NLCAA), a Commission-approved Lighting Controls ATTCP.

All agencies with the authority to issue building permits may accept NLCAA's third-party Certificates of Acceptance NRCA-LTI-02, NRCA-LTI-03, NRCA-LTI-04, and NRCA-LTO-02 to certify compliance with the lighting controls acceptance testing requirements of Section 130.4 of the Energy Standards.

For more information on the ATTCP program, please visit the Energy Commission's website at: http://energy.ca.gov/title24/attcp/.

Improved Mechanical Compliance Document

The ventilation worksheet for compliance document NRCC-MCH-03-E has been updated to calculate the required ventilation airflow when demand controlled ventilation (DCV) and carbon dioxide (CO_2) sensors are used. This updated document is available on the Energy Commission's website at: http://www.energy.ca.gov/title24/2013standards/.

The calculation complies with Section 120.1(b)2 of the 2013 Energy Standards. For more information about the ventilation requirements for nonresidential, high-rise residential, and hotel/motel buildings, please see Section 4.3 of the 2013 Nonresidential Compliance Manual.

Q&A

Performance Compliance Approach

For nonresidential alterations utilizing the performance compliance approach, Section 141.0(b)3B states,

> ***"When the third party verification option is specified, all components proposed for alteration must be verified."***

Does this mean that all altered components must undergo third party verification?

Section 141.0(b)3B refers to the two options presented in TABLE 141.0-D, allowing for a different standard design when third party verification of existing conditions is performed. The intent of this sentence is to state that all altered components for which compliance credit is being taken are subject to third party verification; the third party verification requirement does not apply to those altered components for which compliance credit is not being taken.

It is important to note that the third party verification option for nonresidential alterations has not been implemented or enforced for the 2013 Energy Standards. Existing conditions can be used for the standard design without third party verification at this time.

Can I use the performance compliance approach for a residential alteration project that alters just one component (for example, a single window replacement)?

No. The performance compliance approach is to be used only for projects that include tradeoffs (see Section 150.2(b)2). Trading off components is the practice of installing a component that is more efficient than the standard design to make up for a component that is less efficient than the standard design. At least two components must be altered to be eligible for a tradeoff. Components being traded off may consist of two or more of the same type of component, such as windows; or two or more different types of components, such as windows and insulation (see TABLE 150.2-B).

Information regarding performance compliance approach calculations can be found in the 2013 Residential Alternative Calculation Method Reference Manual.

Lighting Controls

Can tuning be used to satisfy the multi-level lighting control requirements for a luminaire modification-in-place?

Tuning alone cannot satisfy the multi-level lighting control requirements in TABLE 141.0-F for a luminaire modification-in-place when using dimmable luminaires. The modified luminaires need to have a two level lighting control or a dimming control which allows the occupant to dim the lighting through the controls steps listed in TABLE 130.1-A.

A two level lighting control can be used if the lighting power is less than or equal to 85 percent of allowed lighting power per Section 140.6. The two level lighting control must have a control step between 30 and 70 percent of the design lighting power. Tuning does not provide a lighting control step; it provides a preset/pre-adjusted light level with no ability for the occupant to control the lighting level.

The multi-level lighting control requirements in Section 130.1(b) must be met if the lighting power is greater than 85 percent of allowed lighting power per Section 140.6. Section 130.1(b) requires indoor lighting to have control steps in accordance with TABLE 130.1-A. This means that lighting should have a control to allow the dimming ranges or control steps listed in TABLE 130.1-A. Using dimmable luminaires without having the control to dim through the ranges would not satisfy this requirement. Tuning does not provide the ability to control the lighting through the control steps of TABLE 130.1-A.

For a newly constructed parking structure over 10,000 ft², are demand responsive controls required if only 500 ft² of the space within the parking structure (for example the elevator lobby) has a lighting power density of 0.5 W/ft² or greater?

Spaces with a lighting power density of less than 0.5 W/ft² do not count towards the 10,000 ft² threshold for triggering demand responsive control requirements. Since there is only 500 ft² of space with lighting power density of 0.5 W/ft² or greater, demand responsive controls are not required (see Section 130.1(e)).

Commissioning

I am constructing a mixed occupancy building. The lower two stories of the building are for commercial/retail use and account for 25 percent of the conditioned floor area of the building. The remaining stories account for 75 percent of the conditioned floor area and are residential. Since the building is primarily residential, do I still need to have the building commissioned?

Yes. However, the commissioning requirements of Section 120.8 only apply to the nonresidential portions of the building. Section 100.0(f) requires the space for each occupancy to meet the applicable provisions of the Energy Standards for that occupancy.

I am constructing a mixed occupancy building which has both residential and nonresidential spaces. The water heating system serves both the residential and nonresidential spaces of the building. Do I need to include the water heating system in the building commissioning?

Yes. Since the water heating system is serving both residential and nonresidential spaces, the water heating system must be included in building commissioning as required by Section 120.8.

Is commissioning required for nonresidential buildings which have less than 10,000 ft² of conditioned space?

Yes. However, for buildings less than 10,000 ft² only the design review (Section 120.8(d)) and commissioning measures shown in the construction documents (Section 120.(e)) need to be completed.

Water Heating Requirements

I am installing a storage gas water heater at my residence. The water heater meets the new 2015 National Appliance Energy Conservation Act (NAECA) Standards. Am I required to wrap the water heater with R-12 insulation per the requirements of Section 150.0(j)1A?

If the storage gas water heater meets the new 2015 NAECA Standards, it has an internal insulation of R-16, and therefore the water heater does not need to be wrapped with R-12 insulation.

The California Energy Commission welcomes your feedback on *Blueprint*. Please contact Andrea Bailey at Title24@energy.ca.gov.

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CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY DIVISION

Issue 108 March - April 2015

In This Issue

California Lighting Technology Center Lighting Guides

The California Lighting Technology Center (CLTC) has published guides to help navigate the lighting requirements in the 2013 Building Energy Efficiency Standards (Energy Standards). The guides focus on specific lighting applications and provide useful information on lighting concepts and principles, technology overview, best practices, compliance requirements, and examples of real world lighting applications. The goal of these guides is to assist builders and lighting industry professionals in meeting and exceeding the 2013 Energy Standards.

The CLTC has published the following guides:

- High Efficacy Residential Lighting Guide
- Office Lighting Guide
- Outdoor Lighting Guide
- Residential Lighting Guide
- Retail Lighting Guide

The lighting guides are available on the CLTC's webpage at: http://cltc.ucdavis.edu/publication-type/guides.

The guides are sponsored by Pacific Gas and Electric Company (PG&E) and were developed in collaboration with the California Energy Commission (Energy Commission). These guides are supplements to Chapter 6 of the 2013 Residential Compliance Manual and Chapters 5, 6 and 7 of the 2013 Nonresidential Compliance Manual. Additionally, these guides complement lighting courses developed through the CLTC and are sponsored by PG&E's Energy Education program.

For more information, please visit: http://cltc.ucdavis.edu/.

New Mechanical Acceptance Test Technician Certification Provider

On March 11, 2015, the Energy Commission approved the National Energy Management Institute Committee (NEMIC) as a Nonresidential Mechanical Acceptance Test Technician Certification Provider (ATTCP).

This means that NEMIC has the authority to train, certify, and oversee Acceptance Test Technicians (ATTs) and their employers. NEMIC will train and certify ATTs to perform all 18 mechanical acceptance tests required in the 2013 Energy Standards.

For more information on the ATTCP program, please visit the Energy Commission's website at: http://energy.ca.gov/title24/attcp/.

New HERS Provider for Residential Alterations

Energy Analysis & Comfort Solutions, Inc. (EACS) was approved as a Home Energy Rating System (HERS) Provider, under the 2013 Energy Standards at the February 25, 2015, Energy Commission Business Meeting.

EACS is authorized to train and certify HERS Raters for field verification and diagnostic testing for alterations to residential buildings.

EACS may be reached at:

Telephone: (844) 411-3227

E-mail: info@eacsinc.com

Website: www.eacsinc.com

For a complete list of approved HERS Providers, please visit: http://www.energy.ca.gov/HERS/providers.html.

Q&A

Luminaire Certification Requirements

Do LED luminaires need to be certified to the Energy Commission?

For nonresidential lighting applications, nonresidential LED luminaires (as described in Section 110.9(e)) are not required to be certified to the Energy Commission.

For residential lighting applications (including areas listed in Section 130.0(b)), residential LED luminaires or LED light engines must be certified to the Energy Commission per Section 110.9(e) to qualify as high efficacy lighting. Section 150.0(k) does have requirements for the installation of high efficacy luminaires for residential construction. Please see TABLE 150.0-A for classification of high efficacy and low efficacy light sources.

A list of certified high efficacy LEDs can be viewed in the Title 20 Appliance Efficiency Database by selecting the "Lighting Products" category, and selecting "High Efficacy LEDs for Title 24" as the type.

Are luminaires with integrated controls required to be certified to the Energy Commission?

For nonresidential lighting applications, luminaires are not required to be certified to the Energy Commission. However, there are certification requirements for lighting controls.

Self-contained lighting controls must be certified to the Energy Commission per Section 110.9(a)3 of the Energy Standards. This includes self-contained lighting controls integrated into the luminaire or fixture. The luminaire or fixture itself does not need to be certified. A listing of certified self-contained lighting controls can be viewed in the Appliance Efficiency Database.

A self-contained lighting control is defined in Section 100.1 as:

> *"A unitary lighting control module that requires no additional components to be a fully functional lighting control."*

Lighting control systems do not need to be listed in the Appliance Efficiency Database.

Lighting control systems are defined in Section 100.1 as requiring:

> *"Two or more components to be installed in the building to provide all of the functionality required to make up a fully functional and compliant lighting control. "*

For example, a lighting control system may consist of a group of luminaires with a factory-integrated control that must be programmed in the field to be a fully functional and complaint lighting control.

For more information on certification requirements for lighting controls, see Fact Sheet - Certification and Verification of Lighting Controls.

Exempt Processes

If a process does not meet the definition of a covered process, as defined in Section 100.1, do the mandatory and prescriptive requirements for covered processes need to be met?

No, if a process does not meet the definition of a covered process, it is considered to be an exempt process. Exempt processes do not need to meet the mandatory requirements of Section 120.6 or the prescriptive requirements of Section 140.9.

If a process is listed in the definition of a covered process, but the process itself does not meet its own definition, is the process considered an exempt process?

Yes, the process is considered an exempt process. An exempt process is not required to comply with the mandatory requirements of Section 120.6 or the prescriptive requirements of Section 140.9.

For example, consider a computer room which has a design equipment power density of 15 watts per square foot of conditioned floor area. A computer room is listed in the definition of a covered process. However, the definition of a computer room in Section 100.1 is:

> *"A room whose primary function is to house electronic equipment and that has design equipment power density exceeding 20 watts/ft² (215 watts/m²) of conditioned floor area."*

Because the computer room in this example does not meet the definition of a computer room, it is an exempt process.

Do exempt processes that have space conditioning systems, which include an airside economizer, need to meet the multispeed fan control requirements in Section 140.4(m)3?

Not necessarily. Multispeed fan control is required for airside economizers that are designed to meet the requirements of Section 140.4(e)1. If the economizer does not meet the design requirements of Section 140.4(e)1, because it meets one of the exceptions, then it does not need to meet the multispeed requirements of Section 140.4(m)3. Possible exceptions include: the exempt process has special humidity requirements; or special outside air filtration and treatment for the reduction and treatment of unusual outdoor contaminants makes compliance infeasible (see Section 140.4(e)1).

I am installing a fan powered high-efficiency particulate air (HEPA) filtration module in a clean room. The HEPA filtration module is not part of the space conditioning system. Must an electronically commutated (EC) motor be used to comply with Section 140.4(c)4?

No, because the fan powered HEPA filtration module is not part of the fan system used for space conditioning, compliance with Section 140.4(c)4 is not required.

Acceptance Testing

If a building is less than 10,000 square feet, do I need to have acceptance testing conducted?

Yes, all nonresidential, high-rise residential, and hotel/motel projects, where applicable lighting controls or mechanical systems are installed, must undergo acceptance testing. This applies to new construction, additions and alterations (see Sections 120.5, 130.4 and 141.0).

Air Flow and Fan Efficacy for New Duct Systems

I have installed all new ducts for my air conditioning system. The system has passed the minimum airflow requirement of 350 cubic feet per minute (CFM) per ton of nominal cooling capacity through the return grilles. However, it exceeds the air handling unit fan efficacy maximum of 0.58 watts per CFM listed in Section 150.0(m)13B. Why is this occurring?

Undersized ducts could be the cause. Undersized duct system installations are common, causing issues such as reduced air flow, increased static pressure, increased watt draw of the space conditioning system, a decrease in tons of available cooling capacity, and an overall decrease in air handler fan efficiency. In order to overcome

these issues, oversized space conditioning systems are sometimes installed to force air through the duct system and pass air flow testing. The overall power consumption increases due to the oversized space conditioning system, resulting in poor fan efficacy.

Fan efficacy can be improved by implementing the following measures:

1. Pull flexible ducts tight;
2. Reduce bends in ducts;
3. Make only large radius bends;
4. Do not install hard 90s;
5. Fix compressed ducts;
6. Install supply grills that are not stamped;
7. Add a second return;
8. Increase return duct size and filter grill area;
9. Do not install oversized space conditioning systems.

Also, note that an alternative to meeting the airflow and fan efficacy requirements is available for standard ducted systems, by sizing return ducts and grilles according to TABLE 150.0-C or TABLE 150.0-D.

Power Distribution

If I change a feeder to an electrical panel, do I need to upgrade the panel to disaggregate the electrical circuit?

Yes, Section 130.5(b) requires the electrical circuits to be disaggregated according to TABLE 130.5-B. Please note that disaggregation of electrical circuits may not be required for certain load types with electrical services rated 50 kVA or less. Disaggregation can be accomplished by using any of the methods specified in Section 130.5(b).

Additionally, the feeder must also meet the voltage drop requirements of Section 130.5(c)1.

A subpanel is being relocated during a tenant improvement (TI) remodel. Is disaggregation of the electrical circuit required or does this project qualify for an exemption?

Since the subpanel is being relocated the project does not qualify for an exemption. Therefore, the electrical circuit must be disaggregated as required by Section 130.5(b).

Exceptions may apply. EXCEPTION 2 to Section 130.5(b) states,

"Alterations where all of the following conditions exist are not required to comply with this section:

A. The following existing equipment remains in place:

i. Service distribution switchboards or panelboards; and

ii. Feeders; and

iii. Motor control centers or panelboards.

B. Existing equipment included in Item A (above) remains unaltered except for:

i. Changes to load circuit connections; or

ii. Changes to the quantity of outgoing overcurrent protection devices; or

iii. *Changes to the ampacity of outgoing overcurrent protection devices."*

New cubicles, which include new receptacles, are being installed in an existing open office area. The existing branch circuits are not being changed. Are the controlled receptacle requirements triggered?

Yes, the newly added receptacles of the new cubicles must meet the controlled receptacle requirements of Section 130.5(d)4.

New cubicles, which have new receptacles, are being installed in an existing open office area. The existing branch circuits have to be moved. Do all receptacles within the open office area need to be upgraded to controlled receptacles?

No, only newly added, altered, or replaced receptacles of the new cubicles must meet the requirements of Section 130.5(d)4.

Existing cubicles are going to be reconfigured in an existing open office area. The branch circuits have to be moved. However, there will be no other changes to the existing circuiting. Are the requirements of Section 130.5 triggered?

Based on the description, there are no newly added, altered, or replaced receptacles and the branch circuits have not been altered, other than being moved. Therefore, the requirements of Section 130.5 are not triggered.

Are the controlled receptacle requirements applicable to additions or alterations?

The requirements of Section 130.5 are applicable for additions and alterations as specified in Sections 141.0(a)1 and 141.0(b)2.

Newly added or altered receptacles have to meet the applicable requirements of Section 130.5(d).

In spaces that require controlled receptacles, do I have to install controlled and uncontrolled receptacles in a 1 to 1 ratio?

No, each controlled receptacle must be installed within 6 feet of an uncontrolled receptacle. Two or more uncontrolled receptacles can be within 6 feet of the same controlled receptacle (see Section 130.5(d)).

The California Energy Commission welcomes your feedback on *Blueprint*. Please contact Andrea Bailey at Title24@energy.ca.gov.

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CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY DIVISION

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In This Issue

Cool Roofs & Condensation

A cool roof is a roofing material with high thermal emittance and high solar reflectance, or low thermal emittance and exceptionally high solar reflectance that reduces heat gain through the roof. Because cool roofs gain and retain less heat than traditional roofs, less heat is transferred through the envelope into the building's interior. By lowering internal temperatures, cool roofs reduce occupant demand for air conditioning, allowing for building cooling cost savings.

The temperature of the cool roof is reduced to such an extent that moisture no longer evaporates as it would with a traditional roof. When cool roofs are not installed properly, moisture condenses and becomes trapped within the roofing materials. The trapped moisture can lead to mold growth and damage to the roofing materials or supporting elements.

To prevent the trapping of moist air, it is essential to follow proper air sealing procedures as outlined in Section 110.7 of the 2013 Building Energy Efficiency Standards (Energy Standards). Proper installation may require the installation of: air barriers, vapor barriers, insulation above the roof deck, and additional ventilation.

For more information on cool roofs, please review the U.S. Department of Energy's *Energy Saver* article "Cool Roofs" at: http://www.energy.gov/energysaver/articles/cool-roofs.

Quality Insulation Installation (QII) Compliance Credit for Insulated Headers

The 2013 Energy Standards provide Quality Insulation Installation (QII) compliance credit for R-2 insulated headers as indicated in Section RA3.5.6.2.9 of the 2013 Reference Residential Appendices (RA). Insulation or wood must fill the cavities, leaving no air gaps in or around the header. To obtain QII credit, use compliance document CF2R-ENV-21-H. Compliance with the R-2 insulated header requirement is verified in Section C, number 13 of this compliance document.

Three options meet the R-2 insulated header requirement:

1. Two-member header with insulation in between. The header and insulation must fill the wall cavity. Example: a 2x4 wall with two 2x nominal headers, or a 2x6 wall with a 4x nominal header and a 2x nominal header. Insulation is required to fill the wall cavity and must be installed between the headers.

2. Single-member header, less than the wall width, with insulation on the interior face. The header and insulation must fill the wall cavity. Example: a 2x4 wall with a 3 1/8" wide header, or 2x6 wall with a 4x nominal header. Insulation is required to fill the wall cavity and must be installed to the interior face of the wall.

3. Single-member header, same width as wall. The header must fill the wall cavity. Example: a 2x4 wall with a 4x nominal header or a 2x6 wall with a 6x nominal header. No additional insulation is required because the header fills the cavity.

Please see the graphic description at: http://www.energy.ca.gov/efficiency/blueprint/documents/Headers.pdf.

Approved Acceptance Test Technician Certification Providers for Lighting Controls

The Energy Commission has approved the California Advanced Lighting Controls Training Program (CALCTP) and National Lighting Contractors Association of America (NLCAA) as Lighting Controls Acceptance Test Technician Certification Providers.

This action gives the CALCTP and NLCAA authorization to train and certify qualified individuals and employers beyond the interim period established by the 2013 Energy Standards. Individuals interested in becoming a Certified Lighting Controls Acceptance Test Technician or employer can apply to either of these providers.

Links to both providers' websites are posted on the Energy Commission's web page at: http://www.energy.ca.gov/title24/attcp.

Free Training Opportunities

Free utility sponsored training on the 2013 Energy Standards and compliance software is available across the state.

For upcoming training opportunities, please check the following websites:

- http://energycodeace.com/
- https://pge-web.ungerboeck.com/classcalendar/Search.aspx
- www.sdge.com/eic
- www.sce.com/wps/portal/home/business/consulting-services/energy-education-centers
- https://www.smud.org/en/business/education-safety/workshops-and-training/index.htm
- http://socalgas.com/innovation/energy-resource-center/

To receive regular information about training and software updates, please sign-up for the Blueprint, Building Standards, and Efficiency list servers at: www.energy.ca.gov/efficiency/listservers.html.

Q&A

Commissioning

Do the commissioning requirements apply to additions and alterations?

No, commissioning applies only to newly constructed nonresidential buildings (see Section 120.8). A newly constructed building is defined in Section 100.1 as: "*A building that has never been used or occupied for any purpose.*"

Do the commissioning requirements apply to tenant improvements (first time build-outs) for multi-tenant buildings such as a strip mall?

Possibly, it depends on the local enforcement agency's policy. Commissioning may be completed for the entire building prior to tenant improvements, or for each individual tenant improvement. Check with your local enforcement agency for their commissioning policies for multi-tenant buildings.

Do the commissioning requirements apply to unconditioned nonresidential buildings?

No, the scope of the 2013 Energy Standards does not include commissioning (Section 120.8) for unconditioned nonresidential buildings in Section 100.0(e)2C.

Is third party design review required for buildings with complex systems that serve less than 10,000 square feet?

No, the licensed professional engineer who completes and signs the Design Review Kickoff Certificate(s) of Compliance, and the Construction Document Design Review Checklist Certificate(s) of Compliance does not need to be a third party (see Section 10-103(a)1).

Are covered processes required to meet the commissioning requirements?

No, covered processes are excluded from the commissioning requirements (see Section 120.8).

Covered processes can be included in the Basis of Design document (see Section 120.8(c)), however it is not required. Please note that the Energy Standards require acceptance testing for certain systems and controls serving covered processes.

For additional information on the commissioning process and requirements, please review the Nonresidential Compliance Manual and Energy Design Resources' *e-News* #96 "Commissioning for Code Compliance".

Nonresidential Economizers

The 2013 Energy Standards state that each cooling fan system with a total mechanical cooling capacity over 54,000 Btu/hr shall have either an air economizer or a water economizer. Is the term "cooling fan system" referring to the condensing unit (see Section 140.4(e)1)?

No, the term "cooling fan system" is referring to the evaporator coil and fan, not the condensing unit.

I have a variable refrigerant flow (VRF) air conditioning system, which has four 24,000 Btu/hr fan coils connected to a single 96,000 Btu/hr condensing unit. Is an economizer required in this scenario?

In this scenario, an economizer is not required because each cooling fan system is 24,000 Btu/hr. An economizer is only required for each cooling fan system, including a VRF, which has a total mechanical cooling capacity over 54,000 Btu/hr.

Residential Reroof Projects

Are cool roof requirements triggered for residential reroof projects?

Cool roof requirements are triggered when more than 50 percent of the exterior surface of the roof is replaced on steep-sloped roofs in Climate Zones 10 through 15, and low-sloped roofs in Climate Zones 13 and 15 (see Section 150.2(b)1H).

For steep-sloped roofs in Climate Zones 10 through 15, a cool roof must be installed with a minimum aged solar reflectance of 0.20 and a minimum thermal emittance of 0.75, or a minimum solar reflectance index (SRI) of 16.

Exceptions to the cool roof requirements for steep-sloped roofs include:

- Air-space of 1.0 inch (25 mm) is provided between the top of the roof deck to the bottom of the roofing product; or
- The installed roofing product has a profile ratio of rise to width of 1 to 5 for 50 percent or greater of the width of the roofing product; or
- Existing ducts in the attic are insulated and sealed according to Section 150.1(c)9; or
- Buildings with at least R-38 ceiling insulation; or
- Buildings with a radiant barrier in the attic meeting the requirements of Section 150.1(c)2; or
- Buildings that have no ducts in the attic; or
- R-4 or greater insulation above the roof deck.

For low-sloped roofs in Climate Zones 13 and 15, a cool roof must be installed with a 3-year aged solar reflectance equal to or greater than 0.63 and a thermal emittance equal to or greater than 0.75, or a minimum SRI of 75.

Exceptions to the cool roof requirements for low-sloped roofs include:

- Buildings that have no ducts in the attic; or

- The aged solar reflectance can be met by using insulation at the roof deck specified in TABLE 150.2-A.

Luminaire Modifications-in-Place

When are Luminaire Modification-in-Place requirements triggered?

Luminaire Modification-in-Place requirements, as outlined in TABLE 141.0-F, are triggered when 40 or more luminaires are modified in a building space within a twelve month period, and 10 percent or more of the existing luminaires in an enclosed space are modified.

Compliance with TABLE 141.0-F is not required if less than 40 luminaires are modified in the building space.

A building space is defined in TABLE 141.0-F as: a complete single story building; a complete floor of a multi floor building; the entire space in a single tenant under a single lease; or all of the common space in a single building.

An enclosed space is a space that is substantially surrounded by solid surfaces, including walls, ceilings or roofs, doors, fenestration areas, and floors or ground.

I am doing a Luminaire Modification-in-Place project for 40 or more luminaires in a building space. If the luminaires were modified to reduce the wattage and are not dimmable, do the multi-level lighting control requirements apply?

Yes, multi-level lighting controls are required for each enclosed space where 10 percent or more of the luminaires are modified. Multi-level lighting controls are only applicable to the modified luminaires. Two level lighting control can be used if the resulting lighting power is 85 percent or less of the allowed lighting power. Two level lighting control requires each luminaire to have at least one control step between 30 percent and 70 percent of design lighting power in a manner providing reasonably uniform illumination (see TABLE 141.0-F). Alternatively, the multi-level lighting control requirements in Section 130.1(b) can be met.

If the lighting power were greater than 85 percent of the allowed lighting power, then the requirements in Section 130.1(b) would have to be met.

I am doing a Luminaire Modification-in-Place project for 40 or more luminaires in a building space. In some of the enclosed spaces, 10 percent or more of the luminaires are modified. What are the applicable control requirements for those enclosed spaces?

If the lighting power is 85 percent or less of the allowed lighting power, per Section 140.6, area controls and shut-off controls are required in the enclosed space(s). Additionally, multi-level lighting controls are required only for luminaires which are Modified-in-Place.

If the lighting power is more than 85 percent of the allowed lighting power, area controls and shut-off controls are required in the enclosed space(s). Additionally, multi-level lighting controls and automatic daylight controls are required only for luminaires which are Modified-in-Place.

The California Energy Commission welcomes your feedback on *Blueprint*. Please contact Andrea Bailey at Title24@energy.ca.gov.

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CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY DIVISION

Issue 106 Special Edition December 2014

Below Deck Netting Insulation Method Provides an Effective Means to Achieve High Performance Attics

Over the next two building code cycles (2016 and 2019), the California Energy Commission (Energy Commission) is moving towards Building Energy Efficiency Standards (Energy Standards) that will require Zero Net Energy in all residential newly constructed buildings. For the 2016 Energy Standards update, the number one priority is for the building industry to move to high performance attics by insulating at the roof deck. Insulating at the roof deck dramatically lowers attic temperatures, that otherwise can exceed 150°F in the summer, keeping that heat from getting into the conditioned space below, and creating a much cooler attic environment, which results in reduced HVAC duct losses. The Energy Commission will provide builder flexibility by offering a number of optional methods to achieve high performance attics by installing insulation either above or below the roof deck.

Some builders have chosen below deck insulation in unvented attics (see Figure 1). Features which make unvented attics attractive are:

1. Higher attic temperatures in the winter;
2. Fewer roof penetrations making photovoltaic (PV) system mounting less complicated;
3. Elimination of the need for acceptable attic vent materials in Wildland-Urban Interface Fire Areas;
4. Reducing duct losses by placement of ducts and HVAC in indirectly conditioned space; and

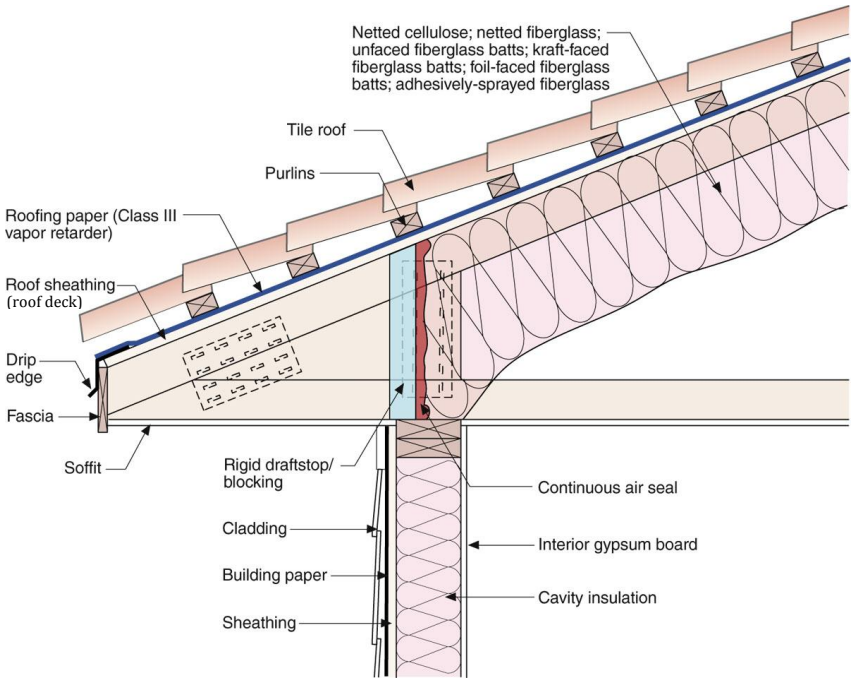

Figure 1 - Placement of attic insulation in an unvented attic[1].

5. Potentially reducing the need for air sealing of the ceiling to achieve low air leakage levels for the entire building envelope.

One challenge in building with unvented attics has been meeting the mandatory R-30 ceiling insulation requirement in the Energy Standards. In an unvented attic, insulation is mounted or applied to the underside of the roof deck instead of at the ceiling. Wood roof trusses constructed with 2x4 materials yield a cavity space of 3.5 inches, which limits the options for builders to meet the R-30 ceiling insulation requirement. Loose-fill materials such as fiberglass and cellulose are popular air-permeable insulation materials that are installed on the ceiling in vented attic construction, largely due to ease of installation and cost effectiveness. To achieve these same advantages for under roof deck installation, netted insulation systems could be used. Typical netted wall insulation systems do not yield the R-30 needed to meet the Energy Standards requirement when applied below the roof deck in 2x4 truss systems.

Alternative installation methods can provide high R-value insulation below the roof deck. One approach is a new netting system that is suspended from the top member of the truss, or top chord, to provide a fill depth that completely encloses the top chord, creating a uniform insulation layer of loose-fill fiberglass across the entire underside of the roof deck (see Figure 2). This method can be done with common loose-fill insulation tools and equipment. Other approaches may also be feasible.

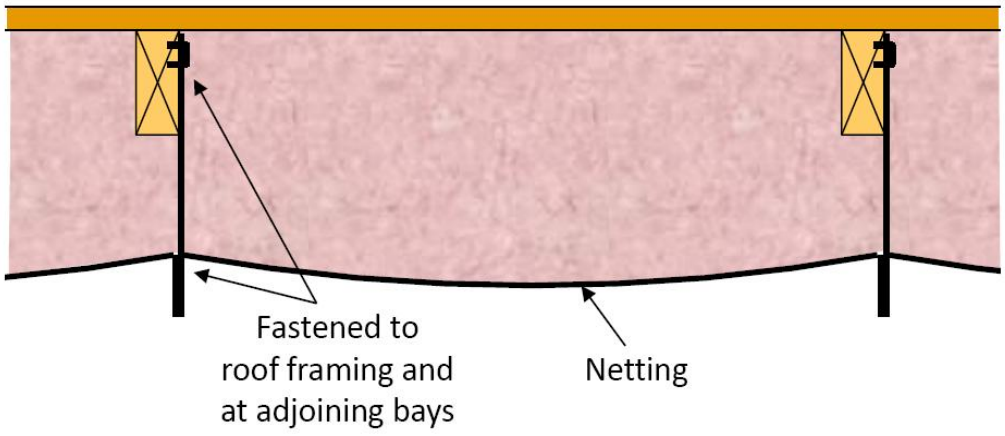

Figure 2 - Netting insulation installed below the roof deck. Image courtesy of Owens Corning[2].

An Energy Commission funded study[1] concluded that moisture is not expected to be an issue, except in Climate Zone 16, when installing air-permeable insulation below and in direct contact with the roof deck in unvented attics, and when installing tile roofing with top side ventilation (tile installed on battens) in combination with a vapor semi-permeable roofing paper (Class III vapor retarder)(see Figure 1). Class II or Class I vapor retarders, typically fully adhered vapor impermeable membranes, should not be installed in place of Class III roofing paper in this attic configuration. Note that in Climate Zones 14 and 16, Section

[1] Lstiburek, Joseph and Schumacher, Christopher. *Hygrothermal Analysis of California Attics*. Somerville, MA: Building Science Corporation, October 2, 2011. http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/current/Reports/Residential/Envelope/Hygrothermal_Analysis_of_California_Attics-BSC.pdf, Figure 25, pp. 33.

150.0(g)1 also requires a Class II vapor retarder to be installed on the conditioned space side of air-permeable insulation in unvented attics.

To comply with the California Residential Code (CRC) California Code of Regulations Title 24, Part 2.5, Section R806.5, builders may wish to request local building department approval of alternates, pursuant to CRC Section 1.8.7.2.

The California Energy Commission welcomes your feedback on Blueprint. Please contact Andrea Bailey at Title24@energy.ca.gov.

CALIFORNIA ENERGY COMMISSION

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CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY DIVISION

Issue 105 November - December 2014

New Compliance Documents Without Watermarks Available

2013 Building Energy Efficiency Standards (Energy Standards) compliance documents are now available with no watermark.

The California Energy Commission (Energy Commission) has simplified the permitting process by creating new compliance and installation documents without watermarks for simple alterations and additions to existing residential buildings that do not require HERS field verification and registration.

This applies to the following compliance documents:

Alterations:

CF1R-ALT-05-E

CF2R-ALT-05-E

Additions:

CF1R-ADD-02-E

CF2R-ADD-02-E

Electronic copies of these compliance documents are available on the Energy Commission's website at:

www.energy.ca.gov/title24/2013standards/res_compliance_forms/

2016 Energy Standards Workshop

Energy Commission staff is conducting a workshop to present draft revisions to be considered for inclusion in the 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings (California Code of Regulations, Title 24, Part 1, Chapter 10, and Part 6, including the associated Reference Appendices and Alternative Calculation Method Manuals), and the voluntary energy efficiency related provisions in the California Green Building Standards (CalGREEN) (California Code of Regulations, Title 24, Part 11).

The workshop will be used to solicit public comment on the proposed revisions and will be held:

Monday, November 3, 2014
9:00 a.m.

CALIFORNIA ENERGY COMMISSION
1516 Ninth Street
Hearing Room A
Sacramento, California

In This Issue

Teleconference option: interested parties and the public may attend the public workshop in person at the above location or by telephone and/or by computer via our "WebEx" web conferencing system.

For additional details on how to participate via WebEx, please see the notice at: www.energy.ca.gov/title24/2016standards/prerulemaking/documents/#11032014

For more information about the 2016 Building Energy Efficiency Standards proceeding, including the schedule for future workshops and public comment opportunities, please visit: www.energy.ca.gov/title24/2016standards/prerulemaking/

Existing Conditions Compliance Documents

The CalCERTS, Inc. registry is now accepting CF1Rs that call for existing conditions verification and CF3R-EXC-20-H compliance documents that are used to document that verification. Currently, all CalCERTS, Inc. Whole House Raters, in good standing, may perform existing conditions verifications and submit the CF3R-EXC-20-H compliance document to the registry. Tutorials, including a webinar, on how to create a project that calls for existing conditions verifications are available on CalCERTS' Instructional Material website at:

www.calcerts.com/TrainingMaterials.cfm

For more information, please contact CalCERTS at:

Phone: (916) 985-3400 ext. 800

Email: tech@calcerts.com

Q&A

Light Emitting Diodes (LEDs)

Is there a definition for Tubular LEDs and are there provisions that apply specifically to these products?

No, tubular LED products are not defined differently nor handled differently from other LED retrofit approaches. LED retrofit options for linear and U-shaped fluorescent luminaires and lamps include products that use the existing lamp holders and products that are installed inside existing fluorescent troffers that do not make use of the lamp holders at all. All of these products are considered by the 2013 Energy Standards and meet requirements for inclusion in new construction.

How are LED retrofits, for fluorescent luminaires, rated and classified, and are they rated differently if they are part of an addition, alteration, or repair?

LED retrofits are rated and classified according to Section 130.0(c) whether they are a new installation, an addition, an alteration, or a repair. However, note that classification is based on the permanently installed components of the luminaire, not the lamps. If the retrofit is made up of LED lamps that use existing fluorescent ballasts for power, then the luminaire will be classified under Section 130.0(c)6. Similarly, if the retrofit is made up of LED lamps paired with transformers (such as drivers), then the luminaires or permanently installed (hard-wired) LED light engines will be classified under Section 130.0(c)9.

Can an LED retrofit be part of a lighting system alteration or a Luminaire Modification-in-Place, as described in Section 141.0(b)2I?

Yes, LED retrofits of appropriate types can be part of a lighting system alteration or a Luminaire Modification-in-Place covered by the 2013 Energy Standards. However, this will not exempt them from needing to be rated and classified according to Section 130.0(c).

I'm considering a lamp changeout of an existing lighting system and there are no alterations on the wiring or lighting system other than installing new lamps (I am just replacing tubular fluorescent lamps with tubular LED lamps). Does this trigger 2013 Energy Standard requirements?

No, this kind of indoor lighting alteration is not considered a Luminaire Modification-in-Place and is addressed by the language in Section 141.0(b)2Ivii that specifies compliance is not required.

Are all LED retrofits considered lighting system alterations? Are any LED retrofits not covered by the 2013 Energy Standards?

The 2013 Energy Standards specify that some indoor lighting alterations are not covered by the lighting requirements. Section 141.0(b)2Ivii reads as follows:

The following indoor lighting alterations are not required to comply with the lighting requirements in Title 24, Part 6:

a. Replacement in kind of parts of an existing luminaire that include only new lamps, lamp holders, or lenses, when replacement of those parts is not a Luminaire-Modification-in-Place in accordance with Section 141.0(b)2Iiii.

b. Lighting Alterations directly caused by the disturbance of asbestos.

***EXCEPTION to Section 141.0(b)2Iviib:** Lighting alterations made in conjunction with asbestos abatement shall comply with the applicable requirements in Section 141.0(b)2I.*

Section 141.0(b)2Ivii applies to retrofits where the only change to the lighting system is to replace a fluorescent lamp with an equivalent LED lamp (the shape of the respective lamps does not matter).

I'm considering including lamp changeouts as part of a larger covered lighting system alteration. As this means that some luminaires will be classified under Section 130.0(c)6 even though they are using LED lamps, can I use Reference Nonresidential Appendix NA8 to determine their luminaire power?

Yes, if a lamp changeout is part of a covered lighting system alteration, Reference Nonresidential Appendix NA8 can be used to determine luminaire power where fluorescent ballasts are used by LED lamps. Simply find the matching ballast and type/length of linear or U-shaped fluorescent lamp, and use this value. If more than one value applies use the smallest appropriate value.

The California Energy Commission welcomes your feedback on *Blueprint*. Please contact Andrea Bailey at Title24@energy.ca.gov.

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CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY DIVISION

Issue 104 September - October 2014

HERS Providers Approved Under the 2013 Energy Standards

The California Energy Commission (Energy Commission) has approved CalCERTS, Inc. and U.S. Energy Raters Association (USERA) as Home Energy Rating System (HERS) Providers under the 2013 Building Energy Efficiency Standards (Energy Standards).

CalCERTS, Inc. is approved to train and certify raters for:

- Field verification and diagnostic testing for newly constructed and additions to residential & nonresidential buildings;
- Field verification and diagnostic testing for alterations of residential & nonresidential buildings;
- California whole-house home energy ratings;
- HERS building performance contractors; and
- New Solar Homes Partnership Program.

CalCERTS may be reached at:
Phone: (916) 985-3400 or (877) 437-7787
Email: general@calcerts.com
Website: www.calcerts.com

USERA is approved to train and certify Raters for:

- Field verification and diagnostic testing for alterations of residential buildings.

USERA may be reached at:
Phone: (888) 931-1116
Email: info@usenergyraters.com
Website: www.usenergyraters.com

HERS Providers are approved by the Energy Commission based upon several factors including their ability to: train and certify HERS raters, create and maintain a registry and database, provide ongoing access to the registry and database for Energy Commission staff, create a Quality Assurance Program and conduct quality assurance inspections on their HERS raters' work, and report annually to the Energy Commission certain data as required by Title 20.

What is an Acceptance Test Technician, and when does Acceptance Testing become mandatory?

Acceptance Test Technicians (ATTs) are building specialists, trained and certified by Acceptance Test Technician Certification Providers (ATTCPs). ATTs conduct required tests, submit test results and certificates to enforcement agencies, and are employed by certified ATT employers. These employers are required to have specialized training by an ATTCP. ATTCPs have developed training programs for lighting controls and mechanical systems.

In This Issue

The following ATTCPs have been approved to offer training:

Lighting (interim approval)
- California Advanced Lighting Controls Training Program (CALCTP) www.calctp.org

Mechanical (interim approval)
- National Environmental Balancing Bureau (NEBB) www.nebb.org

- Testing Adjusting and Balancing Bureau (TABB) www.tabbcertified.org

Lighting Controls Acceptance Testing by an ATT became mandatory on July 1, 2014.

Currently, a mechanical contractor (or their field technician) is allowed to conduct Mechanical Systems Acceptance Testing without being certified as an ATT. Mechanical Systems Acceptance Testing becomes mandatory once reasonable access to Acceptance Test Technician Certification Programs are available and 300 technicians are certified to perform Mechanical Systems Acceptance Testing. The Energy Commission will determine when these thresholds have been met and will notify all building departments and the building industry accordingly.

CBECC-Res Update

On August 27, 2014, the Energy Commission approved an update to CBECC-Res, the public domain software for compliance with the 2013 Energy Standards, to demonstrate compliance for permit applications. With the approval of CBECC-Res Version 3, CBECC-Res Version 2 is decertified for permit applications submitted on or after October 13, 2014.

Version 3 improvements include:
- Increased speed (50% faster on average);
- Added tool to view the Log File from inside the program (to find errors);
- Calculates California Advanced Homes Program (CAHP) incentives;
- Ability to move walls/windows up or down (if they are out of your preferred order);
- Models wall furnaces; and
- Models central fan integrated system.

CF1R issues that were corrected include:
- No watermark if existing + addition has no HERS measures (additions $\leq$ 1,000 ft^2, duct systems with < 40 linear feet in unconditioned space, or non-ducted HVAC);
- "No Cooling" will remove HERS verification requirement;
- High EER/SEER trigger levels corrected
- Zonal control and multi-speed compressor listed;
- Several special features messages corrected: default roof reflectance, no cooling with heat pumps, non-standard construction, reports miscellaneous (lighting/appliance) energy Use; and
- For Green Codes, the miscellaneous energy use is reported below the energy use results.

Visit the Energy Commission's 2013 Approved Computer Compliance Programs webpage for links to approved compliance software and prior versions, which are now decertified, at: http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html

MASTER PLAN PERMIT APPLICATIONS

When builders submit permit applications to building departments for new residential subdivisions, they often have multiple model homes or "master plan" designs to which all homes in the project will be built. Energy Commission approved compliance software is used at that time to generate registered Certificates of Compliance (CF1Rs), demonstrating compliance with the 2013 Energy Standards.

When registered CF1Rs for new residential subdivisions are submitted to and approved by building departments, builders can continue to pull permits for all the homes in the subdivision under the approved "master plan" design using the approved CF1Rs unless one or more of the approved "master plan" designs have been changed.

If one or more of the "master plan" designs have changed, then new homes within the residential subdivision affected by the change will be required to submit a new CF1R with the permit application, generated by the most recently approved version of the residential compliance software. A new CF1R is only required for plans that were changed.

Duct Sealing and Asbestos

The 2013 Energy Standards require testing of ducts, after a central air conditioning and/or heating system is installed or replaced in an existing home, with some exceptions. The contractor is required to test the ducts to determine if the ducts have been properly sealed. As a confirmation step, the duct system tightness is verified by a third-party field specialist, known as a Home Energy Rating System (HERS) rater. If a HERS rater determines that the duct system leaks more than 15 percent, the contractor will be required to properly seal the ducts at no additional cost to the homeowner.

(Note: HERS verification of duct sealing may be random, if part of a sample group).

If existing ducts are constructed, insulated, or sealed with asbestos-based materials, it is important to note that duct sealing is not required, and should not be performed. If the presence of asbestos is suspected, the homeowner should contact the Contractors State Licensing Board at (800) 321-2752 for more information, or obtain "A Consumer's Guide to Asbestos" at:
http://www.cslb.ca.gov/Resources/GuidesAndPublications/AsbestosGuideForConsumers.pdf

Utility Sponsored Training

Utility sponsored training on the 2013 Energy Standards and new compliance software is available across the state.

For training opportunities, please check the following websites:

- http://energycodeace.com/
- www.pge.com/pec
- www.sdge.com/eic
- www.sce.com/wps/portal/home/business/consulting-services/energy-education-centers
- https://www.smud.org/en/business/education-safety/workshops-and-training/index.htm
- http://socalgas.com/innovation/energy-resource-center/

To receive regular information about training and software updates, please sign-up for the Blueprint, Building Standards, and Efficiency list servers located at:
www.energy.ca.gov/efficiency/listservers.html

Q & A

Radiant Barriers

What is the minimum attic ventilation requirement when installing radiant barriers?

Section 150.1(c)2 of the 2013 Energy Standards requires that radiant barriers meet the installation criteria specified in Reference Residential Appendix RA4. Section RA4.2.1.1(a) of the 2013 Reference Appendices requires a "*minimum free ventilation area of not less than one square foot of vent area for each 300 ft² of attic floor area.*" It is also required that the radiant barrier be installed according to the manufacturer's instructions (which may have different attic ventilation requirements that must be met).

Please note that Section 1203 of the 2013 California Building Code (Title 24, Part 2) and Section R806.2 of the 2013 California Residential Code (Title 24, Part 2.5) both have minimum attic ventilation requirements which may differ. For a clarification on how or when those codes apply (Part 2 and 2.5), you can check with your local enforcement agency, or contact the California Building Standards Commission at (916) 263-0916.

Watt Meters

I'm a HERS rater, can you please provide information on portable watt meters, such as clamp-on watt meters, to be used on packaged units that are approved by the Energy Commission?

The Energy Commission does not maintain an approved list of portable watt meters or portable clamp-on watt meters. However, if a portable watt meter is used for Air Handler Watt Draw Verification, certain requirements must be met. It must be able to measure true power (i.e. sensor plus data acquisition system) reading an accuracy of ± 2 percent or ± 10 watts, whichever is greater (see RA3.3.1.3). Portable clamp-on type meters that read true power are recommended to provide flexibility for isolating the correct fan wires in packaged air conditioning or heat pump systems (see sections RA3.3.1.3 and RA3.3.2.2.1).

Many true power measuring clamp-on meters, which are rated for higher voltage packaged air conditioning and heat pump systems, are available. An internet search for clamp-on meters will provide a large selection of available products.

Pet Doors

How do I account for a pet door installed in an exterior wall in a newly constructed residential building design?

Pet doors installed in exterior walls are considered to be doors under Title 24, and the performance approach must be used to demonstrate compliance when they will be installed. First the U-factor of the pet door must be determined by a National Fenestration Rating Council (NFRC) accredited testing lab using NFRC 100 U-factor requirements; otherwise, non-rated pet doors must assume a default U-factor of 0.99 from Table 110.6-A of the 2013 Energy Standards for a nonmetal single pane door. Second, the rated pet door shall have an air leakage of 0.3 cfm/ft² or less when tested using ASTM E283.

Note that additional insulation may need to be added to the wall if it (including the pet door) is unable to meet the mandatory minimum U-factor requirement. For example, the weighted average U-factor of the wall assembly including the pet door must not exceed a U-factor of 0.102 for a 2x4 wood frame wall assembly with R-13 cavity insulation, or a U-factor of 0.074 for a 2x6 wood frame wall assembly with R-19 cavity insulation.

Need Assistance?

Help is available! Email addresses, for various programs, are provided below.

Computer Compliance Programs

CBECC - Com (for commercial buildings)
- cbecc.com@gmail.com

CBECC – Res (for residential buildings)
- cbecc.res@gmail.com

Energy Pro support
- support@energysoft.com

IES Virtual Environment
- title24@iesve.com

Right-Energy Title 24
- support@wrightsoft.com

HERS Registry

CalCERTS
- tech@calcerts.com

USERA
- sbates@usenergyraters.com

Title 24, Part 6 Building Energy Efficiency Standards

Energy Standards Hotline
- Phone: (800) 772-3300 (within California) or (916) 654-5106 (outside California)
- E-mail: Title24@energy.ca.gov

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CEC-400-2014-021

CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY DIVISION

MARCH- APRIL 2014

Starting July 1
You must comply with the
2013 Building Energy Efficiency Standards!

Residential Early Adopter Program Available NOW

The California Energy Commission launched an early adopter program to assist members of the residential building industry who would like to show compliance with the 2013 Building Energy Efficiency Standards (Title 24, Part 6 and Part 11) prior to July 1.
Specifically, the Energy Commission offers assistance to early adopters of who use the new approved residential compliance software programs (CBECC-Res or EnergyPro).

- Until a Home Energy Rating System (HERS) Provider is approved by the Energy Commission, registered certificates of compliance (CF-1R's), which are required to be submitted to building departments, will *not* be available.
- Unregistered CF-1R's, however, are being accepted by building departments now.
- For final permits to be issued, unregistered CF-1R's must be replaced with a HERS Provider registered CF-1R's as soon as a HERS Provider is approved by the Energy Commission.
- Approval of a HERS Provider is anticipated by July 1, 2014.

2013 Computer Compliance Software

The Energy Commission is required to develop the California Building Energy Code Compliance (CBECC) software, an open source public domain software program designed for modeling buildings for the 2013 Building Energy Efficiency Standards. Approved compliance software is required if you use the Performance Compliance method. This software also provides an access to source code for development of derivative works by vendors. More information on CBECC for residential and commercial buildings, FAQs and training tutorial videos are available at http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html.

You can choose one of two methods to demonstrate compliance:

Prescriptive Compliance Method: There is no software needed for showing compliance with 2013 Building Energy Efficiency Standards prescriptively.

or

Performance Compliance Method: A software modeling program provides the necessary Alternative Calculation Methods set forth in the 2013 Alternative Calculation Method Reference Manual. For the Performance Compliance Method, a list of approved compliance modeling programs for the 2013 Building Energy Efficiency Standards can be found on the Energy Commission's website: http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html.

Included in the list are two programs: public domain software provided by the Energy Commission and proprietary software programs offered by private vendors. The public domain software programs are:

- California Building Energy Code Compliance - Commercial (CBECC-Com)
- California Building Energy Code Compliance - Residential (CBECC-Res)

The CBECC software programs are available for download at no cost. Training tutorial videos for CBECC-Com are available at: http://www.energy.ca.gov/title24/training/.

Utility-Sponsored Compliance Software Training Available

Architects, Engineers, Energy Consultants, and Builders! Be ready to comply with the 2013 Building Energy Efficiency Standards on July 1.

California's utilities, in partnership with the Energy Commission, offer software training to prepare you for compliance with the 2013 Building Energy Efficiency Standards. Below are dates for upcoming training classes in your area. Visit the utility website links on page 4 to register for training today!

Southern California Edison: 2-Day courses on May 21- 22 and June 24- 25

SDG&E: 2-Day course on June 16- 17

PG&E: 2-Day courses on June 4 and 18

Builder Energy Code Training Program

PG&E contracts with ConSol, a third-party energy efficiency implementation specialist, to provide the Builder Energy Code Training Program (BECT). BECT provides in-depth code compliance education at no cost, to help the residential new construction and alterations building industry understand and comply with California's 2013 Building Energy Efficiency Standards. BECT focuses on the most comprehensive and cost-effective ways to bring a residence up to, and above, the California Energy Efficiency Standards requirement through building science techniques, effective application of the compliance documentation workflow, and the operational interaction of different construction trades.

BECT is sponsored by PG&E, funded by California utility ratepayers, and administered by PG&E under the auspices of the California Public Utilities Commission. The number of classes are limited and offered on a first-come, first-serve basis. Eligible attendees include residential builders, subcontractors for builders, architects, building department staff and local government staff throughout the PG&E Service Territory.

The trainings are available in a classroom setting, on-site at a builder job location, or online via webinar. If you or your organization would like to host a BECT class or if you would like to attend the next scheduled

class or learn more about the 2013 Building Energy Efficiency Standards, please contact Lynne Martinez at lmartinez@consol.ws or visit the BECT website at www.bect.ws.

Tubular LED Lamps and the 2013 Energy Standards

Lighting Retrofits (also known as Luminaire Modifications in Place) are now regulated by the 2013 Building Energy Efficiency Standards.

The 2013 Building Energy Efficiency Standards allow for the installation of TLED (Tubular light emitting diode) lamps as replacements for linear fluorescent lamps in existing luminaires. However, an existing linear fluorescent luminaire with TLED lamps is not recognized as an LED lighting system for compliance purposes. For Luminaire Modifications in Place, Section 141.0(b)2Ii requires luminaires to be classified, and power to be determined, according to Section 130.0(c). Following are the requirements for classifying linear fluorescent luminaires and determining input power:

> SECTION 130.0 (c) Luminaire classification and power.
>
> 6. Luminaires with permanently installed or remotely installed ballasts. The wattage of such luminaries shall be determined as follows:
>
> A. Wattage shall be the operating input wattage of the rated lamp/ballast combination published in ballast manufacturer's catalogs based on independent testing lab reports as specified by UL 1598.
>
> B. Replacement of lamps in a luminaire manufactured or rated for use with linear fluorescent lamps, with linear lamps of a different technology such as linear LED lamps, shall not be recognized as converting the fluorescent luminaire to a different technology for compliance with Part 6.

Refer to the 2013 Building Energy Efficiency Standards *Nonresidential Appendix NA8, Luminaire Power* for the recommended method to determine input wattage and compliance for Luminaire Modifications in Place with TLED lamps only. The following is a link to that document:

http://www.energy.ca.gov/2012publications/CEC-400-2012-005/CEC-400-2012-005-CMF-REV3.pdf

Appendix NA8 contains a limited list of lamp and ballast combinations. These tables provide an alternate voluntary option to the provision in Section 130(c) for determining luminaire power for any lamp and ballast combination specifically listed in Appendix NA8.

The recommendation is to find the identical type and length of linear fluorescent lamp in Appendix NA8, which matches the type and lengths of lamp the TLED is replacing, and use the lowest wattage available for that lamp in the Appendix.

See examples on the next page

Examples:

1. For a Luminaire Modification in Place which contains two 4-foot TLED lamps after modification, the lowest fluorescent wattage available to use is in Table NA8-3 for two F32T8/30ES, EE reduced output ballast for 45 watts.

   Therefore, for input wattage compliance purposes, two 4-foot TLED lamps = 45 watts

2. For a Luminaire Modification in Place which contains three 3-foot TLED lamps after modification, the lowest fluorescent wattage available to use is in Table NA8-3 for three F25T8, Electronic reduced output ballast for 59 watts.

   Therefore, for input wattage compliance purposes, three 3-foot TLED lamps = 59 watts

Note: The above recommendation does not apply to lighting in newly constructed spaces or to lighting alterations which do not qualify as a Luminaire Modification in Place.

Utility Sponsored Training Available NOW

Standards and compliance software training is available across the state, at city and county building offices, and utility training centers, and is conveniently available via the Energy Commission website. For training opportunities, please check the following websites:

- http://www.pge.com/pec
- http://www.sdge.com/eic
- http://www.socalgas.com/innovation/energy-resource-center
- https://www.sce.com/wps/portal/home/business/consulting-services/energy-education-centers
- https://www.smud.org/etc

To receive regular information about training and software updates, please sign-up for the Blueprint, Building Standards, and Efficiency list servers located at http://www.energy.ca.gov/efficiency/listservers.html.

The California Energy Commission welcomes your feedback on the Blueprint. Please contact Daniel Johnson at (916) 651-3746 or daniel.johnson@energy.ca.gov.

CALIFORNIA ENERGY COMMISSION

Standards Implementation Office
1516 Ninth St, MS-26
Sacramento, CA 95814-5512
(916) 654-4064

Need Help? Energy Standards Hotline
(800) 772-3300 (toll-free in CA)

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CEC-400-2014-008

CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY DIVISION

JANUARY- FEBRUARY 2014

2013 Energy Efficiency Standards Revised Implementation Date

New Effective Date will be July 1, 2014

The Energy Commission has established an "early adopter" program to assist those members of the industry who, for logistical or marketing purposes, would like to show compliance with the 2013 Building Energy Efficiency Standards prior to July 1, 2014.

Specifically, the Energy Commission is offering assistance to early adopters of the 2013 Building Energy Efficiency Standards that are using the new certified residential compliance software programs (CBECC-Res or EnergyPro v6.0). Until a Home Energy Rating Service (HERS) Provider is approved by the Energy Commission, registered certificates of compliance (CF-1R's) that are required by the 2013 code will not be available. Unregistered residential certificates of compliance can be submitted to building departments now. However, for final permit, the unregistered CF-1R forms must be replaced with a HERS Provider registered CF-1R as soon as one or more HERS Providers are approved by the Energy Commission. It is anticipated that this will happen in early spring of 2014.

Until that time, for early adopter assistance from the Energy Commission, please contact Pedro Gomez, Manager at the Standards Implementation Office, at (916) 654-4045 or Pedro.Gomez@energy.ca.gov.

2013 Title 24 Training Webinars

This month, the Energy Commission is conducting two, all-day webinars on Energy Efficiency Standards for residential and nonresidential buildings. The Building Standards are important requirements that homeowners, building owners, and the construction industry need to understand. All types of buildings, new construction or alterations, are required to comply with the California Building Standards.

This training series is free and highly recommended by the Energy Commission. This training:

- Summarizes the major changes to the 2013 Building Standards effective on July 1, 2014
- Simplifies compliance and enforcement for the new standards during the plan review and field inspection processes
- Details all compliance approaches

Register your attendance at title24training@energy.ca.gov.

January 23, 2014
Nonresidential Buildings
8:00AM - 5:00PM
12:00PM - 1:00PM Lunch Break

https://energy.webex.com/ec
Meeting number: 921 329 118
Meeting password: meet@8am

CALBO Education Weeks

The Energy Commission's Efficiency Division team members Daniel Johnson, Chris Olvera, Brian Samuelson and Suzie Chan participated at CALBO's Ontario and San Ramon Education weeks. Chris provided two full days of classroom training on the new 2013 Residential and Nonresidential Energy Standards. The Energy Commission distributed more than 500 CDs containing the 2013 Standards, Compliance Manuals, and Reference Appendices. Look for us at upcoming statewide events to obtain your copies or you can request a copy by writing us at title24@energy.ca.gov. You can also access information on the Standards online at: www.energy.ca.gov/title24/2013standards/supporting_docs.html.

Mandatory Solar Ready Area Requirement

All single family subdivisions and low-rise multi-family projects must submit a copy of the Solar Ready Area – New Construction (CF1R-SRA-01-E) form showing how the home or building is complying with the solar ready requirements. The user will select one of six options for showing compliance and depending on which compliance path is chosen, additional documents may be required. For compliance paths that require additional documentation, the CF1R-SRA-01-E lists the names of the forms that will have to be submitted.

All high-rise multifamily buildings and hotel/motel occupancies with 10 stories or fewer and nonresidential buildings with three stories or fewer must submit a copy of the Solar Ready Areas (NRCC-SRA-01-E) form showing how the building is complying with the solar ready requirements. The user will select one of five options for showing compliance and depending on which compliance path is chosen, additional documents may be required. For those compliance paths that require additional documentation, the NRCC-SRA-01-E lists the names of the forms that will have to be submitted.

Required Occupancy Types

- Subdivisions with 10 or more single-family residences with a subdivision map deemed complete after 1/1/14. These types of developments must comply with the requirements of Section 110.10(b) through 110.10(e).
- Low-rise multifamily buildings must comply with the requirements of Section 110.10(b) through 110.10(d).

- Hotel/Motel Occupancies and high-rise multifamily buildings with 10 stories or fewer must comply with the requirements of Section 110.10(b) through 110.10(d).
- All other nonresidential buildings with three stories or fewer must comply with the requirements of Section 110.10(b) through 110.10(d).

The Solar Ready requirements DO NOT apply to additions or alteration of single-family residences or low-rise multifamily buildings. Additions or alterations to non-residential buildings, high-rise multifamily buildings or hotel/motel occupancies that increase the area of the roof by 2000 square feet or more must comply with the Solar Ready requirements per Section 141.0(a) of the Standards.

Solar Zone Area Requirements

Section 110.10 (b)

For single-family residences, the solar zone must be located on the roof or overhang of the building and have a total area no less than 250 square feet for a single-family residence.
For low-rise and high-rise multifamily buildings, Hotel/Motel occupancies and nonresidential buildings, the solar zone must be located on the roof or overhang of the building, the roof or overhang of another structure located within 250 feet of the building, or on covered parking installed with the building. The solar zone must have a total area of no less than 15 percent of the total roof area of the building excluding any skylight area.

There are several exceptions that apply to the solar zone requirements. Claiming some exceptions will reduce the required size of the solar zone on a building while other claiming other exceptions will eliminate the need to comply with any of the Solar Ready requirements.

All sections of the solar zone located on steep-sloped roof (ratio of rise to run of greater than 2:12) must be oriented between 110 degrees and 270 degrees of true north.

No obstruction shall be located in the solar zone. Any obstruction located on the roof or any other part of the building that projects above a solar zone must be located a sufficient horizontal distance away from the solar zone in order to reduce the resulting shading of the solar zone.
Construction drawings must indicate the structural roof dead load and roof live load of all areas of the roof designated as solar zones.

Section 110.10(c)

The construction documents must indicate location for inverters and metering equipment and a pathway for routing of conduit from the solar zone to the point of interconnection with the electrical service.

The construction documents must also indicate a pathway for routing of plumbing from the solar zone to the water-heating system.

Section 110.10(d)

A copy of the construction document or a comparable document indicating the information from the Section 110.10(b) through 110.10(e) must be provided to the occupant.

Section 110.10(e)

The main electric panel shall have a minimum busbar rating of 200 amps.

The main electrical service panel must have space to allow for the installation of a double pole circuit breaker for a future solar installation.

The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location.

The reserved space must be permanently marked as “For Future Solar Electric”.

Builder Energy Code Training (BECT) Program

Pacific Gas and Electric Company (PG&E) has contracted with ConSol, a third-party energy efficiency implementation specialist, to implement the Builder Energy Code Training (BECT) Program. The BECT Program provides in-depth codes and compliance education at no cost to help the residential new construction and alterations building industry understand and comply with California's 2013 Title 24 Energy Code. BECT focuses on the most comprehensive and cost-effective ways to bring a home up to and above the CA Energy Code requirements through building science techniques, effective application of the compliance documentation workflow, and the operational interaction of different construction trades.

The BECT Program is sponsored by PG&E and funded by California utility customers and administered by PG&E under the auspices of the California Public Utilities Commission (CPUC). The number of classes are limited and offered on a first-come, first-serve basis. Eligible attendees include residential builders, subcontractors for builders, architects, building department staff and other local government staff throughout PG&E’s Service Territory.

The trainings can be held in a classroom, on-site at a builder job location, or online via webinar. If you or someone in your organization would like to host a BECT class or if you would like to attend the next scheduled class or learn more about the BECT Program, please contact Lynne Martinez via email at lmartinez@consol.ws or visit the BECT Program website at www.bect.ws.

The California Energy Commission welcomes your feedback on the Blueprint. Please contact Daniel Johnson at (916) 651-3746 or daniel.johnson@energy.ca.gov.

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CEC-400-2014-001

CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY DIVISION

SEPTEMBER - OCTOBER 2013

The 2013 Standards Will Go Into Effect January 1, 2014

The Blueprint is your guide to information, training and resources for the 2013 Building Energy Efficiency Standards. The California Energy Commission has partnered with the Statewide Codes & Standards Program to provide training and resources for building officials. California's building energy code can help save energy, keep our air cleaner and offset the need to build new power plants. We understand it can be quite technical and difficult to navigate new standards, especially when time and resources are limited.

The Statewide Codes & Standards Program offers free energy code training, tools and resources for building department personnel, as well as others who need to understand and meet the requirements of Title 24, Part 6. Designed to improve compliance with the state's building energy code, the program aims to advance the adoption and effective implementation of energy efficiency measures and building practices to lock in long-term energy savings. The program recognizes that codes and standards are one of the most effective pathways to ensuring sustained market transformation. The key to making them work well is found in the enforcement efforts of building department professionals. Program offerings are designed for counter staff, plans examiners, field inspectors and building officials.

The California Statewide Codes & Standards Program is funded by California utility customers under the auspices of the California Public Utilities Commission and implemented by Pacific Gas and Electric Company, San Diego Gas and Electric, Southern California Edison and Southern California Gas, in support of the California Energy Commission.

Fall 2013 Classroom Trainings Offered

- Title 24 Residential *or* Nonresidential Standards Essentials for Plans Examiners & Building Inspectors
- Residential Lighting: Title 24 & Technology Update
- Retail Lighting: Title 24 and Technology Update
- Title 24 Standards Essentials for Supermarket Refrigeration
- Title 24 Standards Essentials for Residential AC Quality Installation Contractors
- Title 24 Standards Essentials for Small Commercial AC Quality Installation Contractors

Courses are offered at utility energy training centers and at special locations upon request. For more information please email wendy@mbaenergy.com. For scheduled classes, check these energy center websites to register:

- http://www.pge.com/pec
- http://www.sdge.com/eic
- http://www.socalgas.com/innovation/energy-resource-center
- https://www.sce.com/wps/portal/home/business/consulting-services/energy-education-centers

Decoding: Let's Talk Series for Building Officials

Utilize these FREE 90-minute interactive online events to discuss and decode Title 24 Part 6 Nonresidential Indoor Mandatory Lighting Controls. These webinars will help you with Field Inspection preparation, time management, and dealing with non-compliant projects.

Decoding Lighting: Let's Talk Nonresidential Indoor Mandatory Lighting Controls for Building Inspectors

- ☑ November 12, 8:00am – 9:30am
  http://t24.cc/DecodeLightingNov12AM
- ☑ November 12, 3:00pm – 4:30pm
  http://t24.cc/DecodeLightingNov12PM
- ☑ November 13, 8:00am – 9:30am
  http://t24.cc/DecodeLightingNov13AM
- ☑ November 13, 3:00pm – 4:30pm
  http://t24.cc/DecodeLightingNov13PM
- ☑ November 14, 8:00am – 9:30am
  http://t24.cc/DecodeLightingNov1

For more information on the Statewide Codes and Standards Program, please contact Jill Marver at JKZ1@pge.com.

Free Tools and Resources

In addition to trainings, the program provides free tools and resources to help make complying with Title 24 easier and more efficient. These can be found at www.t24ace.com and include:

- **Fact Sheets & Trigger Sheets** - Residential HVAC Changeouts, Cool Roofs Residential Re-Roofing, Residential Fenestration, and Commercial HVAC Alterations
- **Reference Ace** - helps you navigate the Title 24, Part 6 Standards documents using key word search capabilities along with hyperlinked tables and related sections. *2008 available now, 2013 coming soon!*
- **Forms Ace** – aids in determining which Title 24, Part 6 Forms are applicable to your specific projects using a series of questions in order to determine the appropriate forms. *2008 beta available now, 2013 coming soon! Feedback encouraged – let us know what you think.*
- **Installation Ace** (*Coming Soon*) – a "field guide" to assist you in identifying proper installation techniques related to Title 24, Part 6 components and includes visual aids for some components that are commonly improperly installed.

2013 Energy Standards documents are available online at
www.energy.ca.gov/title24/2013standards/supporting_docs.html

What's New for 2013 Non-Residential

The process to develop the 2013 Standards began with a call for ideas in winter of 2010, moved through a series of IOU sponsored stakeholder meetings throughout the state, Energy Commission staff workshops and Energy Commission hearings in 2011 through 2012 and concluded at the adoption hearing on May 23, 2012. Energy Commission staff, contractors, utilities and many others participated in the process. The following paragraphs summarize the principle changes that resulted.

All Buildings

Revisions to the administrative §10-103 sets the format and informational order for electronic compliance document registration and submittal and for electronic retention of compliance documentation, including the nonresidential forms, for future use and clarifies the roles and responsibilities of the documentation author and the responsible person.

1. §10-109 describes the rules for approving compliance software, alternative component packages, exceptional methods, data registries and related data input software, or electronic document repositories.
2. §10-111 describes the rules for reporting fenestration U-factor, SHGC, and VT.
3. §110.3(c)5 explains the requirements for the water heating recirculation loops serving multiple dwelling units, high-rise residential, hotel/motel, and nonresidential occupancies.
4. Revisions to §110.9 now covers ballasts and luminaires and residential vacancy sensors.

Non-Residential Buildings

Envelope

1. Increased low-slope cool roof requirements (increase reflectance from 0.55 to 0.63 for new construction and alterations). (§140.3(a)1Aia1)
2. Established a maximum air leakage rate (0.04 cfm/sf) except in mild climate zones. (§140.3(a)9B)
3. Increased fenestration requirements to reduce solar gains and increase visual transmittance for daylighting; 0.36 U-factor, 0.25 SHGC, VT 0.42 for fixed windows; the numbers are different for operable windows and skylights. (§140.3(a)5B,C & D)
4. Fenestration. The Standards now include Dynamic Glazing, Window Films and new maximum values for Visible Transmittance (VT). New Dynamic Glazing, Window Films requirements and changes are in the Reference Nonresidential Appendix NA6 and NA7.4
5. Added mandatory Roof insulation requirements and minimum insulation for demising walls. (§110.8(e) & (f))

Lighting

1. Clarification and simplification of existing language; removing exceptions no longer relevant. (§130.0-130.5, 140.6-140.8)
2. Lighting control devices moving from Title 24 Part 6 to Title 20; lighting control systems shall now be acceptance tested for Title 24. (§110.9(b) & §130.4(a))
3. Nonresidential indoor lighting, advanced multi-level lighting controls (controllable ballasts) increased in granularity (in addition to ON/OFF, increasing from one intermediate level to three intermediate levels or continuous dimming), favoring dimmable ballasts for linear fluorescent lighting systems. These controls will allow precise and non-interruptive adjustment of lighting to match the available daylighting, and provide dimming and demand response function

throughout the building. (§130.1(a) 2C) & §130.1(b)

4. Enhancing, modifying, and adding to the prescriptive and mandatory daylighting control requirements; daylighting language significantly simplified. (§130.1(d) & (§140.6(d))
5. Requirements for demand responsive reduction of lighting power being applied to smaller spaces. (§130.1(e))
6. Mandatory Automated Lighting Controls and Switching Requirements in Warehouses and Libraries - Require the installation of occupancy sensors in warehouse aisle ways and open spaces, and library stack aisles. (§130.1(c)6A & B)
7. Mandatory automated lighting controls and switching requirements for hotels and multifamily building corridors - Require the installation of occupancy sensors in corridors and stairwells in lodging and multifamily buildings. (§130.1(c)6C)
8. New mandatory occupancy sensor and daylighting controls in parking garage spaces. (§130.1(d)3)
9. Increased requirements for multi-level lighting controls for nonresidential outdoor lighting. (§130.2(c)3B)
10. Alternate path to comply with existing outdoor lighting cutoff (shielding) requirements, phasing in the new Backlight, Uplight, Glare (BUG) requirements. (§130.2(b))
11. Reduction of allowed lighting power density for some nonresidential indoor and outdoor lighting applications. (§140.6(c) and §140.7(d))
12. Tailored lighting revisions - Reduce the allowed LPD for Floor Display, Wall Display, and Ornamental Lighting under the Tailored Compliance. §140.6(c)3I, J & K)
13. Plug Load Circuit Controls - requiring automatic shut-off controls of electric circuits that serve plug loads, including task lightings, in office buildings. (§130.5(d)1)
14. Hotel/Motel Guest Room Occupancy Controls for HVAC and lighting systems - would require installation of occupancy controls for HVAC equipment, and all lighting fixtures in hotel/motel guest rooms, including plug-in lighting. (§120.2(e)4 & §130.1(c)8)
15. Reduction of threshold when lighting alterations must comply with the Standards, from when 50% of the luminaires are replaced, to when 10% of the luminaires are replaced. Consistent with proposed changes to ASHRAE 90.1- 2010. (§141.0(b)2I & J)

Mechanical

1. Added requirements for Fan Control and Integrated Economizers. 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. (§140.4(c) & (e))
2. Reduced ability for HVAC systems to reheat conditioned air. (§140.4(d))
3. Increased chiller efficiency requirements, consistent with ASHRAE 90.1-2010. (§140.4(i))
4. Increased cooling tower energy efficiency and WATER Savings. (§140.4(k)2)
5. Added requirements for commercial boiler combustion controls. (§140.4(k)3)
6. Added acceptance tests for HVAC sensors and controls, including those for demand controlled ventilation. (§120.5(a))
7. Added efficiency requirements for small motors. (§140.4(c)4)
8. Added credit for evaporative systems that meet the Western Cooling Efficiency Challenge (WCEC program to acknowledge high energy and water efficiency in evaporative systems).
9. Moving Fault Detection and Diagnostics (FDD) protocols for air temperature, economizers, damper modulation, and excess outdoor air to mandatory measures from the current compliance option. (§120.2(i))

2013 Energy Standards documents are available online at
www.energy.ca.gov/title24/2013standards/supporting_docs.html

Electrical

1. Added mandatory requirement for receptacle controls in private offices, open office areas, reception lobbies, conference rooms, kitchens, and copy rooms to automatically shut off task lighting and other plug loads when the area is not occupied. (§130.5(d))
2. Added mandatory requirement for electrical panels to be isolated by energy end use (e.g. lighting, HVAC, plug loads). (§130.5(b)2)

Covered Processes

The 2013 Standards now cover some specific process energy applications, such as supermarket refrigeration, refrigerated warehouses, commercial kitchen ventilation requirements, laboratory exhaust, parking garage ventilation, compressed air, and computer rooms.

Definitions for Covered Processes and Exempt Processes were added. Covered Processes are defined as processes for which there are listed requirements. All other processes are Exempt Processes. Specific requirements for Covered Processes are in separate sections (§120.6 Mandatory and §140.9 Prescriptive). It should be noted that the HVAC equipment efficiencies in §110.1 and §110.2 also apply to Covered Processes. In the 2013 Standards, the Covered Processes include:

1. Increased mandatory requirements for refrigerated warehouses. (§120.6(a))
2. Added mandatory requirements for commercial supermarket refrigeration. (§120.6(b))
3. Added mandatory ventilation control requirements for parking garages. (§120.6(c))
4. Added mandatory requirements for process boilers. (§120.6(d))
5. Added mandatory requirements for storage and unloading for compressed air systems (§120.6(e)) Added prescriptive requirements for HVAC systems serving computer rooms. (§140.9(a)
6. Added prescriptive ventilation control requirements for commercial kitchens. (§140.9(b))
7. Added prescriptive requirements for variable air volume for laboratory exhaust systems. (§140.9(c))

Solar Ready

1. Added mandatory requirements for nonresidential buildings (3 stories or less) to make provisions to more easily enable the future addition of solar electric or solar water heating systems. (§110.10(a)4)

Commissioning

1. Moved Part 11 commissioning requirements to Part 6 for energy-related building components. (§120.8)
2. Added mandatory requirements for design-phase commissioning, which includes an early review of design intent documents and highlighting efficiency specifications in both construction documents and Standards compliance forms. (§120.8(d))

Compliance Option

Hybrid Evaporative Cooling Systems in Nonresidential Buildings

What's New for 2013 Residential

All compliance approaches

1. Revisions to the administrative section §10-103 sets the format and informational order for electronic compliance document registration and submittal and for electronic retention of compliance documentation for future use and clarifies the roles and responsibilities of the documentation author and the responsible person; §10-109 describes the rules for approving compliance software, alternative component packages, exceptional methods, data registries and related data input software, or electronic document repositories. §10-111 describes the rules for reporting fenestration U-factor, SHGC, and VT.
2. §110.3(c)5 explains the requirements for the water heating recirculation loops serving multiple dwelling units, high-rise residential, hotel/motel, and nonresidential occupancies.
3. Revisions to §110.9 now covers ballasts and luminaires and residential vacancy sensors.

Mandatory Measures

1. Duct sealing in all climate zones (CZs). (Section 150.0(m)11)
2. Return duct design or fan power, airflow testing, and grill sizing requirements (Residential HVAC Quality Installation Improvements). (Section150.0(m)13)
3. 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. (Section150.0(k)
4. New luminaire efficacy levels in Table 150.0-B
5. Hot water pipe insulation - Requires insulation on pipes ¾ inch and larger. (Section150.0(j)2Aii)
6. Solar Ready Measure – 250 square feet of solar ready zone on single family roofs in subdivisions of 10 or more swelling units. (Section150.0(r))
7. Walls with 2x6 framing and larger must have at least R-19 insulation. (Section 150.0(c)2)
8. New mandatory U-factor of 0.58 for vertical fenestrations products and skylights. (Section 150.0(q))
9. New third party HERS verifications requirement for Ventilation for Indoor Air Quality, ASHRAE 62.2 requirements. (Section 150.0(o))

Prescriptive Compliance

1. High Performance Windows – Reducing the U-Factor to 0.32 and SHGC to 0.25 in most climate zones. (Section 150.1(c)3A)
2. Duct Insulation – Raise minimum from R-4.2 to R-6.0 in climate zones 6, 7, and 8. (Section 150.1(c)9)
3. Night Ventilation – Whole house fan required to be installed in climate zones 8 through 14; a Smart Vents and Night Breeze allowed as performance path alternatives. (Section 150.1(c)12)
4. Expand the Radiant Barrier requirements to climate zones 3, and 5 through 7. (Section 150.1(c)2)
5. Refrigerant charge and verification now expanded to include ducted package units, mini-splits, and other units. (Section 150.1(c)7)
6. Increase wall insulation to R15+4 in all CZs. (Section 150.1(c)1B)

Performance Compliance

The modeling procedures and requirements for compliance software have been significantly modified for the 2013 Standards. All compliance software vendors must use a single modeling approach and a single interpretation of the performance compliance rules. This "Compliance Manager" software will be integrated into vendor-supplied compliance software that is certified by the Energy Commission. More information is available in the 2013 Residential ACM Approval Manual and the 2013 Residential ACM Reference Manual.

Additions and Alterations

1. Simplified Compliance documentation requirements for small additions and alteration projects that do not involve a HERS measure. (Section 10-103(a)1C and Section 10-103(a)3C)
2. Simplified rules for both the prescriptive and performance paths for additions, alterations, and existing plus additions plus alterations. (Section 150.2(a) and (b))

The California Energy Commission welcomes your feedback on the Blueprint. Please contact Daniel Johnson at (916) 651-3746 or daniel.johnson@energy.ca.gov.

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CEC-400-2013-011

BLUEPRINT

Issue 100 June 2012 CEC-400-2012-009 NEWSLETTER

2013 Standards Update

Martha Brook

Interview with Martha Brook, California Energy Commission

BP: What are the reasons for updating the *Building Energy Efficiency Standards*?

MB: The *Standards* are updated periodically to comply with the Warren-Alquist Act, which mandates that the California Energy Commission create and periodically update building energy efficiency standards. Updating the *Standards* is also consistent with the Energy Commission's *Integrated Energy Policy Report*, California Air Resources Board's *Climate Change Scoping Plan*, and the California Public Utilities Commission's *Long-Term Energy Efficiency Strategic Plan*, all of which articulate the importance of the state's energy policy goal of zero net energy for new residential construction by 2020 and new nonresidential construction by 2030.

BP: What is the process for updating the *Standards*?

MB: The update to the *Standards* is based on the combined research and experience of Energy Commission staff, technical experts who advise the Energy Commission, and utility consultants. Energy-efficient techniques and technologies are evaluated to determine whether they are ready for inclusion into the *Standards*. Considerations of cost effectiveness, technical feasibility, constructability, and potential energy savings are documented in Codes and Standards Enhancement reports. The content of these reports is shared with industry stakeholders in public workshops to raise, discuss, and resolve potential issues. Based on the results of these public workshops, staff decide on a set of updates to include in the proposed *Standards*. The proposed updates then become the basis of an Energy Commission rulemaking proceeding, in which the Energy Commissioners hear comments on the proposed *Standards* and make the decision to modify and ultimately adopt the proposed *Standards*.

BP: How much energy will the *2013 Standards* save as compared to the *2008 Standards*?

MB: A newly constructed residential building built to the prescriptive requirements of the *2013 Standards* will use 25% less energy for lighting, heating, cooling, ventilation, and water heating than one built to the prescriptive requirements of the *2008 Standards*. For (nonresidential buildings, there

(Continued on Page 3.)

Struggling with the *Standards*?

The Energy Commission's Energy Education Center, online since December 2009, provides a variety of tools to help building professionals and building owners comply with the *Building Energy Efficiency Standards* (*Standards*). The Energy Education Center consists of an Online Learning Center and an Energy Videos Center. The Online Learning Center contains courses, study guides, interactive checklists, tutorials, and exams on the *Standards*. The courses cover residential and nonresidential newly constructed buildings, additions, and alterations. The Energy Videos Center features videos on the *Standards*, building science, renewable energy, plan review, and inspection. Please visit the Energy Education Center at www.energyvideos.com.

In This Issue

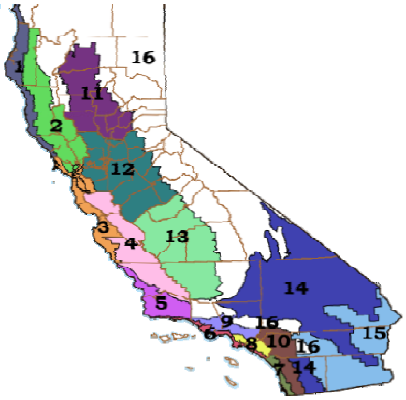
Residential Compliance Q & A

Where do I find the forms I need to demonstrate compliance with the residential requirements of the *2008 Building Energy Efficiency Standards*?

The residential forms are located here.

How do I know which climate zone my project is in?

The Energy Commission's Climate Zone Page provides several methods for determining which climate zone your project is in.



What is Package D, and where can I find it?

Package D is the standard design package that prescribes the minimum energy efficiency requirements for a home. Package D is found in Table 151-C of the *2008 Building Energy Efficiency Standards*.

What is Joint Appendix JA4, and where can I find it?

Joint Appendix JA4 contains insulation values for building materials that must be used in compliance calculations. It can be found in the *2008 Reference Appendices*.

How do I know whether an appliance or device I am considering has been approved by the California Energy Commission?

Certification to the Energy Commission is required for certain products to be used in a *Building Energy Efficiency Standards*-compliant project. To see whether a product you are considering has been certified to the Energy Commission, visit the Commission's Appliance Efficiency Database.

Which forms are required to be submitted with the application for a building permit?

Every residential construction project will require the appropriate CF-1R form and the Mandatory Measures List (MF-1R) form. The project often will require other forms and worksheets when applicable; refer to the *Residential Compliance Manual*, Section 2.3 (Table 2-1).

I am reroofing a house. Which forms will I need to submit?

You will need to submit both the CF-1R-ALT form (only complete the "General Information" box on Page 1, the "Roofing Products" table on Page 3, and the signature boxes on Page 5) and the MF-1R form.

I will be installing a new air conditioner or furnace in my house. What forms will my licensed C-20 contractor need to submit? Does the installation need to be verified by a HERS rater?

The contractor will need to submit the CF-1R-ALT-HVAC form for the appropriate climate zone and the MF-1R form. The installation may need to be verified by a Home Energy Rating System (HERS) rater; refer to the *Residential Compliance Manual*, Section 8.4.2.

Who can sign a form as the Designer or Documentation Author?

Section 2.4 of the *2008 Residential Compliance Manual* details who may sign a form as a Designer or Documentation Author.

Whom can I hire to help with completing these forms?

To locate a Certified Energy Analyst or Certified Energy Plans Examiner, visit the website for the California Association of Building Energy Consultants (CABEC) and click "Find an Energy Consultant" or call CABEC at (877) 530-3045.

When can I use electric resistant heating?

Electric resistant heating can be used when there is no gas available to the home, when the existing system is electric resistant heating (even if gas is available), or when using the performance compliance method.

Whom can I hire to do an energy rating of my home?

You can hire a HERS Rater, trained by CalCERTS, which has been certified by the Energy Commission to conduct California whole-house ratings. You can find a list of certified HERS Raters through CalCERTS at www.calcerts.com/Rater_Directory_new.cfm.

2013 Standards Update

(Continued from Page 1.)

will be a 30% reduction in energy use.

BP: What are some of the major changes to the *Standards* for 2013?

- This is the first *Standards* update designed to put newly constructed homes on a path to achieve California's Zero Net Energy goals by 2020.
- This is the first *Standards* update to establish a photovoltaic compliance option, which allows a portion of the energy generated by a solar electric system to count toward meeting the energy budget in the performance *Standards*.

- Wall insulation requirements for residential buildings are increased to prevent heat transfer and reduce HVAC loads.

- Process equipment installed in grocery stores, commercial kitchens, data centers, laboratories, and parking garages is now covered by the *Standards*.
- All 3/4-inch and larger residential hot water pipes must be insulated to avoid wasting water and energy, and reduce the time it takes to get hot water to where it is needed.

Photo credit: Energy Upgrade California

BP: When will the *2013 Standards* go into effect?

MB: The *2013 Standards* were adopted by the Energy Commission on May 31, 2012, and will go into effect in January 2014.

Residential HVAC Cards

The California Energy Commission and Contractors State License Board have created quick reference cards for residential contractors and homeowners replacing a heating, ventilating, or air-conditioning (HVAC) system. The cards detail what is required by law and what work needs to be performed to ensure optimum HVAC system performance. There are two versions of the card, one for HVAC contractors and one for homeowners.

HVAC contractors are encouraged to provide a copy of the homeowners card when bidding on HVAC projects to differentiate themselves from contractors who fail to pull permits and comply with the *Standards* and California contractor law.

The cards are available for download here.

Energy Efficiency Hotline

- Toll-free in California: (800) 772-3300
- Outside California: (916) 654-5106
- Title24@energy.ca.gov

Standards Training

- Energy Education Center: www.energyvideos.com
- Additional training: www.energy.ca.gov/title24/training

Blueprint 99 • March - April 2011

CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY AND RENEWABLE ENERGY DIVISION

In this Issue:

Get Involved in Energy Upgrade California

Energy Upgrade California is a new one-stop-shop website that helps property owners adopt energy and water efficiency improvements and renewable energy installations across California. These improvements and installations reduce energy and water use, decrease greenhouse gas emissions and waste, create jobs, and stimulate local economies. The program, an unprecedented partnership among federal, state, and local government agencies, utilities, businesses, nonprofit organizations, and educational institutions, connects property owners with Energy Upgrade Participating Contractors who assess, plan, and complete projects, and help property owners receive rebates and incentives. Energy Upgrade California is expected to upgrade more than 100,000 homes in California and create more than 18,000 construction and manufacturing jobs, while reducing energy and water use and greenhouse gas emissions.

Initially for single-family residences, the program will be expanded over the next year to include multi-family and commercial properties. The program consists of Basic and Advanced Upgrade Packages, which provide straightforward upgrade options that qualify for rebates. Basic Upgrade focuses on sealing a home to eliminate leaks that waste heating and cooling energy. There is a fixed rebate of $1,000 available for completing all seven basic measures; this package results in an average 10 percent energy savings. The Advanced Upgrade is a customized energy efficiency solution for the whole house. It begins with an energy assessment to establish a baseline, then the property owner, with help from an Energy Upgrade Participating Contractor, selects a combination of upgrade measures. Confirmed energy savings of 15 to 40 percent qualify for a rebate of $1,250 to more than $4,000, depending on location and utility provider. The more energy you save, the higher the rebate.

www.EnergyUpgradeCA.org, which launched March 1, 2011, provides easy-to-use tools and resources for property owners to contact a Participating Contractor to assess which efficiency measures will yield the highest energy savings. Sign up for Energy Upgrade California e-updates at https://energyupgradeca.org/statewide_email_updates to receive newsletters and updates as they become available.

Contractors

Contractors are key to the success of Energy Upgrade California. This program is an opportunity for local contractors to expand their skills and build new business. It offers tangible benefits for building professionals, including training in the latest home performance standards, listing in an online contractor directory, connection to clients looking for services, marketing support, and outreach materials. To participate in the program, you must be licensed by the Contractors State License Board, be certified by the Building Performance Institute, and participate in program orientation and training.

For more information on how to become an Energy Upgrade California Participating Contractor, visit https://energyupgradeca.org/statewide_for_contractors.

Property Owners

Energy Upgrade California is a great opportunity to save money on energy bills, increase occupant comfort, help the environment, and create jobs. For more information, visit www.EnergyUpgradeCA.org and enter your county to find local rebates and contractors.

www.EnergyUpgradeCA.org

BLUEPRINT
CALIFORNIA ENERGY COMMISSION

Guidance for Enforcement Agencies Regarding Approval Procedure for Weigh-In Method

Without an approved alternative procedure to verify refrigerant charge when temperatures are below *55*°F, there have been reports of HERS raters conducting verification of refrigerant charge using an unapproved method to close permits due to pressure by contractors. In other cases, some enforcement agencies are issuing final building permits on the condition provided in RA 2.4.4 (quoted below). There doesn't appear to be a formalized process to ensure that the HERS rater provides the verification required by the *2008 Building Energy Efficiency Standards* after the final building permit has been issued. The following guidance has been developed to ensure that the HERS rater has been contracted to complete the verification process when outdoor temperatures are 55°F or above and the building permit was approved conditionally.

From RA 2.4.4:

> *If necessary to avoid delay of approval of dwelling units completed when outside temperatures are below 55°F, the enforcement agency may approve compliance credit for refrigerant charge and airflow measurement when installers have used the alternate charging and airflow measurement procedure described in Section RA3.2. This approval will be on the condition that installers provide a signed agreement to the builder with a copy to the enforcement agencies to return to correct refrigerant charge and airflow if the HERS rater determines at a later time when the outside temperature is above 55°F that correction is necessary.*

When the Alternate Charge Measurement Procedure (weigh-in method) is used for refrigerant charge measurement due to outdoor temperatures being below 55°F, the enforcement agency may finalize the CF-6R on the condition that the installer provides a signed agreement to the builder or homeowner with a copy to the enforcement agency to return to correct refrigerant charge and airflow if the HERS rater determines that correction is necessary (per RA 2.4.4). The enforcement agency should verify a written agreement is in place between the installer and a certified HERS rater, which documents that the HERS rater will measure the refrigerant charge using the Standard Charge Measurement Procedure when outdoor temperatures are 55°F or above and complete and register the required compliance documentation.

This written agreement should be signed by both the installer and the HERS rater and contain the project address and homeowner's/builder's name, the HERS rater's and Installer's names, and specify how the HERS rater will be paid for performing the verification.

This agreement should be submitted to the enforcement agency instead of a CF-4R before the final permit for the project is issued. Therefore, in cases where the Alternate Charge Measurement Procedure is used for refrigerant charge measurement, the enforcement agency may final the permit after receiving the CF-1R, CF-6R, and the written agreement between the HERS rater and installer detailed above. No CF-4R will be required at that time, but the HERS rater will provide the registered CF-4R to the homeowner when the verification is complete and the CF-4R is registered.

For questions or clarification, contact the Energy Commission's Building Standards Hotline at (800) 772-3300 or title24@energy.state.ca.us.

BLUEPRINT

CALIFORNIA ENERGY COMMISSION

Attention Energy Professionals: The California Energy Commission Is Hiring!

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Building Energy Efficiency Standards Training

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www.title24learning.com

For training offered by utilities and others, please visit the following websites:

Pacific Gas and Electric Company
www.pge.com/mybusiness/edusafety/training/pec/classes/

Southern California Gas Company
http://seminars.socalgas.com

San Diego Gas & Electric Company
http://seminars.sdge.com

Southern California Edison
www.sce.com/b-sb/energy-centers/workshops-classes.htm

Sacramento Municipal Utility District
www.smud.org/en/education-safety/

California Building Officials
www.calbo.org

California Association of Building Energy Consultants
http://cabec.org/cepe2008standardsinfo_2010.php

Flex your POWER℠

Flex Your Power News
www.fypower.org/news

GO solar CALIFORNIA

www.gosolarcalifornia.org

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BLUEPRINT

Erik Jensen
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Special thanks to:
Christine Collopy, Eurlyne Geiszler, Vanessa Byrd, and Carol Robinson for their help in creating this edition of the Blueprint.

Need Help?
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Blueprint 98 • November – December 2010

CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY AND RENEWABLE ENERGY DIVISION

In this Issue:

Residential Radiant Barrier Compliance for the *2008 Building Energy Efficiency Standards*

This article will clarify various performance parameters and provide compliance guidance when using radiant barriers in new or existing residential buildings to comply with the *2008 Building Energy Efficiency Standards* (*Standards*).

Performance and installation criteria and general compliance guidelines for radiant barriers are addressed in the *2008 Residential Compliance Manual* (Section 3.3.3), the *2008 Reference Appendices* (Section 4.2.2), and to some degree in the *2008 Residential Alternative Calculation Method Approval Manual* (Section 3.4.3 and Tables R3-7 and R3-11).

1. **Installation criteria** contained in these documents apply to new buildings, additions to existing buildings with roofs/attics of wood or steel framing, and enclosed rafter spaces of wood or steel framing such as vaulted/cathedral ceilings. For compliance with the *Standards,* a radiant barrier must:

   a. Be certified by the California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation (http://www.bhfti.ca.gov/home.shtml) and be listed in their *Consumer Guide and Directory of Certified Insulation Material*, at http://www.bhfti.ca.gov/industry/tinsulation.shtml.

   b. Have a tested emittance less than or equal to 0.05 per ASTM C1371 or ASTM E408.

   c. Be installed in the upper portion of the building's truss/rafters, covering the entire roof/attic (including all gable ends), with the reflective surface facing down (towards the attic). Radiant barriers can be installed in any of four configurations, or any combination of these configurations (See Figure 1.):

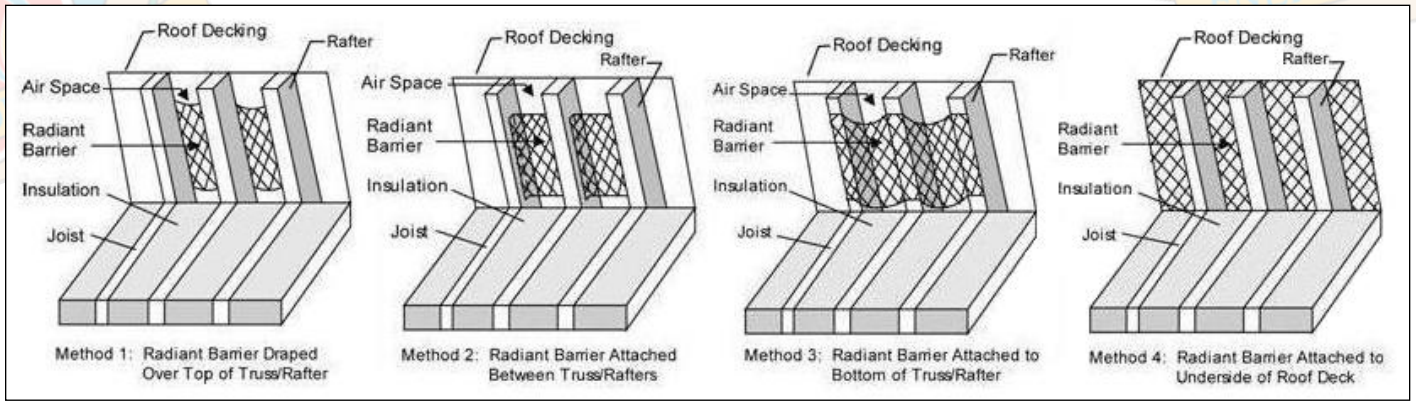
i) Draped over the top chord of the truss/rafters.

ii) Fastened/stapled to the sides of the truss/rafters.

iii) Fastened/stapled to the bottom of the truss/rafters, maintaining a minimum of 1 inch of air space between the radiant barrier and the bottom of the roof sheathing.

iv) Laminated directly to the underside of the roof sheathing, perforated by the manufacturer to allow moisture/vapor transfer through the roof decking material.

Figure 1: Radiant Barrier Installation Methods



Source: California Energy Commission

NOTE: For enclosed attics and enclosed rafters (such as vaulted ceilings[1]) the California Building Code (CBC) requires a minimum of 1 inch of air space between the underside of the roof sheathing and the top of the insulation below, to prevent moisture buildup.[2]

d. Have attic ventilation of no less than one square foot of vent area for every 150 square feet of attic floor area and have no less than 30% of the vent area located in the upper portion (at least 3 feet above eave or cornice vents) of the space being ventilated.[3]

NOTE: When the building has vaulted ceilings, each enclosed rafter space between framing members must be ventilated at the eave or cornice and the top of the roof ridge.

2. Showing compliance with the **Prescriptive Approach**:

All performance and installation criteria in "1." above must be met.

NOTE: When the building has vaulted ceilings, each enclosed rafter space between framing members must be ventilated at the eave or cornice and the top of the roof ridge. Minimum attic air

1. *Vaulted ceiling* - Also referred to as a *cathedral ceiling,* a high open ceiling formed by finishing exposed roof rafters; the ceiling follows the pitch or angle of the roof.
2. 2007 CBC, Section 1203.2
3. NOTE: 2007 CBC, Section 1203.2 requires a minimum of 50% of the required ventilators to be located in the upper ventilated area. Check with your local building department to insure the proper method of compliance.

ventilation is 1/150 (one square inch of net free ventilation for every 150 square inches of attic floor area).

3. Showing compliance with the **Performance Approach**:

   All performance and installation criteria in "1." above must be met, *except* that modeling of the proposed building's attic ventilation may be reduced based on the CBC's allowed requirements or by the local building official.

   Changes made for the *Standards* allow the user to directly input into the computer program the presence of a radiant barrier and parameters of the proposed building's total attic ventilation area and proportion of high vents. For this situation, any changes in the proposed building's ventilation parameters that are different from the "standard design" building's assumed values from Package D may require energy efficiency improvements elsewhere in the proposed building.

   NOTE: When the building has vaulted ceilings, each enclosed rafter space must be ventilated at the eave or cornice and at the top of the roof ridge, dependent on the ventilation scheme (such as 1/150 or 1/300) allowed by the CBC[3] and/or by the building official. Energy credit for radiant barriers *may not* be taken for unventilated attics or unventilated rafter roof designs.

   For modeling roof areas that cannot be ventilated, such as some vaulted rafter designs, there are two modeling options: (1) model the entire building as a single zone with no radiant barrier, or (2) model the ventilated and unventilated roof areas as two separate zones, following the computer program's modeling guidance for assigning opaque assemblies, fenestration, and so forth to each zone, with the unventilated roof zone as having no radiant barrier.

Best practice for a radiant barrier ensures that it "sees" the roof above and attic below. Providing ventilation above and below the radiant barrier, such as a minimum of 3.5 inches between the radiant barrier and insulation below and a minimum of 6 inches (measured horizontally) at the roof's peak, allows hot air to escape from each side of the radiant barrier's surface.

Efficiency Requirements for Water Chilling Packages: Clarification of Table 112-D

Table 112-D (*Water Chilling Packages – Minimum Efficiency Requirements*) of the *2008 Building Energy Efficiency Standards* has caused some confusion. Specifically, electrically operated, air-cooled water chilling packages with condensers are divided into those with a capacity less than 150 tons and those with a capacity equal to or greater than 150 tons, without a corresponding division in efficiency requirements. This division should not have been made. All capacities of electrically operated, air-cooled water chilling packages with condensers must meet the listed efficiencies of 2.80 COP and 3.05 IPLV.

BLUEPRINT
CALIFORNIA ENERGY COMMISSION

Guidelines for Residential HERS Compliance Documentation Registered on or After October 1, 2010 – Newly Constructed Buildings and Additions

Starting January 1, 2010, the *2008 Building Energy Efficiency Standards* required all compliance documentation for newly constructed low-rise residential buildings requiring HERS verification and demonstrating compliance under the multiple orientation alternative to be registered with the appropriate HERS Provider. On October 1, 2010, this requirement was extended to all low-rise residential buildings requiring HERS field verification.

To ensure compliance with this regulation, please follow these guidelines for newly constructed dwellings and additions:

- Look for and review a registered Certificate(s) of Compliance (CF-1R) submitted with the building plans. A registered CF-1R will have a HERS Provider's watermark and a unique 12-digit registration number followed by 13 zeros located at the bottom of each page.*

- Look for and review an electronically signed and registered Installation Certificate(s) (CF-6R)* posted by the installing contractor at the building site. The first 12 digits of its 21-digit registration number (followed by four zeros) will match the associated CF-1R's registration number.

- At final inspection, look for and review an electronically signed and registered Certificate(s) of Field Verification and Diagnostic Testing (CF-4R) posted at the building site by a certified HERS rater. The first 20 digits of its 25-digit registration number will match the associated CF-1R's registration number.

- At final inspection, verify that the work listed on the CF-1R has actually been completed and that the installed equipment matches what is listed on the CF-6R posted at the building site.

- You may verify that any registered compliance document is valid by searching for it on the appropriate HERS Provider's website using the document's registration number. (Currently CalCERTS [www.calcerts.com] is the only HERS Provider certified for newly constructed residential buildings and additions.) If the submitted CF-1R, 6R, or 4R does not exactly match the version posted on the provider's website, or if there is no electronic version available, its validity should be questioned.

*Visit www.energy.ca.gov/title24/toolkit for a Registration Number Guide and an example registered CF-6R.

Continued on next page.

Guidelines for Residential HERS Compliance Documentation Registered on or After October 1, 2010 – HVAC Alterations

Starting October 1, 2010, all required energy compliance forms for residential HVAC alterations shall be registered with an approved HERS provider when HERS field verification and/or testing is required. This will include the CF-1R-ALT-HVAC form (or CF-1R-ALT form), all required CF-6R-MECH-HERS forms, and all required CF-4R forms. To help simplify verification that all of these forms are registered when required, please follow these guidelines:

- The CF-1R-ALT-HVAC form (or CF-1R-ALT form) shall be completed by hand, signed, and submitted along with the building permit application by the individual applying for the permit. This form will not be registered at the time of permit application.
- For the final inspection, the building inspector shall verify that the following energy compliance forms are completed and signed by the installing contractor (or homeowner if the homeowner installed the HVAC equipment and/or ducting), and that the forms are registered by an approved HERS provider:
  - CF-1R-ALT-HVAC form (or CF-1R-ALT form)
  - ALL required CF-6R-MECH-HERS forms
  - ALL required CF-4R forms

  NOTE: The CF-1R-ALT-HVAC form identifies which CF-6R-MECH-HERS forms and CF-4R forms are required depending on climate zone and the type of HVAC alteration.
- After the final inspection, the installing contractor shall provide a copy of the registered energy compliance forms to the homeowner.

HERS Providers currently approved for alterations:

CalCERTS – www.calcerts.com

CBPCA – http://thecbpca.org

For more information regarding residential HVAC alterations, required energy compliance forms, or the registration of forms, please visit the newly developed 2008 Energy Standards Online Learning Center at www.energyvideos.com, or contact the Energy Standards Hotline at (800) 772-3300.

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CALIFORNIA ENERGY COMMISSION

Attention Energy Professionals: The California Energy Commission Is Hiring!

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Building Energy Efficiency Standards Training

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www.title24learning.com

For training offered by utilities and others, please visit the following websites:

Pacific Gas and Electric Company
www.pge.com/mybusiness/edusafety/training/pec/classes/

Southern California Gas Company
http://seminars.socalgas.com

San Diego Gas & Electric Company
http://seminars.sdge.com

Southern California Edison
www.sce.com/b-sb/energy-centers/workshops-classes.htm

Sacramento Municipal Utility District
www.smud.org/en/education-safety/

California Building Officials
www.calbo.org

California Association of Building Energy Consultants
http://cabec.org/cepe2008standardsinfo_2010.php

Flex your POWER

Flex Your Power News
www.fypower.org/news

GO solar CALIFORNIA

www.gosolarcalifornia.org

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BLUEPRINT

Erik Jensen
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Special thanks to:
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Blueprint 97 • September – October 2010

CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY AND RENEWABLE ENERGY DIVISION

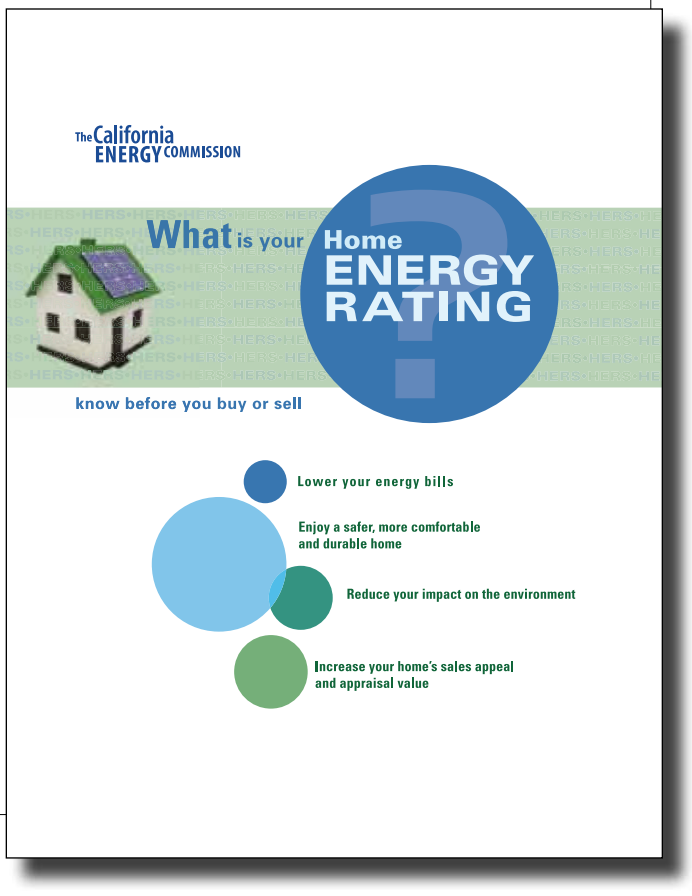
In this Issue:

New Edition of the Home Energy Rating System Booklet

The California Energy Commission, which administers the statewide Home Energy Rating System (HERS) Program, has published a new edition of the HERS Booklet: *What Is Your Home Energy Rating?* The booklet is a colorful and informative publication designed to:

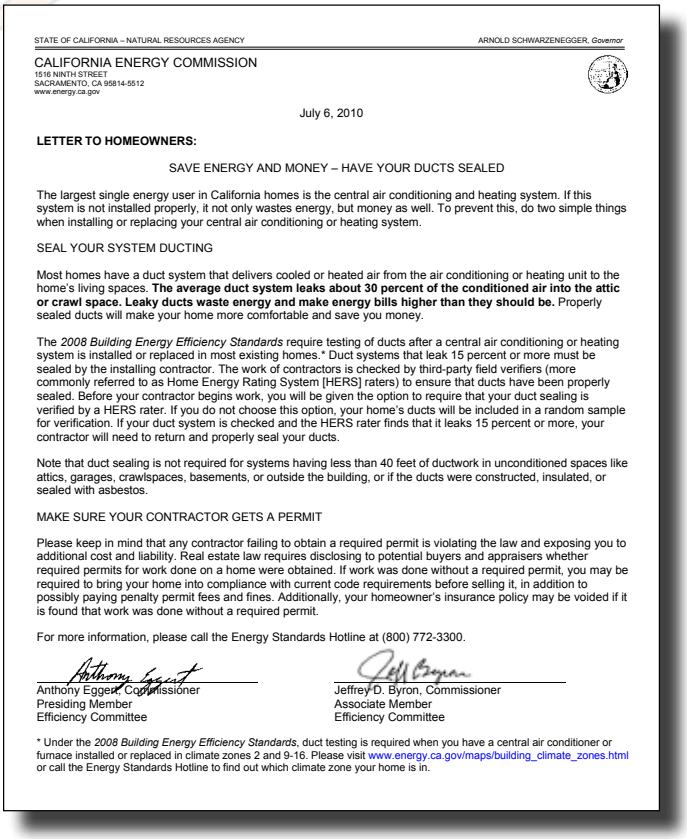
- Describe Whole-House Home Energy Rating services and their benefits, and how to find a certified professional HERS Rater.
- Provide home buyers, sellers, brokers, and appraisers with information about the opportunity to invest in energy efficiency improvements at the time of sale.
- Explain the desirability of obtaining utility bills from the seller.
- Identify the potential of adding sales appeal and value to your home through energy efficiency upgrades.
- Offer options for financing energy efficiency improvements and explain where to find tax credit and rebate information.

To learn more about the California HERS Program, visit www.energy.ca.gov/HERS and click on the "New HERS Booklet" link to view and download the publication.



New Duct Sealing Letter to Homeowners

The California Energy Commission has released a letter to homeowners regarding the importance of duct sealing for homes in climate zones 2 and 9-16. The letter also points out that heating, ventilating, and air-conditioning (HVAC) work should be carried out by licensed HVAC contractors and that a permit is required for this type of work. The letter may be obtained by printing Page 3 of this Blueprint, or by visiting http://www.energy.ca.gov/title24/2008standards/changeout/.



STATE OF CALIFORNIA – NATURAL RESOURCES AGENCY ARNOLD SCHWARZENEGGER, *Governor*

CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
SACRAMENTO, CA 95814-5512
www.energy.ca.gov

July 6, 2010

LETTER TO HOMEOWNERS:

SAVE ENERGY AND MONEY – HAVE YOUR DUCTS SEALED

The largest single energy user in California homes is the central air conditioning and heating system. If this system is not installed properly, it not only wastes energy, but money as well. To prevent this, do two simple things when installing or replacing your central air conditioning or heating system.

SEAL YOUR SYSTEM DUCTING

Most homes have a duct system that delivers cooled or heated air from the air conditioning or heating unit to the home's living spaces. **The average duct system leaks about 30 percent of the conditioned air into the attic or crawl space. Leaky ducts waste energy and make energy bills higher than they should be.** Properly sealed ducts will make your home more comfortable and save you money.

The *2008 Building Energy Efficiency Standards* require testing of ducts after a central air conditioning or heating system is installed or replaced in most existing homes.* Duct systems that leak 15 percent or more must be sealed by the installing contractor. The work of contractors is checked by third-party field verifiers (more commonly referred to as Home Energy Rating System [HERS] raters) to ensure that ducts have been properly sealed. Before your contractor begins work, you will be given the option to require that your duct sealing is verified by a HERS rater. If you do not choose this option, your home's ducts will be included in a random sample for verification. If your duct system is checked and the HERS rater finds that it leaks 15 percent or more, your contractor will need to return and properly seal your ducts.

Note that duct sealing is not required for systems having less than 40 feet of ductwork in unconditioned spaces like attics, garages, crawlspaces, basements, or outside the building, or if the ducts were constructed, insulated, or sealed with asbestos.

MAKE SURE YOUR CONTRACTOR GETS A PERMIT

Please keep in mind that any contractor failing to obtain a required permit is violating the law and exposing you to additional cost and liability. Real estate law requires disclosing to potential buyers and appraisers whether required permits for work done on a home were obtained. If work was done without a required permit, you may be required to bring your home into compliance with current code requirements before selling it, in addition to possibly paying penalty permit fees and fines. Additionally, your homeowner's insurance policy may be voided if it is found that work was done without a required permit.

For more information, please call the Energy Standards Hotline at (800) 772-3300.

Anthony Eggert, Commissioner
Presiding Member
Efficiency Committee

Jeffrey D. Byron, Commissioner
Associate Member
Efficiency Committee

* Under the *2008 Building Energy Efficiency Standards*, duct testing is required when you have a central air conditioner or furnace installed or replaced in climate zones 2 and 9-16. Please visit www.energy.ca.gov/maps/building_climate_zones.html or call the Energy Standards Hotline to find out which climate zone your home is in.

Refrigerant Charge Verification: 70°F Return Air Requirement

Maintaining return air temperature above 70°F while performing refrigerant charge verification when the outside temperature is between 55 and 65°F has been a requirement of the *Building Energy Efficiency Standards* since 2001. This requirement can be met by using the installed furnace to preheat the dwelling air before conducting the refrigerant charge test and/or applying supplemental heating to the airflow during the refrigerant charge test by placing portable electric resistance heating devices near the return air grille. A combination of preheating and supplemental heating will, in most cases, be used to keep the temperature of the return air above 70°F long enough to perform a valid refrigerant charge verification.

A letter explaining this procedure in more detail is at http://www.energy.ca.gov/title24/2008standards/changeout/.

Refrigerant Charge Verification: Requirements for Non-Working Air Conditioning

Section 152(b)1F of the *2008 Building Energy Efficiency Standards* states that a refrigerant charge measurement is required for low-rise residential buildings when "a space-conditioning system is altered by the installation or replacement of the air handler, outdoor condensing unit of a split system air conditioner or heat pump, cooling or heating coil, or the furnace heat exchanger." The refrigerant charge measurement must be completed in accordance with Reference Residential Appendix RA3 in Climate Zones 2 and 8-15, even when only the heating equipment is being altered in a split space-conditioning system.

In some instances, however, the air-conditioning equipment may not be functional at the time the heating equipment is altered or replaced on a split system, making it impossible to measure the refrigerant charge. In this case, a refrigerant charge measurement is not required *only if the building inspector determines that the air-conditioning equipment of the altered split system is nonfunctional*. A refrigerant charge measurement will be required once the air-conditioning equipment is working.

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SEAL YOUR SYSTEM DUCTING

Most homes have a duct system that delivers cooled or heated air from the air conditioning or heating unit to the home's living spaces. **The average duct system leaks about 30 percent of the conditioned air into the attic or crawl space. Leaky ducts waste energy and make energy bills higher than they should be.** Properly sealed ducts will make your home more comfortable and save you money.

The *2008 Building Energy Efficiency Standards* require testing of ducts after a central air conditioning or heating system is installed or replaced in most existing homes.* Duct systems that leak 15 percent or more must be sealed by the installing contractor. The work of contractors is checked by third-party field verifiers (more commonly referred to as Home Energy Rating System [HERS] raters) to ensure that ducts have been properly sealed. Before your contractor begins work, you will be given the option to require that your duct sealing is verified by a HERS rater. If you do not choose this option, your home's ducts will be included in a random sample for verification. If your duct system is checked and the HERS rater finds that it leaks 15 percent or more, your contractor will need to return and properly seal your ducts.

Note that duct sealing is not required for systems having less than 40 feet of ductwork in unconditioned spaces like attics, garages, crawlspaces, basements, or outside the building, or if the ducts were constructed, insulated, or sealed with asbestos.

MAKE SURE YOUR CONTRACTOR GETS A PERMIT

Please keep in mind that any contractor failing to obtain a required permit is violating the law and exposing you to additional cost and liability. Real estate law requires disclosing to potential buyers and appraisers whether required permits for work done on a home were obtained. If work was done without a required permit, you may be required to bring your home into compliance with current code requirements before selling it, in addition to possibly paying penalty permit fees and fines. Additionally, your homeowner's insurance policy may be voided if it is found that work was done without a required permit.

For more information, please call the Energy Standards Hotline at (800) 772-3300.

Anthony Eggert, Commissioner
Presiding Member
Efficiency Committee

Jeffrey D. Byron, Commissioner
Associate Member
Efficiency Committee

* Under the *2008 Building Energy Efficiency Standards*, duct testing is required when you have a central air conditioner or furnace installed or replaced in climate zones 2 and 9-16. Please visit www.energy.ca.gov/maps/building_climate_zones.html or call the Energy Standards Hotline to find out which climate zone your home is in.

BLUEPRINT

CALIFORNIA ENERGY COMMISSION

Attention Energy Professionals: The California Energy Commission is Hiring!

The California Energy Commission is testing and hiring for several professional level positions. Please visit the Energy Commission's careers page at http://www.energy.ca.gov/careers/index.html to find out about the exam and hiring process and view openings.

Building Energy Efficiency Standards Training

Please visit the Energy Commission's **Online Learning Center** at

www.title24learning.com

For training offered by utilities and others, please visit the following websites:

Pacific Gas and Electric Company
www.pge.com/mybusiness/edusafety/training/pec/classes/

Southern California Gas Company
http://seminars.socalgas.com

San Diego Gas & Electric Company
http://seminars.sdge.com

Southern California Edison
www.sce.com/b-sb/energy-centers/workshops-classes.htm

Sacramento Municipal Utility District
www.smud.org/en/education-safety/

California Building Officials
www.calbo.org

California Association of Building Energy Consultants
http://cabec.org/cepe2008standardsinfo_2010.php

Flex Your Power News
www.fypower.org/news

www.gosolarcalifornia.org

Building Standards Implementation Office
1516 Ninth Street, MS-26
Sacramento, CA
95814-5512
(916) 654-4064

BLUEPRINT

Erik Jensen
Editor

Special thanks to:
Gary Flamm, Helen Lam, Sam Lerman, Jeff Miller, Chris Olvera, Vanessa Byrd, and Carol Robinson for their help in creating this edition of the Blueprint.

Need Help?
Energy Standards Hotline
(800) 772-3300 (toll-free in California),

CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY AND RENEWABLE ENERGY DIVISION

In this Issue:

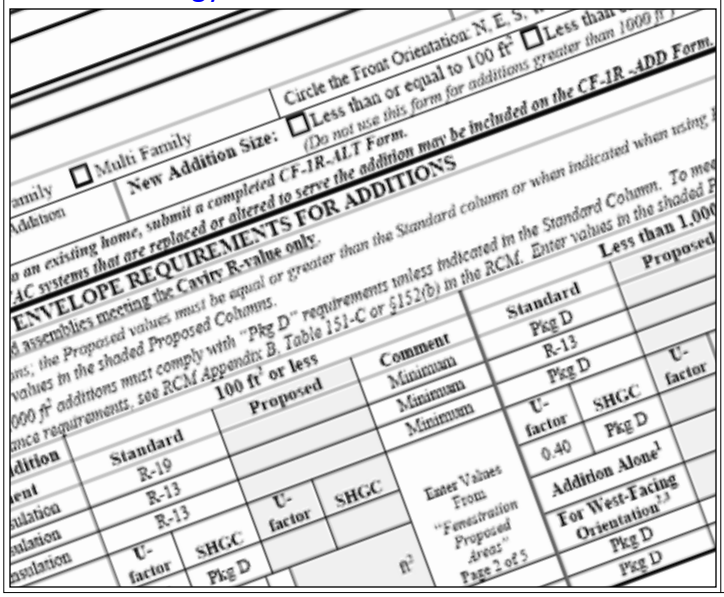
Electronic Compliance Forms

The Energy Commission is in the process of making certain compliance forms electronic, meaning that they can be filled out on a computer before being printed and submitted as usual.

For the residential compliance forms, go to www.energy.ca.gov/title24/2008standards/residential_manual.html#forms.

For the nonresidential compliance forms, go to www.energy.ca.gov/title24/2008standards/nonresidential_manual.html#forms.

If you have any questions about the new electronic forms, please contact the Energy Standards Hotline at (800) 772-3300 (toll-free in California), (916) 654-5106, or title24@energy.state.ca.us



Energy Education Center Wins Awards

The Energy Commission's Energy Education Center website was recently recognized by two organizations for its commitment to helping contractors and others comply with the *Building Energy Efficiency Standards*. The website received a Bronze Award from the Sacramento Public Relations Association at the 2009 CAPPIE awards and an Honorable Mention from the State Information Officers Council at the 2010 SiOC awards. More videos are being developed for the Energy Education Center's Online Learning Center, and they will be posted as they are completed.

The Energy Education Center was featured in Blueprint 94, which may be viewed at www.energy.ca.gov/efficiency/blueprint/. Please visit the Energy Education Center at www.energyvideos.com.

Guide to the Indoor Ventilation Requirements of the *2008 Building Energy Efficiency Standards* (*ASHRAE 62.2*)

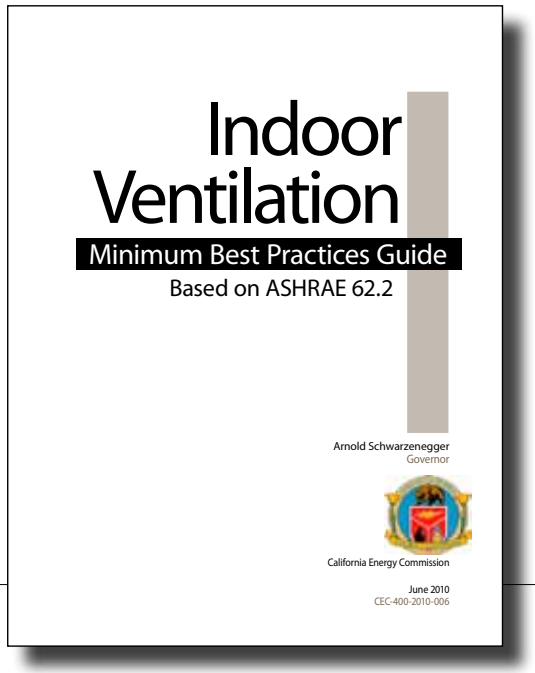
The Energy Commission's *Indoor Ventilation Minimum Best Practices Guide*, for compliance with *ANSI/ASHRAE Standard 62.2-2007*, has been completed and is available at http://www.energy.ca.gov/title24/2008standards/index.html. The guide contains, in a checklist format, the requirements for showing compliance with an exhaust-only ventilation approach, including:

- The calculation of minimum whole-building continuous ventilation airflow.
- Minimum requirements for exhaust fan selection and control.
- Minimum fan ratings for intermittent bathroom and kitchen fans.
- The exhaust duct design requirements found in ASHRAE Table 7.1.

The guide also contains reference appendices that include:

- The whole-building minimum airflow equation.
- Fan selection and duct design requirements.
- Sample note blocks to be placed on the building plans.
- An ASHRAE information form.
- A comprehensive two-page checklist of exhaust-only ventilation system requirements.

To consider alternatives to an exhaust-only approach, refer to Section 4.6 of the Residential Compliance Manual or contact the Energy Standards Hotline at (800) 772-3300 (toll-free in California), (916) 654-5106, or title24@energy.state.ca.us.



Energy Standards Hotline

The Energy Standards Hotline, run by the Energy Commission's Efficiency and Renewable Energy Division, provides callers with comprehensive and timely technical information on how to comply with the *Building Energy Efficiency Standards* and on appliances certified for sale in California. Used daily by building, energy, and utility professionals, the Hotline responds quickly to technical questions with a variety of services. The Hotline is available to receive phone calls Monday through Friday, 8 a.m. to 12 p.m., and 1 p.m. to 4:30 p.m.

To have your *Standards*-related questions answered, contact the Energy Standards Hotline at (800) 772-3300 (toll-free in California), (916) 654-5106, or title24@energy.state.ca.us.

The following tables are a summary of the calls received by the Energy Standards Hotline in March and April 2010.

Caller	Calls
Contractor	802
Engineer/Architect	399
Building Official	245
Owner/Builder	163
Energy Consultant	86
Manufacturer	38
Other	227
Not recorded	6
Total	1966

Topic	Calls
Forms	288
HVAC	274
HVAC Changeout	70
Title 24, General	230
Lighting, Indoor	217
Roofs	204
Software Modeling	79
HERS Rating/Raters	63
Fenestration/Skylights	57
Lighting, Outdoor	53
Water Heating	42
Climate Zones	40
Computer Programs	37
Walls	36
Lighting, Kitchen	20
Website Navigation	18
Multi-Subject	13
Floors	12
Title 24 Code Comparison	12
Lighting, Sign	11
Documentation	9
Reference Appendices	5
Other	111
Not recorded	65
Total	1966

California Energy Commission and Contractors State License Board Team Up to Enforce Compliance with *Building Energy Efficiency Standards*

A memorandum of understanding (MOU) between the California Energy Commission and Contractors State License Board (CSLB) that was approved on June 30, 2010, will help assure that heating, ventilating, and cooling systems being installed, repaired, or replaced in California meet the latest *Building Energy Efficiency Standards* (*Standards*).

Under the MOU, the Energy Commission will report to CSLB any allegations of violations of the permits and testing required by the *Standards*. The Energy Commission will assist CSLB investigations and sting operations that target potential violators, and provide testimony and documentation to support CSLB action against licensees who fail to adhere to the *Standards*. CSLB will also partner with the Energy Commission for education and outreach efforts to contractors, consumers, and building department personnel in California.

CSLB's contractor notification effort began in late 2009, and the board ramped up its permit compliance enforcement in January 2010, partnering with the California Building Officials (CALBO). Letters were mailed to C-20 (warm-air heating, ventilating, and air-conditioning, or HVAC) contractors in the cities of Fairfield, Folsom, Grand Terrace, La Puente, Porterville, Rocklin, and Whittier before a series of sting operations was conducted in those cities during February and March, 2010.

Most of the 50 contractors contacted during the sting operations indicated they knew about the permits, energy, and safety requirements associated with HVAC systems. However, some offered to skirt the process in order to offer a lower bid to investigators posing as homeowners. About one third of those invited to the stings committed potential permit violations. As a result of the stings, CSLB issued six citations and two more are pending.

In addition to being a violation of the *Standards*, failure to pull the proper permits and assure that HVAC systems are inspected and approved is also a violation of California Business and Professions Code Sections 7110 and 7090. Contractor discipline can result in up to $5,000 in fines per citation, as well as suspension and/or revocation of the contractor license.

Additionally, CSLB distributed a letter to its nearly 12,000 C-20 license holders in late June and early July to reinforce awareness of CSLB's accelerated enforcement of *Standards* requirements for HVAC permits and testing. The letter explains the importance of adherence to the *Standards* for energy efficiency, health, and safety. It also outlines the potential penalties for violating the Business and Professions Code by failing to adhere to the *Standards*.

-Contributed by Contractors State License Board.

CABEC Certified Energy Plans Examiner Training and Exams

Would you like to earn a certification showing your competence and expertise in preparing Title 24 Energy Code compliance reports? The California Association of Building Energy Consultants (CABEC) has been certifying Plans Examiners and Consultants to signify their qualification to plan check and/or prepare Title 24 Energy Code documents since 1988.

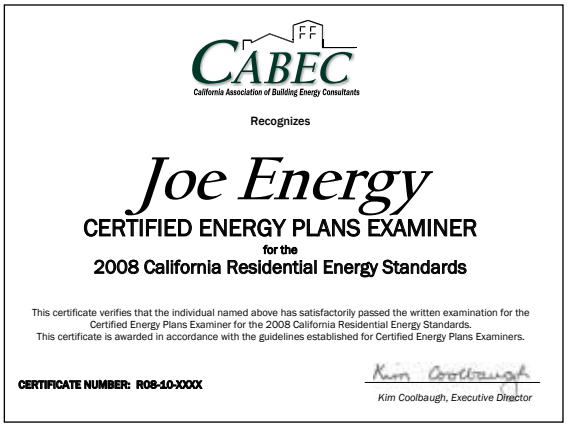
Passing the Certified Energy Plans Examiner (CEPE) exam results in being assigned a unique CEPE certification number, which demonstrates that you have passed an exam testing your understanding of the *2008 Building Energy Efficiency Standards*. Potential clients can find a complete list of current CEPEs and Certified Energy Analysts (CEAs) on the CABEC website at http://www.cabec.org/index.php?option=com_content&view=category&id=39&Itemid=58.

Training and Certification Exams for the *2008 Standards* have been scheduled for fall of 2010, and registration is open now.

Training is funded by PG&E and administered by CABEC. Training is done by Webcast on September 16 and 21 for residential and on October 21 and 26 for nonresidential. Participation requires a high-speed internet connection.

Exams are administered by CABEC. Residential exams will be given in Costa Mesa and Sacramento on October 8; nonresidential exams will be given in the same cities on November 12.

For questions regarding the CEPE program, call CABEC at 877-530-3045. To register for training and/or the exam, go to http://www.cabec.org/index.php?option=com_content&view=category&id=36&Itemid=55.


CABEC
California Association of Building Energy Consultants
Recognizes
Joe Energy
CERTIFIED ENERGY PLANS EXAMINER
for the
2008 California Residential Energy Standards
This certificate verifies that the individual named above has satisfactorily passed the written examination for the Certified Energy Plans Examiner for the 2008 California Residential Energy Standards.
This certificate is awarded in accordance with the guidelines established for Certified Energy Plans Examiners.
CERTIFICATE NUMBER: R08-10-XXXX
Kim Coolbaugh, Executive Director

Requirements for HVAC Contractors and Demolition Professionals

THE Mercury Thermostat Collection Act OF 2008

The Mercury Thermostat Collection Act of 2008 requires construction and demolition professionals to properly remove and dispose of out-of-service mercury-added thermostats.

Effective July 1, 2009, the law requires the following:

HVAC Contractors who install heating, ventilation, and air-conditioning components are required to:

- Handle and transport out-of-service mercury-added thermostats in accordance with the Universal Waste Regulations (UWR) found in CA Code of Regulations, Title 22, Chapter 23. *For summary of the UWR for out-of-service mercury-added thermostats visit* http://www.dtsc.ca.gov/HazardousWaste/upload/UW-_-thermostats_NS.pdf
- Take out-of-service mercury-added thermostats to a collection location that is operated in accordance with Universal Waste Regulations.

Persons engaged in building demolition are required to:

- Remove out-of-service mercury-added thermostats prior to demolition in accordance with the UWR.
- Handle and transport out-of-service mercury-added thermostats in accordance with the Universal Waste Regulations found in CA Code of Regulations, Title 22, Chapter 23. *For summary of the UWR for out-of-service mercury-added thermostats visit* **http://www.dtsc.ca.gov/HazardousWaste/upload/UW-_-thermostats_NS.pdf**
- Take out-of-service mercury-added thermostats to a collection location that is operated in accordance with Universal Waste Regulations.

Collection bins for out-of-service mercury-added thermostats are required by law to be provided at HVAC wholesaler locations in California. *To find a HVAC wholesaler near you, visit* **http://www.thermostat-recycle.org** [1].

Collection bins may also be found at local government agency household hazardous waste (HHW) collection facilities. *To find a HHW collection facility near you, visit* **http://www.dtsc.ca.gov/HazardousWaste/UniversalWaste/HHW.cfm**

Failure to comply with this law may result in penalties of up to twenty-five thousand dollars ($25,000) for each separate violation or, for continuing violations, for each day that a violation continues.

Learn more about the law and the obligations for contractors and building demolition at: **http://www.dtsc.ca.gov/HazardousWaste/Mercury_Therm_Act.cfm**

For questions/concerns, contact DTSC at **thermostats@dtsc.ca.gov** *or DTSC's Regulatory Assistance Officers at* **800-72-TOXIC (800-728-6942).**

1. The link provides additional information that may be useful or interesting and is being provided consistent with the intended purpose of the Mercury Thermostat Collection Act. However, DTSC cannot attest to the accuracy of information provided by this link or any other linked site. Providing links to a non-DTSC Web site does not constitute an endorsement by DTSC or any of its employees of the sponsors of the site or the information or products presented on the site.

Department of Toxic Substances Control

Building Energy Efficiency Standards Training

Please visit the Energy Commission's new **Energy Education Center** at:

www.energyvideos.com

For training offered by utilities and others, please visit the following websites:

Pacific Gas and Electric Company
www.pge.com/mybusiness/edusafety/training/pec/classes/

Southern California Gas Company
http://seminars.socalgas.com

San Diego Gas & Electric Company
http://seminars.sdge.com

Southern California Edison
www.sce.com/b-sb/energy-centers/workshops-classes.htm

Sacramento Municipal Utility District
www.smud.org/en/education-safety/

California Building Officials
www.calbo.org

California Association of Building Energy Consultants
http://cabec.org/cepe2008standardsinfo_2010.php

Flex your POWER℠

Flex Your Power News
www.fypower.org/news

GO solar CALIFORNIA

www.gosolarcalifornia.org

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BLUEPRINT

Erik Jensen
Editor

Special thanks to:
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CEC-400-2010-007

Blueprint 95 • April–May 2010

CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY AND RENEWABLE ENERGY DIVISION

In this Issue:

Cool Roof Requirements Under the *2008 Building Energy Efficiency Standards*

WHAT ARE *COOL ROOFS*?

The term *cool roof* refers to a roofing product with high solar reflectance and thermal emittance properties. These properties help reduce cooling loads by lowering roof temperatures on hot, sunny days. There are numerous materials in a wide range of colors that meet cool roof requirements.

WHAT'S NEW IN THE *2008 STANDARDS* REGARDING COOL ROOFS?

Under the *2005 Building Energy Efficiency Standards* (*2005 Standards*), cool roofs were required only when using the prescriptive approach for low-sloped roofs in nonresidential buildings. Under the *2008 Standards*:

- Cool roofs are required when using the prescriptive approach for most low-sloped *and* steep-sloped roofs in residential *and* nonresidential buildings.
- Cool roof requirements vary by climate zone and roofing material weight.
- Solar reflectance values are now based on their reflectance properties after three years (known as "aged reflectance") as opposed to their initial values.
- A Solar Reflectance Index (SRI) has been developed to provide another means of demonstrating compliance.

Photo Credit: ASC Building Products

WHAT ARE *SOLAR REFLECTANCE* AND *THERMAL EMITTANCE*?

Solar reflectance refers to a material's ability to reflect the sun's energy back into the atmosphere, much like how light is reflected by a mirror. Even for materials with high solar reflectance, a portion of the sun's energy is absorbed and stored as heat. Once absorbed, some of this heat is rejected, or emitted, back into the air. *Thermal emittance* provides a means of quantifying how much of the absorbed heat is rejected for a given material. Materials with good solar reflectance and thermal emittance properties are critical in delivering the low surface temperatures associated with cool roofs.

WHAT IS THE SOLAR REFLECTANCE INDEX (SRI)?

The SRI provides an alternative to meeting solar reflectance and thermal emittance requirements for cool roofs. The SRI allows for tradeoffs between the minimum solar reflectance and thermal emittance values that would otherwise be used for compliance under the prescriptive approach. The SRI values range from 0 to 100, with a higher SRI being better.

WHO RATES COOL ROOF MATERIALS?

The Cool Roof Rating Council (CRRC) is the sole entity the California Energy Commission recognizes for certifying the solar reflectance and thermal emittance values of roofing products. Only reflectance and emittance values listed within the CRRC's Rated Products Directory, at www.coolroofs.org/products/search.php, may be used to meet cool roof requirements.

WHY DO THE *STANDARDS* CALL FOR AGED REFLECTANCE VALUES RATHER THAN INITIAL REFLECTANCE VALUES?

As a roofing material ages, its ability to reflect heat decreases. Using an aged reflectance value rather than an initial reflectance value more accurately represents how a roofing material will perform over time. If an aged reflectance value is not yet in the Rated Products Directory, the following equation may be used to calculate the aged Solar Reflectance, where $\rho_{initial}$ is the initial solar reflectance value found in the directory:

$$\text{Aged Reflectance}_{calculated} = (0.2 + 0.7[\rho_{initial} - 0.2])$$

ARE LIQUID-APPLIED ROOF COATINGS ALLOWED TO BE USED IN CALIFORNIA?

Absolutely. When used to take performance compliance credit or to meet prescriptive requirements for reflectance and emittance, liquid-applied roof coatings (like any other roofing products) must have a clearly visible packaging label that lists the solar emittance and the initial and three-year aged reflectance from the CRRC's Rated Products Directory.

Additionally, packaging for liquid-applied roof coatings must state that the product meets the ASTM requirements specified in Section 118(i) 4 of the *Standards*.

WHAT ARE THE MINIMUM REQUIREMENTS NEEDED TO DEMONSTRATE COMPLIANCE WITH THE PRESCRIPTIVE APPROACH?

The following tables show the minimum solar reflectance, thermal emittance, and SRI values needed to demonstrate compliance under the prescriptive approach. If a climate zone is not listed in the tables for a given building type and roof characteristic, cool roofs are not required for that climate zone, building type, and roof characteristic. These requirements apply only to *conditioned buildings*, buildings that are mechanically heated or cooled. A *low-sloped* roof has a rise to run ratio of 2:12 or less. A *steep-sloped* roof has a rise to run ratio greater than 2:12. Please refer to www.energy.ca.gov/maps/building_climate_zones.html or call the Energy Efficiency Hotline at (800) 772-3300 to find out what climate zone a proposed project is in.

Photo Credit: MonierLifetile

RESIDENTIAL BUILDINGS

Climate Zone	Roof Characteristic(s)	Aged Reflectance	Emittance	SRI
13 & 15	Low-sloped	0.55	0.75	64
10-15	Steep-sloped and roofing product density < 5 lb/ft^2	0.2	0.75	16
1-16	Steep-sloped and roofing product density ≥ 5 lb/ft^2	0.15	0.75	10

NONRESIDENTIAL BUILDINGS

Climate Zone	Roof Characteristic(s)	Aged Reflectance	Emittance	SRI
2-15	Low-sloped	0.55	0.75	64
2-16	Steep-sloped and roofing product density < 5 lb/ft^2	0.2	0.75	16
1-16	Steep-sloped and roofing product density ≥ 5 lb/ft^2	0.15	0.75	10

HIGH-RISE RESIDENTIAL BUILDINGS, HOTELS, AND MOTELS

Climate Zone	Roof Characteristic(s)	Aged Reflectance	Emittance	SRI
10, 11, 13-15	Low-sloped	0.55	0.75	64

RELOCATABLE PUBLIC SCHOOL BUILDINGS WHERE THE MANUFACTURER CERTIFIES USE IN ALL CLIMATE ZONES

Roof Characteristic(s)	Aged Reflectance	Emittance	SRI
Low-sloped	0.55	0.75	64
Steep-sloped and roofing product density < 5 lb/ft^2	0.2	0.75	16
Steep-sloped and roofing product density ≥ 5 lb/ft^2	0.12	0.75	10

ARE THERE ANY EXCEPTIONS TO THE ABOVE REQUIREMENTS?

- Cool roofs are not required for a roof area covered by building-integrated photovoltaic panels or building-integrated solar thermal panels.
- Cool roofs are not required for low-sloped roof constructions that have thermal mass over the roof membrane with a weight of at least 25 lb/ft^2. This includes green roofs (roofs that are covered with vegetation) weighing at least 25 lb/ft^2, though any portion of the roof not covered with vegetation will need to comply with cool roof requirements if not otherwise exempt.
- Cool roofs are not required for nonresidential wood-framed roofs in climate zones 3 and 5 if the roof assembly has a U-factor* of 0.039 or lower.
- Cool roofs are not required for nonresidential metal-framed roofs in climate zones 3 and 5 if the roof assembly has a U-factor of 0.048 or lower.

*In general terms, U-factor describes how readily a building material transmits heat; a lower U-factor indicates that a material is a better insulator.

- The following exceptions and alternatives to the prescriptive requirements apply to residential alterations:

SLOPE	COOL ROOFS ARE NOT REQUIRED IN THE FOLLOWING SITUATIONS
Low-Sloped	• Building has no ducts in the attic.
Steep-Sloped	• Insulation with a thermal resistance of at least 0.85 hr·ft^2·°F/Btu or at least a 3/4-inch air-space is added to the roof deck over an attic. • Existing ducts in the attic are insulated and sealed according to §151(f)10. • In climate zones 10, 12, and 13, with 1 ft^2 of free ventilation area of attic ventilation for every 150 ft^2 of attic floor area, and where at least 30 percent of the free ventilation area is within 2 feet vertical distance of the roof ridge. • Building has at least R-30 ceiling insulation. • Building has a radiant barrier in the attic meeting the requirements of §151(f)2. • Building has no ducts in the attic. • In climate zones 10, 11, 13, and 14, R-3 or greater roof deck insulation above vented attic.

WHAT ARE THE INSULATION REQUIREMENTS FOR ROOF ALTERATIONS?

If reroofing certain building types with low-sloped roofs that have less than R-7 insulation, new insulation must be installed that meets the requirements of the table below.

	Nonresidential Buildings		High-Rise Residential Buildings and Guest Rooms of Hotels and Motels	
Climate Zone	Continuous Insulation R-value	U-factor	Continuous Insulation R-value	U-factor
1, 3-9	R-8	0.081	R-14	0.055
2, 10-16	R-14	0.055	R-14	0.055

Photo Credit: MonierLifetile

HERS Verification Requirements for the Alternate Charge Measurement Procedure

For an air conditioner that is installed when the outdoor temperature is below 55°F, the installing contractor must use the Alternate Charge Measurement Procedure (Weigh-in Charging Method, Reference Residential Appendix RA3.2.3). Every system on which the Alternate Charge Measurement Procedure was used must be field verified by a Home Energy Rating System (HERS) rater, using the Standard Charge Measurement Procedure (Reference Residential Appendix RA3.2.2), when the outdoor temperature is above 55°F. Group sampling is not allowed for HERS verification compliance for systems when the installing contractor used the Alternate Charge Measurement Procedure.

Note that, according to Reference Residential Appendix RA2.4.4, an enforcement agency may approve compliance credit for refrigerant charge measurement when installers have used the Alternate Charge Measurement Procedure. This approval will be on the condition that the installer provides a signed agreement to the builder, with a copy to the enforcement agency, to correct the refrigerant charge if the HERS rater determines at a later time, when the outside temperature is above 55°F, that correction is necessary.

If the Alternate Charge Measurement Procedure was used, the installing contractor must complete and submit a CF-6R-MECH-26-HERS. If the Standard Charge Measurement Procedure was used, the installing contractor must complete and submit a CF-6R-MECH-25-HERS. When either charge measurement procedure was used by the installing contractor, the HERS rater must complete and submit a CF-4R-MECH-25.

CSLB Enforcement Efforts

Beginning in January 2010 the Contractors State License Board (CSLB) accelerated their enforcement efforts against contractors who are performing work without required building permits. CSLB notes that permit violations are not only a health and safety issue for property owners, but can also be a financial liability if someone is injured.

Contractors performing work without a required permit are subject to disciplinary action by CSLB. If you know of a contractor who is performing work without a required permit, you should notify CSLB and the local building department where the work is being performed. CSLB has developed a "Permit Violation Referral Form" to report offenders and on November 30, 2009, issued *Industry Bulletin # 09-19* to address this issue.

The California Energy Commission, CSLB, California Building Officials (CALBO), and your local building jurisdictions are working to help locate and identify suspected offenders. These agencies, with the assistance of the Attorney General's Office, are actively investigating complaints to increase compliance with the *Building Energy Efficiency Standards* and other codes, to level the playing field for the licensed contractors who pull permits and perform work as required by the codes, ordinances, and standards.

To obtain a copy of the "Permit Violation Referral Form" and review the CSLB *Industry Bulletin*, go to the following Energy Commission website:

www.energy.ca.gov/title24/2008standards/changeout/

BLUEPRINT
CALIFORNIA ENERGY COMMISSION

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www.energyvideos.com

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PG&E
www.pge.com/mybusiness/edusafety/training/pec/classes/

SoCal Gas Company
http://seminars.socalgas.com

San Diego Gas and Electric
http://seminars.sdge.com

SCE
www.sce.com/b-sb/energy-centers/workshops-classes.htm

SMUD
www.smud.org/en/education-safety/

CALBO
www.calbo.org

CABEC
www.cabec.org

Flex your POWER℠

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Erik Jensen
Editor

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Need Help?
Energy Standards Hotline
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CEC-400-2010-005

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CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY AND RENEWABLE ENERGY DIVISION

In this Issue:

Descriptions of the *Standards* and Supporting Documents

2008 Building Energy Efficiency Standards for Residential and Nonresidential Buildings (Standards)

Purpose

The *Standards*, which comprise Title 24, Parts 1 and 6, of the *California Code of Regulations*, are a legal document establishing the minimum energy efficiency for newly constructed buildings, additions, and alterations in California.

Building Types Covered

- The residential portions of the *Standards,* and the *Residential Compliance Manual,* cover newly constructed single-family dwellings of any number of stories, duplex (two-family) dwellings of any number of stories, multi-family dwellings of three or fewer habitable stories;* and additions or alterations to any of the above.
- The nonresidential portions of the *Standards,* and the *Nonresidential Compliance Manual,* cover newly constructed offices; stores; restaurants; assembly and conference areas; industrial work buildings; commercial and industrial storage; schools; churches; theaters; hotels and motels; apartments and multi-family buildings with four or more habitable stories; long-term care facilities with four or more habitable stories; dormitory-style sleeping quarters with six or more "guest rooms"; private garages, carports, sheds, and agricultural buildings; and additions or alterations to any of the above.
- A multi-family building with four or more habitable stories is under the scope of the nonresidential requirements, but the dwelling units must meet the lighting, water heating, and setback thermostat requirements for low-rise residential buildings.
- The *Standards* do not apply to California Building Code Occupancy Group I, which includes hospitals, daycare facilities, nursing homes, and prisons. The *Standards* also do not apply to buildings that fall outside the jurisdiction of California Building Codes, such as mobile structures. If outdoor lighting is associated with a Group I occupancy, it is exempt from *Standards* compliance.

Residential Compliance Manual and *Nonresidential Compliance Manual*

The *Residential Compliance Manual* and *Nonresidential Compliance Manual* are intended to help anyone involved in the planning of newly constructed buildings, additions, or alterations understand, comply with, and enforce the *Standards*. The manuals include compliance strategies, sample compliance options, and questions and answers regarding *Standards* compliance.

**The Standards define a "habitable story" as one that contains space in which humans may live or work in reasonable comfort, having at least 50% of its volume above grade.*

2008 Reference Appendices

The *Reference Appendices* are composed of three sections:

- The "Joint Appendices," applicable to both residential and nonresidential construction, consist of:
  - A glossary.
  - Reference weather and climate data.
  - Time dependent valuation information.
  - U-factor, C-factor, and thermal mass data.
  - Charge indicator display information.
  - Installation procedures for medium-density, closed-cell spray foam.
  - Light-emitting diode light source testing procedures.
- The "Reference Residential Appendices" include HERS measures that were moved from the *Residential Alternative Calculation Method (ACM) Manual* as well as additional new information, and consist of:
  - HVAC sizing information.
  - Residential HERS verification, testing, and documentation procedures.
  - Residential field verification and diagnostic test protocols.
  - Energy efficiency measure eligibility criteria.
  - Interior mass capacity information.
- The "Reference Nonresidential Appendices" include acceptance tests that were moved from the *Nonresidential ACM Manual* as well as additional new information and consist of:
  - Nonresidential HERS verification, testing, and documentation procedures.
  - Nonresidential field verification and diagnostic test procedures.
  - Fan motor efficiencies.
  - Compliance procedures for relocatable public school buildings.
  - The overall envelope time dependent valuation energy approach (envelope tradeoff procedure).
  - Alternate default fenestration procedure to calculate thermal performance.
  - Acceptance requirements for nonresidential buildings.
  - Illuminance categories and luminaire power.

Terms Used in the *2008 Building Energy Efficiency Standards* and Supporting Documents

The **prescriptive approach** to compliance offers relatively little design flexibility but is easy to use. For residential construction, the prescriptive approach requires that each building component meet or exceed the minimum efficiency level specified in the appropriate package. Refer to Section 1.6.2 of the *Residential Compliance Manual* for information on the prescriptive compliance packages. For nonresidential construction, the prescriptive approach requires that the building components (envelope, mechanical, and lighting) meet the requirements of certain sections of the *Building Energy Efficiency Standards (Standards)*. Refer to Section 142 of the *Standards* for the locations of the prescriptive requirements for nonresidential construction.

The **performance approach** to compliance uses an Energy Commission-approved computer software program to model a proposed building, determine its allowed energy budget (based on prescriptive Package D), calculate its energy use, and determine whether the design complies with the budget. This approach is more complicated than the prescriptive approach but offers considerable design flexibility. The programs that are approved for demonstrating compliance with the residential standards are EnergyPro 5®, CalRes®, and Micropas 8®. The programs that are approved for demonstrating compliance with the nonresidential standards are EnergyPro 5 and PERFORM 2008®.

When using the performance approach, **compliance credit** is available if the proposed design exceeds the Package D requirements in certain areas. Refer to Chapter 7 of the *Residential Compliance Manual* for the list of areas where compliance credit is available and for more information about the performance approach.

Mandatory measures must be met whether the builder intends to use the prescriptive approach or the performance approach for compliance. When the chosen approach calls for a more stringent requirement than a mandatory measure, or vice versa, the more stringent requirement must be followed. The following examples illustrate this principle:

- Under the performance approach, even if the software program used to model a home indicates that the home would meet the required energy efficiency with less than R-19 insulation in the ceiling, R-19 is the minimum

insulation that may be used because R-19 is specified in the mandatory measures.

- Under the prescriptive approach, ceiling insulation of at least R-30 must always be installed; in this case, the mandatory measure is superseded by the requirements of the prescriptive approach.

Some prescriptive measures regulated by the *Standards* vary by **climate zone**, either in stringency or whether they are required at all, so it is important to know what climate zone you are in when applying the *Standards*. Go to http://www.energy.ca.gov/maps/building_climate_zones.html to find out what climate zone a proposed project is in.

HVAC Updates for the *2008 Standards*

2008 Residential HVAC Updates

- A new prescriptive package is introduced, Package E, which allows for the use of metal frame fenestration products. This package offsets the higher U-factors by requiring higher duct insulation values and higher efficiency equipment in certain climate zones when compared to Package D.
- Duct sealing is required for both newly constructed buildings and changeouts; there are no alternatives to duct sealing when using the prescriptive approach.
- Performance compliance credits are available for low-leakage ducts in conditioned space and for low-leakage air handlers (furnaces), and the maximum rated total cooling capacity performance credit has been modified.
- Thermostatic expansion valves can no longer serve as an alternative to the refrigerant charge verification requirement for split system air conditioners. However, the installation of a charge indicator display (not yet available) can serve as an alternative. Refer to Section 4.3.2 of the *Residential Compliance Manual* for more information on the use of a charge indicator display.
- All prescriptive packages with central forced air handlers in climate zones 10 - 15 are required to meet the cooling coil airflow and fan watt draw criteria found in Section 4.3.3 of the *Residential Compliance Manual*. Performance compliance credits are available for cooling coil airflows that exceed the prescriptive requirements and for fan watt draws that are less than the prescriptive requirements.
- All newly constructed low-rise residential buildings are required to have a whole-building ventilation system and satisfy other requirements to achieve acceptable indoor air quality. The Energy Commission adopted the requirements of *ASHRAE Standard 62.2-2007*, except that opening windows is not an acceptable option for providing whole-building ventilation in California. The mechanical ventilation and indoor air quality requirements are mandatory measures. Refer to *Blueprint 93* for an overview of these new requirements; they are covered more thoroughly in Section 4.6 of the *Residential Compliance Manual*.
- If a central fan integrated ventilation system is used to meet the *ASHRAE Standard*, the watt draw of the furnace fan in air distribution mode must be less than 0.58 W/CFM.
- There are performance compliance credits available for evaporatively cooled condenser air conditioners (Sections 4.7.3 and 4.7.8 of the *Residential Compliance Manual*) and ice storage air conditioners (Section 4.7.9 of the *Residential Compliance Manual*).

2008 Nonresidential HVAC Updates

- There are new mandatory requirements for refrigerated warehouses with a floor area of 3,000 or more square feet. Refer to Section 126 of the *Standards* or Chapter 8 of the *Nonresidential Compliance Manual* for more information.
- The direct control ventilation requirements are expanded to multi-zone systems with direct digital controls but exempt spaces with high occupant density from these requirements to ensure adequate ventilation (*Standards* Section 121[c]).
- There are new mandatory and prescriptive requirements for hotels and motels to use residential water heating models (*Standards* Sections 113 and 145).
- There are new variable air volume control requirements, effective January 1, 2012, for larger air-conditioning units serving single zones (*Standards* Section §144[l]).
- Direct digital control system requirements are expanded to zone level for HVAC systems (*Standards* Section 122[b]), including demand shedding controls (*Standards* Section 122[h]) and VAV zone minimums (*Standards* Section 144[d]).

Energy Education Center

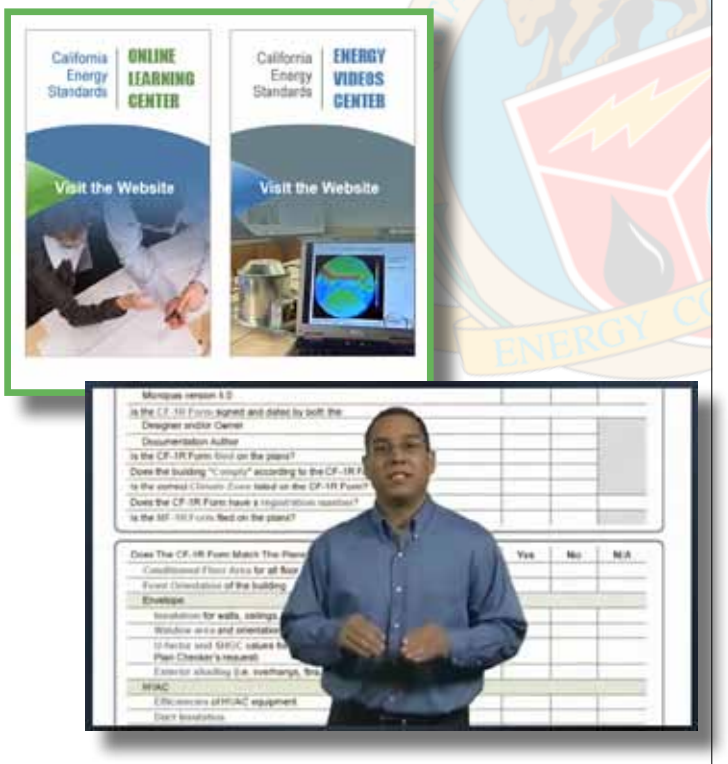
On December 21st, the California Energy Commission (Energy Commission) launched the Energy Education Center, a website covering the *2008 Building Energy Efficiency Standards (Standards)*. The Energy Commission is the state's primary energy policy and planning agency and promotes energy efficiency by adopting and publishing the *Standards*. The Energy Commission is also responsible for providing education to local building officials and enforcement personnel regarding the *Standards*. Building department staff understanding the *Standards* is an integral part of achieving compliance and managing enforcement processes, and the Energy Commission recognizes the limited budgets and resources some building departments are faced with. The Energy Education Center will allow building department personnel and others to learn the new *Standards* without the time and expense of travel; the site is available free of charge 24 hours a day, 7 days a week.

Consisting of an Online Learning Center (OLC) and an Energy Videos Center (EVC), the site should result in:

- Building department personnel having greater knowledge of the *Standards*, allowing them to enforce the *Standards* more effectively, resulting in greater energy savings.
- Builders being better able to construct buildings that are in compliance with the *Standards*.
- Consumers having increased knowledge of the *Standards* and insisting on *Standards*-compliant construction.

Online Learning Center

The OLC provides builders, contractors, enforcement agency/building department personnel, and consumers with educational tools to guide the design and construction of efficient, durable, and sustainable buildings in California. Complete with courses, study guides, interactive checklists, tutorials, exams, and completion certificates, this educational program is designed to bring building departments up to speed on plan review and building inspection for compliance with the 2008 *Standards*. The five courses currently available, each about one hour in length, focus on the 2008 updates to the residential and nonresidential portions of the *Standards*, plan review for residential and nonresidential newly constructed buildings, and plan review for residential alterations.



Course completion, in most instances, can be used toward continuing education units. Lessons in the Residential and Nonresidential Plan Review courses have "Additional Information" tabs with short videos offering a deeper understanding of material covered in the lessons. The "resource library" tab contains links to the *Standards* and related documents, as well as interactive plan review checklists and guides.

The second phase of the OLC, expected to be released in late spring 2010, will focus on building inspection and efficient lighting.

Energy Videos Center

The EVC provides informational videos covering the *Standards*, building science, renewable energy, and plan review and inspection. Additionally, the "Resources" tab contains a link to the Collaborative for High Performance Schools Video Series.

The Energy Education Center is compatible across PC and Mac platforms, and provides video transcripts that comply with the requirements of the Americans with Disabilities Act.

Please visit the Energy Education Center at

www.energyvideos.com.

Forms Required for Permitting Under the *2008 Building Energy Efficiency Standards*

The diagrams below outline the energy efficiency requirements that must be addressed when planning a newly constructed building, an addition, or an alteration, and the forms that are required to be on the plans when submitted for review.

Low-Rise Residential Construction

- Single-family buildings with any number of stories
- Duplexes with any number of stories
- Multi-family buildings with three or fewer habitable stories

Requirements

Building Envelope

- Mandatory and Prescriptive Requirements for :
  - Fenestration
  - Opaque Surfaces
  - Roof Products (Cool Roofs)
- Thermal Mass
- Infiltration and Air Leakage
- Vapor Barriers and Moisture Protection

Building HVAC

- Mandatory and Prescriptive Requirements for:
  - Heating Equipment
  - Air Distribution Ducts and Plenums
  - Cooling Equipment
- Controls, including Zonal Controls
- Indoor Air Quality and Mechanical Ventilation
- Refrigerant Charge and Airflow Testing
- HERS Measures

Water Heating

- Water Heater Types
- Equipment Efficiency
- Pipe Insulation Requirements
- Distribution System Types
- Solar Heating Calculations
- Pool and Spa Equipment Requirements

Lighting

- High Efficacy Lighting and Controls for:
  - All Interior Spaces
  - Outdoor Lighting (including Parking Lots and Garages)
  - Interior Common Areas of Multi-family Buildings

Compliance Documents by Construction Type

Newly Constructed Buildings and Additions over 1,000 Sq Ft *

- **CF-1R:** Certificate of Compliance (Prescriptive or Performance Approach)
- **MF-1R** Mandatory Measures Summary

Additions under 1,000 Sq Ft *

- **CF-1R ADD:** Certificate of Compliance (Prescriptive or Performance Approach)
- **MF-1R** Mandatory Measures Summary

Alterations *

- **CF-1R ALT:** Certificate of Compliance (Prescriptive or Performance Approach)
- **MF-1R** Mandatory Measures Summary

*** For Prescriptive Method, as Applicable**

- **WS-1R:** Thermal Mass Worksheet Checklist
- **WS-2R**: Area Weighted Average Calculation Worksheet
- **WS-3R:** Solar Heat Gain Coefficient (SHGC)
- **WS-SR 100:** Solar Water Heating System
- **WS-SR 300:** Solar Rating and Certification Corporation (SRCC)

Nonresidential Construction

- Occupancy Groups A, B, E, F, H, M, S, and U
- Multi-family buildings with four or more habitable stories
- Hotels and Motels

	Requirements	Compliance Forms

Building Envelope	• Mandatory and Prescriptive Requirements for
	  ○ Fenestration, including Skylights
	  ○ Opaque Surfaces, including Cool Roofs
	  ○ Infiltration and Air Leakage
	• Relocatable Public School Buildings
	• Overall Envelope TDV Approach
	• Additions and Alterations
		• **ENV-1C:** Certificate of Compliance and Field Inspection Checklist
		• **ENV-2C:** Envelope Component Approach
		• **ENV-3C**: Overall Envelope TDV Energy Approach
		• **ENV-4C**: Skylight Area Support Worksheet (Prescriptive Method Only)

Mechanical (including HVAC and Water Heating)	• Mandatory and Prescriptive Requirements for
	  ○ HVAC Equipment
	  ○ Service Water Heating Equipment
	  ○ Air Distribution System
	• Mechanical and Natural Ventilation
	• Equipment Sizing and Load Calculations Req.
	• Additions and Alterations
		• **MECH-1C:** Certificate of Compliance and Field Inspection Checklist
		• **MECH-2C:** Air, Water Side System, Service Hot Water and Pool Requirements
		• **MECH-3C:** Mechanical Ventilation & Reheat
		• **MECH-4C:** Fan Power Consumption (Prescriptive Method Only)
		• **MECH-5C:** Equipment Details (Performance Method Only)

Lighting (Indoor)	• Luminaire Power Calculations • Mandatory Lighting Measures • Actual Lighting Power Calculations and Control Credits • Allowed Lighting Power Calculations (Prescriptive Approach) • Additions and Alterations	• **LTG-1C:** Certificate of Compliance and Field Inspection Checklist • **LTG-2C:** Lighting Controls Credit Worksheet • **LTG-3C**: Indoor Lighting Power Allowance • **LTG-4C**: Tailored Method Worksheet • **LTG-5C**: Line Voltage Track Lighting Worksheet
Lighting (Outdoor)	• Outdoor Lighting Zones and Ordinances • Mandatory Lighting Measures • Determining Actual Lighting Power • Allowed Outdoor Lighting Power Allowances • Lighting Alterations	• **OLTG-1C**: Certificate of Compliance and Field Inspection Checklist • **OLTG-2C**: Outdoor Lighting Worksheet
Lighting (Sign)	• Determining Actual Sign Lighting Power • Mandatory Lighting Controls • Alternative Lighting Sources • Sign Alterations	• **SLTG-1C**: Certificate of Compliance
Refrigerated Warehouses	• Mandatory Building Envelope Requirements • Mandatory Building Mechanical Systems Req. • Additions and Alterations	• **RWH-1C**: Certificate of Compliance

HERS Rater Decertification

A Home Energy Rating System (HERS) field verification and diagnostic testing rater certified by one of the three approved HERS providers for the *2005 Building Energy Efficiency Standards* was decertified effective February 2, 2010, after it was found that the rater knowingly provided untrue field verification and diagnostic testing results on a CF-4R to the Sutter County Community Services Department, Building Inspection Division.

The Sutter County Building Inspector received a CF-4R that had not been completely filled out and immediately reported it to the California Energy Commission's Standards Compliance and Enforcement Unit. Through an investigation and interviews it was found that the HERS rater had falsified the CF-4R, did not have a CF-6R from the contractor, and did not visit the project site to conduct the diagnostic tests prior to signing the CF-4R. These actions were cause for the rater's certification to be immediately revoked by the provider.

This is a reminder to all HERS raters that **it is a felony to submit falsified documents to a government agency**. The Energy Commission's Standards Compliance and Enforcement Unit is actively investigating complaints and taking action to increase compliance with the *2008 Building Energy Efficiency Standards*. HERS raters who are decertified by a provider for fraudulent activity cannot be certified by another provider. Providers are made aware of any rater decertification.

For projects permitted on or after January 1, 2010, the CF-4Rs that building department personnel receive for a final will be registered with a HERS provider. The registered CF-4R will be computer generated, have a watermark on the document identifying the HERS provider, be electronically signed by the HERS rater, and have a registration number on the bottom of the form. The registration number can be verified by referencing the HERS provider's data registry at

www.CalCERTS.com or www.CHEERS.org.

Currently CalCERTS and CHEERS are the only HERS providers certified for field verification and diagnostic testing for the *2008 Building Energy Efficiency Standards*.

If you have knowledge of unlawful activity by a HERS rater or a contractor, please report it to the rater's provider or call the Energy Commission's Energy Standards Hotline at (800) 772-3300.

Download or Purchase the *2008 Building Energy Efficiency Standards* and Supporting Documents

Electronic versions of the *Standards* and supporting documents are available at

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

Building department staff, please contact the Energy Standards Hotline prior to ordering publications.

For hard copies, please submit a request in writing, along with payment and publication number, to:

California Energy Commission
Attention: Publications Office
1516 9th Street
Sacramento, CA 95814

Title	Publication Number	Cost
2008 Standards	400-2008-001-CMF	1st copy free; additional copies $10 each.
2008 Residential Compliance Manual	400-2008-016-CMF-Rev 1	$35
2008 Nonresidential Compliance Manual	400-2008-017-CMF-Rev 1	$40
2008 Reference Appendices	400-2008-004-CMF	Free with the purchase of a manual.

Building Energy Efficiency Standards Training

Please visit the Energy Commission's new **Energy Education Center** at:

www.energyvideos.com

For training offered by utilities and others, please visit the following websites:

PG&E
www.pge.com/mybusiness/edusafety/training/pec/classes/

SoCal Gas Company
http://seminars.socalgas.com

San Diego Gas and Electric
http://seminars.sdge.com

SCE
www.sce.com/b-sb/energy-centers/workshops-classes.htm

SMUD
www.smud.org/en/education-safety/

CALBO
www.calbo.org

CABEC
www.cabec.org

Flex your POWER℠

Flex Your Power News
www.fypower.org/news

GO solar CALIFORNIA

www.gosolarcalifornia.org

The *2008 Building Energy Efficiency Standards* are now in effect.

Need Help?
Energy Standards Hotline
(800) 772-3300
or (916) 654-5106

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This issue will address residential indoor air quality, Building Energy Efficiency Standards documents, approved HERS providers, public domain compliance software, and the new television efficiency regulations.

CALIFORNIA ENERGY COMMISSION

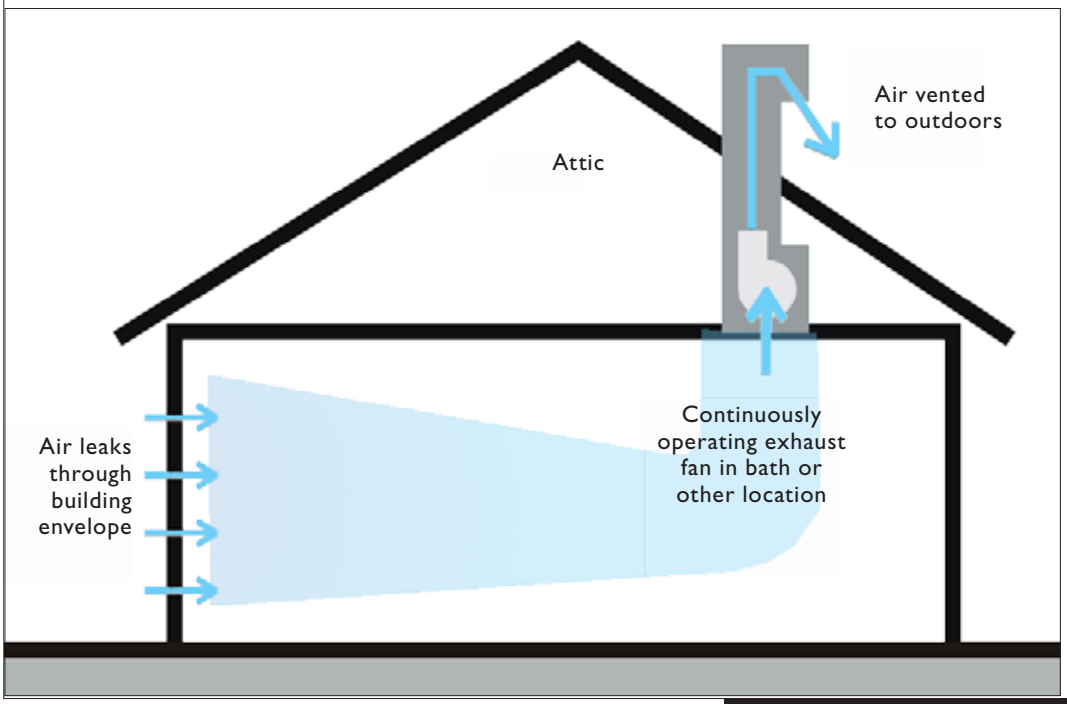
BLUEPRINT

EFFICIENCY AND RENEWABLE ENERGY DIVISION

ASHRAE 62.2
Residential Indoor Air Quality
under the 2008 Building Energy Efficiency Standards

Background

The ASHRAE 62.2 Ventilation Standard for Residential Low-Rise Buildings (ASHRAE Standard) and various ways to meet this standard are described in detail in the 2008 Residential Compliance Manual. Since their initial adoption in 1978, the Building Energy Efficiency Standards (Standards) have dealt predominantly with energy efficiency issues and strategies. The 2008 Standards deal with health and safety as well as energy efficiency. Contaminants from building materials, cleaners, finishes, and furniture, and the mitigation of mold growth, require a minimum level of fresh outside air to maintain a healthy indoor environment. The thermal performance of building envelopes has improved over the years, which has decreased air infiltration, and Energy Commission-sponsored research has revealed that many occupants do not open windows regularly for ventilation. As a result, the 2008 Standards include mandatory mechanical ventilation strategies intended to improve air quality in houses, apartments, and other residential buildings.



Requirements

The ASHRAE Standard requires a minimum level of ventilation in two areas: (1) whole-building continuous ventilation and (2) local kitchen and bathroom exhaust ventilation. There are a variety of ways to meet these requirements. The simplest and most straightforward is to provide an exhaust fan in each kitchen and bathroom, with one of the fans designated for continuous whole-building operation. There are additional requirements regarding the following:

Continued on next page...

- Transfer air from outdoors, not from adjacent dwelling units, garages, or crawlspaces;
- Instructions and labeling to communicate how the ventilation system is designed, proper system operation and maintenance, the expected system performance, and air filter requirements;
- Clothes dryer ventilation to the outdoors;
- Fan operation for combustion and solid fuel-burning appliances;
- Special requirements for garages; and
- Ventilation openings, air filtration, and air inlets.

These additional requirements are applied on a project-by-project basis when applicable. There are also new requirements for including a minimum of information on the dwelling plans in order to obtain a building permit, and there is a new installation certificate to demonstrate compliance with the ASHRAE Standard prior to occupancy (CF-6R-MECH-05, found in Appendix A of the Residential Compliance Manual).

ASHRAE Ventilation Standard Minimum Best Practice Guide

The ASHRAE Ventilation Standard Minimum Best Practice Guide, currently in progress, contains the requirements for showing compliance with an exhaust-only ventilation approach, including:

- The calculation of minimum whole-building continuous ventilation airflow,
- Minimum requirements for exhaust fan selection and control,
- Minimum fan ratings for intermittent bathroom and kitchen fans, and
- The exhaust duct design requirements found in ASHRAE Table 7.1.

The Guide also contains reference appendices that include:

- The whole-building minimum airflow equation,
- Fan selection and duct design requirements,
- Sample note blocks to be placed on the building plans,
- An ASHRAE information form, and
- A short but comprehensive checklist of exhaust-only ventilation system requirements.

When the Guide is available on the Energy Commission website, an email will be sent to the Blueprint and Title 24 mailing lists. To consider alternatives to an exhaust-only approach, refer to Section 4.6 of the Residential Compliance Manual or contact the Energy Standards Hotline at (800) 772-3300 (toll-free in California), (916) 654-5106, or title24@energy.state.ca.us.

Public Domain Compliance Software for the 2008 Building Energy Efficiency Standards

Compliance with the 2008 Building Energy Efficiency Standards (Standards) is primarily demonstrated through the performance approach by using compliance software to show that each proposed building meets the energy budget established for that building. CALRES 2008 is the public domain program for demonstrating Standards compliance for low-rise residential buildings, and PERFORM 2008 is the public domain program for demonstrating Standards compliance for newly constructed nonresidential buildings, high-rise residential buildings, and hotels and motels.

Each program is available on a CD-ROM disk and comes with a User's Guide as a PDF file on the disk. CALRES 2008 costs $125 and PERFORM 2008 costs $250. The purchase price includes automatic updates to the programs. To purchase either program, send your request with a check or money order made out to the California Energy Commission to:

California Energy Commission
Re: CALRES 2008
(or PERFORM 2008)

Rob Hudler, MS-37
1516 Ninth Street
Sacramento, CA 95814-5504

The Energy Commission does not provide technical support for either program. Support for CALRES 2008 is available for $250 per year from Enercomp, Inc., and support for PERFORM 2008 is available for $250 per year from EnergySoft, LLC. For questions regarding the capabilities of either program, call Rob Hudler at (916) 654-4072.

CHEERS and CalCerts Approved as HERS Providers

On November 18, 2009, the California Energy Commission approved California Home Energy Efficiency Rating Services (CHEERS) and California Certified Energy Rating and Testing Services (CalCerts) as Home Energy Rating System (HERS) Providers for HERS raters conducting field verification and diagnostic testing to demonstrate compliance with the 2008 Building Energy Efficiency Standards. The Providers can now certify raters to perform field verification and diagnostic testing on projects permitted on or after January 1, 2010. Energy Commission staff determined that these two Providers met the requirements for certification after conducting a thorough review of each of their applications for certification, which included information on their training materials, quality assurance programs, and data registries.

Energy Commission Approves Appliance Efficiency Regulations for Televisions

On November 18, the California Energy Commission adopted energy efficiency regulations for new televisions offered for sale in California. Tier 1 of the regulations will take effect January 1, 2011, and will reduce television energy consumption by an average of 33 percent. Tier 2 of the regulations will take effect in 2013 and, in conjunction with Tier 1, will reduce television energy consumption by an average of 49 percent. As of late September 2009, more than 1,000 TV models available for sale met the Tier 1 regulations.

2008 Building Energy Efficiency Standards Documents

Electronic versions of the 2008 Building Energy Efficiency Standards, Residential and Nonresidential Compliance Manuals, and Reference Appendices are available on the California Energy Commission website at

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

*Publication numbers and costs for hard copies of the documents are as follows:**

Title	Publication Number	Cost
2008 Building Energy Efficiency Standards for Residential and Nonresidential Buildings	400-2008-001-CMF	1st copy free; additional copies $10 each.
2008 Residential Compliance Manual	400-2008-016-CMF-Rev 1	$35
2008 Nonresidential Compliance Manual	400-2008-017CMF-Rev 1	$40
2008 Reference Appendices	400-2008-004-CMF	Free with the purchase of a manual.

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Attention: Publications Office
1516 9th Street
Sacramento, CA 95814

The direct line to the Publications Office is(916) 654-5200.

Questions related to the Standards should be directed to the Energy Standards Hotline at (800) 772-3300 (toll-free in California) or (916) 654-5106, or *title24@energy.state.ca.us.*

Building Energy Efficiency Standards Training

Links for training on issues relating to California Building Energy Efficiency Standards for Low-Rise Residential and Nonresidential/High-Rise Residential Buildings (Title 24, Part 6) are available on the Energy Commission's website at:
www.energy.ca.gov/title24/training

The Energy Commission's Energy Code Online Training:

www.energyvideos.com/

Other Energy Standards Training

For training offered by the utilities and other organizations please see the following websites:

PG&E

www.pge.com/mybusiness/edusafety/training/pec/classes/

SoCal Gas Company

http://seminars.socalgas.com

San Diego Gas and Electric

http://seminars.sdge.com/int/default.asp

SCE

www.sce.com/RebatesandSavings/EnergyCenters/workshops.htm

SMUD

www.smud.org/education/index.html

CALBO Training Institute

www.calbo.org

CABEC

www.cabec.org

Flex your POWER

Flex Your Power Newswire

www.fypower.org/news/enewswire.html

GO solar CALIFORNIA

www.gosolarcalifornia.org/

The effective date for the 2008 Building Energy Efficiency Standards (Title24, Parts 1 and 6) is January 1, 2010.

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BLUEPRINT

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CALIFORNIA ENERGY COMMISSION

BLUEPRINT

EFFICIENCY AND RENEWABLE ENERGY DIVISION

This month's issue will address residential LED lighting, labeling of lighting products by manufacturers, and non-regulated alterations.

Lighting Requirements for the 2008 Building Energy Efficiency Standards

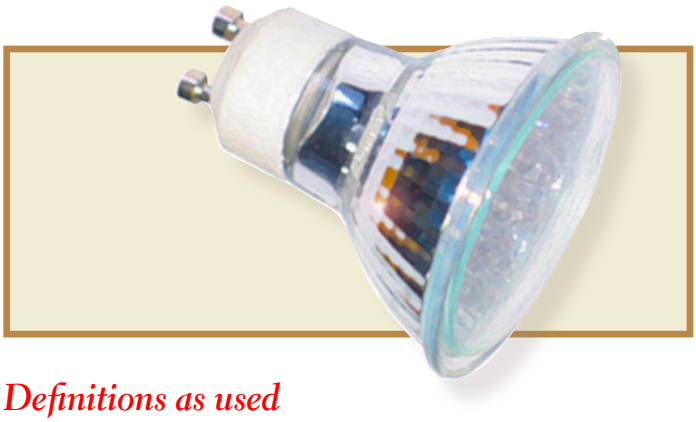
The Basics of LED Lighting

The Energy Commission Hotline has received many calls from parties under the impression that a light-emitting diode (LED) light source must be certified to the Energy Commission under the *2008 Building Energy Efficiency Standards* (Standards). This is not always true. An LED light source needs to be certified to the Energy Commission only when it is to be used as high efficacy for compliance with the residential lighting requirements in Section 150(k) of the Standards. There are additional requirements for LED trims and hybrid LED luminaires to be classified as high efficacy; those requirements will be covered briefly in this article.

LED lighting which has not been certified to the Energy Commission is treated as low efficacy and may be installed anywhere low efficacy lighting is allowed. Refer to Sections 6.4 through 6.6 of the *2008 Residential Compliance Manual* for allowable uses of low efficacy lighting
.

Nonresidential Lighting

Because power input per square foot is calculated in nonresidential lighting, there is no high efficacy classification in nonresidential lighting—it is left up to the lighting designer to decide how to meet the nonresidential lighting requirements. Refer to Sections 5 and 6 of the *2008 Nonresidential Compliance Manual* for more information on the nonresidential lighting requirements.



Definitions as used in the Standards:

- A lamp, commonly referred to as a "light bulb," is the part of a luminaire which gives off light.
- A luminaire, commonly referred to as a "lighting fixture," is a complete lighting unit consisting of a lamp or multiple lamps, the parts which position and protect the lamp(s), and the parts which connect the lamp(s) to a power supply.
- An LED trim, commonly referred to as a "module," is a one-piece integral unit containing a power supply, transformer, heat sink, and LED circuit board designed to be installed into a recessed luminaire housing.

Refer to Section 150(k) of the Residential Compliance Manual for the definitions of high efficacy and low efficacy luminaires.

Continued on next page...

Certification to the Energy Commission

LED light sources which are certified to the Energy Commission as high efficacy are listed in the Energy Commission's Appliance Efficiency Database at: *www.energy.ca.gov/appliances/database/*

Refer to Section 6.2.9 of the Residential Compliance Manual for more information on certification of high efficacy lighting sources.

LED Trims

For the installation of an LED trim to be classified as high efficacy, all of the following requirements must be met:

- The trim must be certified to the Energy Commission.
- The trim must be hardwired directly to the luminaire housing or contain a mid-line connector which does not allow a low-efficacy lighting system to be used.
- The trim **must not** contain a screw-base socket, even if there is an adaptor which the manufacturer claims is permanent. If the trim comes from the manufacturer with a screw base attached to the end of a pigtail, the screw base must be cut off and discarded prior to hardwiring the trim directly into the luminaire housing. Performing such a modification may void the Underwriters Laboratory (UL) listing of the housing or trim. It is the manufacturer's responsibility to acquire UL listing for a modified trim.

Compliance with these requirements does not exempt a luminaire recessed in an insulated ceiling from the applicable insulation contact and airtight requirements.

Refer to Section 6.10.1 of the 2008 Residential Compliance Manual for more information.

GU-24 Luminaires

A luminaire with a factory installed GU-24 socket may be classified as high efficacy provided that all of the following requirements are met:

- The luminaire is not a recessed downlight rated to be used with a compact fluorescent lamp. (See below.)
- The luminaire does not contain any other type of line–voltage socket or lamp holder.
- The luminaire is rated for use only with high efficacy lamps (compact fluorescent or LED) or a high efficacy LED lighting source system, according to Table 150-C of the Standards.
- The manufacturer does not make available adaptors or other modular components for the luminaire which will convert the GU-24 lamp holder to any other type of socket or lamp holder.

Why are recessed downlights with GU-24 sockets not allowed to be rated for compact fluorescent lamps (CFLs)? Aren't CFLs high efficacy?

CFLs are high efficacy. Luminaire manufacturers requested that CFLs with GU-24 bases not be used in recessed downlights because GU-24 ballasts and ballast-lamp products are not currently rated for hot environments. The high temperatures in a recessed downlight can cause a non-heat-rated ballast to fail prematurely. Unless future versions of the standards allow heat-rated GU-24 products to be used, all GU-24 products will continue to not be allowed in recessed downlights.

Hybrid LED Luminaires

In the picture on the left, the luminaire's fluorescent light source is illuminated. In the picture on the right, the luminaire's LED night light is illuminated.

A hybrid LED luminaire (which contains an LED light source and another type of light source) may be classified as high efficacy if the LED light source has been certified to the Energy Commission and the other light source in the luminaire is high efficacy according to Table 150-C of the Standards.

When a hybrid LED luminaire contains a high efficacy LED light source and a low efficacy light source of another type, the LED light source will be treated as high efficacy lighting and the other light source will be treated as low efficacy lighting.

LED Light Source Wattage

If a residential kitchen contains both high and low efficacy lighting, the input power of both high and low efficacy lighting must be determined to ensure that no more than 50% of the lighting input power for the kitchen is going to low efficacy lighting. When calculating the wattage of LED lighting the following regulations apply:

- The input wattage of an LED light source shall be the maximum rated input wattage of the system, including fans, transformers, and power supply devices. The maximum rated input wattage shall be listed on a permanent, pre-printed, factory-installed label as specified by UL.
- When multiple luminaires are connected to a single power supply/driver, the following regulations apply:

Continued on next page...

- The label used to determine the maximum wattage of the LED system shall be located on the LED power supply/driver.
- The wattage of the system shall be either of the following:
  - The connected load of the LED power supply/driver as determined by the manufacturer of the luminaire.
  - The rating of the LED power supply/driver as determined by the manufacturer of the power supply/driver.

Labeling

Please note the following information regarding the labeling of lighting products:

- It is inappropriate to place a "Title 24" or "Title 24-compliant" label on a product.
- A product which has been certified by Energy Star does not automatically comply with the 2008 Building Energy Efficiency Standards.

- The California Energy Commission and the State of California do not grant endorsements. It is therefore illegal for a manufacturer to use either entity's logo anywhere, including products, packaging, and marketing materials.
- The following are examples of acceptable statements that may be included on a lighting product label:
  - "Can be used to comply with Title 24 high efficacy requirements."
  - "Can be used to comply with Title 24 airtight requirements."
  - "This is a high efficacy fixture according to the 2008 Title 24 Standards."
  - "This lighting control device has been certified by the California Energy Commission for use in a Title 24 project. For more information, visit: *www.energy.ca.gov/title24/*

Non-Regulated Alterations

The Standards state that the replacement of parts of an existing luminaire, including installing a new ballast or new lamps, without replacing the entire luminaire, is not an alteration subject to Title 24. The following products **may only be used in projects not requiring Title 24 compliance**:

- An LED trim with a screw base
- A compact fluorescent trim with a screw base
- An LED lamp with a screw base
- A compact fluorescent lamp with a screw base
- A screw base to GU-24 adaptor

None of these products may be used in new construction, alterations, or additions needing to demonstrate compliance with Title 24.vv

Under no circumstances are GU-24 to screw base adaptors allowed.

Title 20 makes it illegal to sell or install such adaptors in California.

Building Energy Efficiency Standards Training

Links for training on issues relating to California Building Energy Efficiency Standards for Low-Rise Residential and Nonresidential/High-Rise Residential Buildings (Title 24, Part 6) are available on the Energy Commission's website at:
www.energy.ca.gov/title24/training

The Energy Commission's Energy Code Online Training:

www.energyvideos.com/

Other Energy Standards Training

For training offered by the utilities and other organizations please see the following websites:

PG&E
www.pge.com/stockton

SoCal Gas Company
http://seminars.socalgas.com

San Diego Gas and Electric
http://seminars.sdge.com/int/default.asp

SCE
www.sce.com/RebatesandSavings/EnergyCenters/workshops.htm

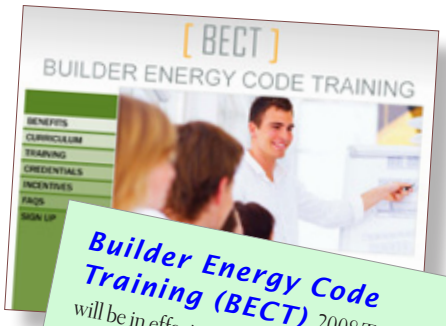
SMUD
www.smud.org/education/index.html

CALBO Training Institute
www.calbo.org

CABEC
www.cabec.org

Flex Your Power Newswire
www.fypower.org/news/enewswire.html

GO solar CALIFORNIA
www.gosolarcalifornia.org/



Builder Energy Code Training (BECT) 2008 Title 24 code will be in effect soon, schedule a free training session to find out what it means for you. BECT will show you the changes from the 2006 to the 2008 code, as well as cost effective compliance options you can incorporate. Schedule your training and be ahead of the curve. The BECT website can be found at **www.BECT.ws** Contact Andrew Au at 209-473-5049 to schedule your training session.

The effective date for the 2008 Building Energy Efficiency Standards (Title24, Parts 1 and 6) is January 1, 2010.

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BLUEPRINT

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CALIFORNIA ENERGY COMMISSION

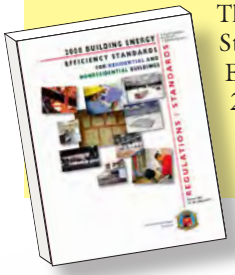
BLUEPRINT

August 2009 – Number 91

EFFICIENCY AND RENEWABLE ENERGY DIVISION

NEWS FLASH...

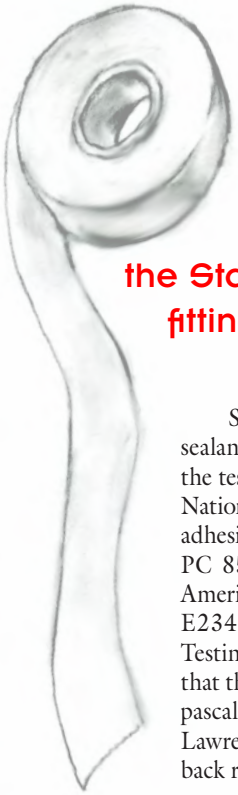
The effective date for the 2008 Building Energy Efficiency Standards (Title24, Parts 1 and 6) has been changed to January 1, 2010.



The 2008 Building Energy Efficiency Standards were adopted by the Energy Commission on April 23, 2008. The effective date was August 1, 2008; however, the Energy Commission has experienced delays in completing the public domain compliance software.

The Energy Commission had anticipated that these software programs would be available earlier; however the software required further programming attention before the programs could be released. The Energy Commission is resolving those problems and will provide the programs in the near future.

This delay provides the industry and building officials more time to prepare for the new Standards. The Energy Commission will use this additional time to provide more information for the Standards and work with the California utilities, building industry, and the California Building Officials to provide training on the new Standards.

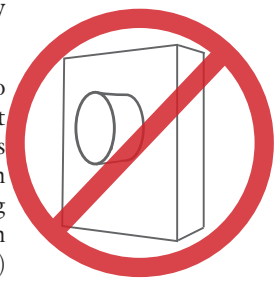


In April the Energy Commission's Efficiency Committee determined that Shurtape Technologies' cloth back synthetic adhesive duct tape, PC 858CA, can be used to show compliance with the Standards to seal flex duct to fitting joints without being used in combination with mastic.

Shurtape PC 858CA duct tape has passed duct sealant longevity testing comparable to the testing conducted by the Lawrence Berkeley National Laboratory, in which cloth back rubber adhesive duct tapes failed. The testing of Shurtape PC 858CA followed the protocol specified in the American Society for Testing and Materials (ASTM) E2342-03, Standard Test Method for Longevity Testing of Duct Sealant Methods, with the exception that the pressure difference used in the testing was 84 pascals (Pa) to match the original testing conducted by Lawrence Berkeley National Laboratory of the cloth back rubber adhesive duct tapes. Shurtape PC 858CA employs a combination of polymers in its synthetic adhesive to achieve enhanced performance compared with cloth back rubber adhesive tapes.

The Energy Commission has approved two cloth-backed duct tapes with special butyl or synthetic adhesives rather than rubber adhesive to seal flex duct to fittings. These tapes are:

- **Polyken 558CA or Nashua 558CA, manufactured by Berry Plastics, Tapes and Coatings Division.**
- **Shurtape PC 858CA, manufactured by Shurtape Technologies, Inc.**



These tapes can be used to seal flex duct to fittings without using mastic. These tapes cannot be used to seal other duct system joints, such as the attachment of fittings to plenums and junction boxes. These tapes have on their backing a drawing of a fitting to plenum joint in a red circle with a slash through it (the international symbol of prohibition) to illustrate where they are not allowed to be used. Installation instructions in their packing boxes explain how to use them to attach duct core to fittings and a statement that the tapes cannot be used to seal fitting to plenum and junction box joints.

The Energy Commission wishes to thank Shurtape Technologies for recognizing the need to make improvements to the adhesive used on cloth back duct tape to meet California's requirements, for conducting the ASTM E2342-03 testing, and for developing the labels and installation instructions for Shurtape PC 858CA duct tape. These changes and labels will assist installers to make flex duct airtight to fitting attachments and building officials to verify that Shurtape PC 858CA has been properly used in compliance with the Standards.

Building On Successful Relationships

Energy Commission staff receives input from many outside groups and individuals and try to learn from your comments. We have restructured ourselves, based on many suggestions to better serve you. We welcome your ideas for improving our training, outreach and compliance assistance. We will continue to collaborate with public and private groups and individuals to increase understanding and compliance with the new 2008 Building Energy Efficiency Standards.

Outreach and Education Unit

This unit supports the development of comprehensive and audience-specific education and outreach information on the 2008 Building Energy Efficiency Standards (Standards).

Building department staff has reported having difficulty enforcing the Standards due to a lack of adequate staff training and the complicated nature of the Standards. The unit manages the Energy Commission's Hotline and is responsible for the development of information (training curriculum, training videos, handouts, flyers, the Blueprint newsletter, trade journal articles, workshops, etc.) to educate and improve local enforcement of the Standards by building department personnel and the building industry.

Staff provides clear, concise answers on energy efficiency, Standards compliance, and the Commission's roles and responsibilities.

Stay on Course with the 2008 Standards

Coming soon, the Energy Commission will launch its California Building Standards Online Learning Center. The new resource tool will help building department personnel understand and comply with the Standards. The website will provide detailed information about the Standards as well as interactive videos, in-field video presentations, study guides, quizzes, exams, an evaluation, and a certificate of completion for those who complete the on-line courses. Courses will highlight such topics as the planchecking process, HVAC change-outs, cool roofs, lighting, Home Energy Rating System (HERS) measures, and more.

Photos courtesy of NREL

The Compliance and Enforcement Unit

The Compliance and Enforcement Unit investgates complaints and provides assistance to enforcement agencies, the public, and other energy professionals to increase compliance with the Title 24, Building Energy Efficiency Standards.

Staff members work to resolve complaints at the lowest level possible, and some investigations are done in conjunction with the Contractors State License Board (CSLB) and/or individual building departments, or outside parties.

Helping Local Building Departments Enforce the 2008 Energy Standards

The Compliance and Enforcement Unit released a clarification letter, addressed to all the building departments in the state, explaining the Third Party Quality Control Program. The letter was developed in response to an inquiry from a building official seeking information about the program. The clarification letter has been well received and has prompted additional questions on related areas to which staff is responding.

Compliance and Enforcement staff also met with the personnel from the city of Winters to provide plan review assistance for their staff on the city's new Police and Fire complex.

Staff and building departments have forged good working relationships to increase local building department understanding and compliance with the Standards.

Also, staff is presenting overviews of the 2008 Standards to the International Code Council Chapters (building department personnel) to educate and increase compliance with the Standards.

The Energy Commission, Building Officials and the Contractors State License Board Continue Their Work Together

The California Energy Commission, the Contractors State License Board (CSLB), and building departments statewide are working to educate the public, contractors, and each other about the Standards and the Home Energy Rating System (HERS) and the Appliance regulations.

These partnering efforts will encourage the enforcement of laws and regulations intended to protect consumers and reduce energy use in houses and buildings.

Energy Commission staff is learning about CSLB's enforcement program and disciplinary process. Staff has attended CSLB's mandatory settlement conferences, an arbitration hearing and observed a CSLB sting operation targeting non-licensed contractors.

Energy Commission staff conducted a presentation for some of CSLB's consumer services representatives and enforcement representatives to educate them about the role of HERS Providers and Raters; to familiarize them with compliance documentation required for newly constructed and renovated structures; to inform them of the requirements for HVAC change outs; and more.

Staff from the Energy Commission is providing training to explain the changes coming with the Standards and providing

information on how building departments, and CSLB help enforce the Standards. Staff has been well received by the building departments, and we are learning about their policies and procedures while they learn more about the Standards.

Energy Commission staff has supplied information and handouts for consumers and contractors, which CSLB distributed through their district offices. Information about the new 2008 Building Energy Efficiency Standards, the requirements for HVAC installations and change outs and the new requirements for cool roofs will be published in CSLB's quarterly newsletter.

CSLB is working to protect consumers from "energy scams" and recently issued a Consumer Alert to warn unsuspecting property owners of scams in the popular "green" contracting trades.

According to CSLB's website, several Sonoma County victims have apparently lost tens of thousands of dollars to a business called American Sun Solar Corporation, operated by Peter Davidson. CSLB's Statewide Investigative Fraud Team (SWIFT) investigators are searching for additional victims or witnesses who have done business with Davidson or American Sun Solar Corporation.

Anyone who has information about American Sun Solar Corporation or Davidson is urged to contact CSLB's Santa Rosa Office at (707) 576-2196. Visit the CSLB website at www.cslb.ca.gov for additional information.

If you have suggestions or ideas on how the Energy Commission can help improve our efforts to enforce laws and protect consumers and legitimate contractors, please contact us at:

Building Standards Hotline
1-800-772-3300 (toll free in Calif.)
1-916-654-5106
or e-mail us at:
title24@energy.state.ca.us.

New Energy Standards for HVAC Clarified[1]

The new (2008) California Building Energy Efficiency Standards will become effective on January 1, 2010.[2] The new Standards make a distinction between two types of changeout situations:

1) New or Replacement Space Conditioning Systems

include a completely new or replacement duct system, and a new or replacement air handler unit.

2) Altered Space Conditioning Systems

utilize the preexisting duct system when installing or replacing some or all of the system components such as: air handler unit, outdoor condensing unit, cooling or heating coil, or furnace heat exchanger.

The new Standards require that changeouts must be tested to ensure they meet the Home Energy Rating System (HERS) requirements in some climate zones as shown in the table below.

Duct Sealing and Testing

In Climate Zones 2 and 9-16 the duct sealing and testing rules that began in 2005 remain in effect. There are no changes to the allowable leakage rates or to which of the climate zones must meet the requirements.

However, there is a change that eliminates the Table 8-3 "Alternatives to Duct Sealing" options from the Residential Compliance Manual. The result is that installation of higher efficiency equipment is no longer an available alternative to meeting the HERS Duct Seal Test requirements.

Refrigerant Charge (RC) Verification

In climate Zones 2 and 8-15, for *Altered space conditioning systems* and also for *New or Replacement space conditioning systems*, Refrigerant Charge Verification by a third-party HERS rater is required either for each unit or by sampling as is done in the current Standard.

The installing contractor must measure the refrigerant charge, make any necessary corrections, then complete an Installation Certificate form that must be posted at the job site for use at final inspection. A third party HERS rater must also verify the RC. In order to achieve a valid RC verification, the system must meet or exceed a minimum Cooling Coil Airflow (CCA) rate of 300 cfm per nominal ton of capacity by direct measurement or by the temperature split method. This airflow requirement is less stringent than airflow rate required for Cooling Coil Airflow and Fan Watt Draw testing described below.

If the system fails to meet the minimum airflow requirement, the HVAC contractor must modify the duct system or air handler equipment in order to increase the system airflow.

Installers of *New or Replacement space conditioning systems* should consider reevaluating the duct system design prior to installation of the ducts (using an industry recognized duct design method such as ACCA Manual D) rather than simply replacing an old poorly designed duct system with "like for like" to end up with a brand new poorly designed duct system. Installers of *Altered space conditioning systems* need to consider modifications to the existing ducts to improve the airflow. Modifications such as enlarging the return duct and return grille, or installing a second return duct and return grille may be sufficient.

Installers of *New or Replacement space conditioning systems* (with new duct systems) must install Saturation Temperature Measurement Sensors (STMS). STMS make

Continued on next page page

[1] *This article was authored by California Energy Commission staff and was first published in the March 2009 edition of "Indoor Comfort News.." The article is reprinted here in slightly altered form courtesy of "Indoor Comfort News" and its Editor, Peter Landau.*

[2] *Editors note: This article has been updated with the new effective date of January 1, 2010.*

it possible for HERS raters to verify RC without attaching gages to the refrigerant lines. Installers of *Altered space conditioning systems* do not have to install the STMS.

Both Altered and New or Replacement space conditioning systems require Temperature Measurement Access Holes (TMAH). A non-intrusive alternative to RC that is introduced by the new Energy Standards is the Charge Indicator Display (CID). If a CID is installed at the factory or in the field by the HVAC contractor, STMS and TMAH are not required.

Temperature Measurement Access Holes (TMAH)

are 5/16" holes that the installing contactor must drill – one in the supply plenum and one in the return plenum. The exact locations are specified in the Energy Commission document Reference Residential Appendices in section RA3.2. Watch for classes and training on installation of the TMAH.

Saturation Temperature Measurement Sensors (STMS)

are type K thermocouples that are attached permanently – one to the evaporator coil and one to the condenser coil. The mini plug at the end of the thermocouple wire is plugged into a handheld digital thermometer to read the coil saturation temperature. This direct measurement of the temperature of the saturated region of the coil is an alternative to use of gages for determining the coil saturation temperature readings needed for the refrigerant charge verification. The STMS may be installed at the factory, or in the field by the HVAC contractor. Watch for classes and training on installation of the STMS.

Charge Indicator Display (CID)

is a new technology that is not yet commercially available, but when these devices become available, this will be a non-intrusive alternative to performing RC verification for the HERS rater. However the HVAC contractor will still need to perform RC verification at the time of the installation of the system. Watch for more information about the CID when it becomes available.

Thermostatic Expansion Valves (TXV)

no longer qualify for an automatic "pass" for HERS refrigerant charge verification. Systems with TXVs need to be tested for correct subcooling to verify refrigerant charge, and tested for superheat to ensure the TXVs are mounted and operating as designed.

Cooling Coil Airflow (CCA) and Fan Watt Draw (FWD) Testing

In Climate Zones 10-15, *New or Replacement space conditioning systems* (with new duct systems) must meet the CCA and FWD requirements. The airflow and Watt draw measurements must be made simultaneously, and the results from the measurements are used to calculate a Watt per cfm value for the test result.

The air handler must deliver an airflow of at least 350 cfm per nominal ton of capacity in order to pass, and the calculated result must be less than or equal to 0.58 Watts per cfm of measured airflow in order to pass the test. The installing contractor must measure the CCA and FWD, make any necessary corrections, then complete an Installation Certificate form that must be posted at the job site for use at final inspection. A third party HERS rater must also verify the CCA and FWD.

If the system fails to meet the minimum airflow, the HVAC contractor must modify the system ducts and/or air handler equipment in order to increase the system airflow. Duct system improvements such as those mentioned above for meeting the minimum airflow for refrigerant charge verification are applicable to CCA and FWD. Additionally, installation of a more efficient air handler unit may be a solution to meeting the required Watt per CFM.

In some situations (but not all) an air handler with a brushless permanent magnet motor might provide reduced fan Watt draw. If the problem is low air flow due to high static pressure, a higher efficiency motor by itself will probably not solve the problem. A good duct design, carefully installed, is highly recommended, and may be the lowest cost solution. Watch for classes and training on recommendations for meeting CCA and FWD.

Airflow measurement

procedures are described in the Energy Commission document Reference Residential Appendices in section RA3.3. There are three acceptable methods:

Flow Capture Hood at the return grille(s)

Flow Grid Device at the return grille(s) or other point where all the fan airflow shall flow through the flow grid.

Plenum Pressure Matching Procedure uses the same duct pressurization and flow measurement device (fan flowmeter) as is used to measure duct leakage. This procedure has been simplified for the new Standards to allow connection of the fan flowmeter at the return grille in the same way as for the duct leakage test. This change makes it possible to test both the duct leakage and the airflow with the same setup, which may be a time saver. Watch for classes and training on this method.

Fan Watt Draw

measurement must be done with a true power meter device that measures voltage and amperage simultaneously and reports the true power value. True power meters are available in both plug-in and clamp-on configurations. Voltage and amperage can be taken separately, but their product is VoltAmps or "Apparent Watt Draw." True watt draw is the product of the voltage, amperage, AND power factor.

Conclusion

This article clarifies the airflow requirements and diagnostic measurement procedures for CCA and FWD, and for RC Verification, and clarifies the distinction between two types of "changeout" situations: installation of new or replacement space conditioning systems (with a new duct system) and installations that involve altered space conditioning systems.

Both situations must meet the refrigerant charge verification requirements. But systems that do not have a completely new duct system are not required to meet the CCA and FWD requirements. Additional information has been given to clarify some suggested ways to meet these HVAC performance requirements.

Watch for additional training videos and classes on these and other quality HVAC installation topics.

If you have questions about Title 24,

e-mail: title24@energy.state.ca.us

Or contact the Energy Standards Hotline:

916-654-5106 or

1-800-772-3300 (toll free in Calif.)

Additional information about the 2008 Building Energy Efficiency Standards can be found on the Internet at:

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

Climate Zone	HERS Test*		
	Duct Seal & Test	Refrigerant Charge Verification	Cooling Coil Airflow and Fan Watt Draw and Saturation Temperature Sensors
1	Not Required	Not Required	Not Required
2	Required	Required	Not Required
3 – 7	Not Required	Not Required	Not Required
8	Not Required	Required	Not Required
9	Required	Required	Not Required
10 – 15	Required	Required	Not Required
16	Required	Not Required	Required For "New or Replacement Space-Conditioning Systems" (with new duct systems)
			Not Required

Photos courtesy of NREL

*This chart has been modified from the chart originally published in the March 2009 edition of "Indoor Comfort News.."

New Roofing Requirements

Beginning January 1, 2010, the California Energy Commission's updated Title 24 Building Energy Efficiency Standards (Standards) for residential and nonresidential roofing will go into effect.

Photos courtesy of Eagle Roofing

The new Standards affect new construction, significant repairs of existing roofs, re-roofing, plus additions and alterations of existing buildings and homes.

Currently, a residential cool roof is an optional energy efficiency measure, however on January 1, 2010, a cool roof will be required for residential buildings. Cool roof standards are designed to reduce air conditioner demand, save money, and reduce the urban heat island effect.

Cool roof requirements for residential and nonresidential now apply to low-slope and steep-slope roofs. The aged solar reflectance and thermal emittance requirements will vary, depending on the slope of the roof, climate zone, and density of the roofing product.

All roofing products must be certified and labeled according to the Cool Roof Rating Council (CRRC) to comply with the Standards. There are exceptions to both residential and nonresidential requirements.

For more information contact the **Energy Standards Hotline:** (916) 654-5106, (800) 772-3300, or e-mail: *title24@energy.state.ca.us.*

For more information on the **2008 Building Energy Efficiency Standards**, visit the Energy Commission's website: ***www.energy.ca.gov/2008publications/CEC-400-2008-01/CEC-400-2008-001-CMF.PDF***

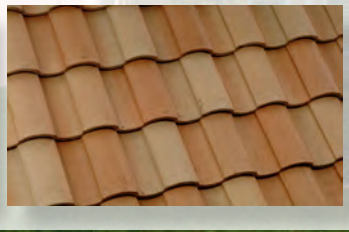
For a certified listing of cool roof products, **visit:** ***www.coolroofs.org.***

Photo courtesy MCA Clay Roof Tile

Cool Roofs Come in Colors

Cool roofing materials now come in a wide variety of materials and colors. Nonwhite pigments with high near-infrared (NIR) reflectance historically have been used to camouflage military surfaces (by mimicking foliage) and to minimize solar heating of dark exterior architectural surfaces, such as colored vinyl siding and gray battleship hulls. In recent years roofing manufacturers have incorporated NIR-reflecting pigments in coatings applied to a variety of nonwhite roofing products, such as metal panels and clay tiles.

Replacing NIR-absorbing ("conventional") roofing with visually similar, NIR–reflecting ("cool") roofing can significantly reduce building heat gain. A roof with high solar reflectance (ability to reflect sunlight) and high thermal emittance (ability to radiate heat) stays cool in the sun, reduces demand for cooling power in conditioned buildings, and increases occupant comfort in unconditioned buildings.



Photos courtesy of Eagle Roofing

Photo courtesy MCA Clay Roof Tile

Aged Reflectance Calculation

Effective January 1, 2010, Section 118(i) of the 2008 Energy Standards will require that a Cool Roof material meet an aged solar reflectance value (3 year testing) provided by the Cool Roof Rating Council (CRRC): www.coolroofs.org

If the three year aged solar reflectance value is not available from the CRRC, then you can input the initial solar reflectance value from the CRRC into the calculation listed, which will assume an aged solar reflectance for the cool roof material.

Here is an example of how to complete the calculation:

1. *Three year aged solar reflectance not available from the CRRC.*

2. *Initial solar reflectance value is available from the CRRC (let's assume an initial solar reflectance value of 0.77).*

3. *Input initial solar reflectance value into the equation:*

[0.2 + 0.7(initial solar reflectance - 0.2]

[0.2 + 0.7(0.77 - 0.2]

[0.2 + 0.7(0.57)]

[0.2 + 0.40] = 0.60 aged solar reflectance

Local Energy Ordinances

Cities or counties may choose to adopt local energy standards that are more stringent than the statewide energy Standards for a variety of reasons. Some of these reasons may include the need to address local building patterns or issues, addressing local air, water, land use, or resource constraints, or addressing state legislation such as Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006), which is the California Global Warming Solutions Act of 2006 (AB 32) or Executive Orders. Cities or counties can also adopt new statewide energy Standards before their effective date. These cities or counties are called "early adopters."

Many cities and counties have been approved by the Energy Commission to enforce local energy standards that exceed the statewide energy Standards. These include large and small cities and counties, in high density urban areas as well as lower density suburban regions. Their climate zones vary from coastal to desert.

Each local energy standard is unique and addresses local growth issues or building practices, and most are designed to reduce demand for electricity, especially during high use (peak) periods such as hot summer afternoons. Recently local energy standards have been adopted as part of more comprehensive "green" ordinances, and include requirements related to land use, water use, recycling, indoor air quality, and reduction goals for greenhouse gas emissions as well as energy efficiency requirements.

The California Energy Commission commends the following local agencies that have adopted energy ordinances requiring more stringent energy requirements than those set by California's 2005 Building Energy Efficiency Standards Title 24, Part 6.
The cities or counties are: *Culver City, La Quinta, Los Altos, Los Altos Hills, Marin County, Mill Valley, Palo Alto, Palm Desert, Rohnert Park, City and County of San Francisco, San Mateo County, Santa Barbara, Santa Monica and Santa Rosa.*

The Energy Commission's website also includes a table of local standards that have been adopted by the Energy Commission, since the effective date of the 2005 Building Energy Efficiency Standards. The table includes the name of each city or county, the date the local standard was approved by the Energy Commission and a link to the application the city or county submitted to the Energy Commission. In most cases, the text of the local ordinance is a part of the application. **You can see the table at:** *www.energy.ca.gov/title24/2005standards/ordinances_exceeding_2005_building_standards.html*

Section 10-106 of the Building Energy Efficiency Standards describes the requirements and application process for adopting local energy standards. The local standards must be approved by the Energy Commission before a city or county can enforce the standards in their jurisdictions. The Energy Commission reviews all proposed local standards to assure that the requirements of the local standards are at least as stringent as the statewide energy Standards and are not in conflict with any federal or state requirements.

Those cities or counties that currently enforce local energy standards will need to resubmit applications to the Energy Commission and go through the approval process again to continue to enforce local energy standards after the 2008 Building Energy Efficiency Standards go into effect on January 1, 2010.

Energy Commission staff is happy to provide support to local governments requesting assistance. Local energy standards generally take from five weeks to three months to complete the Energy Commission review and approval process.

CALIFORNIA ENERGY COMMISSION

BLUEPRINT

August 2009 – Number 91

EFFICIENCY AND RENEWABLE ENERGY DIVISION

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Need Help?
Energy Standards Hotline
(800) 772-3300
or (916) 654-5106

Building Energy Efficiency Standards Training

Links for training on issues relating to California Building Energy Efficiency Standards for Low-Rise Residential and Nonresidential/High-Rise Residential Buildings (Title 24, Part 6) are available on the Energy Commission's website at:
www.energy.ca.gov/title24/training

The Energy Commission's
Energy Code Online Training: www.energyvideos.com/

Other Energy Standards Training

For training offered by the utilities and other organizations please see the following websites:

PG&E
www.pge.com/stockton

SoCal Gas Company
http://seminars.socalgas.com

San Diego Gas and Electric
http://seminars.sdge.com/int/default.asp

SCE
www.sce.com/RebatesandSavings/EnergyCenters/workshops.htm

SMUD
www.smud.org/education/index.html

CALBO Training Institute
www.calbo.org

CABEC
www.cabec.org

Flex your POWER
Flex Your Power Newswire
www.fypower.org/news/enewswire.html

www.gosolarcalifornia.org/

GO solar CALIFORNIA

NEWS FLASH...

The effective date for the 2008 Building Energy Efficiency Standards (Title24, Parts 1 and 6) has been changed to January 1, 2010.

SPECIAL BLUEPRINT BULLETIN

CEC-400-2009-003

CALIFORNIA ENERGY COMMISSION

BLUEPRINT

Efficiency and Renewable Energy Division

February 2009 – Number 90

2008 Standards Take Effect

August 1, 2009

The effective date for the 2008 Building Energy Efficiency Standards has been changed from July 1, 2009, to August 1, 2009. The Energy Commission agreed to a California Building Standards Commission request that all parts of the California Building Standards Code (Title 24), including the Building Energy Efficiency Standards, be effective on August 1, 2009, so that the entire code update will have the same effective date. The 2008 Standards must be followed if the application for the building permit is submitted on or after August 1, 2009.

Online Learning Center launches early Summer 2009

The Energy Commission is developing an online learning center for building department personnel on the 2008 Energy Efficiency Standards, targeting specific areas of responsibility within the building department. The California Energy Standards Online Learning Center will consist of several courses, each of which will include in-field video presentations, study guides, online quizzes, final exams, an evaluation, and a certificate of completion. Courses will highlight changes to the 2008 Standards, including topics such as HVAC change-outs, cool roofs, lighting, and Home Energy Rating System (HERS) measures. The Online Learning Center will launch in early summer 2009.

Questions related to the standards should be directed to the Energy Commission's Energy Efficiency Hotline (916) 654-5106 or 1-800-772-3300 (toll free in California).
Email: *title24@energy.state.ca.us*

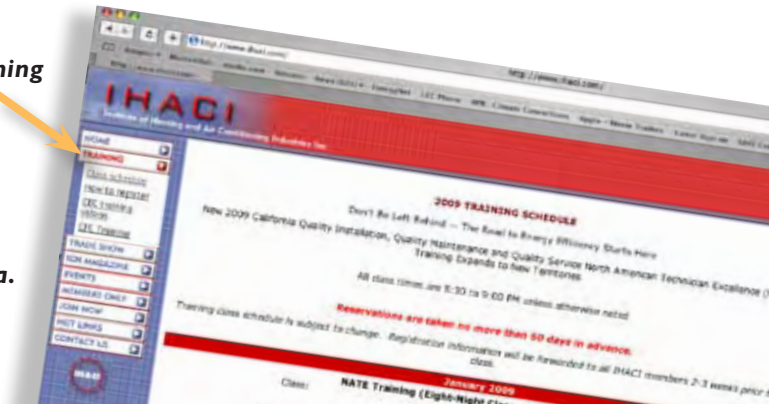
IHACI and Southern California utilities unite to provide Energy Standards Training

The Institute of Heating and Air Conditioning Industries, Inc., (IHACI) is offering a series of education programs during 2009 to help attendees comply with the high expectations set by the new 2008 Energy Efficiency Standards. Training is provided in co-sponsorships with Southern California Gas, San Diego Gas & Electric, and Southern California Edison. Class modules will be offered throughout the year in California Quality Installation, California Quality Maintenance, and California Quality Service.

Go online to IHACI, click on Training and then Class Schedule:

www.ihaci.com

Or contact your local utilities for additional details on training scheduled in your area.



CALIFORNIA ENERGY COMMISSION

BLUEPRINT

Efficiency and Renewable Energy Division

October 2008 – Number 89

The 2008 Standards have been adopted

Effective July 1, 2009

Final Standards and related documents will be posted on the web in early 2009

On April 23, 2008 the "2008 Building Energy Efficiency Standards" were adopted by the California Energy Commission.

The Commission completed a thorough and open public process in developing and adopting these new regulations. California utilities, the California Building Industry Association (BIA), the California Association of Building Energy Consultants (CABEC), the Natural Resources Defense Council (NRDC), and many others, support the newly approved changes. The 2008 Standards will take effect on July 1, 2009.

Changes for 2008

The 2008 Energy Efficiency Standards, incorporate new measures to reduce energy use and greenhouse gas emissions. This brief overview explains some of the most significant changes, and some of the next steps before the new Standards go into effect.

This Blueprint is intended to help building departments, builders, contractors, designers and energy consultants understand the upcoming changes. This edition is a brief easy reference to help anyone that is directly or indirectly involved in the design and construction of energy efficient buildings to comply with the standards.

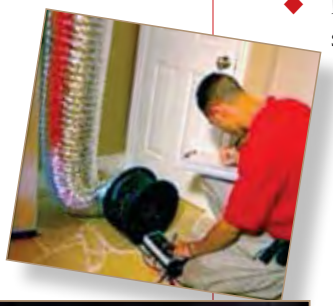
2008 Low-Rise Residential Only Changes

- Upgrade window u-factor requirements
- Update lighting requirements, including controls and kitchens
- Require mechanical ventilation to maintain indoor air quality, establish standards for ventilation rates, ventilation strategies and modeling
- Update swimming pool and spa requirements to include two-speed pumps and time clocks, limit flow velocity

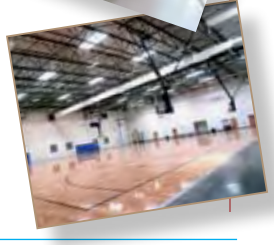
Continued on next page

- Update air conditioning refrigerant charge and airflow and protocols; discontinue credit for thermostatic expansion valves.
- Establish requirements for furnace fan airflow duct design.
- Require under-slab hot water pipe insulation to reduce heat loss.
- Compliance credit that manufacturers incorporate into their equipment for:
  - Airtight air handler boxes
  - High-efficiency furnace fans
  - Refrigerant charge indicator displays
- New Solar Homes Partnership (NSHP) participation is an optional way to comply.

Additional Low-Rise Residential Compliance Options for 2008 Standards:



- New and expanded credits for saving energy in attics/roofs:
  - Duct sealing
  - Attic ventilation
  - Buried ducts
  - Cool roofs
  - Radiant barriers
  - Insulation above roof deck
- Expanded credits for envelope sealing with blower door testing.
- Easier credit for air conditioner right sizing.



2008 Nonresidential/High-Rise Residential Only Changes

- Upgrade insulation requirements for roofs, walls and floors.
- Update indoor lighting requirements to include Tailored Method, Display Lighting Power Densities (LPDs).
- Add more Area Categories for indoor lighting.
- Add requirements for high efficacy load shedding ballasts and demand response controls to reduce indoor lighting when signaled.
- Add requirements for occupant sensors in schools and other areas.
- Require day-lit areas near windows for some types of buildings, change definition of daylit area and requirements for daylighting controls.
- Expand skylight and daylighting sensor requirements to include smaller buildings, buildings with lower ceiling heights.
- Update outdoor lighting power densities; require outdoor lighting to meet Title 24 Standards when alterations replace 30% of fixtures.
- Update requirements for signs to improve energy efficiency.
- Change site-built fenestration requirements to simplify NFRC certification, default values, and modeling rules.
- Add new acceptance requirements for outdoor lighting and building envelopes
- Expand direct digital control systems to zone level for HVAC systems, including demand shedding controls, hydronic pressure reset, VAV zone minimums, demand control ventilation, and supply air temperature reset.
- Establish envelope and mechanical requirements for refrigerated warehouses.

Additional Nonresidential/High-Rise Residential Compliance Options for 2008 Standards:

- Under Floor Air Distribution Systems, Displacement Ventilation
- Fault detection and diagnostics for air handler units, VAV, and rooftop units.
- The Standards no longer allow using the R-value of to show compliance. Only U-factors may be used to demonstrate compliance.

2008 Standards changes for Low-Rise Residential and Nonresidential/High-Rise Residential

- Add cool roof requirements for steep-sloped roofs for new roofs and reroofing.
- Refine and clarify requirements for additions and alterations for residential and nonresidential buildings, including how to calculate energy budgets.

Details on these and all of the other changes will be available will be available in the Residential and Nonresidential Compliance manuals; which will be published online by January 2, 2009.

Next Steps

Training:

The Energy Commission will work closely with building officials, builders, energy consultants and the utilities to provide training to implement the new Standards.

The utilities are planning to offer training on the new Standards, and some classes are already scheduled. Links for information from your local utility:
www.energy.ca.gov/title24/training

Compliance Manuals:

The Residential and Nonresidential Manuals will be posted on the web later this year. The manuals clarify the new Standards, provide forms and answer compliance questions.

Enforcement:

The Energy Commission's Building Standards Enforcement Unit investigates complaints and provides assistance to Building Officials and energy professionals to increase compliance with the Title 24, Building Energy Efficiency Standards.

Some investigations are done in conjunction with the Contractors State License Board (CSLB), and/or individual building departments or outside parties.

Outreach and Education,

More detailed articles on specific parts of the Standards will appear in future Blueprint issues. New videos will be produced to clarify and explain the new Standards.

Hotline:

For questions on the Building Energy Efficiency Standards and/or to file a complaint of noncompliance with the Building Standards Enforcement Unit call:

Building Standards Hotline 1-800-772-3300
or 1-916-654-5106 or e-mail us at:
title24@energy.state.ca.us

Additional 2008 Standards information:

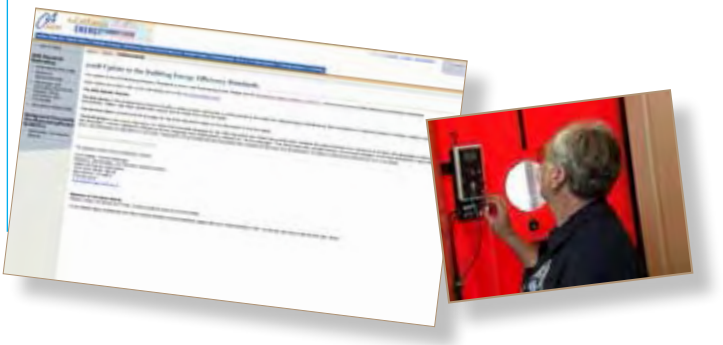
www.energy.ca.gov/title24/2008standards/index.html

Blueprint:

This online newsletter answers commonly asked questions and clarifies issues in the Energy Efficiency Standards.
www.energy.ca.gov/efficiency/blueprint/

Videos:

www.energyvideos.com



CALIFORNIA ENERGY COMMISSION

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San Diego Gas and Electric
http://seminars.sdge.com/int/default.asp

SCE
www.sce.com/RebatesandSavings/EnergyCenters/workshops.htm

SMUD
www.smud.org/education/index.html

CALBO Training Institute
www.calbo.org

CABEC
www.cabec.org

Flex Your Power Newswire
www.fypower.org/news/enewswire.html

Flex your POWER

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Energy Efficiency
Hotline
(800) 772-3300
or (916) 654-5106

Publication number
CEC-400-2008-025

Revision 1, November 14, 2008

BLUEPRINT
EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

Questions and Answers

Historic Buildings

Q. Do the Title 24 energy standards apply to historic buildings?

A. The extent to which the Energy Standards apply to historical buildings is governed by the State Historic Building Code (SHBC). The intent of the SHBC is to protect California's architectural heritage by recognizing the unique construction problems inherent in historic buildings and by providing a code to deal with these problems. For this reason Section 100(a) of the Energy Standards (Title 24, Part 6), which states what building occupancy groups are covered by the Standards, contains the following exception:

> "Exception 1 to Section 100(a): Qualified historic buildings, as defined in the State Historic Building Code (Title 24, Part 8)."

"New work" within an historic property is routinely expected to conform to the requirements of current codes and regulations including the Energy Standards. However, that new work is also governed by the SHBC, so that whenever the historic character or the historic geometry interfaces with new work, the new work is expected to accommodate existing historic conditions.

For additions, which extend the footprint of the historic structure, the mandates of the regular code properly take greater precedence, although the project remains under the SHBC's governance. The reason for this is to again insure—on a case-by-case basis—that the new work does not interact unfavorably, either practically or aesthetically, with the historic property.

The State Historical Building Safety Board (SHBSB) and its staff provide a resource to owners, architects and jurisdictions in helping to formulate the reasonable alternatives and reasonable equivalencies which are key to the SHBC's implementation.

Finally, when necessary, the SHBSB will hear formal appeals and establish formal rulings, which, by statute, are the final administrative authority with respect to interpretation of the SHBC.

Information about the State Historic Building Code can be found on the following web link to the California Division of the State Architect: http://www.dsa.dgs.ca.gov/StateHistoricalBuildingSafetyBoard/2001chbc.htm

Seeking Excellence

An interview With Rick Chitwood on – page 3

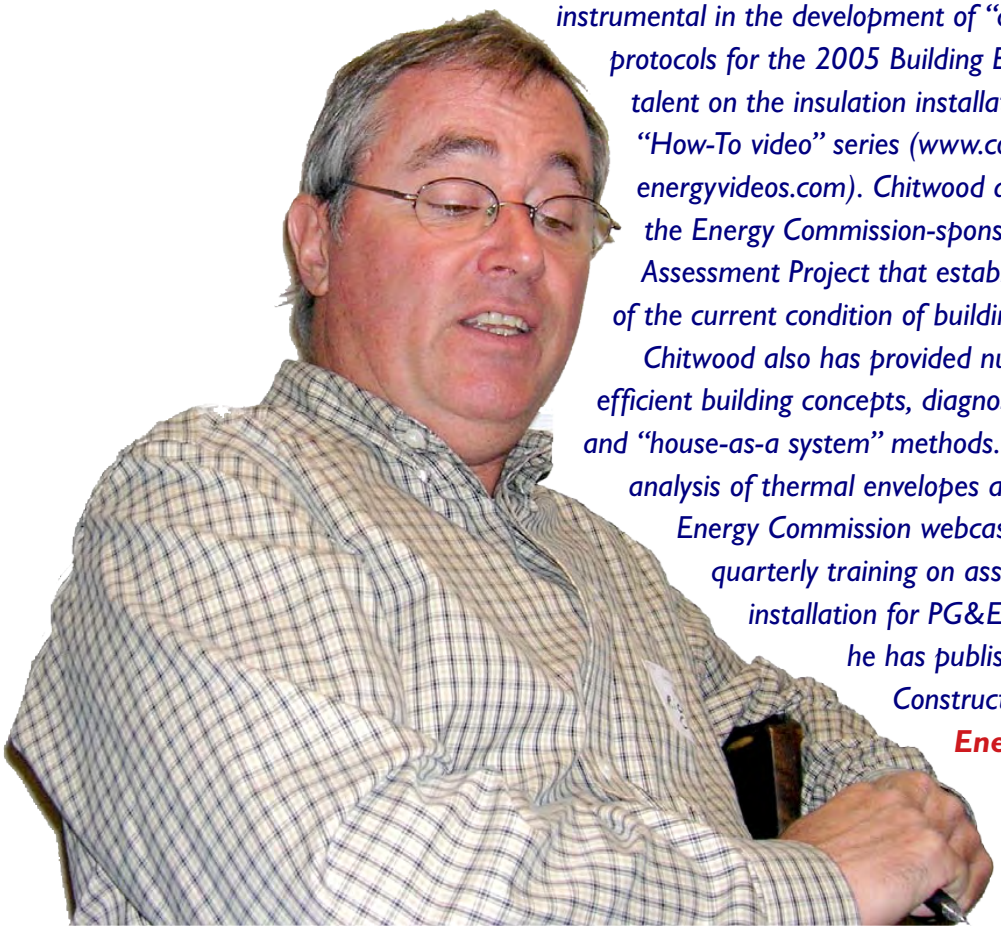
EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION
BLUEPRINT

Seeking Excellence

The seventh in a series of articles about building department employees, builders, energy consultants, HERS raters, utilities and others who are making exemplary efforts to achieve energy efficiency in buildings.

Richard (Rick) Chitwood founded Chitwood Energy Management, Inc., as a residential and light commercial HVAC systems installation firm. Chitwood has grown the firm to focus on energy efficienct design and installation and performance testing. His business is a consistent leader in quality construction issues and building performance testing.

Chitwood has worked on several projects for the California Energy Commission as an expert in high performance building envelopes. He was instrumental in the development of "quality insulation installation (QII)" protocols for the 2005 Building Energy Efficiency Standards. He is the key talent on the insulation installation videos of the Energy Commission's "How-To video" series (www.consumerenergycenter.org or www.energyvideos.com). Chitwood also performed extensive field testing for the Energy Commission-sponsored Residential Construction Quality Assessment Project that established an important level of understanding of the current condition of building envelope construction in California. Chitwood also has provided numerous training sessions on energy efficient building concepts, diagnostic techniques, infiltration control, and "house-as-a system" methods. He conducted training on infrared analysis of thermal envelopes and infiltration control as part of an Energy Commission webcast on the 2005 Standards. He provides quarterly training on assessing insulation performance and proper installation for PG&E's "See the Heat" training seminar and he has published several articles including the "New Construction Report Card" series in ***Home Energy Magazine****.*



Why did you become so interested in saving energy? I've always been interested in saving energy. I was first motivated when I was going to school back in the late 70s and early 80s, We had to go through the long lines of the gasoline shortages.

After I graduated in 1983, energy became my sole focus — installing solar domestic hot water systems — maybe an underutilization of my mechanical engineering degree, but it just happened. Since then, I've continued to seek the best way to make homes more energy efficient.

Another pivotal point was in 1994 when Bruce Manclark came to town with one of the early duct blasters. My company and I had been using building performance test equipment and had been testing ducts with the flow hood subtraction method. He was demonstrating the new "Minneapolis Duct Blaster." Together we tested a duct-system on my parent's house. The air leakage was so large that the machine couldn't test it. Almost all of the airflow leaked out. I could see at the time that I still had a lot to learn.

"One of my biggest disappointments is that so many consumers think that new homes are as energy efficient as they possibly can be."

— Rick Chitwood

What do you try to accomplish in your business? I focus on trying to make people as comfortable as possible, using as little energy as possible for extremely high comfort levels, low noise levels, improved indoor air quality and guaranteed low utility bills. At that point my company and I feel we are successful.

What is the relationship between comfort and energy efficiency? These are interwoven and go hand in hand. When we take the steps necessary to install a truly energy efficient mechanical system, rather than just install high rated equipment it automatically provides high comfort levels.

When we produce a great, energy efficient thermal envelope, there are also very high comfort levels.

The first thing I always say to contractors is that the secret of energy efficiency is that there is no "silver bullet." There are a thousand "silver bb's." I learned this "silver bullet vs. silver bb's" description at an Affordable Comfort conference years ago – and now use it often.

There are many tiny little energy features, like properly installing each fiberglass batt and sealing up every hole, and when everything is done right, there will be almost immeasurable improvement. Then we get buildings that are two-to-three times more energy efficient because we're doing small improvements in many places rather than just one big improvement.

I don't have a formula for efficient buildings such as, specifying one big energy feature, for instance. We need to pay attention to the numerous tiny, seemingly insignificant things that overall, when done right, have a huge impact.

EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

BLUEPRINT

How important is energy efficiency to your customers? I talk so much about energy efficiency because it is the easiest thing to quantify. Real numbers for energy efficiency can be arrived at, but it is hard to put a real value on, or to truly identify "human comfort." The value of good indoor air quality and the value of low noise levels are hard to talk about in real numbers. For energy efficiency, if you can do something real like guaranteeing a low energy bill, that is something you can discuss in concrete terms.

Again, it is so easy to have a major impact – significantly better than the trade standard – when you focus on all the factors.

It is easy to install a high efficiency piece of equipment, But when you install that high efficiency piece of equipment, connect it to a high efficiency duct system and the whole system is in a highly efficient thermal envelope with good insulation, air sealing and windows, the reward is that then all of those systems will work well together.

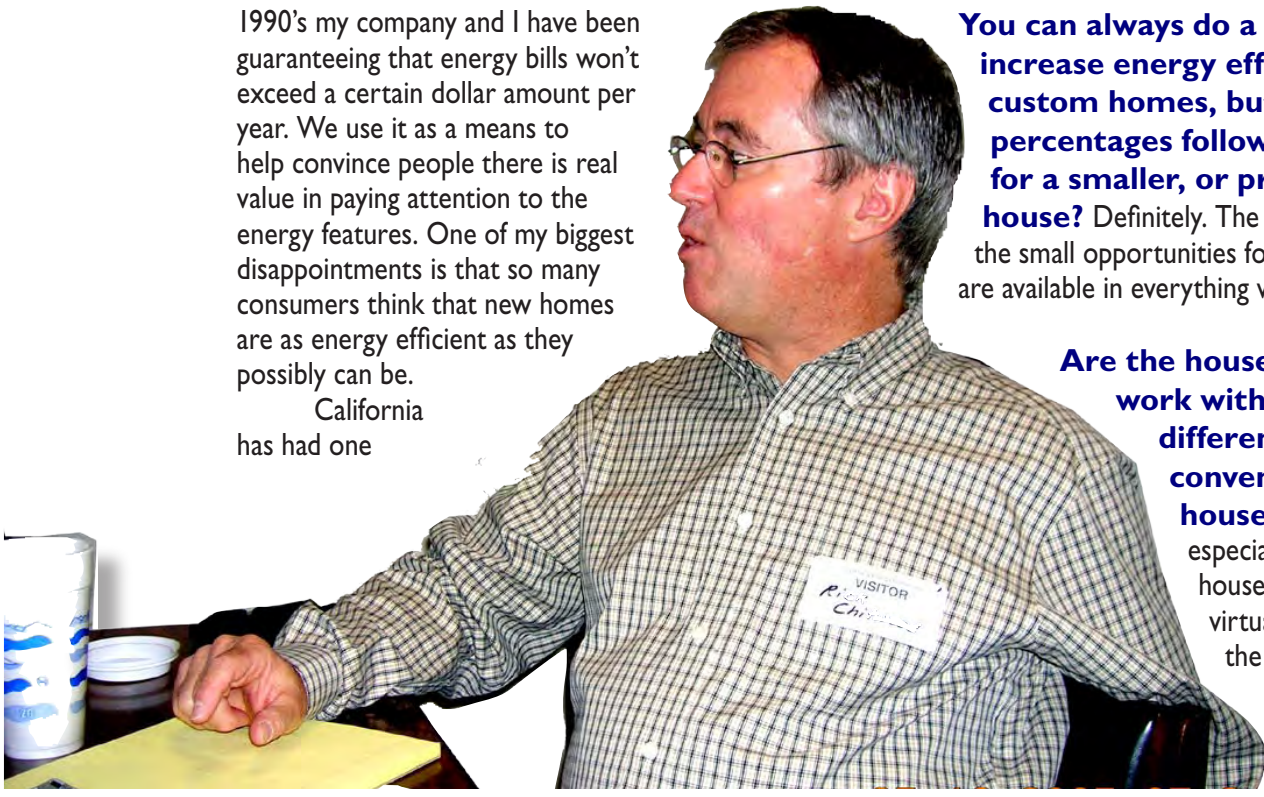
Something I talk a lot about is the "house-as-a-system" concept. Making sure that everything is working well together provides overall an extremely comfortable home with much lower energy operating cost for space conditioning than typical new homes.

You guarantee low energy bills. How does that work? Since the late 1990's my company and I have been guaranteeing that energy bills won't exceed a certain dollar amount per year. We use it as a means to help convince people there is real value in paying attention to the energy features. One of my biggest disappointments is that so many consumers think that new homes are as energy efficient as they possibly can be.

California has had one of the strongest energy codes since 1978, and we do energy efficiency better than any other state in the nation. But there is still a huge opportunity for improvement; it all hinges on all those little opportunities we focus on.

What level of energy bills do you guarantee and how is your guarantee structured? Our company guarantees that energy bills will be in the range of ten-to-twenty-cents per square foot per year for space conditioning. Of course, to accomplish that, we are not the low bidder. People have to pay us more to do a good job on the thermal envelope and the mechanical system. We convey to the homeowner that it could cost as much as $10,000 more for big houses like 6,000 square feet. That extra $10,000 will increase their mortgage payment about $70 month. On those same large houses, we're showing savings of $150-200 a month on their utility bills. So we're able to show a positive cash flow of $100 a month from the first month they move in. And the homeowner gets a more comfortable, quieter, cleaner house with easier-to-maintain equipment.

And you also do quite a number of moderately sized houses, like 1,500 3,000 square feet? Yes, that is our mainstay — the average house of about 2,000 square feet.



You can always do a lot to increase energy efficiency in custom homes, but do the percentages follow through for a smaller, or production house? Definitely. The small defects, the small opportunities for improvement, are available in everything we do.

Are the houses you work with that much different from conventional houses? In general, especially the smaller houses, there is virtually no change in the specified energy features. My

company and I don't use more or special insulation. We use regular 80 percent gas furnaces in the attic and SEER 13 AC, very typical for an average energy feature specification.

When we install fiberglass batts in the walls, we spend about 3 times more time, first caulking and sealing the cavity and then properly installing the batt. So the home ends up with a more airtight, less leaky thermal envelope. We can reduce heating and cooling loads to about half the size of a typical house of that size because we pay this much attention to the thermal envelope. After that, there is this great synergy that occurs.

Once we reduce the loads, we are able to install a smaller furnace, with small ducts, and because the envelope is good, we only need to run the ducts to the closest corner of the room so we reduce the duct surface area and therefore, the conductive losses. We need less fan energy because the ducts are shorter and we are able to use smaller ducts so they are a lot easier to bury in the ceiling insulation. This reduces the loads and furnace size even more.

Our company also specifies the right, energy efficient windows. We use the spectrally selective products, which are several times better than windows used to be just a few years ago.

Don't some builders believe that the air ducts need to run all the way to the outside facing wall, so registers will be over the windows? There is no reason to run the duct over to the window, because energy efficient windows are so good now. So we can shorten up that run by 10-15 feet and just use the properly selected register in the corner of the room closest to the air handler.

There are so many installation choices now. What do you feel is the best form of insulation? A couple of things to consider with all the new systems – whether it's the fanciest systems like SIPS – or just some of the insulation systems that can be used in conventional buildings like spray applied cellulose, or fiberglass sprayed behind fabric or spray applied foams, all of which are great systems. The biggest advantage is because they are more immune to installation defects; although their performance isn't that much different than a properly installed fiberglass batt.

I so often see fiberglass batts poorly installed. My company uses fiberglass batts, and the only thing we do differently is pay careful attention to be sure they are properly installed. We think fiberglass batts are the most cost effective, but only if they are put in correctly. If you couldn't ensure that for whatever reason, then

Rick, is interviewed by Steve Easley for the Energy Commission's online video training series.

one of the other systems should be considered.

You referred a number of times to "properly installed" insulation. What do you mean by that?
Let's talk about the quality insulation installation of (QII) protocol. The fundamentals of installing fiberglass batt insulation properly are really simple, but to get everyone trained and up to speed to do it correctly in the building industry, takes a little extra effort.

What are these QII protocols and what is it that's different in properly installing insulation? The basic installation criteria for insulation is real simple. The difficult part is applying those criteria to the almost infinite number of obstacles you run into in new construction.

In wall insulation, the first thing to do is ensure that the cavity is air tight; second, the batt must be installed so it fully fills, and is in contact with all six sides of the cavity — side to side, top to bottom, and most importantly front to back.

We need to make sure that there are no areas of excessive compression, for instance when there is a big water pipe in the cavity that needs to be worked around. Lastly, there should be no voids or gaps.

New California buildings are becoming more architecturally complex and are filled with more and more amenities. There are more obstacles to install insulation around, so applying simple criteria takes close attention to detail.

We were on a job site with a builder and we were looking at the quality of the insulation. We found a problem caused by the dry wallers. They had come in to do their work, and not realized how important it was to keep batts in contact with the dry wall. They had created voids by leaning against the batts as they lifted the dry wall, and shoving the insulation in at different spots. Do you hear much of that happening? Yes, too much. One of the biggest fears we have is coming back to a job after it has been dry walled and seeing three or four fiberglass batts that we knew we had installed properly in the wall now lying on the floor.

That is one of the advantages of building performance test equipment. We can completely troubleshoot for insulation performance by using infrared cameras and blower doors to assess the thermal performance of the insulation and any air infiltration points. We can identify all that stuff and fix it, sometimes even fixing it after the fact.

However, it is seldom cost effective to put back in the batts the dry-wallers left out; you can't have it perfect. If we install 1,000 batts in a house with a high quality installation and the dry-wallers compress five or six, we still have an extremely high quality job compared to trade standard work.

We look at the situation on the jobsite, like our old grading system in school. In theory we should always be aiming for A+ work. But we think B or B+ work is the most cost effective as long as we are focusing on every single energy feature.

Often some subcontractors are required to provide D- work, since to get the job they must be low bidder, which means they are aiming for code minimums and not paying attention to installation quality.

Production homes comprise about 75 to 80 percent of all the houses built in California. Do you think it is possible to do high quality installation of insulation and other parts of the "house-as-a-system," including the HVAC system, windows, and envelope, and still make it cost effective for the builder and homeowner? It is definitely possible in production homes, and the cost effective opportunity for improvement is clearly there.

The biggest obstacle is that the building industry has many sub trades, and one sub trade really doesn't know or care what the other sub

trade is doing. So, the plumber and electrician are making it hard to insulate walls, and the dry wallers may be damaging the insulation as they install their product.

There are all these negative interactions, and no one trade is in charge of all these energy features, so that heating/cooling installers don't know how good the job the insulation guys are going to do, yet it is the insulation that is going to keep the heated and cooled air in the building. Due to these difficulties, I choose to do HVAC and insulation work together, so that I have complete control of all the main energy features.

"What we want to do is pay attention to the whole house as one system and pay attention to the interactions between different components and make sure they work properly together."

— Rick Chitwood

How can we improve existing housing stock? Standards apply to all new homes; however, what can help homes built 20-to-30 years ago? Two weeks ago, I worked on a 60-year-old home in Berkeley. The owner works for *Home Energy Magazine*. I predicted that with the renovation of her energy features, her space conditioning energy would be reduced by about 78 percent. I gave her 12 envelopes to use to send me her energy bills for the next year to see how close to that prediction I came. Her furnace, dryer, and water heater were replaced. Radiant floor heating was installed in her bathroom, and the entire house and crawlspace were insulated.

What about her walls? The walls were already done. With all those energy features, most of her equipment was 40-60 years old, so she did a complete energy upgrade, including a ventilation system, which she didn't have before. All of it was done for under $10,000.

So what is the expected payback on the project? Hopefully, there will be positive cash flow in the first month. This is where we need to put some value on comfort, because she wasn't comfortable. Now she seldom turns on the heat. For starters, she is going to save about $300 a year on her gas consumption alone.

Sometimes people who were not comfortable using their AC before, because it did not work well, will end up using it more after they get new highly efficient equipment and the ducts and the system are fixed. How is that addressed? That is called "take back." A couple of years ago, I did a retrofit on my father-in-law's house in Stockton.

I brought my whole crew and worked for 3 days installing new AC ducts, furnace, insulation and new lights. I fixed the crawlspace.

He was only spending $100 a year for AC. He hated using it because when he turned it on, nothing happened because of about 400 cubic-feet-per-minute duct leakage with poorly insulated ducts.

Looking at his bills after we worked on the house, he was still spending about $100 a year for AC even though the efficiency of the AC system quadrupled, but now he is comfortable. I received a lot of thanks from the family because they like to visit him now.

What do you do that is different from the protocols? Everything we do as a company is in complete compliance with the quality insulation installation (QII) protocol. We differ from the protocol with one notable exception; we have an infrared camera so we can do a more thorough overall performance inspection.

Do you think the protocols are going to work well? One of the obstacles is people not understanding the real value when they look at these credits. The value for them is the trade-off of a compliance credit for more window area, but the overall benefit for comfort, indoor air quality, building durability and reduction in heating and cooling costs is often underappreciated.

Is this the right direction for the Energy Efficiency Standards? What else do you think should be done to increase energy efficiency? Absolutely. The more performance-based work that is either encouraged or required by the Standards is definitely the right direction.

Let's talk about what else needs to be done. I would like to see us move quicker to performance testing the whole-house combined with some sort of utility bill benchmarking. That would give true feedback and there would be a better understanding of the energy savings.

In my perfect world, the keys to an energy efficient building consist of two things: the "house-as-a-system" concept and "performance testing." That is how to learn to make the energy features work together and perform properly. One of the best ways to make those two things happen is by better feedback, which would be a benchmarking system.

Most homeowners don't know what they should be spending to heat and cool their homes, and the costs vary tremendously. On average, homes are good, but there are a bunch with energy use so much higher than the average, it is obvious they really need work.

If I can get the cost down into the ten-

Monitored Building Performance

Chitwood Energy Management has employed building science performance concepts for well over a decade. Even though the company has worked on several hundred homes, there has never been real data on the energy performance of those homes, until now. Building America and Redding Electric Utility provided funding for complete, third party, energy consumption and comfort level monitoring on a home in Redding with energy features installed by Chitwood Energy Management. The results of the monitoring effort are summarized below.

1. ***Air conditioner monitored energy savings, compared to a standard new home, 81 percent total savings; 83 percent reduction in compressor energy consumption, and 68 percent reduction in cooling fan energy use.***
2. ***Heating monitored energy savings compared to a standard new home 49 percent reduction in gas usage and a 65 percent reduction in heating fan energy consumption.***
3. ***The DOE 2 computer modeling that was done for the home under-predicted the benefits of good installation quality – under-predicting performance for heating and cooling by 46 percent and 43 percent respectively***
4. ***This house out-performed the geothermal heat pump used to heat and cool the house next door by about 60 percent in energy consumption and only had ¼ of the cooling peak demand***
5. ***The cost of energy improvements were 0.4 percent of the home's cost, or $5,139.00.***
6. ***A two-ton air conditioner kept this 3,500 sq.ft. house in Redding at 73°F all summer.***
7. ***This performance was accomplished with conventional energy specifications: batts in the walls, loose-fill insulation in the attic (standard R-38), and ducts in the attic.***

to-twenty-cents per square foot range, I think I've been successful, and the home is more comfortable.

What do you mean by "house-as-a-system?" Basically, all the pieces of the house and all the different systems in a home will work properly together. Often, there are bizarre and unrelated interactions between different components in a home. For example, the exhaust fan of a clothes dryer or a range hood can backdraft a fireplace and create problems. Often these interactions take place between the work of different subcontractors.

What we want to do is pay attention to the entire house as one system and pay attention to the interactions between different components and make sure they all work properly together.

Regarding the quality insulation installation protocol, you stated that the direction the Standards are taking related to performance testing is a good direction. Do you believe the Standards are going in the right direction in other areas and can you give us an example? Yes. The thing I don't like is that because California has had the strongest energy code in the nation for over 20 years, many people believe that there is no more opportunity for improvement, that homes are as cost effectively efficient as they can be. They think that when you buy a home, you shouldn't need to invest in any more energy efficiency.

But I feel there is still great opportunity for improvement. Our space conditioning costs, for example should be one-half or one-third of what they are today in new homes. Lighting and appliance improvements are still significant, and of course the 2005 Standards are addressing the huge opportunity in lighting.

What do you see for the future of performance testing? Performance testing is the most important thing we can do. When we test houses that are part of a specific energy program, we often see that just the performance-tested features that are required by the program, things like duct leakage, are noticably improved.

We see that those tested features perform well, but when we performance test other features – whether it is insulation performance, or room-by-room air balance, or refrigerant charge, or total airflow across the evaporator – those features don't perform well because they weren't performance tested. In my mind, the more performance testing we do on a home, the faster homes will improve in all areas.

What is your definition of benchmarking? I would like each homeowner to know what they are spending in a year to heat their house, and what will be spent in a year to cool the house. And what will be spent in a year for everything else.

And then be able to compare, on average, what their neighbors are spending in their homes that were built about the same time.

That way they would have some idea of whether the costs are high or low. As an industry, we only look at the averages.

On average, homes are pretty efficient. We're only spending a few hundred dollars a year to heat and cool them, and things are good. But when looking at specific house data, there are variations by a factor of three-to-ten from one house to the next. Some of that is occupant operation, but a lot of it is equipment and envelopes that aren't working well and need to be fixed.

But there is no way to identify those homes. Some form of feedback could have a big impact on energy conservation.

Utilities could provide this service by using simple disaggregation software, so that when it reads the electric or gas meter every month, it can do a simple software calculation, and disaggregate the heating portion of the bill and the cooling portion of the bill.

Those numbers would be reported to the homeowner along with a report on other people's averages, without sacrificing customer privacy issues. That is what I would like to see – for a homeowner to know if he is spending three-to-four times more than he should for heating and cooling than the average home in the neighborhood.

Do you think that at that point the homeowner would take action to improve their home's energy efficiency? For the homeowner to capture that opportunity for improvement, there needs to be better trained technicians in the field. There is very little pride in workmanship these days. We have to bring some of that back with people with better training at installing and fixing energy features.

You've been working hard for a number of years on this. Where do you see yourself going from here, and are there any new approaches you are taking or things you want to do differently? I'm constantly excited about the future, because there is such an opportunity to improve energy efficiency in homes. To move things forward, I want to demonstrate to people just how much opportunity there is for improvement.

For example, one of the energy efficient houses we did in Redding – the hot north end of the Sacramento Valley – has a guaranteed cooling bill of only $76 a year and guaranteed heating bill of only $250 a year for a 3,500 square foot house. The Department of Energy-sponsored "Building America" program actually monitored the energy performance of this house for a year (see page 8).

Another thing I'm trying to do to move things forward is show people that they really are getting benefits of energy efficiency. In Mount Shasta, I'm building an affordable "net zero energy" multi-family building, a triplex, that will be all electric and won't have any net energy bills. It will produce a little extra electricity this summer using photovoltaics, and then get that back from the utility in the winter. The technology exists today to have houses that are so efficient that they don't need any energy from the grid. That's where we need to get.

The California Energy Commission does not endorse any products, supplier, manufacturer or builder. The text in this interview is meant to be informational and not all inclusive.

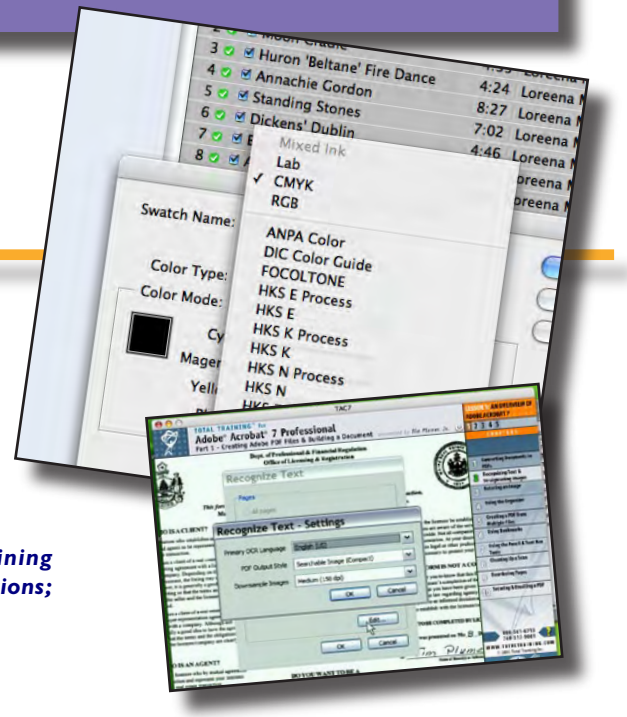
The California Energy Commission's

Energy Code Online Training Website

http://www.energyvideos.com/

This site provides video training on a variety of energy code and related building science issues, and offers guidance on the design and construction of efficient, durable and sustainable buildings in California. Both Residential and Non-Residential topics are covered.

Each "Resource" module is comprised of featured training videos; what the Standard says; and frequently asked questions; additional related links.



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BLUEPRINT

Duct Testing and a Satisfied Customer

And the Homeowner is the Ultimate Winner

Recently the California Energy Commission received an e-mail from a homeowner from the San Diego area (Climate Zone 10) about the 2005 Energy Efficiency Standards requirements for residential HVAC changeouts. The letter was about the homeowner's recent experience with the new requirements, and about her dealings with an HVAC contractor and the Home Energy Rating System (HERS) rater during the changeout process.

The new regulations regarding HVAC changeouts, which went into effect on October 1, 2005, state that the contractor must test for leaks in a home's duct system when a new air conditioner or furnace is installed. If the test reveals that a specified percentage of the cooled or heated air flowing through the ducts is leaking, then the contractor must seal the ducts. In addition, a HERS rater must verify that the duct system has been properly sealed. The regulations do, however, offer alternatives to the duct-sealing requirements, such as installing equipment with a high efficiency rating (both a high SEER and EER for an air conditioner).

The San Diego homeowner was aware of the HVAC changeout requirements and alternatives. She decided to replace the air conditioner and furnace with lower rated equipment. The homeowner felt that this was the right decision for her considering that she uses the air conditioner only a few times a year, and believes the reduction in her utility bills due to the higher rated units would not be enough to offset the initial cost of the units.

The homeowner was aware that with the equipment she had chosen, the contractor would have to test for duct leakage and have a HERS rater verify that the ducts have been properly sealed. At first, the HVAC contractor she had hired did not want to comply with the new regulations and perform the duct testing. However, the homeowner insisted and was prepared to file a complaint with the Contractors State License Board if the contractor did not perform the duct testing and seal the leaks.

Consistent with the changeout requirements, a HERS rater came to the home and performed a visual inspection of the duct system and a smoke test after the contractor finished the installation and the duct sealing. The smoke test revealed additional leaks that the contractor had missed and would have to seal. After the contractor sealed the additional leaks, the total duct system leakage was reduced by another 15 percent.

The homeowner was pleased with the end result. She was very happy that she had decided to go with the lower rated equipment and have the home's duct system tested.

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BLUEPRINT

Arnold Schwarzenegger
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Title 24 Energy Efficiency Standards

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http://www.energy.ca.gov/title24/training

The Energy Commission's Energy Code Online Training
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For training offered by the utilities and other organizations please see the following websites:

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http://www.pge.com/stockton

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http://seminars.socalgas.com/int/default.asp

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http://www.sce.com/RebatesandSavings/EnergyCenters/workshops.htm

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NEW!
Videos and information for building department staff on Title 24 Compliance for ***changeouts*** *and* ***cool roofs*** *is available at:*
www.buildingmedia.com/calbo/videos_dept.html

BUILDING INDUSTRY INSTITUTE (BII)
http://www.consol.ws/bect.asp

CABEC:
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Residential Lighting Design Guide
– Best practices and lighting designs to help builders comply with California's 2005 Title 24 energy code
http://www.cltc.ucdavis.edu/

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Special Bulletin

Questions and Answers

Residential and Nonresidential

Incorporating Title 24 Onto Your Plans

Section 10-103(a)2 of Title 24, Part 1 states that "for all newly constructed buildings, additions, alterations or repairs regulated by Part 6, the applicant shall file the appropriate Certificate(s) of Compliance on the plans." The form(s) that constitute the Certificate(s) of Compliance and need to be incorporated onto the plans depend on whether the building permit application is for a residential or nonresidential project. Also, how these forms are "incorporated" onto the plans (imprinted, stapled, attached using sticky-back paper, etc.) requires approval from your local building department.

Residential Applications

The Certificate of Compliance is the ***CF-1R*** Form, which needs to be incorporated onto the plans. If the building department does not require plans for projects such as alterations, then the CF-1R alone must be submitted to the building department.

Also, depending on the compliance approach, additional compliance documentation may need to be submitted with the plans. Table 2-1 of the 2005 Residential Compliance Manual lists the Compliance Methods and the appropriate forms that are required for submittal when applying for a building permit:

Table 2-1 Documentation Requirements, Prescriptive and Performance Compliance Methods

Phase	Method	Documentation Required when applicable
Building Permit	Prescriptive or Performance	CF-1R, Certificate of Compliance
	Prescriptive or Performance	MF-1R, Mandatory Measures Checklist
	Prescriptive	WS-1R, Thermal Mass Worksheet Checklist
	Prescriptive	WS-2R, Area Weighted Average Calculation Worksheet
	Prescriptive	WS-3R, Solar Heat Gain Coefficient (SHGC)
	Prescriptive	WS-4R, Fenestration – Maximum Allowed Worksheet
	Prescriptive or Performance	WS-5R, Residential Kitchen Lighting Worksheet
	Prescriptive or Performance	CF-SR, Solar Water Heating Calculation Form
Construction	Prescriptive or Performance	CF-6R, Installation Certificate
Field Verification and/or Diagnostic Testing	Prescriptive or Performance	CF-4R, Certificate of Field Verification and Diagnostic Testing

Continued on next page

Continued from previous page

Nonresidential Applications

There is a Certificate of Compliance for the Envelope, Indoor Lighting, Outdoor Lighting, and Mechanical components of the building.

When showing compliance with the **Envelope** requirements, the ENV-1-C Form is the Certificate of Compliance. The ENV-1-C is a two-part form; both parts need to be incorporated onto the plans. Additional Envelope documentation may need to be submitted with the plans in addition to the ENV-1-C when applicable. These forms are listed in the footnotes of the Envelope Certificate of Compliance (located at the bottom of the ENV-1-C Form):

Component	Documentation Required when applicable
ENV-1-C	Certificate of Compliance. Part 1 of 2 and 2 of 2 are required on plans for all submittals.
ENV-2-C	Use with the Envelope Component compliance method.
ENV-3-C	Use with the Overall Envelope compliance method.
ENV-4-C	Optional. Use for the minimum skylight requirements for large enclosed spaces.

When showing compliance with the **Mechanical** requirements, the ***MECH-1-C*** is the Certificate of Compliance. The MECH-1-C is a three-part form, and all three parts need to be incorporated onto the plans. Additional Mechanical documentation may need to be submitted with the plans in addition to the MECH-1-C when applicable. These forms are listed in the footnotes of the Mechanical Certificate of Compliance (located at the bottom of the MECH-1-C Form):

Component	Documentation Required when applicable
MECH 1-C	Certificate of Compliance. Part 1 of 3, 2 of 3, and 3 of 3 are required on plans for all submittals
MECH-2-C	Covers Air System / Water System / Hot Water and Pool Requirements. Part 1 of 3, 2 of 3, and 3 of 3 are required for all submittals, and may be on plans.
MECH-3-C	Mechanical Ventilation and Reheat.
MECH-4-C	HVAC (Misc.) Prescriptive.

When showing compliance with the **Indoor Lighting** requirements, the ***LTG-1-C*** is the Certificate of Compliance. Part 1 of 4 and Part 2 of 4 are required for all submittals and need to be incorporated onto the plans. Part 3 of 4 is required to be incorporated onto the plans **only** if Control Credits are claimed, and Part 4 of 4 is required to be incorporated onto the plans when lighting controls are installed. Additional Indoor Lighting documentation may need to be submitted with the plans in addition to the LTG-1-C when applicable. These forms are listed in the footnotes of the Indoor Lighting Certificate of Compliance (located at the bottom of the LTG-1-C Form):

Component	Documentation Required when applicable
LTG-1-C, Parts 1 of 4 and 2 of 4	Certificate of Compliance. Parts 1 of 4 and 2 of 4 are required on plans for all submittals.
LTG-1-C, Parts 3 of 4	Certificate of Compliance. Part 3 of 4 submittal is required only if control credits are claimed.
LTG-1-C, Parts 4 of 4	Certificate of Compliance. Part 4 of 4 submittal is required when control credits are installed.

Continued on next page

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LTG-2-C	Indoor Lighting Schedule
LTG-3-C	Portable Lighting Worksheet
LTG-4-C	Lighting Controls Credit Worksheet
LTG-5-C	Indoor Lighting Power Allowance
LTG-6-C	Tailored Method Worksheet
LTG-7-C	Room Cavity Ratio Worksheet
LTG-8-C	Common Lighting Systems Method Worksheet
LTG-9-C	Line Voltage Track Lighting Worksheet
OLTG-4-C	Signs (See OLTG-4-C Sign Worksheet in Chapter 6, Outdoor Lighting and Signs Chapter).

When showing compliance with the **Outdoor Lighting** requirements, the ***OLTG-1-C*** is the Certificate of Compliance. The OLTG-1-C is a two part form, and both parts need to be incorporated onto the plans. Additional Outdoor Lighting documentation may need to be submitted with the plans in addition to the OLTG-1-C when applicable. These forms are listed in the footnotes of the Outdoor Lighting Certificate of Compliance (located at the bottom of the OLTG-1-C Form):

Component	Documentation Required when applicable
OLTG-1-C	Certificate of Compliance. Part 1 of 2 and 2 of 2 are required on plans for all submittals.
	Either LTG-1-C or OLTG-1-C may be used for signs as follows: 1. Use LTG-1-C if the project consists solely of indoor signs 2. Use LTG-1-C if the project consists of indoor lighting, and outdoor or indoor signs, but no other outdoor lighting. 3. Use OLTG-1-C if the project consists solely of outdoor signs 4. Use OLTG-1-C if the project consists of outdoor lighting, and indoor or outdoor signs, but no other indoor lighting
OLTG-2-C	Lighting compliance summary. Applicable Parts required for ALL outdoor lighting allowances (Except for Signs)
OLTG-3-C	Area calculations worksheets. Applicable parts required for all outdoor area calculations.
OLTG-4-C	Sign lighting compliance. Required for all internally and externally illuminated signs, for both indoor and outdoor signs.

Note: ***Even though Section 10-103(a)2 of the Administrative Regulations only requires that the Certificate(s) of Compliance be incorporated directly onto the plans, the building department has the discretion of requiring that additional Title 24, Part 6 documents also be incorporated onto the plans. Contacting the building department before applying for a building permit will help you determine if additional forms other than the Certificate(s) of Compliance need to be incorporated onto the plans.***

Both the Residential and Nonresidential Compliance Forms are revised and updated periodically for clarification and correctness. We advise that you check our website occasionally for updates of the Compliance Forms at:

http://www.energy.ca.gov/title24/2005standards/index.html

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Title 24

Energy Efficiency Standards Training

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http://seminars.socalgas.com/int/default.asp

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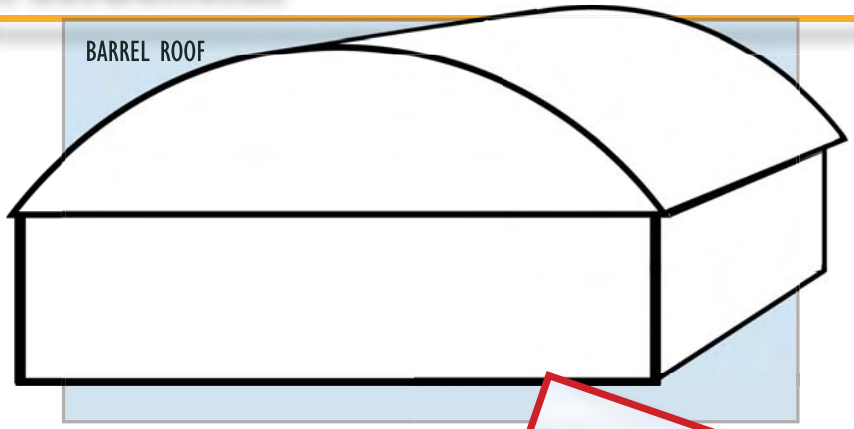
Special Bulletin

Questions and Answers

Nonresidential



Q. I have a barrel roof on a nonresidential conditioned building that needs to be re-roofed. Must I follow the 2005 Title 24 cool roof requirements?

A. Yes, but the requirements apply only to the portion of the roof that is low-sloped (2:12 or less). It may be awkward or impractical to put cool roofing on the low-sloped portions but not on others, so you may end up reroofing the entire roof with cool roof materials. Recall also that the 2005 Standards allow an energy-equivalent amount of insulation if you are reroofing with a noncool roof (using the Overall Envelope Prescriptive Approach or the Performance Approach). See the announcement at the bottom of page 3, for access to a calculator to help determine the appropriate level of insulation.

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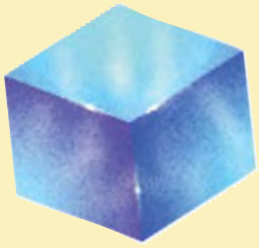
Pacific Building Consultants, Inc.

Update to Blueprint 83 on COOL ROOFS



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Q. What are the 2005 Title 24 Energy Efficiency Standards requirements for cool roofs when reroofing an unconditioned warehouse containing conditioned office space? The warehouse has a low-sloped roof.

A. Let's look at two scenarios and determine the answer for each.

Scenario 1. The walls of the conditioned space do not reach all the way to the warehouse roof (see photo at the right).

In this case, the cool roof requirements do not apply, because the space directly below the roof is unconditioned and communicates with the rest of the unconditoned portion of the warehouse.

Scenario 2. In this situation, we now have either directly or indirectly conditioned space under the roof. The cool roof requirements apply to just the portion(s) of the warehouse roof over the conditioned space(s). The rest of the roof (over unconditioned warehouse space) is not required to be a cool roof.

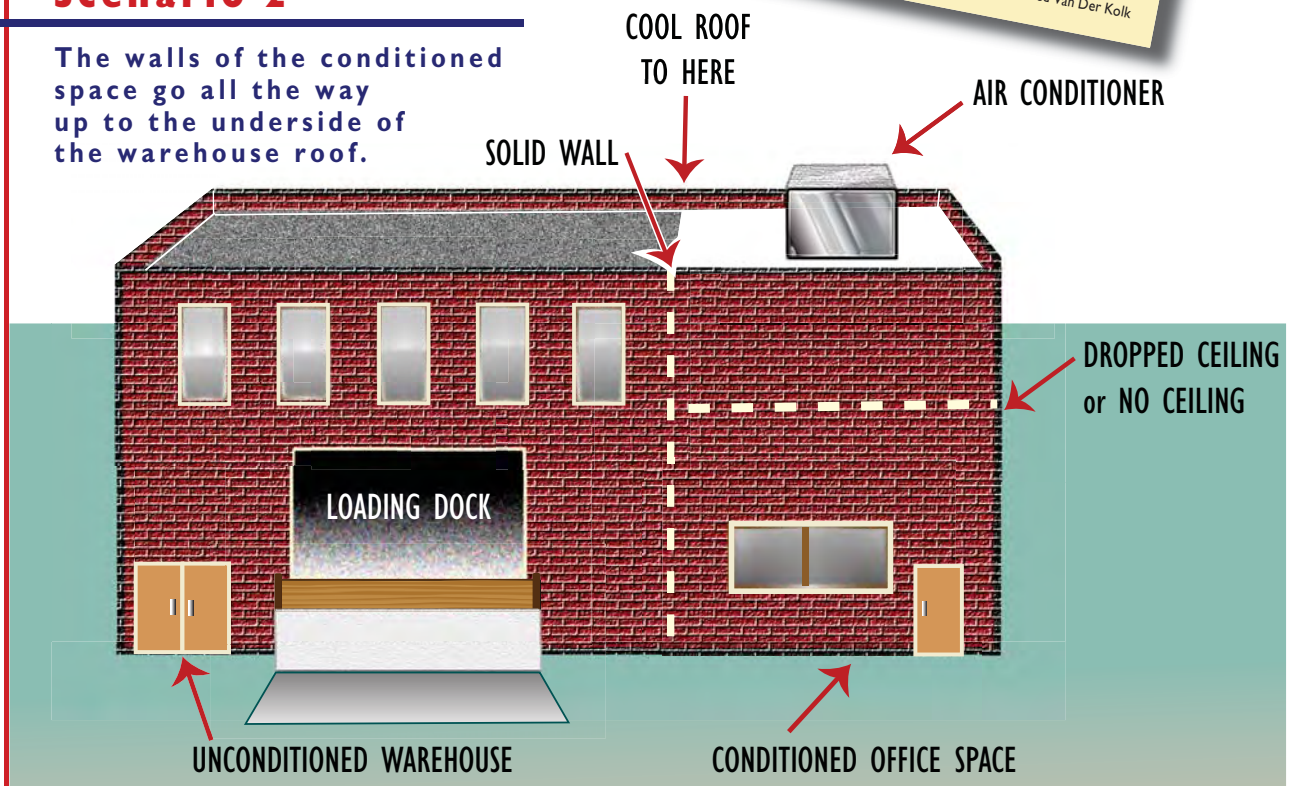
Scenario 1

Walls of the conditioned space do not reach all the way to the warehouse's roof deck.

Photo credit: Ted Van Der Kolk

Scenario 2

The walls of the conditioned space go all the way up to the underside of the warehouse roof.



Q. *I am a roofing contractor bidding on reroofing a building that has retail on the first floor and one floor of living space (apartments) above the retail. The building has a continuous low-sloped roof over the apartments, and both the retail spaces and apartments have heating and/or air conditioning. Since cool roofs are optional for residential occupancies and prescriptive requirements for retail spaces, must I bid based on the 2005 prescriptive cool roof requirements or not?*

A. No, in this case. The Nonresidential Compliance Manual states, in Chapter 1, Section 1.7.4, "Mixed Residential and Nonresidential Occupancies. These occupancies fall under different sets of Standards, [and] they are considered separately." The new roof is going over a residential occupancy, and the 2005 prescriptive cool roof requirements do not apply to residential occupancies. (Note that if the building owner wanted to put on a cool roof to increase the comfort of the apartment renters on hot days, s/he certainly could do so, but no energy credit or special consideration would be given under the energy standards.)

Q. *Let's assume that a building with a low slope-roof has only one story and contains both residential and nonresidential spaces. If I were reroofing and following the prescriptive requirement for cool roofs over the nonresidential spaces would I be allowed to put a non-cool roof over the residential spaces?*

A. Yes. However, you might save in labor and material costs by putting the cool roof over the whole building. You also should realize that for buildings that contain residential and nonresidential occupancies directly under the same roof, when one of those occupancies is less than 10% of the total conditioned area, the building may optionally comply with the requirements for the major occupancy." In this case you would be allowed to put the same roof over the entire conditioned space (either a cool roof if the conditioned space is 90% or more nonresidential, or a non-cool roof if 90% or more of the conditioned space is residential).

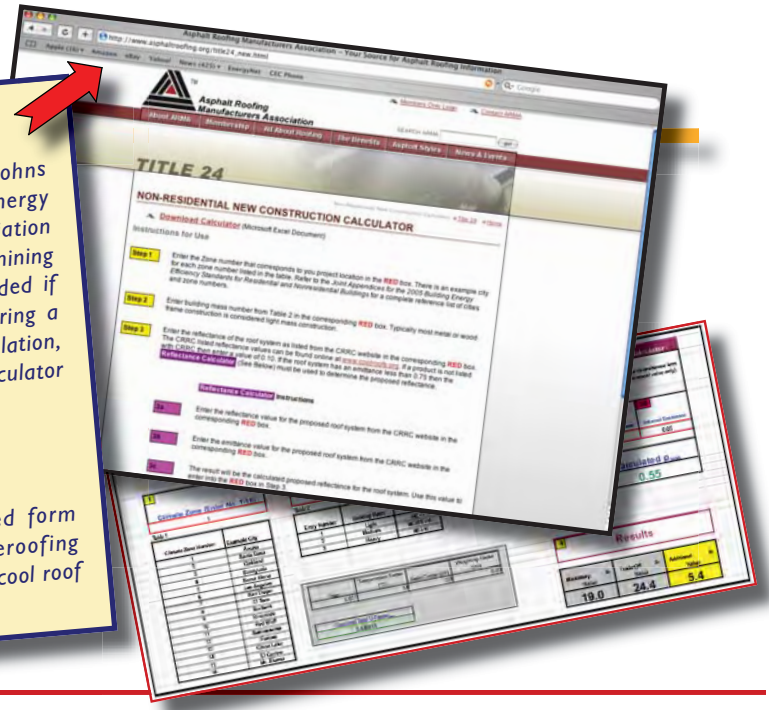
For additional Blueprint questions on cool roofs:
http://www.energy.ca.gov/2005publications/CEC-400-2005-053/CEC-400-2005-053.PDF

Web-based Calculator is now available

In conjunction with Oak Ridge National Laboratory, Johns Manville, Pacific Building Consultants, Inc., and the Energy Commission, the Asphalt Roofing Manufacturers Association (ARMA) has developed a web-based calculator for determining quickly the energy-equivalent R-value of insulation needed if a building owner chooses to install a non-cool roof during a reroof. The R-value depends on the level of existing insulation, the climate zone, and several other factors, and the calculator allows inputs of these factors.

Visit: www.asphaltroofing.org/title24.html.

The Energy Commission is developing a simplified form to accompany a building permit application for reroofing nonresidential low-sloped buildings covered under the cool roof standards.



Update to Blueprint 83 on COOL ROOFS

In 2005/2006 the Energy Commission conducted a proceeding to consider and adopt the following Section 118(i)3. These changes took effect September 10, 2006.

Changes to Title 24, Part 6, Section 118(i)3

The underlined text was added and is now in effect.

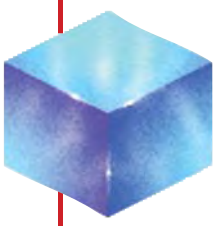
3. Liquid-applied roof coatings applied <u>to low-sloped roofs</u> in the field as the top surface of a roof covering shall:

<u>A.</u> be applied <u>across the entire roof surface to meet the</u> dry mil thickness <u>or coverage recommended by the coating manufacturer, taking into consideration the substrate on which the coating is applied,</u> and

<u>B.</u> meet the minimum performance requirements listed in TABLE 118-C <u>or the minimum performance requirements of ASTM C836, D3468, D6083, or D6694, whichever are appropriate to the coating material</u>.

EXCEPTION 1 to Section 118 (i) 3 <u>B</u>: Aluminum-pigmented asphalt roof coatings shall meet the requirements of ASTM D2824 or ASTM D6848 and be installed as specified by ASTM D3805.

EXCEPTION 2 to Section 118 (i) 3 <u>B</u>: Cement-based roof coatings shall contain a minimum of 20% cement; and shall meet the requirements of <u>ASTM C1583,</u> ASTM D822<u>, and ASTM D5870</u>.

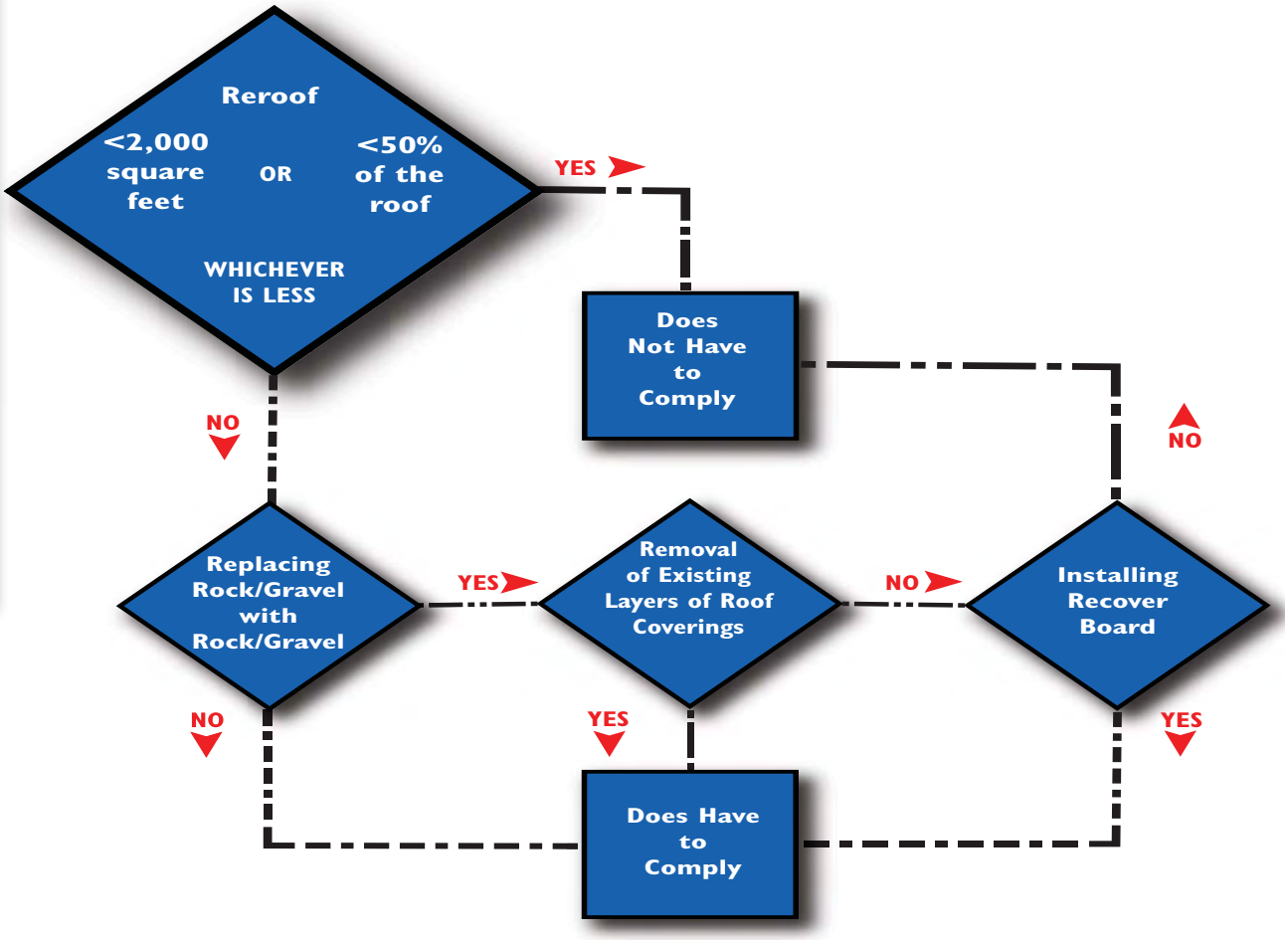


The revised chart on this page includes the changes to Title 24, Part 6, Section 118(i)3

TABLE 118-C

MINIMUM PERFORMANCE REQUIREMENTS FOR LIQUID APPLIED ROOF COATINGS for low-sloped roofs

Physical Property	ASTM Test Procedure	Requirement
Initial percent elongation (break)	D2370	Minimum 200% 73°F (23°C)
Initial percent elongation (break) OR Initial flexibility	D2370 D522, Test B	Minimum 60% 0°F (-18°C) Minimum pass 1" mandrel 0°F (-18°C)
Initial tensile strength (maximum stress)	D2370	Minimum 100 psi (1.38 Mpa) 73°F (23°C)
Initial tensile strength (maximum stress) OR Initial flexibility	D2370 D522, Test B	Minimum 200 psi (2.76 Mpa) 0°F (-18°C) Minimum pass 1" mandrel 0°F (-18°C)
Final percent elongation (break) after accelerated weathering 1000 h	D2370	Minimum 100% 73°F (23°C)
Final percent elongation (break) after accelerated weathering 1000 h OR Flexibility after accelerated weathering 1000 h	D2370 D522, Test B	Minimum 40% 0°F (-18°C) Minimum pass 1" mandrel 0°F (-18°C)
Permeance	D1653	Maximum 50 perms
Accelerated weathering 1000 h	D4798	No cracking or checking. Any cracking or checking visible to the eye fails the test procedure.



Changes to Question 9 from Blueprint 83.

Q. Are there any types of nonresidential low-slope reroofs that are not required to comply with the cool roof requirements?

A. Yes. Any roof over unconditioned space does not have to comply. (A cool roof will, however, increase the comfort level of persons working in unconditioned warehouses in many of California's climate zones.) Also, any reroof under 20 squares (2,000 square feet) or 50 percent of the roof — whichever is less — does not have to comply with the cool roof requirements. For reroofs that are larger than this, there is one special case. Rock or gravel roofs that meet specific conditions, that don't have to comply. Rock and gravel roof recoverings that are allowed by the CBC do not have to meet the cool roof requirements if all of the following conditions are true:

1. The existing roof has a rock or gravel surface; and
2. The new roof has a rock or gravel surface; and
3. There is no removal of existing layers of roof coverings; and
4. There is no recoating with a liquid applied coating; and
5. There is no installation of a recover board, rigid insulation or other rigid, smooth substrate to separate and protect the new roof recovering from the existing roof.

Did You Know?

Energy Code Training Online Website

http://www.energyvideos.com/

This site provides video training on a variety of energy code and related building science issues, and offers guidance on the design and construction of efficient, durable and sustainable buildings in California.

Energy Code Online Training is divided into "modules" for ease of navigation. These are organized first by Residential and Nonresidential. Under these two headings modules are organized by end use and key topics. Residential Code, Energy Code, HVAC, Building Envelope and more.

Each "Resource" module is comprised of training videos, plus additional related resource links, including the actual Code and other documents.

The Energy Policy Act of 2005

includes Federal tax credits and deductions for certain energy efficiency measures in homes and businesses. For details, visit any of the following websites:

- The American Council for an Energy Efficient Economy's website at: *www.aceee.org/press/0602tiap2.htm*
- The Florida Solar Energy Center's website at: *www.fsec.ucf.edu/en/*
- The California Energy Commission's website and look at the bottom of the page under "Special Links" at: *http://energy.ca.gov/efficiency/*

BLUEPRINT

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Revised January 16, 2007

Title 24
Energy Efficiency Standards Training

Links for training on issues relating to California Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24, Part 6) are available on the Energy Commission's website at:

http://www.energy.ca.gov/title24/training

For training offered by the utilities and other organizations please see the following websites:

PG&E:
http://www.pge.com/stockton

SoCal Gas Co.
http://seminars.socalgas.com/int/default.asp

San Diego Gas and Electric
http://seminars.sdge.com/int/default.asp

SCE:
http://www.sce.com/RebatesandSavings/EnergyCenters/workshops.htm

SMUD:
http://www.smud.org/education/index.html

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http://www.consol.ws/bect.asp

CABEC:
http://www.cabec.org/cepetrainandtest.php

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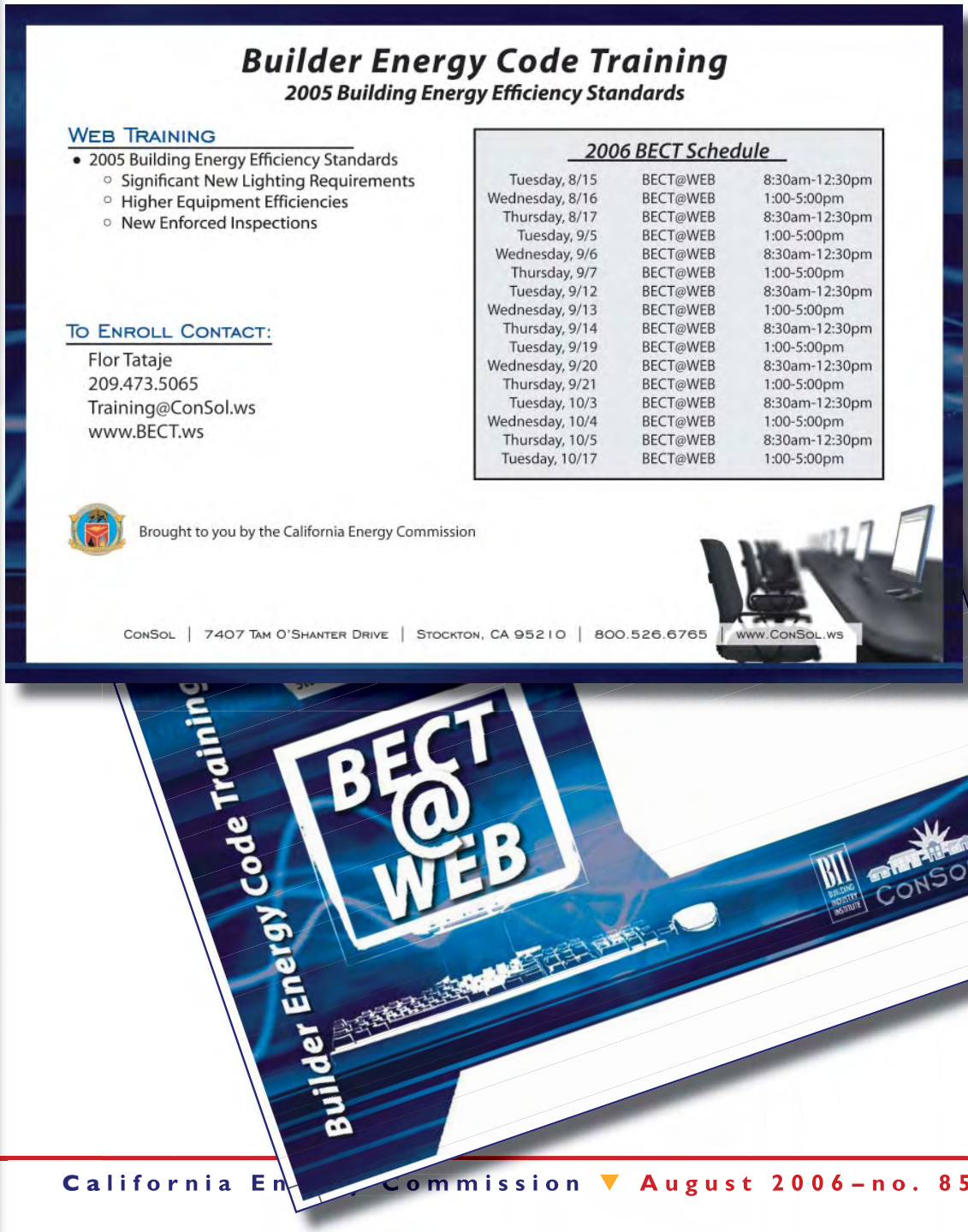
BLUEPRINT
EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

Special Bulletin

Builder Training OnLine

The California Energy Commission provides **Builder Energy Code Training** through the Building Industry Institute (BII) and their subcontractor, Consol. A new series of training sessions on the web is about to begin and postcards have been sent out to advertise the sessions. To sign up for the web training, please contact Flor Tataje at 209-473-5065.



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http://wwwenergyvideos.com/

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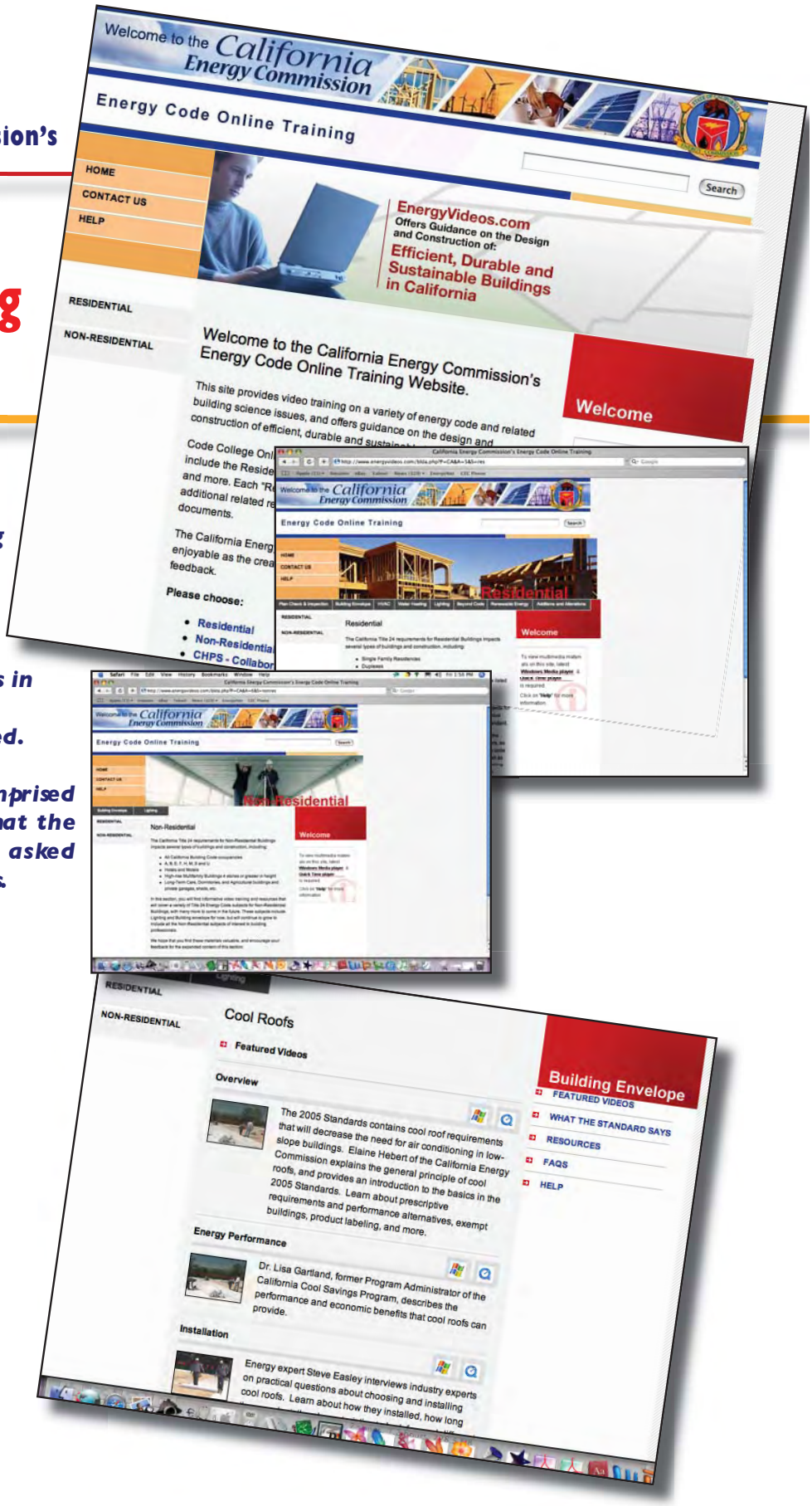
Each "Resource" module is comprised of featured training videos; what the Standard says; and frequently asked questions; additional related links.



The 2005 Energy Efficiency Standards (Title 24, Part 6)

The Energy Efficiency Standards for Residential and Nonresidential Buildings were established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. Energy Commission staff are currently developing the 2008 Energy Efficiency Standards

California's building Energy Efficiency Standards (along with those for energy efficient appliances) have saved more than $56 billion in electricity and natural gas costs since 1978. It is estimated the Standards will save an additional $23 billion by 2013.

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

The Energy Standards Hotline

The Energy Hotline, run by the California Energy Commission's Efficiency Division, provides callers with comprehensive and timely technical information on how to comply with the Title 24 Building Energy Efficiency Standards and information on appliances certified for sale in California.

Used daily by hundreds of utility, building and energy professionals, the Energy Hotline responds quickly to technical questions with a variety of consumer services. These include:

Toll-free phone number
Direct access to trained energy specialists
Technical information and detailed personal responses
HOURS: Monday through Friday 8 a.m. to 12 p.m. and 1 p.m. to 4:30 p.m.

To contact the Energy Hotline, please call or write:

Energy Hotline
California Energy Commission
Buildings and Appliances Office
1516 Ninth Street, MS 25
Sacramento, CA 95814
title24@energy.state.ca.us

(916) 654-5106 or toll free in California (800) 772-3300

The Blueprint Newsletter

The Energy Commission's Blueprint Newsletter is available on the Internet. The Blueprint is published on a regular basis to provide updated information and clarifications regarding California's Title 24, Part 6 Building Energy Efficiency Standards. The Blueprint reaches energy officials, builders, energy consultants, contractors and other professionals that need to know about the Standards.

http://www.energy.ca.gov/efficiency/blueprint

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Publication number CEC-400-2006-013

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http://www.energy.ca.gov/title24/training

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EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

BLUEPRINT

Special Bulletin

Q *I understand that the federal air conditioner standards that require a minimum SEER 13 went into effect on January 23, 2006. Can an air conditioner that has a SEER rating less than SEER 13 be installed in newly constructed buildings, additions or as a replacement unit after January 23?*

A The January 23, 2006 date pertains to the date of manufacture of the air conditioner. To comply with the federal appliance standards, any air conditioner or heat pump that federal law requires to have a SEER rating must be a SEER 13 or greater if it was manufactured on or after January 23. It is unlawful to sell or install an air conditioner manufactured on or after January 23 that fails to have at least a SEER 13 rating.

To comply with the **prescriptive approach** in California's 2005 Building Energy Efficiency Standards, an air conditioner that has a rating between SEER 10 and SEER 13 can be sold and installed in newly constructed buildings, additions or as a replacement unit, if the building department determines that the air conditioner was manufactured before January 23, and all other prescriptive requirements are also met. These requirements include third-party field-verified duct sealing and either third-party field-verified thermostatic expansion valves or refrigerant charge measurement.

To comply through the **performance approach**, an air conditioner that has a rating between SEER 10 and SEER 13 can be sold and installed in newly constructed buildings, additions or as a replacement unit, if the building department determines that the air conditioner was manufactured before January 23, and compliance is shown using Commission-approved compliance software. The proposed design must use the SEER rating of the installed air conditioner.

To comply with **any Commission-approved alternative to doing duct sealing and refrigerant charge measurement or thermostatic expansion valves** (such as Table 8-3 of the Residential Compliance Manual), a SEER rating of 13 or any higher SEER and EER that is specified in that alternative must be installed.

EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

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Title 24
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CABEC:
http://www.cabec.org/cepetrainandtest.php

Nonresidential Fenestration Certification Initiative (NFCI):
http://nfci.ecst.csuchico.edu

Residential Lighting Design Guide
– Best practices and lighting designs to help builders comply with California's 2005 Title 24 energy code:
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Publication number CEC-400-2006-004

EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

BLUEPRINT

Q and A on COOL ROOFS

A Special Blueprint on the new 2005 Cool Roof Requirements

ALSO IN THIS ISSUE:

New Climate Zone Map on page 10

Errata Notification on page 11

Q1. What buildings and roofing projects are subject to the cool roof requirements of the Title 24 2005 Building Energy Efficiency Standards?

A. The 2005 Standards' cool roof requirements apply to roofs on conditioned (heated or cooled) nonresidential buildings that have low-sloped roofs (2:12 or less). The requirements apply to roofs on newly constructed buildings and to most reroofs on existing buildings. A list of building types to which the cool roof requirements apply and a list of exempt building types are included at the end of these questions and answers on page 9 and 10.

NOTE that the 2005 Title 24 Energy Standards are not making building owners replace or recover existing roofs that are not in need of reroofing.

Q2. What qualifies a roof to be a cool roof under the 2005 California Building Energy Efficiency Standards (also called the California Energy Code)?

A. To be considered a cool roof in California under the 2005 Standards, a roof must:

a. be tested and rated through the Cool Roof Rating Council (CRRC); and

b. be labeled for its initial reflectance and initial emittance as determined in the CRRC tests and be labeled that the product meets Title 24, Section 118(i); and

c. achieve at least a 0.75 initial emittance and 0.70 initial reflectance or, if the initial emittance is less than 0.75, have an initial reflectance of at least [0.70 + {0.34 x (0.75 – initial emittance)}];*

and

d. if applied as a liquid coating in the field, be applied at a minimum dry mil thickness of 20 mils* across the entire roof surface and meet performance requirements listed in the table shown immediately below:

TABLE 118-C**

Physical Property	ASTM*** Test Procedure	Requirement
Initial percent elongation (break)	D 2370	Minimum 60% 0 °F (-18 °C) Minimum 200% 73 °F (23 °C)
Initial tensile strength (maximum stress)	D 2370	Minimum 100 psi (1.38 Mpa) 73 °F (23 °C) Minimum 200 psi (2.76 Mpa) 0 °F (-18 °C)
Final percent elongation (break) after accelerated weathering 1000 h	D 2370	Minimum 40% 0 °F (-18 °C) Minimum 100% 73 °F (23 °C)
Permeance	D 1653	Maximum 50 perms
Accelerated weathering 1000 h	D 4798	No cracking or checking Any cracking or checking visible to the eye fails the test procedure

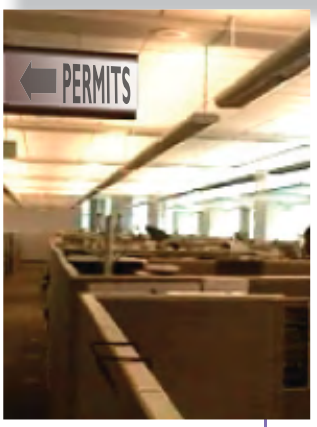
NOTE: Aluminum-pigmented asphalt roof coatings and cement-based roof coatings are not required to meet this table. The former must meet ASTM D2824, D6848, and D3805 and the latter must meet greater dry mil thicknesses (depending on the substrate) and meet ASTM D822. Details are found in Standards Section 118(i)3.

*Being an ENERGY STAR roof does not automatically qualify a roofing material to be a cool roof in California because ENERGY STAR has different criteria.

** The Energy Commission is currently conducting a rulemaking that may result in changes to the minimum dry mil thickness and to Table 118-C. See: www.energy.ca.gov/title24/roofcoatings/

*** *American Society for Testing and Materials*

INDEX on page 9



Q3. I understand that building departments are responsible for enforcing the cool roof requirements. Who is educating building departments about these requirements?

A. Several entities are educating building departments. California's electric and gas utilities hold classes at their training centers and several private consultants are offering training to building departments. The Energy Commission publishes the Nonresidential Compliance Manual with detailed information about the Standards and this Blueprint, which is distributed electronically to all building departments and other subscribers.

The Energy Commission also maintains a Title 24 Hotline (800-772-3300 or 916-654-5106 or title24@energy.state.ca.us) and attends local and statewide meetings of building officials to provide information and training about the Energy Standards. We will also provide or coordinate onsite training upon request.

The Energy Commission is aware that a number of for-profit roofing suppliers and industry groups are holding training for the public and for public officials. The Energy Commission asks that trainers provide their training materials to the Energy Commission for review and provide the dates and locations of the scheduled training. If staff is available, the Energy Commission offers to sit in on training sessions to help assure accuracy and answer questions.

The new 2005 California Energy Efficiency Standards are now in effect as of October 1, 2005

Q4. What determines whether a roofing job must comply with the 2005 Energy Standards or can comply with the 2001 Energy Standards?

A. The effective date of the 2005 Energy Efficiency Standards was October 1, 2005. The date that the building permit application is submitted to the building department is the determining factor. If the building permit application for a newly constructed building, a building addition, or a reroof is submitted on or after October 1, 2005, the project must comply with the 2005 Energy Standards requirements.

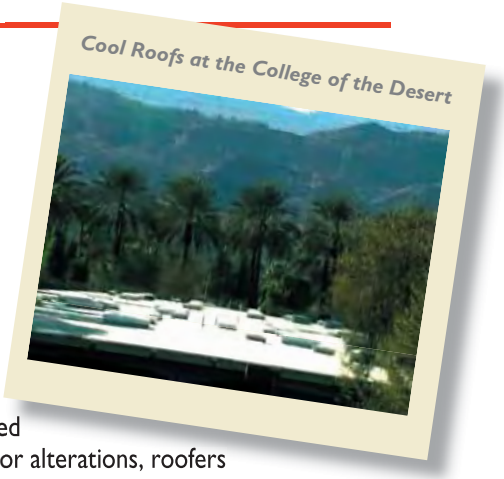
Q5. What if a building department does not require a building permit for a reroof?

A. First, note that the Energy Standards do not apply to small reroofs; they apply only if the job involves over half the roof or more than 2,000 square feet (whichever is less). The Standards must be met if the local building department requires a building permit for reroofs that are larger than those sizes.

Note that often local jurisdictions adopt the permit requirements of the California Building Code (CBC) without change. If the jurisdiction has adopted the 2001 California Building Code, Part 2, Volume 1, Section 106 without changes that exempt roofing, that jurisdiction requires a building permit for reroofs. In that case the Energy Standards apply and the roofing contractor must comply.

If the jurisdiction has not adopted the CBC permit requirements or has adopted changes to them that exempt specific reroofs, the cool roof requirements don't apply for those reroofs. Note that the cool roof requirements still may be considered a "standard of care" in a court proceeding.

Photos for this issue are from the Energy Commission online training series, and the courtesy of Dan Varvais and DNG


Cool Roofs at the College of the Desert

Q6. What if a roof material is not tested and rated through the Cool Roof Rating Council (CRRC)? Can it still be installed in California?

A. In some cases, yes. Without a CRRC rating, a roof material is assigned default values for reflectance and emittance that are substantially lower than the cool roof requirements stated in the answer to Question 2. A newly constructed building with other highly energy-efficient features or a reroofing job that is part of a project that makes other energy efficiency upgrades to the building will be able to comply through the performance approach or the overall envelope approach.

Note: Even if a roof has high reflectance and high emittance, if it does not have a CRRC rating, it cannot claim a reflectance or emittance higher than the default values for showing compliance with the Standards.

Cool Roof Rating Council
www.coolroofs.org

Rated Product Directory
www.coolroofs.org/ratedproductsdirectory.html/

Q7. I am a roofer and am not very familiar with the Energy Standards. How do the Energy Standards work?

A. In general terms, the Energy Standards set an energy budget for newly constructed buildings, and additions and alterations to existing buildings for how much energy they can use. The budget is given in energy (kBtu, or thousand Btu) per square foot per year. The Standards address a number of energy efficiency measures that impact energy used for lighting, water heating and heating, and air conditioning, including the energy impact of the building envelope (windows, doors, skylights, wall/floor/ceiling assemblies, attics, and roofs).

A roofer must submit specific documents to the building permitting agency to show how they are complying with the energy budget, and they must build accordingly. While the Energy Commission has designated some energy measures as mandatory for newly constructed buildings, additions, or alterations, roofers also have several options for complying with the budget, using prescriptive approaches or the performance approach.

For nonresidential buildings, there are two ways to comply with the prescriptive cool roof requirements. The first is the building envelope component approach, in which the cool roof requirements, stated in question two above, must be met with no variation.

This approach is the simplest, but allows no flexibility. The second prescription approach is the overall building envelope approach, which provides equations that allow partial credit for roofing products that have CRRC ratings but don't meet the minimum 0.70 and 0.75 reflectance and emittance levels. This approach allows trade-offs among components of the building envelope and applies to newly constructed buildings, additions or reroofing projects that also involve insulation, window replacement, or other envelope upgrades (under the same building permit).

Not putting on a cool roof has to be compensated by increases in other building envelope components thatmake up for the increased solar heat gain resulting from not having a cool roof. This approach is somewhat more complicated than the building envelope component approach but allows some flexibility.

The other way to comply with the Standards is to use the performance approach. Under this approach, all of the characteristics that impact the energy consumption of the building, addition, or alteration are modeled by computer using Energy Commission-approved compliance software.

The energy budget for a proposed building is determined by modeling the building, but assuming that all the mandatory and prescriptive measures for the proposed building type and its climate zone are installed. The modeled budget-setting version of the building is referred to as the "standard design." Then the proposed building is modeled using its energy-impacting measures; this version is referred to as the "proposed design."

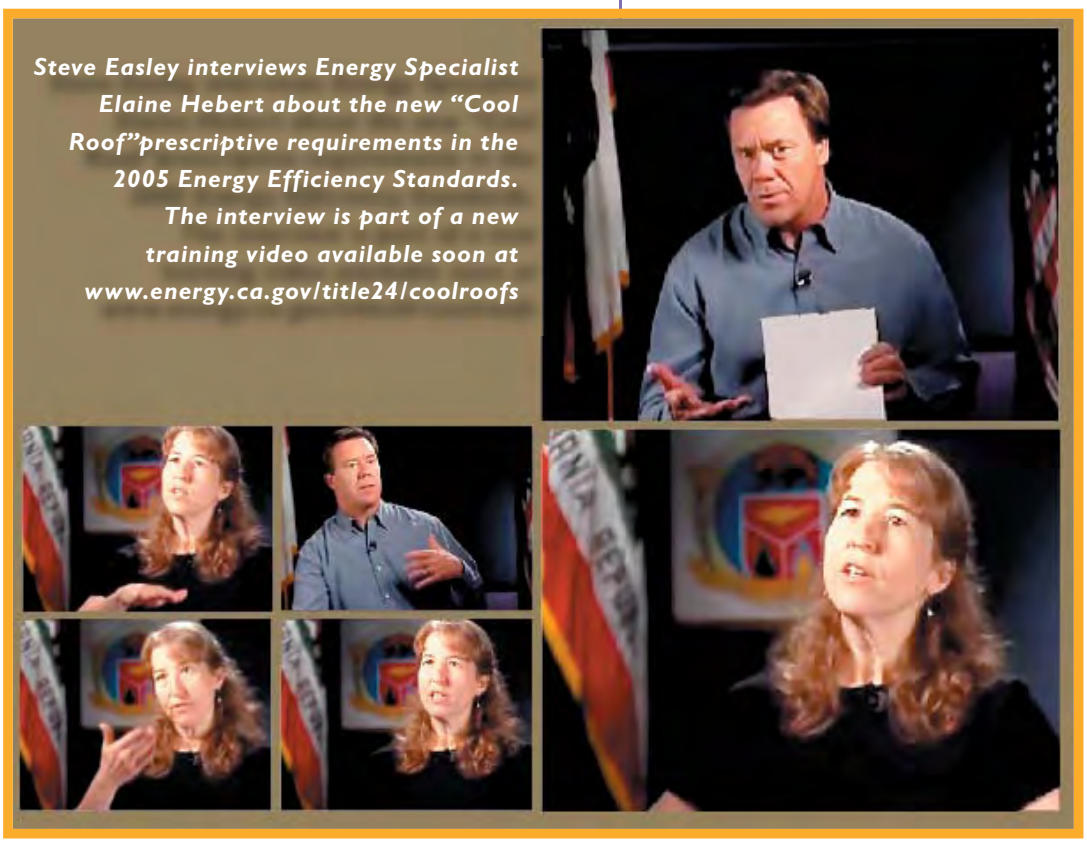
If the energy use of the proposed design is less than or equal to the energy use of the standard design (that is, the energy budget), the proposed building complies; if not, it's back to the drawing board to add more efficiency measures to the proposed building. Many variations of energy efficiency measures can be designed into the proposed building, as long as the computer modeling shows that the building will use no more energy than the energy budget.

The energy budget (standard design) for nonresidential buildings with low-sloped roofs assumes that the building has a cool roof. When modeling the proposed design, the actual CRRC ratings for the planned roofing product are used to help show compliance with the energy budget. "Partial" energy credit is allowed for CRRC-rated roof products that don't fully meet the minimum 0.70 reflectance and 0.75 emittance levels.

The performance approach is the most complicated compliance approach but allows the most flexibility. If you need assistance with the performance approach, energy consultants are available who have expertise in running the software. Many of them belong to the California Association of Building Energy Consultants (CABEC), www.cabec.org, which lists its members with contact information.

Q8. What are the cool roof requirements for reroofing projects?

A. For reroofing of nonresidential, low-sloped roofs over conditioned space, if more than 50 percent of the roof or more than 20 squares (2,000 square feet) — whichever is less — is being replaced, recovered, or recoated, you must install a qualifying cool roof OR you must provide calculations that show that the heat gain into the building through the new roof will be less than or equal to the heat gain through a cool roof. Through these calculations, you can get credit for lowering the heat gain by installing extra insulation. When considering a garden roof in reroofing, these calculations could also account for the extra insulative value of soil or for other energy-saving characteristics or components of the roof assembly.



Steve Easley interviews Energy Specialist Elaine Hebert about the new "Cool Roof" prescriptive requirements in the 2005 Energy Efficiency Standards. The interview is part of a new training video available soon at www.energy.ca.gov/title24/coolroofs

Note: If you make other changes that affect the building's energy use under the same permit as the reroofing, you could consider those changes together in complying with the prescriptive overall envelope approach or the performance approach (see Question 3 for more on prescriptive and performance approaches).

Q9. Are there any types of nonresidential reroofs that are not required to comply with the cool roof requirements?

A. Yes. Any roof over unconditioned space is exempt. (A cool roof will, however, increase the comfort level of persons working in unconditioned warehouses in many of California's climate zones.) Also, any reroof under 20 squares (2,000 square feet) or 50 percent of the roof — whichever is less — does not have to comply with the cool roof requirements. For reroofs that are larger than this, there is one special case. Rock or gravel roofs that meet specific conditions, that don't have to comply. Rock and gravel roof recoverings are allowed by the CBC do not have to meet the cool roof requirements if all of the following conditions are true:

1. The existing roof has a rock or gravel surface, and
2. The new roof has a rock or gravel surface, and
3. There is no removal of existing layers of roof coverings of more than fifty percent of the roof or more than 2,000 square feet of roof, whichever is less; and
4. There is no recoating with a liquid applied coating; and
5. There is no installation of a recover board, rigid insulation or other rigid, smooth substrate to separate and protect the new roof recovering from the existing roof.

Q10. I understand that cool roof requirements apply to nonresidential buildings with low-sloped roofs, but if cool roofs are installed on other types of buildings that are covered by the Standards, do they receive credit toward meeting the energy budget of those buildings?

A. Yes. Compliance credit (credit toward meeting the energy budget) is available for nonresidential buildings with high-sloped roofs, for high-rise (four stories or more) residential buildings, and for hotels and motels. through either the performance approach or the overall envelope approach. Other buildings with CRRC-rated roofs can get credit (even if they don't fully meet the minimum 0.75 initial thermal emittance and 0.70 initial solar reflectance levels in the answer to Question 2)

For low-rise residential buildings, compliance credit is also available through the performance approach for CRRC-rated roofs that meet the initial thermal emittance and initial solar reflectance levels. Compliance credit is available for concrete and clay tile roofs that are CRRC-rated to have initial solar reflectances of 0.40 or greater.

Q11. What is emittance?

A. Emittance is a measure of how well a surface or material gives off (or emits) the energy it absorbs. No roof surface is a perfect reflector; all roof surfaces reflect some of the sun's energy and absorb some of the sun's energy as heat. The longer that heat is held, the more opportunity it has to travel downward through all the layers of roof material and into the conditioned space. That heat can increase the air conditioning load for the building and/or make the occupied space less comfortable. High-emitting roof surfaces give off absorbed heat relatively quickly through the path of least resistance – upward (and out of the building). Emittance is given a number between 0 and 1, where 1 would be a theoretically perfect emitter. A rating of 0.75 is a relative high rating and desirable to keep heat out of air conditioned space.

NOTE: Keeping the air conditioning load down in California is critical for meeting the state's electricity demand. Air conditioning is electricity-intensive. On a hot summer day, when more air conditioning is running to keep people cool, electricity supplies may not be available to meet demand. Recall that in 2000 and 2001, California utilities had to resort to rolling blackouts to keep the electricity grid intact.

Q12. What about garden roofs (roofs whose top surfaces are composed of soil and plants)? They are not cool roofs by their reflectance properties, so will they be allowed under the 2005 Standards?

A. Yes. For newly constructed buildings, use the performance (computer modeling) approach to show that

the proposed building with a garden roof will meet the allowed energy budget. For reroofing, provide heat gain calculations that show that the garden roof (with possible extra insulation added to the roof assembly) will allow no more heat gain into the building than a prescriptive cool roof on the same building.

Q13. What about roofs with a deck or patio meant for foot traffic, where non-cool surfaces, such as concrete pavers, are the roof surface over some percentage of the total roof area?

A. For newly constructed buildings, use the performance (computer modeling) method to show that the proposed building with a patio or deck roof will meet the allowed energy budget. For reroofing, provide heat gain calculations that show that the roof will allow no more heat gain than a prescriptive cool roof would allow. Again, meeting these heat gain requirements is likely to require an added measure such as roof insulation.

Q14. What about solar photovoltaic (PV) panels installed on roofs?

A. Consider the different configurations of solar panels. Often solar panels, for either heating water or generating electricity, are mounted on racks above the roof surface or occasionally resting on the roof surface. The panels could be removed and the roof would still be there. In these cases, the cool roof regulations apply to the roof surface under the solar system.

Solar panels on a cool roof

On the other hand, there are some solar electric photovoltaic (PV) systems on the market that are embedded in or integrated into the roof, becoming the roof surface. With the dark color of solar cells and their function of absorbing solar energy to create electricity, they are not a cool roof material.

In this case the answers is the same as for questions 12 and 13. When reroofing with roof-integrated solar, you must take some measures, such as adding insulation, to insure that heat gain into the conditioned building is no greater with the solar roof than it would be with a cool roof.

Q15. Can the electricity from photovoltaic (PV) solar electric systems be used as a trade-off in meeting a building's energy budget?

A. No. The Energy Commission does not allow trade-offs for PV-generated electricity that would reduce the minimum energy efficiency requirements of the Standards or count toward meeting the energy budget. For the 2008 Standards, the Energy Commission is considering a "Tier II" voluntary Standard that would set a benchmark for the combination of PV and higher-than-Standards-levels of energy efficiency.

Q16. In evaluating the energy savings and cost effectiveness of cool roofs, did the Energy Commission consider the degradation in reflectance over time?

A. Yes. The Energy Commission assumed the reflectance declined to 0.55.

Q17. Do the Energy Standards use the reflectance of roofing products after three years of weather exposure for compliance purposes?

A. No, not in the 2005 Energy Standards. For the 2008 Energy Standards the Energy Commission will consider using CRRC certified three-year aged reflectances when they become available and have been evaluated.

Q18. What are the requirements for adding roof insulation when you are reroofing nonresidential buildings?

A. It depends:

(i) If you are installing a cool roof, you don't need to deal with insulation at all unless you alter existing insulation during the course of the reroof job [that is, you remove or replace some or all of the insulation - see item (iii) below if you alter the insulation]. If you are reroofing with a cool roof and there is absolutely

no insulation anywhere in the roof assembly, you are not required to install any.

(ii) If you are not installing a cool roof on a building that requires a cool roof under the prescriptive approach, you must comply with the Energy Standards some other way. Adding insulation will probably be the most common and easiest way. To calculate how much insulation is needed in this case, you must use the heat gain equations in Standards Section 143(b) or the performance method. Efforts are underway under the Energy Commission's supervision to develop a spreadsheet tool to make this calculation easier.

(iii) If you are reroofing and you alter some existing insulation — that is, you remove or replace it — you must not decrease the R-value of that existing insulation. You must re-install at least the same insulation level.

(iv) If you are reroofing a building that requires a cool roof under the prescriptive approach and there is no insulation anywhere in the roof assembly, and the building owner/manager wants to add some, you can put in any amount of insulation. You do not have to meet the prescriptive requirement.

Q19. I am a roofer and I want to apply a cool roof coating to an existing built-up roof. Under the prescriptive method, a liquid-applied coating over an existing roof must have a minimum dry thickness of 20 mils. One manufacturer is saying that they can achieve the required 20 mils by applying one 10 dry mil layer of their base coat and one 10 dry mil layer of their top coat. The base coat does not have a minimum initial solar reflectance of 0.70, but the top coat does. Is the proposed method of combining one 10 mil layer of a liquid base coat and one 10 mil layer of a qualifying liquid topcoat an approved cool roof?

A. Yes, as long as the two coatings have been tested together (as the manufacturer intends for them to be installed in the field) through the Cool Roof Rating Council and this combination meets the reflectance and emittance requirements.

Q20. What are the cool roof requirements for schools?

A. Schools must meet the requirements of the Standards, including those for cool roofs. Public schools are granted building permits by the State's Division of the State Architect (DSA) rather than by local building departments. DSA's regulations expressly require compliance with the Title 24 Building Energy Efficiency Standards. The same is true for public colleges and universities. Private schools of any grade level require compliance to be shown to the local building department.

Watch for additional questions and answers on Cool Roofs in coming issues of the Blueprint.

California Building Code Uses and Occupancies that apply to cool roofs (CBC, Title 24, Part 2, Chapter 3):

Note: Qualifying historic buildings are exempt from any cool roof regulations.

Types of buildings subject to cool roof requirements:

Group A – Assembly
Building or structure, or portion thereof, for the gathering of 50 or more persons for purposes such as civic, social or religious functions, recreation, instruction, food or drink consumption, or awaiting transportation. Examples: restaurants, arenas, churches, theaters.

Group B – Business
Building or structure, or portion thereof, for office, professional or service-type transactions; includes storage of records and accounts and restaurants with occupant load less than 50. Examples: animal hospitals, kennels, automobile showrooms, banks, barber shops, outpatient clinic and medical offices, educational occupancies above the 12th grade, fire stations, florists and nurseries, testing and research labs, print shops, radio and TV stations

Group E – Educational (through 12th grade)
Building or structure, or portion thereof, for educational purposes through 12th grade for more than 12 hours per week or 4 hours in any one day. Examples: schools, nonresidential buildings used for daycare for more than six children, residential buildings used as daycare for more than 14 persons.

Group F – Factory (low- and moderate-hazard)
Building or structure, or portion thereof, for fabricating, manufacturing, packaging, processing, etc. Examples: furniture manufacturing, bakeries, food processing plants, paper mills, printing or publishing facilities, refuse incineration, shoe factories, dry cleaning facilities.

Group H – Hazardous facilities
Building or structure, or portion thereof, that involves the manufacturing, processing, generation or storage of materials that constitute a high fire, explosion, or health hazard. Examples: manufacturing plants for explosives, blasting agents, fireworks, flammable gases; storage facilities for such products.

Group M – Mercantile (sale of merchandise)
Building or structure, or portion thereof, for the display and sale of merchandise. Examples: department stores, shopping centers, wholesale and retail stores, markets.

Group S – Storage facilities
Building or structure, or portion thereof, for storage not classified as a hazardous occupancy. Examples: storage of beer or wine in metal, glass, or ceramic containers, of cement in bags, of foods in noncombustible containers, of gypsum board, of stoves, washers, and dryers.

Group U – Utility facilities
Private garages, carports, sheds, agricultural buildings, and towers.

Types of buildings which are exempt from cool roof requirements:

Group I – Institutions
Hospitals, sanitoriums, nursing homes with nonambulatory patients with more than 5 patients; nursing homes for ambulatory patients; mental hospitals, jails, prisons; nurseries for the full-time care of at least 5 children under the age of 6.

Cool roofs are optional — not prescriptive — for the following:

- Unconditioned warehouses and other buildings
- "Process spaces" – not meant for human occupancy, held at temperatures less than 55°F or greater than 90°F
- Buildings cooled by swamp coolers/evaporative coolers
- High-rise residential buildings (4 stories and more)
- Hotels and motels
- Any roof with slope greater than 2:12

INDEX

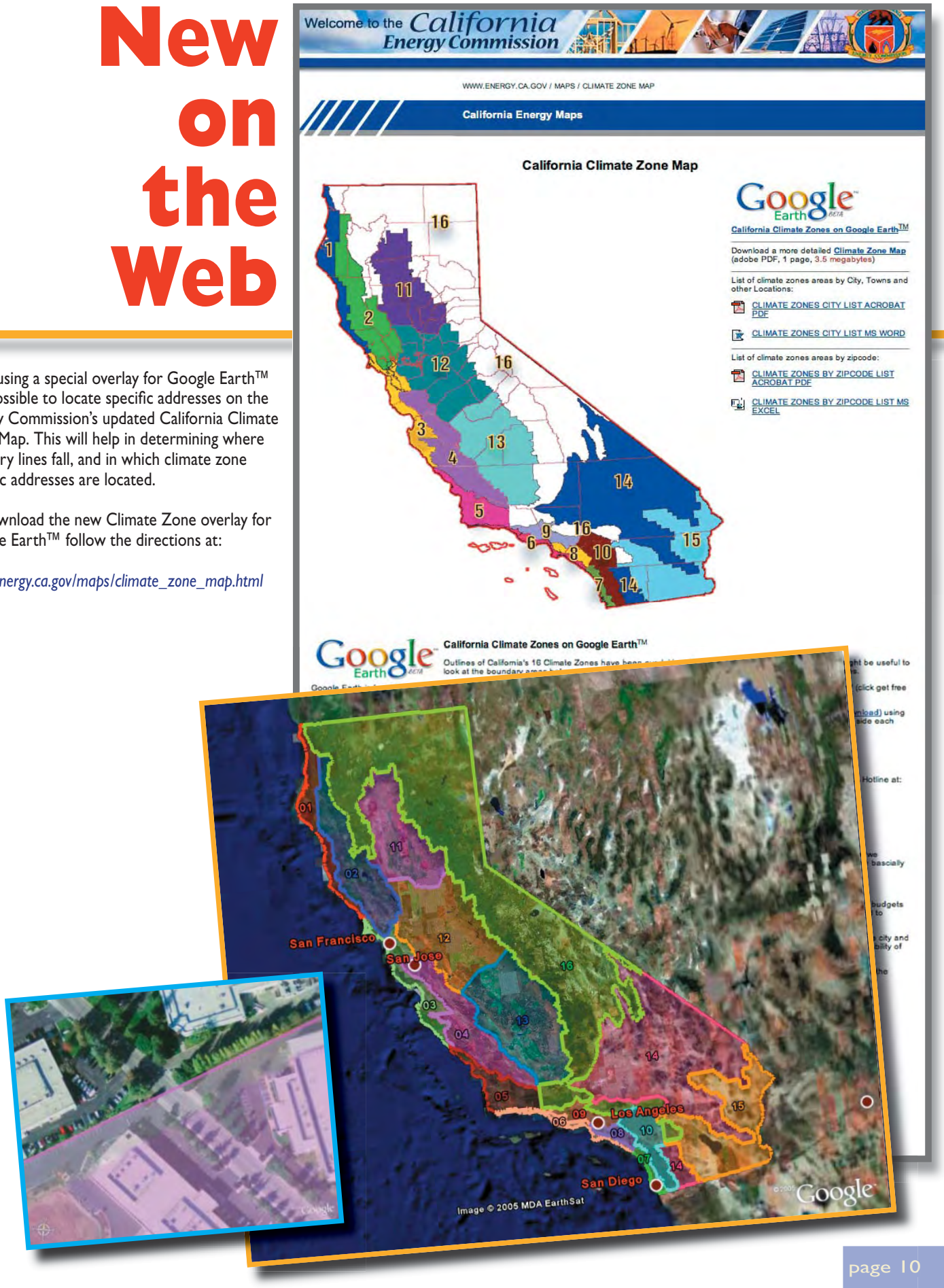
Page Number

New on the Web

Now using a special overlay for Google Earth™ it is possible to locate specific addresses on the Energy Commission's updated California Climate Zone Map. This will help in determining where boundry lines fall, and in which climate zone specific addresses are located.

To download the new Climate Zone overlay for Google Earth™ follow the directions at:

www.energy.ca.gov/maps/climate_zone_map.html



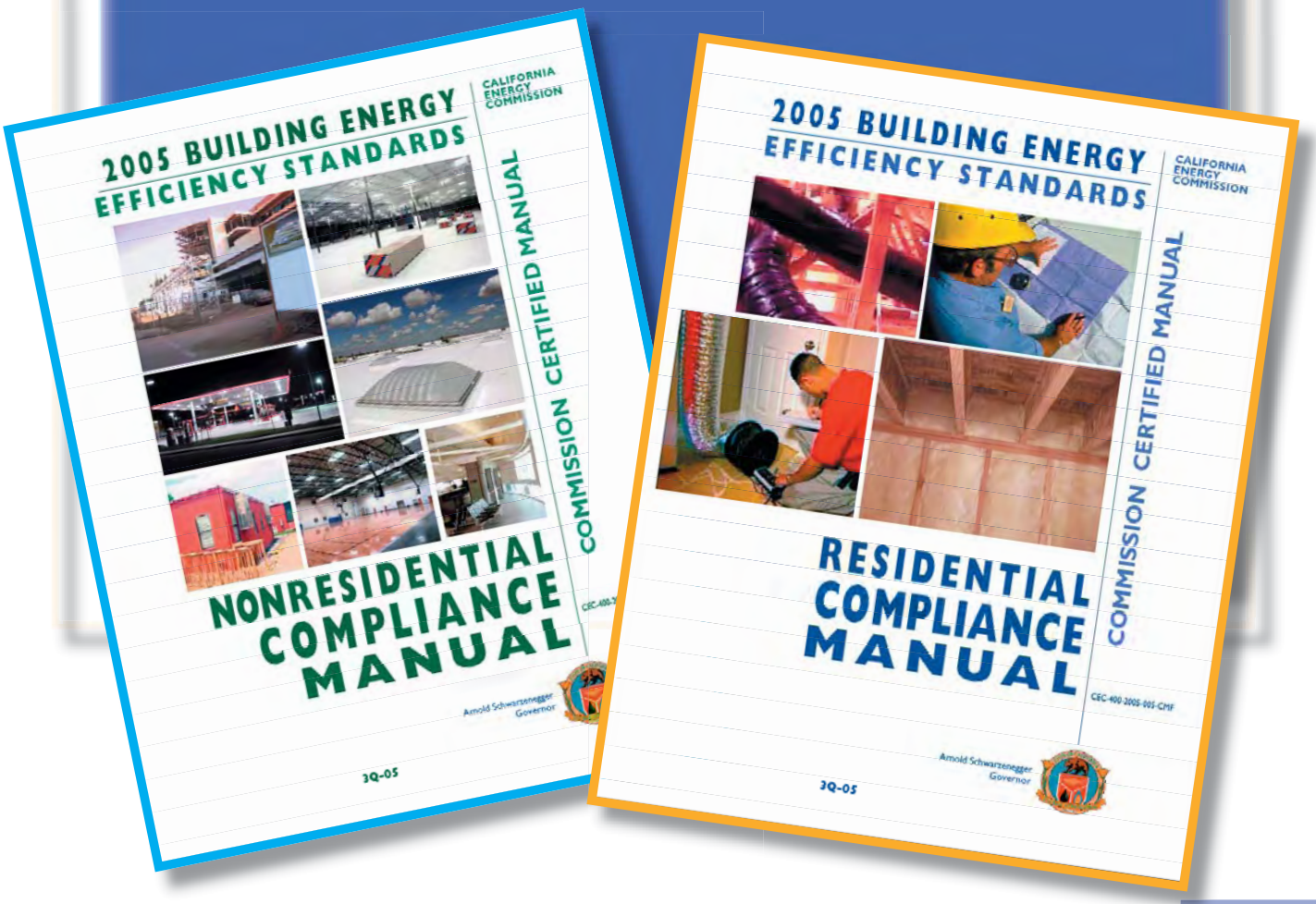
Notification of Available Errata

The Energy Commission recently posted on it's website errata pages for both the 2005 Residential and Nonresidential Compliance Manuals. Each revised page is in PDF format with informational notes indicating the changes. The latest 3rd Quarterly Revision errata labeled 3Q-05 at the bottom can be downloaded from the appropriate web link:

Residential
http://www.energy.ca.gov/title24/2005standards/res_manual_errata/index.html

Nonresidential
http://www.energy.ca.gov/title24/2005standards/nonres_manual_errata/index.html

A Fourth Quaterly Revision (4Q-05) will also be posted in January 2006.



EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

BLUEPRINT

Title 24
Energy Efficiency Standards Training

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Publication number CEC-400-2005-053

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San Diego Gas and Electric
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SCE:
http://www.sce.com/RebatesandSavings/EnergyCenters/workshops.htm

SMUD:
http://www.smud.org/education/index.html

CALBO TRAINING INSTITUTE
http://www.calbo.org

BUILDING INDUSTRY INSTITUTE (BII)
http://www.consol.ws/bect.asp

CABEC:
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EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

BLUEPRINT Questions and Answers

Special Bulletin

Q If the application for a master plan community was submitted before October 1, 2005, can all of the homes under that plan be built under the 2001 energy Standards, even though the build-out of the subdivision may take several years?

A No, each building in the master plan must comply with the current codes at the time each building permit application is submitted. The effective date of the new 2005 Energy Efficiency Standards for residential and nonresidential buildings is October 1, 2005. Builders often build 20 or so buildings at a time and submit applications for permits, pay fees, etc. at the time each phase of construction is set to begin. If the applications for a building permit for each of those buildings are all submitted prior to the effective date of the new Standards, then those buildings can show compliance under the 2001 Standards. Any application for a building permit for a particular building that is submitted after October 1, 2005 must comply with the 2005 Standards.

What the Standards actually say:

TITLE 24, PART 6, SECTION 100 – SCOPE

(a) Buildings Covered. The provisions of Title 24, Part 6, apply to all buildings:

2. For which an application for a building permit or renewal of an existing permit is filed (or is required by law to be filed) on or after the effective date of the provisions, or which are constructed by a governmental agency;

TITLE 24, PART 1, CHAPTER 10, SECTION 10-103 (a)

2. Application for a building permit. Each application for a building permit subject to Part 6, shall contain at least one copy of the documents listed in Sections 10-103 (a) 2 A, 10-103 (a) 2 B, and 10-103 (a) 2 C.

   A. For all newly constructed buildings, additions, alterations or repairs regulated by Part 6, the applicant shall file the appropriate Certificate(s) of Compliance on the plans. The certificate(s) shall indicate the features and performance specifications needed to comply with Part 6, and shall be approved by the local enforcement agency by stamp or authorized signature. …

   B. Plans and specifications submitted with each application for a building permit shall show the characteristics of each feature, material, component, and manufactured device proposed to be installed in order to have the building meet the requirements of Part 6, and of any other feature, material, component, or manufactured device that Part 6 requires be indicated on the plans and specifications. Plans and specifications submitted with each application for a building permit for Nonresidential buildings, High-rise Residential buildings and Hotels and Motels shall provide acceptance requirements for code compliance of each feature, material, component or manufactured device when acceptance requirements are required under Part 6. …

   C. All documentation necessary to demonstrate compliance for the building, and of the sections of Part 6 with which the building is intended to comply shall be submitted with each application for a building permit. …

Publication number CEC-400-2005-050

EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

BLUEPRINT

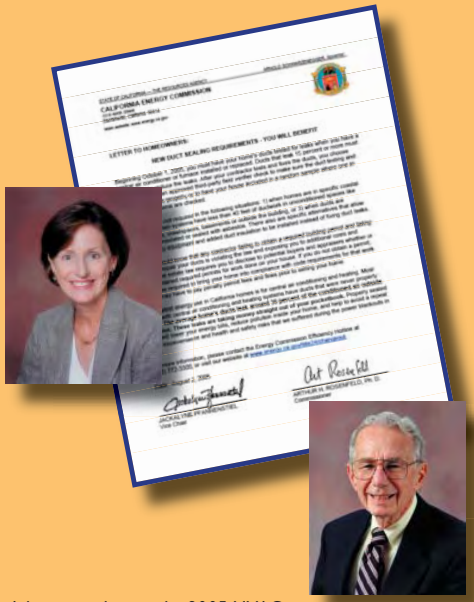
The new California Energy Efficiency Standards go into effect on October 1, 2005

Special Bulletin

Energy Commission Releases Letter to Homeowners on New Duct Sealing Requirements for HVAC Changeouts

The 2005 duct sealing requirements for HVAC change-outs in existing homes become effective October 1, 2005. The Energy Commission has partnered with a number of organizations to provide information and training on the new requirements as detailed below:

Properly sealed duct systems will lower energy bills, increase comfort and reduce indoor air pollutants in consumers' homes. It will also help reduce California's peak energy load.



A letter explaining the 2005 HVAC Change-out to consumers is available on page 3 of this bulletin or you can download the letter at: http://www.energy.ca.gov/title24/changeout/

▼ Letter to Homeowners:

The letter shown on the left hand side of this page (and reproduced full size on page 3), is addressed to homeowners, and is signed by the Energy Commission's Energy Efficiency Committee, Jackalyne Pfannenstiel, Commission Vice Chair, and Commissioner Arthur H. Rosenfeld, Ph.D. It explains the requirements for homeowners. Building department personnel, contractors, builders, equipment manufacturers and distributors are encouraged to reproduce and distribute the letter, which can be copied from this bulletin, or downloaded from the **2005 HVAC Change out Information** website at: www.energy.ca.gov/title24/changeout.

▼ Pacific Gas & Electric (PG&E):

PG&E has sponsored extensive training to contractors in their service territory regarding the new duct sealing requirements for changeouts. PG&E continues to sponsor training for building officials and the industry on Standards requirements. For information on training and class schedules: www.pge.com/stockton.

▼ The Institute of Heating and Air Conditioning Industries, Inc (IHACI):

IHACI and the Southern California Gas Company have teamed up to provide ten training sessions on the change-out requirements to heating and air conditioning contractors throughout Southern California. Southern California Edison also has sponsored two training sessions and has met with IHACI to add more sessions in the future. Additional information can be obtained from the IHACI website at: www.ihaci.org/

Continued on next page

▼ Contractors State License Board (CSLB):

The Energy Commission and the Contractors State License Board have entered into a Memorandum of Understanding (MOU) to encourage licensed contractors to effectively comply with the Energy Efficiency Standards. CSLB's Summer 2005 newsletter— contains an article on page 5 entitled "*CSLB and California Energy Commission Partner to Provide Code Information to Contractors*." CSLB is also planning to release a Bulletin on the new requirements to all licensed C-20 contractors as the next step in the MOU collaboration.

▼ Training videos:

The Energy Commission is nearing completion of training videos, in cooperation with PG&E and IHACI, on the duct sealing requirements. The training videos include segments of a training class (8 segments totaling 2 hours of training); interviews with utility leaders regarding why the duct sealing requirements are important for our electricity supply system; an interview with an HVAC contractor, who provides duct sealing services, explaining why his company is already pursuing duct sealing and welcomes HERS rater field verification. The videos will be available on the Commission's website at: www.energy.ca.gov/title24/changeout CDs containing the videos will be distributed to contractors and building officials.

▼ Blueprint 78 — Changeout Special Bulletin:

A special edition of the *Blueprint* newsletter that covers the duct requirements in detail was distributed on July 20, 2005. See issue 78 at: www.energy.ca/title24/changeout and www.energy.ca.gov/efficiency/blueprint/index.html.

Starting October 1, 2005, California contractors in climate zones 2, and 9 through 16, will be required to do duct sealing when changing out HVAC equipment in existing buildings. Third-party field verification by a certified home energy rater (HERS rater) also is required at least on a sampling basis to insure that the duct sealing is accomplished.

These new requirements apply when replacing the air handler, the outdoor condensing unit of a split system air conditioner or heat pump, cooling or heating coil, or the furnace heat exchanger. These replacements are considered alterations under the Energy Efficiency Standards.

More details than presented here are in the 2005 Energy Standards and 2005 Compliance Manuals available at: www.energy.ca.gov/title24/2005standards/

CALIFORNIA ENERGY COMMISSION
1516 Ninth Street
Sacramento, California 95814

Main website: www.energy.ca.gov

LETTER TO HOMEOWNERS:

NEW DUCT SEALING REQUIREMENTS - YOU WILL BENEFIT

Beginning October 1, 2005, you must have your home's ducts tested for leaks when you have a central air conditioner or furnace installed or replaced. Ducts that leak 15 percent or more must be repaired to reduce the leaks. After your contractor tests and fixes the ducts, you choose whether to have an approved third-party field verifier check to make sure the duct testing and sealing was done properly or to have your house included in a random sample where one in seven duct systems are checked.

Duct sealing is not required in the following situations: 1) when homes are in specific coastal climates; 2) when systems have less than 40 feet of ductwork in unconditioned spaces like attics, garages, crawlspaces, basements or outside the building, or 3) when ducts are constructed, insulated or sealed with asbestos. There also are specific alternatives that allow high efficiency equipment and added duct insulation to be installed instead of fixing duct leaks.

You also should know that any contractor failing to obtain a required building permit and failing to test and repair your ducts is violating the law and exposing you to additional costs and liability. Real estate law requires you to disclose to potential buyers and appraisers whether or not you obtained required permits for work done on your house. If you do not obtain a permit, you may be required to bring your home into compliance with code requirements for that work and you may have to pay penalty permit fees and fines prior to selling your home.

The greatest energy use in California homes is for central air conditioning and heating. Most homes with central air conditioning and heating systems have ducts that were never properly sealed. **The average home's ducts leak around 30 percent of the conditioned air outside the home. These leaks are taking money straight out of your pocketbook.** Properly sealed ducts will lower your energy bills, reduce pollution inside your home, and help to avoid a repeat of the inconvenience and health and safety risks that we suffered during the power blackouts in 2000.

For more information, please contact the Energy Commission Efficiency Hotline at (800) 772-3300, or visit our website at www.energy.ca.gov/title24/changeout.

Date: August 2, 2005

JACKALYNE PFANNENSTIEL
Vice Chair

ARTHUR H. ROSENFELD, Ph. D.
Commissioner

EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

BLUEPRINT

Special Bulletin

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Energy Efficiency Standards Training

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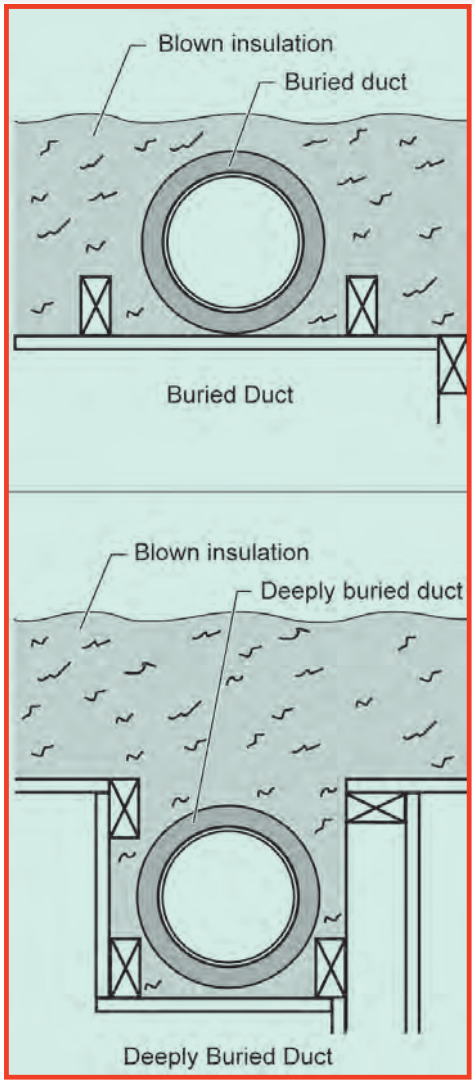
EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

BLUEPRINT

Special Bulletin

Efforts to get ready for the 2005 Residential Lighting Requirements...Page 2

Questions and Answers Residential



Q. For the 2005 Standards there is a new compliance credit for "ducts buried in attic insulation." What must be done to qualify for that credit?

A. Effective October 1, 2005, you can only receive credit for "buried ducts" if the work is done in combination with two additional compliance measures: quality installation of insulation and duct sealing. When taking the buried duct credit, a minimum of R-30 insulation must be blown after the HVAC ducts are installed. Prior to being buried, the ducts must have at least R-4.2 duct insulation. Only the portions of duct runs that are directly on or within 3.5 inches of the ceiling gypsum can take credit for increased effective duct insulation. Note that ducts resting either directly on the ceiling gypsum or within 3.5 inches of the ceiling gypsum, resting on ceiling joists or truss supports, satisfy this requirement and also meet the support requirements for flexible ducts in the California Mechanical Code, Standard 6-5, Section 6.509 (d). As long as the spacing between support does not exceed the manufacturer's recommended intervals, no other support is required.

Credit is allowed only in areas where the ceiling is level and there is at least six inches of space between the outer jacket of the installed duct and the roof sheathing above. The duct design must identify the segments of the ducts that meet the requirements for being buried, and these segments must be input separately into approved compliance software.

Based on the type of attic insulation (blown fiberglass or blown cellulose) the R-value of the attic insulation, and the diameter of the duct, compliance software will calculate the effective duct insulation for each segment. Compliance credit also may be taken for "deeply buried ducts." To qualify for this credit, the duct segment must be in a lowered area of the ceiling, and must be completely covered by at least 3.5 inches of attic insulation. The insulation must be a uniform depth throughout the entire area of the attic; it can't just be mounded over the duct.

"Buried ducts" is a measure that requires field verification by a certified HERS rater (along with the other measures in the combination–quality installation of insulation, and duct sealing). The HERS rater must verify the job both before and after the attic insulation is blown. Before the insulation is blown, the HERS rater will verify that the ducts are installed as shown on the duct design, are consistent with the compliance software inputs and meet the requirements described above.

After the ceiling insulation is installed, the HERS rater will verify that the R-value and type of insulation is the same that is listed on the Duct System Details summary from the compliance software, and that the attic insulation is level and uniform, and meets the other requirements for for claiming compliance credit.

Efforts to get ready for the 2005 Residential Lighting Requirements

California Building Industry Association Lighting Design Seminars

Kudos go to ConSol for organizing a series of four lighting design seminars for the California Building Industry Association (CBIA) to "prime-the-pump" so that builders and suppliers will be fully prepared to comply with the new residential lighting requirements when they go into effect October 1, 2005.

The seminars took place in February 2005, with two held in Northern California and two in Southern California. After presentations on the new lighting requirements by Energy Commission staff, a lighting expert from the California Lighting Technology Center presented recommendations for how to achieve a quality lighting design that meets the needs of home purchasers while fully complying with the Standards.

At each of the seminars, several large production builders brought in sets of construction plans that they intend to submit to the building department within 90 days. A lighting designer from the Sacramento Municipal Utility District (at the Northern California seminars) and an independent lighting designer (at the Southern California seminars) rolled out the builder's plans and did a tabletop review of how the designs could be modified to meet the 2005 lighting Standards.

The builders were able to walk out of the room with an understanding of the lighting products they will need to order to meet the 2005 Standards. By having these orders from builders, suppliers will be able to introduce these products will be introduced into the distribution system well in advance of the effective date.

Manufacturers and suppliers also came to these seminars to present products that can be used to comply with the Standards. These included representatives from Cooper Lighting, the Watt Stopper, Designers Fountain, Mission Lighting, Progress Lighting, Lutron, and Sea Gull Lighting Products.

Design Guidelines for Home Builders

On another front, the California Lighting Technology Center, at the University of California, Davis, has created the "***Residential Lighting Design Guide – Best practices and lighting designs to help builders comply with California's 2005 Title 24 energy code.***"

The *Guide* includes an overview of Standards requirements and design recommendations for each area of the home. The *Guide* is targeted to respond to the information needs of production home builders, lighting specifiers, contractors and designers. The *Guide* is now available and will be distributed through trade shows and a website: http://www.cltc.ucdavis.edu/

The *Guide* project is funded by the Pacific Gas and Electric Company, the Sacramento Municipal Utility District, San Diego Gas and Electric (Sempra Utilities), and the U.S. Environmental Protection Agency (EPA).

Energy Star®

Another breakthrough that helps make it easy for builders to comply with the 2005 lighting requirements took place when EPA updated the Energy Star® residential lighting specifications to match the new California

Efforts to get ready for the 2005 Residential Lighting Requirements

Continued from previous page

residential lighting requirements. EPA released the Energy Star® Version 4.0 Residential Luminaire (lighting fixture) specifications on January 10, 2005. Energy Star® compliant luminaires must meet the new specifications, effective October 1, 2005, to coincide with the effective date for the 2005 California Standards.

The 2005 Standards require either high efficacy luminaires or specific controls when non-high efficacy luminaries are installed in residential buildings. All exterior luminaires attached to a building are required to be either high efficacy or controlled by both a photocontrol and motion sensor.

Installing Energy Star® Version 4.0 compliant luminaires will be an easy way for builders to meet California Standards. Since earlier versions of Energy Star® luminaires do not comply with the new California lighting requirements, it's important that builders make sure to purchase Energy Star® Version 4.0 luminaires.

To encourage easy identification of luminaires that meet the high efficacy requirements in the 2005 Standards, EPA and the Energy Commission are working with several manufacturers who will choose to put a standard label on their luminaires that indicates that the luminaires are both Energy Star® and compliant with the 2005 Standards. Note that the Energy Star® specification includes feature requirements that are not included in the Standards, so if a luminaire does not have the Energy Star®/Title 24 05 label, it still may very well meet the 2005 Standards requirements.

The 2005 Standards do not require Energy Star® labels to establish that a luminaire complies with the high efficacy requirements. The luminaire merely must meet the Title 24 minimum efficacy requirements, not contain a medium screw-base socket, and use an electronic ballast. For outdoor luminaires, the Energy Star® label indicates that the luminaire is either high efficacy or has the lighting controls required by the Standards.

It is important to realize that the Energy Star®/Title 24 05 label does not indicate that a luminaire meets the zero clearance insulation cover or airtight certification requirements in the Standards. Separate labels are required to show that a luminaire has been approved as meeting the zero clearance insulation cover requirements, and is certified airtight according to ASTM E283.

american lighting association

The American Lighting Association (ALA), a national association of lighting manufacturers, has actively supported industry preparation for the new California residential lighting requirements. ALA has invited Energy Commission staff to talk with a large number of lighting luminaire manufacturers through presentations at the ALA Annual Conference in Phoenix, Arizona, and at the Annual Engineering Committee meeting in Dallas, Texas.

Additionally, ALA has included information about the California Standards in several editions of their newsletters to members. As a result, a number of luminaire manufacturers have contacted the Energy Commission for additional information. Manufacturers around the country are getting ready to deliver compliant equipment (including air tight luminaires, electronic ballasts, and occupant sensors).

NKBA National Kitchen & Bath Association The Finest Professionals in the Kitchen & Bath Industry

The National Kitchen and Bath Association (NKBA), an organization of lighting designers that specialize in kitchen and bath lighting, also has sought to bring its members up-to-speed with the 2005 residential lighting requirements.

Energy Commission staff gave a presentation to 160 designers through the NKBA Oakland Chapter. NKBA also partnered with the International Furnishings and Design Association and the American Society of Interior Designers to have Energy Commission staff present the residential lighting standards to design students at the 2005 Student Career Forum in San Francisco.

Continued from previous page

Q. Do the current 2001 and 2005 Standards allow the installation of an appliance rated fireplace, through-the-wall air conditioner, or electric resistance heating unit?

A. Yes, as supplemental space conditioning equipment. Supplemental equipment does not have to be analyzed as part of building energy compliance. To be accepted as supplemental space conditioning equipment, the area served by the supplemental system must also be served by the primary heating or cooling system for the house. The primary system must have sufficient capacity to condition the entire building. If these conditions are not met, the added space conditioning equipment will not be considered supplemental and must comply with the Standards.

Supplemental heating cannot be used in areas such as bathrooms without supply vents from the primary system.

Q. Can a HERS rater sign a CF-4R without having a CF-6R from the installer or builder showing that the home meets the duct sealing requirements?

A. No. Under the 2001 and 2005 Standarsds, HERS raters are required to certify on the CF-4R (Certificate of Field Verification and Diagnostic Testing) that the installer (or builder) has provided a copy of the CF-6R. If the HERS rater is signing the CF-4R that they received a copy of the CF-6R when they did not, then they are in violation of the "true, accurate and complete reporting" requirements that certified HERS raters must abide by (California Code of Regulations, Title 20, Section 1672 (d)) .

To claim Title 24 building energy performance standards compliance credit, you must complete the following sections of the CF-6R that require HERS rater field verification:

Duct Leakage and Design:

- Duct Sealing
- Thermostatic Expansion Valve (TXV)
- Duct Design

Duct Location and Duct Surface Area

- Ducts in Conditioned Space
- Reduced Duct Surface Area.

Building Envelope Sealing

If the CF-6R is not provided to the HERS rater, then the rater has only two options:

1. The rater may contract with the builder to do the necessary diagnostic testing on 100 percent of the homes. The rater cannot do sampling in this case. This testing would have to be done after the sheetrock was installed; it couldn't be done at rough-in. The builder or installing contractor can rely on the rater's testing to sign the CF-6R, but the rater cannot sign the CF-6R. If the rater did 100 percent testing of the homes at rough-in, it would be possible for a different rater to come in and do testing at final on a sampling basis.
2. The only other option is for the rater to delay their diagnostic testing and field verification until they are provided with a properly completed CF-6R signed by the builder or contractor.

Q. As a HERS rater I have the option to sample homes as long as I have a CF-6R from the builder or installing contractor for every house. During sampling I can test one out of every seven homes. If I test a sample home and it does not pass, can I have the HVAC subcontractor fix the system without sampling additional homes?

A. No. Chapter 4 of the 2001 Residential Compliance Manual and Chapter 7 of the 2001 and 2005 Residential ACM Manuals include specific language concerning sampling and failures:

When a HERS rater tests a system and the system fails, it must be entered into the HERS Provider registry as a failure and another home must be tested. It is a violation of the "true, accurate and complete reporting" requirements that certified HERS raters must abide by, to allow the contractor to fix the

Continued on next page

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system, retest, and never report the original failure to the registry. It also would make invalid the sampling for that group of homes.

Once the failure has been reported to the registry, the HERS rater would notify the installer to correct the system. Then the rater would retest to make sure the system passes. The original failure must be fixed, but it is still considered a failure for sampling purposes. It must be recorded in the registry as a failure.

Whenever a home fails the first test, an additional home must be tested in accordance with sampling rules.

If the second home fails, it must be reported as a failure, and all homes in the sample group must be tested, and all must be shown to pass. If the second home passes, the CF-4Rs may be completed for untested homes in the sample group in accordance with sampling rules.

Just as in the discussion above for the first home tested in the sample, the rater is in violation of the "true, accurate and complete reporting" regulation (and destroys the validity of the sample) if the rater allows the contractor to fix the second system, and retests and then does not report the second system as a failure to the registry.

It should be relatively common for a rater to find and report failures to the registry and have to test an entire group of houses, especially for builders and ccontracctors who are new to the process of duct sealing. If this does not happen relatively commonly, it is an indication the the rater may be in violation of the "true, accurate and complete reporting" HERS regulation.

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Q. When calculating the lighting power adjustment factors (control credits) in Table 146-A, and minimum skylight to daylit floor area calculations in Section 143(C), Table 143-F, can we substitute Visible Transmittance (VT) on the NFRC's Label Certificate Performance Ratings for the Energy Commission's Visible Light Transmittance (VLT)?

A. Yes, in both the 2001 and 2005 Standards for lighting power adjustment factor calculations in Table 146-A minimum skylight to daylit floor area of calculating in Section 143(C) and Table 143-F; VT may be substituted for VLT, including in equation 146-A, EFFECTIVE APERTURE OF SKYLIGHTS. Visible Light Transmittance (VLT) is a property of the glass or plastic glazing material only. VLT is the ratio (expressed as a decimal) of visible light that is transmitted through a glazing material to the light that strikes the material. VLT can be determined using the values listed in ASHRAE Handbook, Fundamentals Volume, Chapter 30, Table 24 or from the manufacturer's literature. VT from NFRC includes the effects of framing, and using it to calculate the power adjustment factors in lieu of VLT results in a slightly more conservative (lower) credit levels. Note the if VT is used in lieu of VLT for the purpose of calculating the minimum skylight to daylit floor area of calculating in Section 143(C), Table 143-F, because VT values are lower than VLT values, other parameters in Equation 146-A — such as well efficiency, total skylight area, or daylit area under skylights - must be improved to achieve the desired Effective Aperture levels specified in column three of Table 143-F. For more information on how to determine VLT, refer to Section 5.2.1.4, Daylighting Controls, in the 2005 Nonresidential Compliance Manual.

EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

BLUEPRINT

Special Bulletin

Title 24
Energy Efficiency Standards Training

Links for training on issues relating to California Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24, Part 6) is available on the Energy Commission's website at:

http://www.energy.ca.gov/title24/training

For training offered by the utilities and other organizations please see the following websites:

PG&E:
http://www.pge.com/stockton

SoCal Gas Co.
http://seminars.socalgas.com/int/default.asp

San Diego Gas and Electric
http://seminars.sdge.com/int/default.asp

SCE:
http://www.sce.com/RebatesandSavings/EnergyCenters/workshops.htm

SMUD:
http://www.smud.org/education/index.html

CALBO TRAINING INSTITUTE
http://www.calbo.org

BUILDING INDUSTRY INSTITUTE (BII)
http://www.consol.ws/bect.asp

CABEC:
http://www.cabec.org/cepetrainandtest.php

Nonresidential Fenestration Certification Initiative (NFCI)
http://nfci.ecst.csuchico.edu

Residential Lighting Design Guide
– Best practices and lighting designs to help builders comply with California's 2005 Title 24 energy code
http://www.cltc.ucdavis.edu/

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EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

BLUEPRINT

Seeking Excellence

An interview With Charles Segerstrom on PG&E's Energy Training Center – Stockton – page 6

Extreme Makeover Meets Energy Efficiency

"Extreme Makeover-Home Edition" — The Real Story

Something remarkable happened on ***"Extreme Makeover-Home Edition"*** and ***"Extreme Makeover-How'd They Do That,"*** which aired on Sunday and Monday, March 27, 28, at 8:00 p.m. on the ABC television network.

The program featured a worthy large family (the Leomiti's) who were rewarded with a larger, very energy efficient home to replace their old cramped quarters.

But the remarkable hidden story, was that the new Leomiti home used building science and many current state-of-the art programs, features and techniques to deliver super energy efficiency, comfort, and environmental protection.

The use of photovoltaics, water conservation and energy conservation techniques helped deliver a special house for the family.

It was an important opportunity to increase interest in super-efficient homes with renewable energy — by highlighting the features and performance of this home — and raising the awareness of the public to the possibilities of energy efficiency.

The new home is estimated to provide over a 70 percent savings on the family's electrical bill, compared to a typical home of similar size and design. Fluorescent lighting was used in all recessed cans and exterior fixtures. Each bulb achieves approximately 66 percent energy saving over an incandescent bulb.

Hot water for the home is heated with an on-demand tankless water heater. This type of water heater saves energy by not needing to keep a tank of water hot. Energy Star® appliances were used throughout the house to reduce plug loads. The home uses high thermal mass hard surface floors, 5/8" drywall on walls and two layers of 5/8" drywall on ceilings for maximum thermal mass effect and energy savings.

The HVAC ducts were sealed and tested to a leakage of no more than six percent of the fan airflow to prevent wasted energy. The house has an engineered energy efficient HVAC System with a 90 percent AFUE furnace and 13 SEER air conditioner with a thermostatic expansion valve (TXV).

The new home was built in seven days by a crew from Pardee Homes, during what turned out to be an unusually rainy time in Southern California. While the house's efficiency and convenience were mentioned a number of times on both programs, not much detail on how those savings were achieved was provided.

Instead, the two televised episodes concentrated on the human drama, the glamour of the interior and exterior design involved, and

Continued on next page

Pictured below: Pardee Homes President, Mike McGee and Vice-President of Marketing, Joyce Mason accept recognition from Energy Commissioner Jackalyne Pfannenstiel. The home is an Energy Commission "California Zero Energy New Home," a voluntary pilot program that seeks to achieve a 70 percent savings on electric bills. This house is the first house ever built to these brand new guidelines.

Continued from previous page

a visit to the home by Arnold Schwarzenegger, California's Governor.

Governor Schwarzenegger was there to recognize Pardee's commitment to energy efficiency and conservation of resources.

Including the Governor, a number of other government officials were on the scene to recognize the energy and environmental achievements of this house. The Energy Commission's Vice Chair, Jackalyne Pfannenstiel, thanked Pardee Homes for their commitment to energy efficiency and renewable energy. The home is an Energy Commission ***"California Zero Energy New Home,"*** a voluntary pilot program that seeks to achieve a 70 percent savings on electric bills. This house is the first house ever built to these brand new guidelines.

Governor Arnold Schwarzenegger welcome's the Leomiti family to their new super energy efficient home.

David Garman, Acting Undersecretary of Energy for the U.S. Department of Energy presented Pardee President Mike McGee and VP of Mareketing Joyce Mason with the 2005 ***"Energy Value Housing Award."*** The Leomiti's new home, is a California Energy Star home, which exceeds Title 24 Energy Efficiency Standards by 15 percent. It is also a ***Zero Energy Home*** under a US Department of Energy voluntary pilot program to utilize technologies that will save the family up to 50 percent on their overall Energy Bill.

Below: Pardee Homes President, Mike McGee and VP of Mareketing, Joyce Mason accept the "Energy Value Housing Award" from David Garman, Acting Undersecretary of Energy for the U.S. Department of Energy

The program was filmed February 15-22, 2005 in Los Angeles, California. Pictures shown are through the courtesy of Pardee Homes.

The Leomiti's new house is built under a number of Pardee Homes' special ***"LivingSmart"*** *designations:*

The **"EnergySmart"** component of the home both saves and produces energy. The house has a 3.0 kW photovoltaic system. This system is a new roof-integrated system by GE Energy that blends seamlessly with the roof design.

R-38 attic and R-19 wall insulation were used to provide high insulation levels to reduce heat gain during the summer and heat loss during the winter. A radiant roof barrier, was used to reflect heat away, keeping the attic space cooler and more efficient.

The house also has high performance dual pane vinyl frame windows with spectrally selective glass to increase the comfort of the house.

In the summer, spectrally selective glass lets in visible sunlight while blocking 80 percent of both the infrared and ultraviolet solar energy that drives up cooling costs and degrades curtains, window treatments, carpeting and furnishings. In the winter, these glazing products offer reduced heating costs by reflecting room-side radiant heat back into the room.

The 90 percent AFUE and 13 SEER with a thermostatic expansion valve (TXV) HVAC System was engineered to be properly sized and balanced to assure comfort and energy savings.

The "**SmartVent Cooling System"** has smart thermostat controls and works in conjunction with the home's air conditioner to bring in cool night air to keep the house cooler in warmer summer months.

The Leomiti's new house is **"WaterSmart"** and saves water by using flow restricted plumbing fixtures, including showerheads and toilets. These fixtures save water by reducing the flow from as much as three gallons per minute to one gallon per minute.

For watering parts of the yard, the home is set up with a programmable satellite controlled sprinkler system, which

Continued on next page

Continued from previous page

weather conditions, and drip irrigation of drought tolerant plant material. Artificial turf is used in the backyard.

Inside the house the Energy Star® washing machine uses 40 percent less water than standard models. The Energy Star dishwasher and the tankless water heater save both energy and water.

The home is also a **"California Friendly Home,"** a voluntary program to utilize technologies, both inside and outside the home, that save water. This program is sponsored by the Family of Southern California Water Agencies.

This **"EarthSmart"** house uses Weyerhaeuser wood that comes from managed forests and is engineered to use more of the tree during its manufacturing. The Carpet is made from recycled soda bottles. For every 2,000 sq. ft. of carpet, 10,000 soda bottles will be kept out of the landfill. The bamboo flooring material: a renewable resource, bamboo is actually a grass that renews itself within a short period of time.

Concrete rubble was saved from the build site and re-used as paving in landscape walkways. This prevents waste materials from going into landfill. Approximately 90 percent of construction waste will be recycled.

"HealthSmart" means the formaldehyde-free insulation reduces off-gassing that can sometimes occur. The environmentally-friendly water-based paint reduces odor and off-gassing. Fiber-free hard surfaces on downstairs living areas reduces fiber and dust particles that can float through the air. A central vacuum cleaner reduces dirt and dust in the air of the home by sending it to a canister in the garage. Filtration for indoor air quality is provided by an electronic air filter:

The home was also built to the **California Green Builder Program** requirements, a California Building Industry Association/Building Industry Institute (CBIA/BII) program.

For Additonal information and pictures go to:
http://www.pardeextreme.com/one_extreme_story/stars_and_guest_stars.php

The Energy Commission's New Title 24 web portal is at:
http://www.energy.state.ca.gov/title 24

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Q. If a residential luminaire does not have the Energy Star®/T24 05 label, can we assume that the luminaire does not meet the efficacy, electronic ballast, and outdoor luminaire control requirements of the 2005 Standards?

A. No, you cannot assume that. Participation in the Energy Star® program is voluntary by manufacturers. Some manufacturers will choose to not participate in this program, but will have luminaires that meet the Title 24 efficacy, electronic ballast, and outdoor luminaire control requirements. For these luminaires, product cutsheets or other manufacturer information may be used to identify complying products.

In general, compact fluorescent lamps that plug into four-pin lamp holders contain electronic ballasts and meet the 2005 Standards efficacy requirements. On the other hand, compact fluorescent lamps with two-pin lamp holders have magnetic ballasts and do not comply with the 2005 Standards.

It must also be noted that high efficacy luminaires are not the only option to meet the 2005 Standards lighting requirements. For example, in kitchens, up to 50 percent of the installed watts may be from incandescent sources; these incandescent sources that make up to 50 percent of the installed watts do not have to be high efficacy and, of course, will not have the Energy Star® label. Also, in rooms other than kitchens, the 2005 Standards have an option that includes incandescent luminaires when specified controls (either a manual on, occupant sensor, or dimmer depending on the room) are installed. Those incandescent luminaires will not have the Energy Star® label.

Q. If a recessed luminaire ("can" or "downlight") has the Energy Star®/Title 24 05 label, does that mean the luminaire complies with the zero clearance insulation cover and airtight labeling requirements of 2005 Title 24?

A. No, the Energy Star®/Title 24 05 label only indicates compliance with the high efficacy and electronic ballast requirements. It does not indicate that the luminaire meets the zero clearance insulation cover, or the airtight certification requirements. A separate label is needed to show that a luminaire is certified airtight in accordance with ASTM E283, and a separate UL or equivalent label is needed to show that a luminaire meets the zero clearance insulation cover requirements. The following examples clarify how labels are used on recessed luminaires:

- An Energy Star®/Title 24 05 label indicates the luminaire is high efficacy and has an electronic ballast.
- If there is no Energy Star®/Title 24 05 label, but the fixture has a four-pin compact fluorescent lamp holder, instead of a screw-based socket, the luminaire is high efficacy and has an electronic ballast.
- An ASTM E283 label indicates the luminaire is certified airtight. If there is a label indicating airtight or other airtight designation, but the label does not indicate ASTM E283, additional documentation is needed to show that the luminaire is certified to meet ASTM E283.
- A UL zero clearance insulation cover (IC) label, or label from another testing/rating laboratory recognized by the International Conference of Building Officials, indicates the luminaire meets the zero clearance insulation cover requirements.

CABEC President Julieann Summerford at the Energy Commission, April 21, 2005

Congratulations to CABEC for establishing strong working relationships with HERS raters as their priority goal for 2005.

CABEC's

2005 Priority: Working together With HERS Raters

"We decided that enhancing relations between CABEC members and HERS raters was critical, with the new codes coming onboard this year," said Julieann Summerford, President of the California Association of Building Energy Consultants (CABEC). "There will be so many opportunities for HERS raters and CABEC members to work together this year. So, we decided it was our job to facilitate these meetings and figure out a way to expand the interaction between HERS raters and our members."

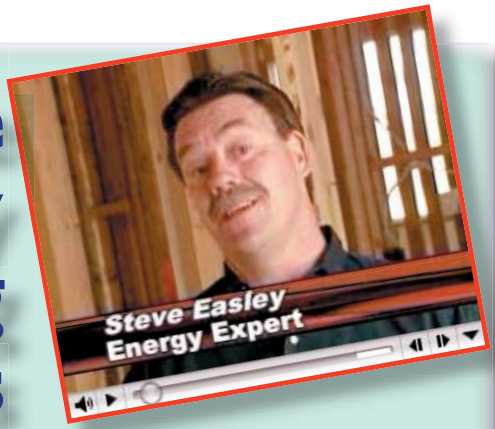
Interactive meetings were held in late April in both Northern and Southern California to foster interaction between HERS raters, other Title 24 consultants, area architects, the Energy Commission and CABEC members.

"These meetings are the first step," according to Summerford. "This idea resulted from a report presented at a CABEC Board meeting by Tom Hamilton from CHEERS. The report dealt with some of the things that Title 24 consultants need in order to establish close working relationships with HERS raters."

According to Summerford, one of the biggest ideas to come out of these meetings is identifying ways to build individual relationships between CABEC members and active HERS raters in their local area. These one-on-one relationships will clarify roles and responsibilities for serving their clients and help them to effectively work together.

"We need to be united," Summerford added. "With the 2005 Standards approaching, these relationships will be key in transitioning through the coming Standards changes and helping to facilitate a cohesive effort in the eyes of our builder/architect clients."

Online Energy Training Videos



Over 100 videos on a variety of energy topics are available both at:

http://www.energyvideos.com or
http://www.ConsumerEnergyCenter.org/videos/

Seeking Excellence

The sixth in a series of articles about building department employees, builders, energy consultants, HERS raters, utilities and others who are making exemplary efforts to achieve energy efficiency in buildings.

Charles Segerstrom

talks to us about

PG&E's Energy Training Center (ETC) – Stockton

Charles Segerstrom

is a true pioneer in weatherization, energy efficiency and diagnostic testing in California. He supervises energy efficiency training for Pacific Gas and Electric Company, (PG&E). Charles has managed the Energy Training Center in Stockton since 1988.

His organization is responsible for developing and delivering training and technical support for PG&E's Customer Energy Efficiency programs. In 2004, the Energy Training Center conducted 448 training sessions for 7,855 contractors, builders, regulators, energy consultants and other market actors.

His tenure as Supervisor of the Center was preceded by seven years as a Trainer and Training Specialist, directly responsible for classroom instruction and oversight of the testing and certification of Residential Conservation Service (RCS) Energy Auditors to meet State and Federal guidelines.

In addition to supervising the Center, Charles has been involved in the development of the Home Energy Rating System (HERS) industry. He is the current Chairman of the Technical Committee and Vice President of the Board of Directors for the California Home Energy Efficiency Rating System (CHEERS).

In the mid-1990s Charles was appointed to the national HERS Council Technical Committee that wrote the national guidelines for HERS program certification and accreditation. He was the author of the Training and Certification and Field Inspection guidelines for the HERS Council. He served on two Residential Energy Services Network (RESNET) technical committees, and is now on the Board of Directors of Affordable Comfort, Inc.

Blueprint: ***Having a major training center devoted to building science and energy efficiency here in Northern California is no accident. Can you tell us how the Energy Training Center (ETC) started and how you became involved in it?***

Segerstrom: The Energy Training Center started in 1978, as a unique partnership between PG&E and the State of California's low-income weatherization programs. It has evolved over the years to support all residential energy efficiency programs; including a big expansion in 1981 to work with the federally mandated Residential Conservation Service Program.

PG&E created a field staff of 300 to do onsite home energy audits. The Energy Training Center was responsible for training them. That is when I started with the organization as a training specialist. I spent many years in the classroom before assuming the role of supervisor in 1988. In the past 17 years I've been supervising our activities. As our programs evolved, the State's weatherization program began to use blower door testing, which was pioneered in the Northeast in pilot programs in the late 1980s.

We've been helping the State in a training partnership to implement blower door-based weatherization since 1991. We also developed the combustion appliance safety protocols to go along with that. We've essentially touched all aspects of residential energy efficiency, with a strong emphasis on incorporating home performance and building science.

Blueprint: ***For readers who may be unfamiliar with your programs, can you tell us what you do here at the Energy Training Center?***

Segerstrom: We're unique because we're an energy center devoted to energy efficiency programs and implementation. The emphasis on diagnostic testing and verification is strong here; our goal is to spread the word to market actors who can make building performance work.

Blueprint: ***Do you charge people who attend training here?***

Segerstrom: No, we advertise as providing free continuing education for building professionals. We're funded by the public goods charge that is used for energy efficiency, renewables and low income programs; so we want to get as much participation as possible. Our programs have enough value to justify taking time away from work, which in itself is a significant cost.

Blueprint: ***What kind of people take classes here?***

Segerstrom: The professions we are targeting are HVAC contractors, residential builders, energy consultants, inspectors, building department staff, architects and general contractors.

Blueprint: ***Can you tell us a little bit about your instructors and their backgrounds?***

Segerstrom: We have in-house instructors who have "lived" this industry. Gary Fagilde has been here over 20 years, and Bill Holloway almost that long. We also do more classes with expert consultants than our own staff. We recruit nationally and internationally to locate the best experts we can find and bring them here for training. We audition many of them at

national conferences.

Blueprint: ***How many classes per year do you run here?***
Segerstrom: We support several different programs. Our contractor and builder training program conducts about 120 sessions per year. But overall, we do approximately triple that amount with all of the programs including low-income program training, commercial seminars, and support for codes and standards.

Blueprint: ***How have the classes you offer changed over the years?***
Segerstrom: We started out doing weatherization training for the State's programs and its employees. We evolved to training our own employees in the Residential Conservation Service. When those programs expired, we turned to the external market and did a lot more work with contractors and builders, as well as training for individuals involved in Title 24 issues. Then we got into training for building inspectors, plan checkers, home energy raters and building consultants.

Blueprint: ***What programs are you planning for the implementation of the 2005 Energy Efficiency Standards?***
Segerstrom: In addition to an on-going suite of Title 24 classes, we are working on a substantial effort to offer 12 different topics in support of both residential and nonresidential 2005 standards changes — everything from a standards overview for building departments to very specific technical training on duct testing rules for HVAC change-outs.

Blueprint: ***Will all of those classes be held here in Stockton?***
Segerstrom: Most will be road show sessions. We want to make it as easy as possible for other groups or government officials to participate.

Blueprint: ***So, if a group asked you for training, you could provide them with training at their location and convenience?***
Segerstrom: Yes, we just need to have a good-sized group of key upstream market participants, and we'll take the training to them.

Blueprint: ***A lot of your early work involved fixing energy leaks and waste in existing buildings, including work with low-income households. What does that weatherization work tell you about what we should be doing now in new buildings?***
Segerstrom: Weatherization evolved from prescriptive approaches such as caulking and weather stripping to diagnostic-based approaches like using blower doors and even infrared thermography. In new buildings, we should be taking advantage of the diagnostic testing and verification systems that are in place and well established, to not just to see that a home performs on paper, but that it also performs well in reality.

We're finding that while we assume insulation performs well in some cases, it's just performing as an air filter, because the insullation hasn't been installed in contact with the air barrier. Small voids in wall insulation can render the R-value to be much less than what is expected. So weatherization work has evolved into looking much more carefully at installation quality, as well as utilizing diagnostic test tools that can objectively determine performance.

Blueprint: ***When you gave us the tour of your facility today, you talked a lot about the house as a system. Could you please tell us a little more about some of the interactions you see?***

Segerstrom: The whole house perspective incorporates the interactive effects of moisture movement, air movement and heat movement. The impacts on the performance of a house are greater than just energy and cost savings.

Blueprint: ***Can you tell us about the relationship between building departments, PG&E and the Energy Training Center?***

Segerstrom: We have done substantial work in needs assessment to study the possible education and training interventions that might assist building departments. We have compiled that study utilizing Doug Beaman and Associates, and from that a training implementation plan has been developed.

The relationship with building departments has grown out of that process. Doug Beaman not only has had the experience of doing quite a few of these classes for us during the energy crisis, but has contacts at the building departments and has helped us work with their various regional chapters to implement the classes.

Blueprint: ***What about the Energy Training Center's relationship with HVAC contractors?***

Segerstrom: We've had a number of various HVAC training programs involving contractors.

Currently we work with the Contractors State License Board to get a comprehensive list of all C20 contractors. We send out a hard copy of our continuing education course calendar to all of them twice a year. Our website also provides details on our classes.

Blueprint: ***Why is PG&E interested in covering the whole performance issue with training for building departments and others?***

Segerstrom: Well, building science dictates that we become more aware of the systems issues in the performance of a building . It's not just the equipment in isolation — it is how it is installed and performs in reality — that will either optimize energy efficiency and comfort or cause problems.

So our interest in whole performance involves verification of actual performance and optimization of energy efficiency potential. Because not looking at the whole system is leaving out a great amount of opportunity.

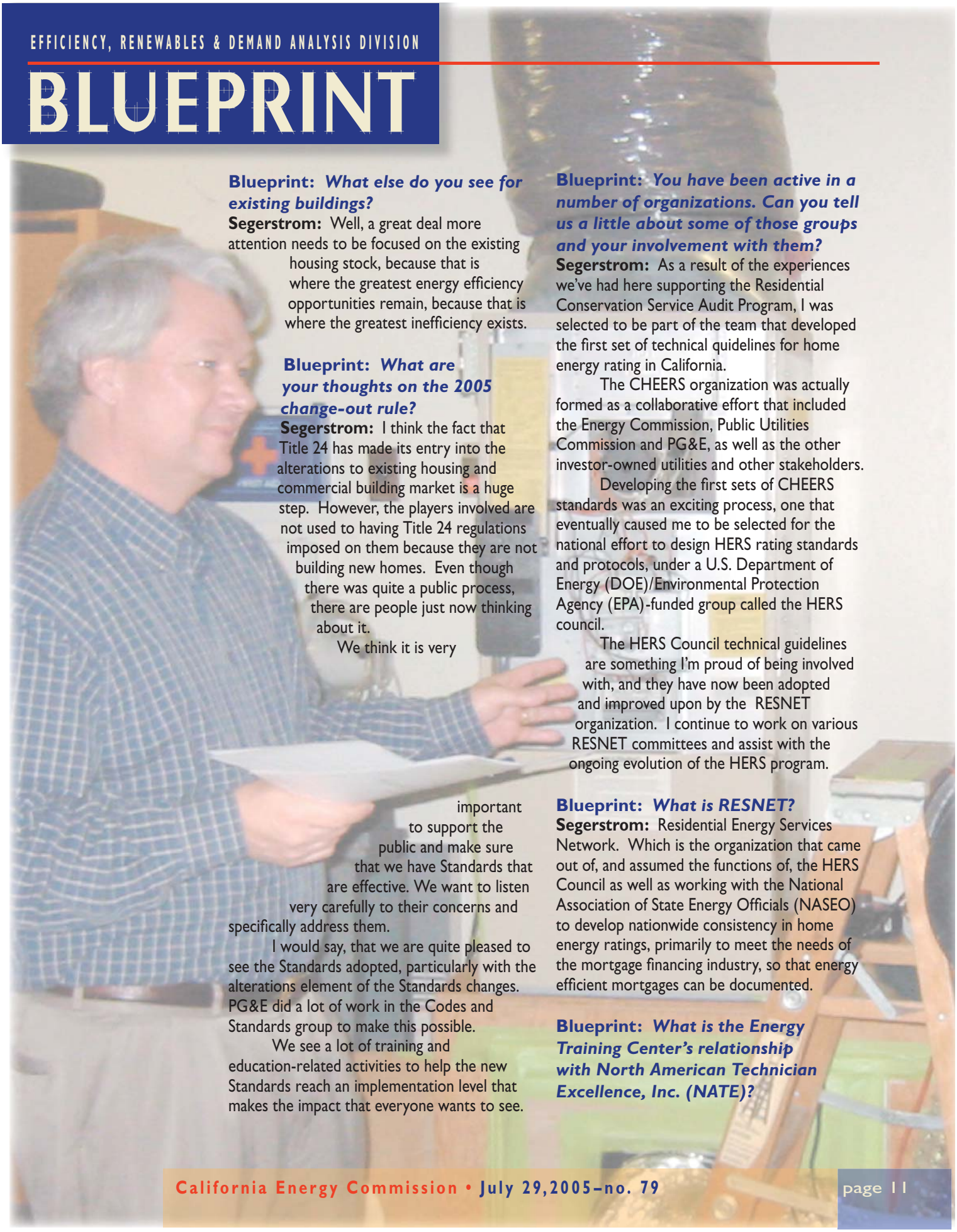
In HVAC for instance, improperly installed systems can be 35 percent less efficient than properly installed systems. So getting that system properly installed and working, with the building department to assist in the Title 24 implementation process, is very important. It has a big impact on the peak demand on our electricity system as well as the actual efficiency people realize in their homes, as opposed to theoretical efficiency.

Blueprint: ***Is field verification necessary?***

Segerstrom: It is definitely necessary. The Yankees would win every year on paper — but they play on grass. The real world of actual, measured home performance is the playing field in the case of field verification.

Having the Standards on paper is important, but having them enforced and complied with in reality is what we really need to work on, particularly in this new arena of existing housing and buildings.

We have a lot of work to do, because alterations to existing housing and commercial structures are not part of a marketplace that is used to Title 24 requirements. Field verification from a systems thinking approach is absolutely necessary given the capabilities we have with diagnostic equipment. It's not as expensive as most individuals think.



Blueprint: *What else do you see for existing buildings?*

Segerstrom: Well, a great deal more attention needs to be focused on the existing housing stock, because that is where the greatest energy efficiency opportunities remain, because that is where the greatest inefficiency exists.

Blueprint: *What are your thoughts on the 2005 change-out rule?*

Segerstrom: I think the fact that Title 24 has made its entry into the alterations to existing housing and commercial building market is a huge step. However, the players involved are not used to having Title 24 regulations imposed on them because they are not building new homes. Even though there was quite a public process, there are people just now thinking about it.

We think it is very important to support the public and make sure that we have Standards that are effective. We want to listen very carefully to their concerns and specifically address them.

I would say, that we are quite pleased to see the Standards adopted, particularly with the alterations element of the Standards changes. PG&E did a lot of work in the Codes and Standards group to make this possible.

We see a lot of training and education-related activities to help the new Standards reach an implementation level that makes the impact that everyone wants to see.

Blueprint: *You have been active in a number of organizations. Can you tell us a little about some of those groups and your involvement with them?*

Segerstrom: As a result of the experiences we've had here supporting the Residential Conservation Service Audit Program, I was selected to be part of the team that developed the first set of technical quidelines for home energy rating in California.

The CHEERS organization was actually formed as a collaborative effort that included the Energy Commission, Public Utilities Commission and PG&E, as well as the other investor-owned utilities and other stakeholders.

Developing the first sets of CHEERS standards was an exciting process, one that eventually caused me to be selected for the national effort to design HERS rating standards and protocols, under a U.S. Department of Energy (DOE)/Environmental Protection Agency (EPA)-funded group called the HERS council.

The HERS Council technical guidelines are something I'm proud of being involved with, and they have now been adopted and improved upon by the RESNET organization. I continue to work on various RESNET committees and assist with the ongoing evolution of the HERS program.

Blueprint: *What is RESNET?*

Segerstrom: Residential Energy Services Network. Which is the organization that came out of, and assumed the functions of, the HERS Council as well as working with the National Association of State Energy Officials (NASEO) to develop nationwide consistency in home energy ratings, primarily to meet the needs of the mortgage financing industry, so that energy efficient mortgages can be documented.

Blueprint: *What is the Energy Training Center's relationship with North American Technician Excellence, Inc. (NATE)?*

Segerstrom: We see NATE as an important certification entity to differentiate HVAC contractors who are willing to learn how to do installation right, and to have the willingness to take certification tests to prove themselves.

So with the knowledge that NATE is actually moving towards an advanced efficiency module, and that NATE has become the standard of excellence for HVAC installation quality, we provide training sessions to help HVAC technicians and installers prepare for their certification exam.

We established a collaborative effort with community colleges to help contractors prepare for the exams. The colleges assist by providing self-testing locations. This month, we unveiled an incentive program to cover testing costs for successful candidates. We hope to dramatically increase the number of HVAC contractors being certified.

I'm also on the Board of Directors of Affordable Comfort, which is a national organization devoted to conducting training and conferences in support of home performance and building science.

We were able to work with Affordable Comfort in bringing the conference to Northern California this past January, which I think was very beneficial to the everyone.

Blueprint: ***What do you think of the million solar homes proposal?***

Segerstrom: I'm happy to see our governor want to emphasize solar energy. I'm a solar energy and green building advocate, but there is nothing greener or more beneficial to society than getting energy efficiency right first.

My caveat with solar is that it's not the first thing you should do. There are some things you should do that have a higher priority. We've even proposed through the HERS process that before the consumer gets their solar energy rebate, they do cost-effective energy efficiency first. Then the solar power system can be smaller and the overall cost-effectiveness is better.

I'd like to make sure we don't just leapfrog to the "sexy" technology and leave relatively bland, but potentially more cost effective energy conservation measures behind.

I like to see the State of California wanting to lead the nation. I feel we are doing our best to do our part.

Blueprint: ***What have you seen that drives you to do the work you do?***

Segerstrom: Personally, this is much more than a nine-to-five job; it's more like a cause. I feel privileged to be able to do this work, because I think its important to the future of our society and for the next generation, including children of my own.

I think what I'm trying to do is further the message that looking at the house-as-a-system, and paying attention to building performance, is critically important. It's not just efficiency in terms of energy bill savings – it's comfort, health, safety and quality of life.

There is a lot left to be accomplished, because the building industry tends to be a collection of specialists. Just like the medical profession, there are many specialists who can surgically work on a piece of the human body, but too few pay attention to the whole patient.

With regards to the housing industry, we need to have more general practitioners, who can see the house-as-a-system and can perform building performance improvements.

Blueprint: ***What do you still hope to accomplish?***

Segerstrom: I just hope to continue doing what we're doing.

This article is important for what we're trying to achieve with education and training programs and I really appreciate efforts made by the Energy Commission and our education and training partnership.

PG&E's Energy Training Center – Stockton

The Energy Training Center emphasizes the "house-as-a-system" and building performance approach to home improvement. Courses are offered to outside contractors on equipment sizing and selection, ducts, insulation, and Home Energy Ratings. Classes promote the application of whole house concepts, as well as technology transfer (regarding the use of diagnostic testing equipment in residential applications) to other companies.

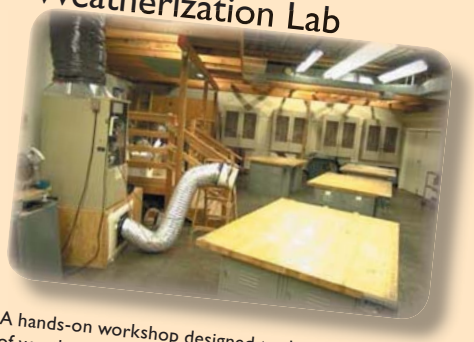
The Energy Training Center also offers a full range of classes on the weatherization assistance program, including auditing and inspection, equipment selection, duct system installation and treatment.

The Energy Training Center also offers to outside contractors courses that will prepare them for obtaining various industry certificates, such as North American Technician Excellence (NATE) and Air Conditioning Contractors of America (ACCA). The thousands of individuals trained and certified to perform residential energy efficiency programs by the Energy Training Center have made over two million service visits in Northern California homes.

Multipurpose Classroom

A versatile "great room" that can be used for large seminars, or quickly transformed into two separate classrooms. This space can accommodate up to 70 people.

Weatherization Lab



A hands-on workshop designed to develop the skills of weatherization workers. Skills required for the installation of building shell measures, such as glazing materials, caulking and weatherstripping are practiced. The lab is also used for duct testing and sealing exercises

Detached Display Home

- 1,500 square-foot, full-size house for hands-on training.
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To receive detailed information about the course schedule, fees, and seating availability, contact:

PG&E's Energy Training Center – Stockton
1129 Enterprise Street
Stockton, CA 95204
(209) 465-6115

e-mail: CFS1@pge.com
Information can also be accessed through the PG&E website at: http://www.pge.com

The California Energy Commission does not endorse any products, supplier, manufacturer, builder or utility. The text in this interview is meant to be informational and not all inclusive.

Special Guest Editorial

Vampire Slaying and Other New Directions for Efficiency Standards

by Alan Meier

This editorial from Home Energy Magazine's March/April issue is reprinted courtesy of the magazine.

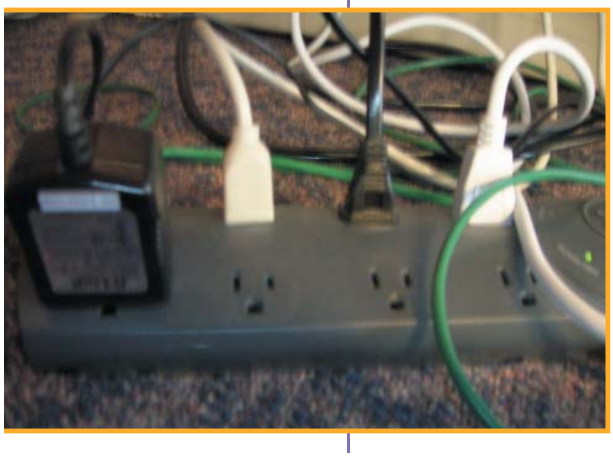
Alan Meier is the Senior Executive Editor of Home Energy Magazine.

www.homeenergy.org

Vampires: *They have two teeth and suck electricity when the appliance is switched off.*

Last December, the state of California approved new minimum efficiency standards for a host of electrical appliances from pool pumps to fans. The regulations target standby power consumption of consumer electronics, such as televisions, video players, and compact stereos. They also establish minimum efficiency standards for the ubiquitous external power supplies—President Bush calls them "vampires"—that power billions of small electrical products, such as electric toothbrushes, cordless phones, and portable hand-held vacuum cleaners.

These new standards implicitly recognize the changing landscape of residential electricity use. They also point to the new directions that efficiency standards will take in the twenty-first century. Consumer electronics are taking up an increasing share of a home's electrical load. In California homes, electronic devices—including stereos, televisions, computers, and telephone equipment—together consume more than 10 percent of a home's electrical usage just when they are off or in another low-power mode.



When on, the larger electronic devices—such as televisions, set-top boxes, and high-end home stereos—can draw sizable amounts of electricity. Televisions alone can use several hundred kWh annually; household energy use for televisions and set-top boxes combined can add up to 1,000 kWh per year.

Most of the smaller devices that the regulations target draw only a little power and consume relatively little electricity over the year. But a typical home can easily have 20 of the smaller devices scattered throughout the house, performing a myriad of visible and invisible functions.

It's easy to criticize this new set of regulations—as some publications have hastily done—as adding unnecessary costs to devices that don't consume much electricity only to achieve energy savings that are even tinier. However, these mandatory improvements are cost effective. In fact, some manufacturers may be able to cut the demand of these power sources by as much as 75 percent with no additional costs.

Although California has a reputation for striving to be on just about any cutting edge, there are a couple of very good reasons for the state to take the lead on this issue. First, California still faces an electricity crisis,

Continued from previous page

Vampire Slaying and Other New Directions for Efficiency Standards

and conservation is an essential part of the state's strategy to keep rolling blackouts at bay. Second, Californians appear to have an unusually robust appetite for these types of consumer electronics.

The collections of miscellaneous appliances in California homes are responsible for a larger fraction of electricity use there than in almost any other part of the world.

In keeping with their cutting-edge status, California's new minimum efficiency requirements for external power supplies are avant-garde for yet another reason: they are the first horizontal standard. The new regulations set a minimum efficiency for external power supplies that are connected to a whole range of devices, including portable vacuum cleaners, electric toothbrushes, cell phones, answering machines, battery chargers, and hundreds of other devices. The standard consists of two parts: a maximum allowable no-load draw and a minimum efficiency of conversion.

Thus, the standard saves power when the appliance is both off and on. Regulating the efficiency of the power supply makes both technical and administrative sense because this tactic avoids the necessity of establishing separate efficiency requirements for each device. Expect to see more horizontal standards on the horizon, especially when dealing with electronic aspects of appliances.

In another new twist, the California standards cover one device that today is barely used in America, the simple digital video converter. But it is expected to appear quickly. When all television stations in the United States convert from analog to digital broadcasting—some stations have already made that switch—existing televisions will no longer make sense of any broadcast signal.

Consumers will have to buy either a new television or a converter box. When on, each converter box draws anywhere from 8W–15W and draws only a tiny bit less when off. For a three-TV household, the converter boxes' energy use could add up to that of a new refrigerator. Converters or decoders are already widely used in Britain. There, the efficiency has actually declined over time as manufacturers sought to lower costs through a race to the bottom in efficiency.

The California standards anticipate the flood of decoders that will be arriving shortly, and they protect the consumers who purchase these devices from unknowingly creating a new electric heater next to each of their televisions.

Most global consumer electronics firms—Sony, Samsung, Panasonic, LG, for example—have a policy of designing to meet the most stringent global standards. California's new regulations are good news for the rest of the world, because they too will receive California compliant equipment.

EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

BLUEPRINT

Title 24
Energy Efficiency Standards Training

Links for training on issues relating to California Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24, Part 6) is available on the Energy Commission's website at:

http://www.energy.ca.gov/title24/training

For training offered by the utilities and other organizations please see the following websites:

PG&E:
http://www.pge.com/stockton

SoCal Gas Co.
http://seminars.socalgas.com/int/default.asp

San Diego Gas and Electric
http://seminars.sdge.com/int/default.asp

SCE:
http://www.sce.com/RebatesandSavings/EnergyCenters/workshops.htm

SMUD:
http://www.smud.org/education/index.html

CALBO TRAINING INSTITUTE
http://www.calbo.org

BUILDING INDUSTRY INSTITUTE (BII)
http://www.consol.ws/bect.asp

CABEC:
http://www.cabec.org/cepetrainandtest.php

Nonresidential Fenestration Certification Initiative (NFCI)
http://nfci.ecst.csuchico.edu

Residential Lighting Design Guide
– Best practices and lighting designs to help builders comply with California's 2005 Title 24 energy code
http://www.cltc.ucdavis.edu/

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EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

BLUEPRINT

COMING Next Week: An interview with **Charles Segerstrom** on PG&E's Energy Training Center in Stockton

Special Bulletin

Change-outs! Don't Be Left-out!

Changes in California's Energy Code for 2005

Q. What are the new 2005 requirements beginning on October 1, 2005 for installers when changing out HVAC equipment, including an air handler, outdoor condensing unit, cooling or heating coil, in an existing building?

A. Field research shows that ducts in existing homes on average allow about 30 percent of the heated or cooled air to wastefully leak out before it reaches the rooms it was intended to heat or cool. In this time of a looming peak electricity crisis, this is unacceptable.

It is a particularly bad idea to waste the energy savings from a new efficient air conditioner or furnace by connecting it to a leaky duct system. By decreasing the leakage of the system, the effectiveness of the equipment is increased, the airflow improves, and the space heats or cools faster, providing the homeowner better performance, lower utility bills, and more comfort.

Also, since leaky return ducts suck in air that may be polluted from the environment they are in (attic, crawlspace, garage), sealed ducts will produce a more healthy living space. To accomplish these benefits, starting October 1, 2005, California contractors in certain climate zones will be required to do duct sealing when changing out HVAC equipment in existing buildings. Third-party field verification by a certified home energy rater (HERS rater) also is required at least on a sampling basis to insure that the duct sealing is accomplished.

These new requirements apply when replacing the air handler, the outdoor condensing unit of a split system air conditioner or heat pump, cooling or heating coil, or the furnace heat exchanger. These replacements are considered alterations under the Standards.

For these change-outs in existing low-rise residential buildings in climate zones 2 and 9 through 16, contractors must use duct pressurization equipment (commonly called a "duct blaster") to test the leakage of the duct system following protocols adopted by the Commission when 40 linear feet or more of the duct system is in unconditioned space. Contractors must comply with one of the following four duct sealing requirements:

i. The measured duct leakage must be less than 15 percent of fan flow; or
ii. The measured duct leakage to outside must be less than 10 percent of fan flow; or
iii. The measured duct leakage must be reduced by more than 60 percent relative to the measured leakage prior to the installation or replacement of space conditioning equipment, and a visual inspection, including a smoke test, must demonstrate that all accessible leaks have been sealed; or
iv. If it is not possible to meet the duct requirements above, all accessible leaks must be sealed by the contractor and verified through a visual inspection and a smoke test by a certified HERS rater.

The ducts must meet duct sealing requirements, and be insulated to R-4.2 (climate zones 6, 7 and 8), R-6 (climate zones 2 and 9 through 13), or R-8 (climate zones 14, 15, and 16), contrractors must use Commission-approved sealing materials and comply with the California Mechanical Code requirements for ducts.

If the installed ducts form an entirely new duct system, the measured duct leakage must be less than 6 percent of fan flow. If the installed ducts are an extension of an existing duct

Continued on next page

Pictured above: Scott Johnson shows Steve Easley how to perform a smoke-test with a duct blaster to help demonstrate a system's duct leakage. Research shows that about 30 percent of the heated or cooled air in a home is lost from duct leaks.

Change-outs!

Don't Be Left-out!

Continued from previous page

system must meet one of the four leakage requirements stated above.

For duct sealing, the contractor is required to test every duct system that is subject to the requirements as described above, and complete and sign page 4 of the CF-6R form for every system. The CF-6R must then be posted or be provided to the building department, and a copy of the CF-6R must be given to the HERS rater for every home.

The HERS rater must do the required field verification and testing (this could be on a sampling basis as discussed below), and then complete a CF-4R form for every home.

The CF-4R must then be provided to the building department before the home can be "finaled." If the contractor complies with requirements i, ii or iii above, the homeowner can choose either to have verification testing for his/her home or to be part of a sample, in which case the HERS rater is required to perform verification testing in only 1 out of 7 of the contractor's installations.

If the contractor is unable to comply with requirements i, ii or iii, and therefore must use requirement iv above, sampling is not an option for the HERS rater, and the HERS rater must visually inspect and smoke test every home for which the contractor uses this option.

During sampling, if the tested duct system does not pass, the HERS rater must test a second duct system from the sampling group. If the second duct system does not pass, then the HERS rater must test the other 5 duct systems in the group, which have been previously designated by the HERS provider (in consultation with the HERS rater and the installing contractor), before a CF-4R may be provided to the building department.

In addition to the duct sealing requirements described above, when split system air conditioners are changed-out in existing low-rise residential buildings in climate zones 2 and 8 through 15, contractors are required to either do refrigerant charge measurement using Commission-approved protocols or install a thermostatic expansion valve (TXV). The refrigerant charge measurement or installation of a TXV must be verified by a certified HERS rater with the homeowner choosing either to have verification testing for his/her home or to be part of a sample as described above for duct sealing.

The refrigerant charge measurement protocol includes airflow measurement. The Commission recommends airflow measurement in accordance with the Commission-approved protocols for every air conditioner change-out, including package and split-air-conditioners and even when the TXV option is chosen for compliance.

Thermostatic Expansion Valve

Also, space conditioning component change-outs must meet the Standards requirements for that component. The replacement unit must meet or exceed appliance efficiency standards (e.g., air conditioners manufactured after January 23, 2006 must meet or exceed an SEER of 13.0). If a thermostat is replaced, the replacement must be a setback thermostat ("ramping" setback thermostats for heat pumps). If cooling system refrigerant suction lines are replaced, they must meet minimum insulation requirements.

By law, HERS raters must be certified by a HERS provider and be independent from the HVAC contractor. HERS raters cannot have a financial interest in the installation of the equipment. HERS raters cannot be employees of the contractor whose work they are verifying, nor can HERS raters have a financial interest in the contractor's business, or advocate or recommend the use of any product or service that they are verifying.

Continued on next page

Change-outs!

Don't Be Left-out!

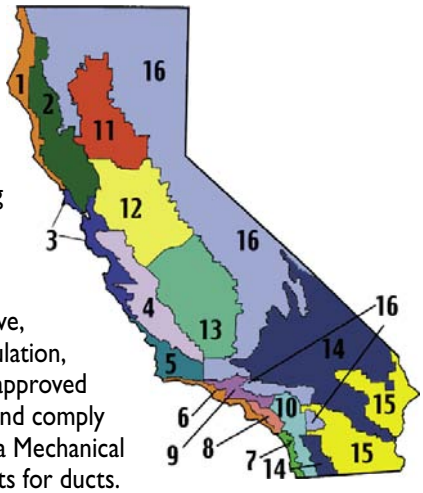
Continued from previous page

The Commission expects HERS raters to enter into a contract with the building owner (or the building owner's agent) to provide independent, third-party diagnostic testing and field verification. The HERS rater cannot be hired by the installing contractor (however, a three-way contract between the building owner, installing contractor and the HERS rater is acceptable). Currrently there are two Commission-approved HERS providers, CHEERS and CalCERTS, who train, certify and oversee HERS raters. Information about the HERS providers can be found at: http://www.CHEERS.org and http://www.CalCERTS.com.

Duct sealing is also required for change-outs of the same HVAC components in existing nonresidential buildings, high-rise residential buildings and hotels and motels. These requirements are very similar but a little different than for low-rise residential buildings. The duct sealing requirements must be met when single zone space conditioning equipment components are replaced and when at least 25 percent of the ducts are installed outside of the building or in unconditioned space (above an insulated drop or sheetrock ceiling).

Duct sealing must comply with requirements i, ii or iv above; complying with requirement iii is not an option. The same requirements apply for HERS rater field verification testing as for low-rise residential buildings.

When ducts are installed outside of the building or in unconditioned space in existing nonresidential, high-rise residential buildings and hotels and motels in all climate zones and for all space conditioning system types, the ducts must meet the duct sealing requirements above, have R-8 duct insulation, use Commission-approved sealing materials and comply with the California Mechanical Code requirements for ducts. Supply ducts installed inside the conditioned space must comply with the California Mechanical Code requirements for ducts.



Change-outs of components in existing nonresidential buildings, high-rise residential buildings and hotels and motels must meet the requirements in the Standards for that component in the same way as they must be done for space conditioning change-outs in existing low-rise residential buildings (see the Standards mandatory requirements for more information).

To find out in which climate zone your project is located, go to the Commission's website: http://www.energy.ca.gov/maps/climate_zone_map.html and view the climate zone map. You can find a listing of the climate zone for each California city on that webpage, or you can also call the Energy Standards Hotline and ask Hotline staff to look it up for you (916-654-5106, or 800-772-3300 in California only).

Note that there are three exceptions to the above duct sealing requirements:

1. Duct systems that are documented to have been previously sealed as confirmed through field verification and diagnostic testing (tested by a HERS rater).
2. Duct systems with less than 40 linear feet in unconditioned spaces.
3 Existing duct systems constructed, insulated, or sealed with asbestos.

Continued on next page

Change-outs! Don't Be Left-out!

Continued from previous page

When replacing space conditioning equipment (or components)in low-rise residential buildings, there are other alternatives to HERS verification of duct sealing (See Table 8-3 from the Residential Compliance Manual, Chapter 8, shown below).

Table 8-3 – Alternatives to Duct Sealing and Refrigerant Charge Measurement

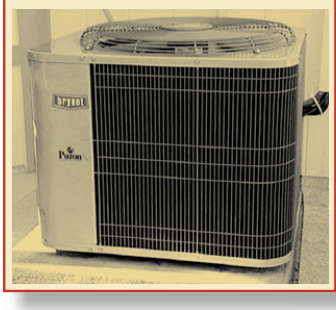
	Option 1	Option 2	Option 3
Climate Zone	0.92 AFUE	SEER-14 & EER-12, with either TXV or refrigerant charge measurement, plus Increased Duct Insulation	SEER-14 & EER-12 with either TXV or refrigerant charge measurement, plus either 0.92 AFUE or 0.82 AFUE with Increased Duct Insulation
CZ2	Yes	No	Yes
CZ9	No	No	Yes
CZ10	No	Yes	Yes
CZ11	No	No	Yes
CZ12	Yes	No	Yes
CZ13	No	Yes	Yes
CZ14	No	No	Yes
CZ15	No	Yes	Yes
CZ16	Yes	No	Yes

1. Increased duct insulation refers to an additional R-4 insulation wrap on existing ducts and R-8 duct insulation for all new ducts.

2. Package systems may use Option 2 or 3 without meeting the requirement for a TXV (or refrigerant charge measurement)

Note - There are no duct sealing requirements in climate zones 1 and 3-8.

In climate zone 8, to avoid TXV or refrigerant charge measurement requirements, a SEER 14 air conditioner or a 0.82 AFUE furnace may be used.



- In **Climate Zones 2 and 12**: In these two climate zones, the contractor may replace an existing air conditioner with an air conditioner with any SEER that complies with the Appliance Efficiency Regulations (SEER 10 for units manufactured prior to January 23, 2006, SEER 13 for units manufactured on or after January 23, 2006), as long as the contractor also replaces the existing furnace or heat pump with a 0.92 or higher AFUE furnace or a 9.0 or higher HSPF heat pump. When this occurs there is no requirement for duct sealing or HERS verification.

- **Climate Zone 16**: In this climate zone the contractor may replace an existing air conditioner with an air conditioner with any SEER that complies with the Appliance Efficiency Regulations (SEER 10 for units manufactured prior to January 23, 2006, SEER 13 for units manufactured on or after January 23, 2006), as long as the contractor also replaces the existing furnace or heat pump with a 0.92 or higher AFUE furnace or a 10.0 or higher HSPF heat pump.

When this occurs there is no requirement for duct sealing or HERS verification.

- In **Climate Zones 10, 13, and 15**: In these three climate zones the contractor may replace an existing air conditioner
  - with an air conditioner that has a 14 or higher SEER and also has a 12 or higher EER , and
  - either does a refrigerant charge measurement or installs a TXV, and
  - adds R-4 duct wrap to all the ducts.

  When this occurs there is no requirement for duct sealing or HERS verification duct testing. There is, however, a requirement for HERS verification of the refrigerant charge measurement or the TXV and the EER. These measures can be HERS verified through sampling of 1 in 7 installations.

- In **Climate Zones 2 and 9 through 15**: In these eight climate zones the contractor has two choices:
  1. The contractor may replace an existing air conditioner with an air conditioner that has a 14 or higher SEER and also has a 12 or higher EER, and
     - either does a refrigerant charge measurement or installs a TXV, and
     - replaces the existing furnace or heat pump with a 0.92 or higher AFUE furnace or with a 9.0 or higher HSPF heat pump.

     When this occurs there is no requirement for duct sealing or HERS verification of the duct testing. There is, however, a requirement for HERS verification of the refrigerant charge measurement or TXV and the EER. These measures can be HERS verified through sampling of 1 in 7 installations; or
  2. the contractor
     - may replace an existing air

Continued on next page


Change-outs!
Don't Be Left-out!

Continued from previous page



Training is available to companies and groups on these new requirements. To request training contact the Commission by e-mail or call John Eash at : jeash@energy.state.ca.us [(916) 653-7181] or Nelson Peña at: npena@energy.state.ca.us [(916) 654-4217].

conditioner with an air conditioner that has a 14 or higher SEER and also has a 12 or higher EER, and
- either does a refrigerant charge measurement or installs a TXV, and
- replaces the existing furnace or heat pump with a 0.82 or higher furnace or 8.5 or higher HSPF heat pump, and
- adds R-4 duct wrap to all the ducts in unconditioned space.

When this occurs there is no requirement for duct sealing or HERS verification of the duct testing. There is, however, a requirement for HERS verification of the refrigerant charge measurement or TXV and the EER. These measures can be HERS verified through sampling of 1 in 7 installations.

- In **Climate Zone 16**: In this climate zone the contractor has two choices:
  1. the contractor may replace an existing air conditioner
     - with an air conditioner that has a 14 or higher SEER and also has a 12 or higher EER, and
     - either does a refrigerant charge measurement or installs a TXV, and
     - replaces the existing furnace or heat pump with a 0.92 or higher AFUE furnace or with a 10.0 or higher HSPF heat pump.

     When this occurs there is no requirement for duct sealing or HERS verification of the duct testing. There is, however, a requirement for HERS verification of the refrigerant charge measurement or TXV and the EER. These measures can be HERS verified through sampling of 1 in 7 installations; or
  2. the contractor
     - may replace an existing air conditioner with an air conditioner that has a 14 or higher SEER and also has a 12 or higher EER and
     - either does a refrigerant charge measurement or installs a TXV and
     - replaces the existing furnace or heat pump with a 0.82 or higher AFUE furnace or 9.0 or higher HSPF heat pump and
     - adds R-4 duct wrap to all the ducts in unconditioned space.

     When this occurs there is no requirement for duct sealing or HERS verification of the duct testing. There is, however, a requirement for HERS verification of the refrigerant charge measurement or TXV and the EER. These measures can be HERS verified through sampling of 1 in 7 installations.

- In **Climate Zones 1 and 3 through 8**: In these seven climate zones there are no low-rise residential requirements for duct sealing. In climate zone 8 there is a low-rise residential requirement for either refrigerant charge measurement or a TXV. In climate zone 8 the contractor may replace an existing air conditioner with a 14 or higher SEER air conditioner or replace an existing furnace or heat pump with a 0.82 or higher AFUE furnace or 8.5 HSPF heat pump. When this occurs there is no requirement for refrigerant charge measurement or TXV installation or HERS verification.

The Commission is working with HVAC trade associations such as the Institute of Heating and Air Conditioning Industries (IHACI), utilities, the Contractors State License Board (CSLB), distributors, and manufacturers to provide fact sheets for contractors to use as handouts to consumers to better explain these new requirements when bidding for change-out jobs.

EFFICIENCY, RENEWABLES & DEMAND ANALYSIS DIVISION

BLUEPRINT

Special Bulletin

Title 24
Energy Efficiency Standards Training

Links for training on issues relating to California Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24, Part 6) is available on the Energy Commission's website at:

http://www.energy.ca.gov/title24/training

For training offered by the utilities and other organizations please see the following websites:

PG&E:
http://www.pge.com/stockton

SCE:
http://www.sce.com/RebatesandSavings/EnergyCenters/workshops.htm

SMUD:
http://www.smud.org/education/index.html

CALBO TRAINING INSTITUTE
http://www.calbo.org

BUILDING INDUSTRY INSTITUTE (BII)
http://www.consol.ws/bect.asp

CABEC:
http://www.cabec.org/cepetrainandtest.php

Register for CABEC training and/or testing online at:
http://register.cabec.org/ceperegistration.php

Nonresidential Fenestration Certification Initiative (NFCI)
http://nfci.ecst.csuchico.edu

Residential Lighting Design Guide
– Best practices and lighting designs to help builders comply with California's 2005 Title 24 energy code
http://www.cltc.ucdavis.edu/

Need Help? CALL THE ENERGY HOTLINE @
(800) 772-3300 or (916) 654-5106

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ENERGY EFFICIENCY AND DEMAND ANALYSIS DIVISION

BLUEPRINT

SEEKING EXCELLENCE

We interview Doug Beaman on training and the state of the art – page 4

NEW YEAR's RESOLUTIONS – page 3

Above: At the California Independent System Operator (Cal ISO) facility in Folsom on Deceember 14, the Governor signed his Green Buildings Executive Order.

Below: Following the Executive Order signing, Governor Schwarzenegger flipped a ceremonial switch to dedicate the upgrade to the Path 15 transmission line. The upgrade adds a new 500 kilovolt power line to the transmission corridor that links Northern and Southern California.

The Governor Proactively Supports Energy Efficiency and Renewables

On December 14, 2004 Governor Schwarzenegger held a news conference which included his latest action related to energy efficiency, Executive Order S-20-04, referred to as the Green Building Initiative. Governor Schwarzenegger, speaking at the California Independent System Operator (Cal ISO) on the benefits of green energy, set the goal for state buildings to be 20 percent more energy efficient by 2015 and encouraged the private sector to do the same. The Green Buildings project will save taxpayers millions of dollars and preserve California's resources and the environment. His statement included the following:

"… Make no mistake. California will face big energy challenges this coming summer and also maybe for years to come. So, its very important that we're proactive and we act now and we don't wait for something to happen and then act."

"What is equally critical for our long term energy plan is a strong commitment to conservation. Conservation! Conservation! Conservation! … Conservation is something that we can do right now in order to deal with our energy crunch. Every megawatt that we save is a megawatt that we do not have to produce…"

"I want all Californians to keep flexing their power and use energy wisely, buying energy efficient homes and buying energy efficient appliances…"

"California is a national leader in conservation and we are not slowing down on my watch … We're going to also sign an executive order creating California's Green Building Initiative today. My initiative sets a goal for state buildings to be 20% more energy efficient by the year 2015 and encourages the private sector to do exactly the same…"

"We will accomplish the common sense goals of our energy plan … more power and lower prices. When I came to Sacramento I said that I would return the power to the people and I meant it in more ways than just one."

You can listen to the full speech at:
http://www.photos.gov.ca.gov/essay26.html

The Governor's Green Building Initiative lays out a comprehensive set of actions for California to take to improve the energy efficiency of nonresidential buildings. The Energy Commission is directed to undertake all actions within its authority to increase the efficiency requirements in the Building Energy Efficiency Standards for nonresidential buildings by 20 % by 2015.

On December 14, Governor Schwarzenegger signed an Executive Order setting aggressive energy conservation goals for state buildings and dedicated the Path 15 Upgrade, which creates an energy transmission superhighway between Northern and Southern California.

Western Governors Recommend Energy Efficiency to Combat Global Warming

On November 18, 2004 Governor Schwarzenegger joined with the Governors of Washington and Oregon to approve a series of recommendations for action to combat the potentially grave impacts of global climate change. Among the recommendations are directives to incorporate aggressive energy efficiency measures into updates of state building codes, with a goal of achieving at least 15 percent cumulative savings by 2015 in each state.

You can read more about the *West Coast Governor's Climate Change Initiative* at:
http://www.energy.ca.gov/global_climate_change/westcoastgov/releases/
and click on November 18, 2004 under News Releases.

Governor Schwarzenegger, as the Co-Lead Governor for Energy, also is advocating energy efficiency and renewables policies at the Western Governors' Association (WGA) as well. This collaborative includes 18 western states and three US-flag Pacific Islands. Prompted by the recommendations of Governor Schwarzenegger, on June 22, 2004 Policy Resolution 04-13 was passed that commits Western Governors to examine the feasibility of and actions that would be needed to "achieve a goal to develop 30,000 MW of clean energy in the West by 2015 from resources such as energy efficiency [and] solar ….and increase the efficiency of energy use by 20% by 2020."

You can read more about the *Clean and Diversified Energy Initiative for the West* at:
http://www.westgov.org/wga/policy/04/clean-energy.pdf

NEW YEAR's Resolutions

At this time of year people think about "New Year's Resolutions." The California Energy Commission is no different. One resolution the Commission has is to take action that will result in better compliance with and enforcement of the Building Energy Efficiency Standards. We will do this by investigating and resolving complaints.

Recently, in October 2004, the Commission received a complaint regarding a new 500-unit subdivision of large homes (5,000 square feet and larger) where HERS verification was required but the builder was providing his "own" person to verify his "own" work! This seemed fine with the building department, because they did not understand how HERS verification works and what role the building department was to play in the process.

Commission staff traveled to the jurisdiction, and provided training and clarification of the HERS process. As a result, the jurisdiction required the builder to comply with the law and hire an independent third party HERS rater to act as a special inspector and to field verify the performance of the HVAC systems of the homes.

The resulting energy savings will be substantial, not only to the homeowner, but to the community. It also will reduce the peak load use of all the air conditioners in these houses helping Californians, hopefully, to avoid the definite risk of not having enough power to keep the lights on in the next few summers.

This subdivion consisted of 500 houses, but how many more new homes are wasting electricity through improperly sealed ducts as conditioned air intended to be distributed throughout the house fot comfort instead pours from leaky ducts into the attic, because a builder is not complying with — or a building inspector is not enforcing — the requirement for HERS rater field verification?

What can we all do about this problem?

To begin with, we recommend a simple action on the part of building inspectors throughout the state: because such a high amount of compliance credit is earned for "sealed ducts" and because field verification and diagnostic testing is so critical to actual energy performance of the building, the Commission asks building departments to focus maximum attention on getting properly signed CF-4R forms from independent HERS raters.

The CF-4R form provided by the HERS rater certifies that they have tested and verified compliance. The form insures that the building was tested and found compliant. The building department inspector should get the CF-4R from an independent, certified HERS rater on every house that calls for field verification. If an inspector doesn't get the form, they shouldn't final the house!

As a builder, hire a HERS rater to verify "sealed ducts" or other measures that require field verifications when chosen for compliance credit. As a building inspector, ask for and receive a completed CF-4R form. Make a New Year's Resolution to be part of the solution to this problem.

For more information, contact the Commission's Hotline at the special telephone number for building departments only, 1-800-PLAN-CHK (800-752-6245) or e-mail John Eash at jeash@energy.state.ca.us.

The fifth in a series of articles about building department employees, builders, energy consultants, HERS raters and others who are making exemplary efforts to achieve energy efficiency in buildings.

SEEKING EXCELLENCE

Doug Beaman, on training and the state of the art today.

Doug Beaman is the owner of Douglas Beaman Associates, a Modesto, California based energy consulting firm. Doug has over 20 years of experience providing training for building inspectors, plan checkers, building contractors, HVAC contractors, building designers, energy consultants, and homeowners.

Doug spends the majority of his time providing training. His high energy, fast-paced, and entertaining training style provides the information that participants need in an enjoyable, comfortable learning environment. He relies upon a combination of extensive field experience and technical expertise to ensure that training is both accurate and relevant.

Doug developed the training curriculum that was approved by the California Energy Commission for certification of the California Home Energy Efficiency Rating System (CHEERS) raters for new construction. Doug also teaches load calculations (ACCA Manual J), duct design (ACCA Manual D) and HVAC system diagnostic skills. Douglas Beaman Associates also coordinates CHEERS' new construction Quality Assurance program.

During the spring and fall, Doug is on the road about four days per week for training with Southern California Gas Company (SoCalGas), San Diego Gas & Electric Company (SDG&E), Pacific Gas and Electric Company (PG&E), the California Home Energy Efficiency Rating System, the California Association of Building Energy Consultants (CABEC) and CHEERS.

Blueprint: *In your career you have done many things. What made you decide to concentrate on training?*
Beaman: I never made a conscious decision to concentrate on training. In 1980 I was offered a part-time teaching position at San Jose State University. In the years since, I have gradually increased the amount of training I provide, until today training takes up the majority of my time. I enjoy training and I think it's truly important, particularly training on the energy standards.

Energy Standards are a pretty challenging topic for training. It's easy to try to just provide the information in a methodical, organized manner. But one of the things I do in training is try to make it a bit more interesting. I try to keep people involved, and make them realize that it's not so difficult. I think that one of the biggest reasons that building department folks don't enforce the Standards more is their lack of understanding of them. Their perception is that the compliance forms, the CF-1R and CF-6R, are just too confusing. One of my goals, in all my classes, is to help people get over their aversion to the Standards and give participants sufficient understanding that they can really get into the plan check and field inspection process.

Before each of my training classes, I always ask myself these questions, "What information do these participants need to understand? How can I provide that information in an understandable and enjoyable fashion? What can I do in this class to help ensure that it truly will be time well spent for each participant?"

Blueprint: *Why do you feel that training on the Standards is important?*

Beaman: I believe in the Energy Standards. When I was a teenager beating nails for our family construction business, we never installed a bit of insulation in our homes because there were no energy standards. I have seen first hand how the Energy Standards lead to more energy efficient housing. I firmly believe that we will see far more serious energy problems in the years ahead. I believe that implementation of the energy standards is important for the long-term economic and social well-being of our society.

The energy standards help ensure that new home buyers receive cost-effective, energy efficient new homes which benefit not only the homeowners but all of society. Hopefully, my training helps improve the implementation of the standards by contractors, energy consultants and code enforcement officials. If my training helps move us down the path to improved energy efficiency even a tiny bit, then I believe that I'm doing an important job.

Blueprint: *You are a past President of CABEC and helped develop their certification program. Could you please tell us about your involvement in that organization?*

Beaman: I was a founding member of the California Association of Building Energy Consultants (CABEC) back in the 1980's and I served as President for two years a few years ago.

The most important role for CABEC is to be the collective voice of the individuals that work with the energy standards every

day. CABEC members, on a daily basis, are in the middle between builders usually looking for lowest construction cost, building departments enforcing the energy standards, and designers that might be more interested in aesthetic features than energy efficiency. Because of this position, CABEC members have a unique role in the implementation of the energy standards.

I encourage CABEC members to become more involved in the development of the standards, in addition to their on-going role in implementing them. CABEC's membership has grown significantly in recent years, and we have taken on a much more professional focus. CABEC's goal is to continue to grow both in number of members and professionalism.

CABEC developed the Certified Energy Analyst (CEA) program since there was no state-wide licensing or certification for individuals performing energy compliance calculations. Anyone that hires a Certified Energy Analyst should be confident that they have hired a knowledgeable, skilled energy analyst.

There are three requirements for an energy consultant to become a CEA, after they join CABEC. First, they must pass the Certified Energy Plans Examiner test. Second, they have to have a minimum of one year's documented experience performing energy compliance calculations. And third, and very important, they have to participate in ethics training and agree to abide by a code of ethics developed by CABEC.

The CEA program has grown over the years and I believe that it will continue to grow in importance in the years ahead.

Blueprint: *How can CABEC members work more closely with HERS raters to get field verification?*
Beaman: Encouraging CABEC members to specify HERS verification measures has been a real challenge. Builders and architects often have the misconception that the HERS measures are too expensive or too difficult, or that they will disrupt the construction schedule, or any of numerous other fallacies. In truth, HERS verification measures often times are the most cost-effective conservation feature available.

Some builders resist any and all change, but eventually they will see the value in using HERS measures. HERS measures benefit their clients, and they often are the lowest cost energy conservation feature which will keep the construction cost down.

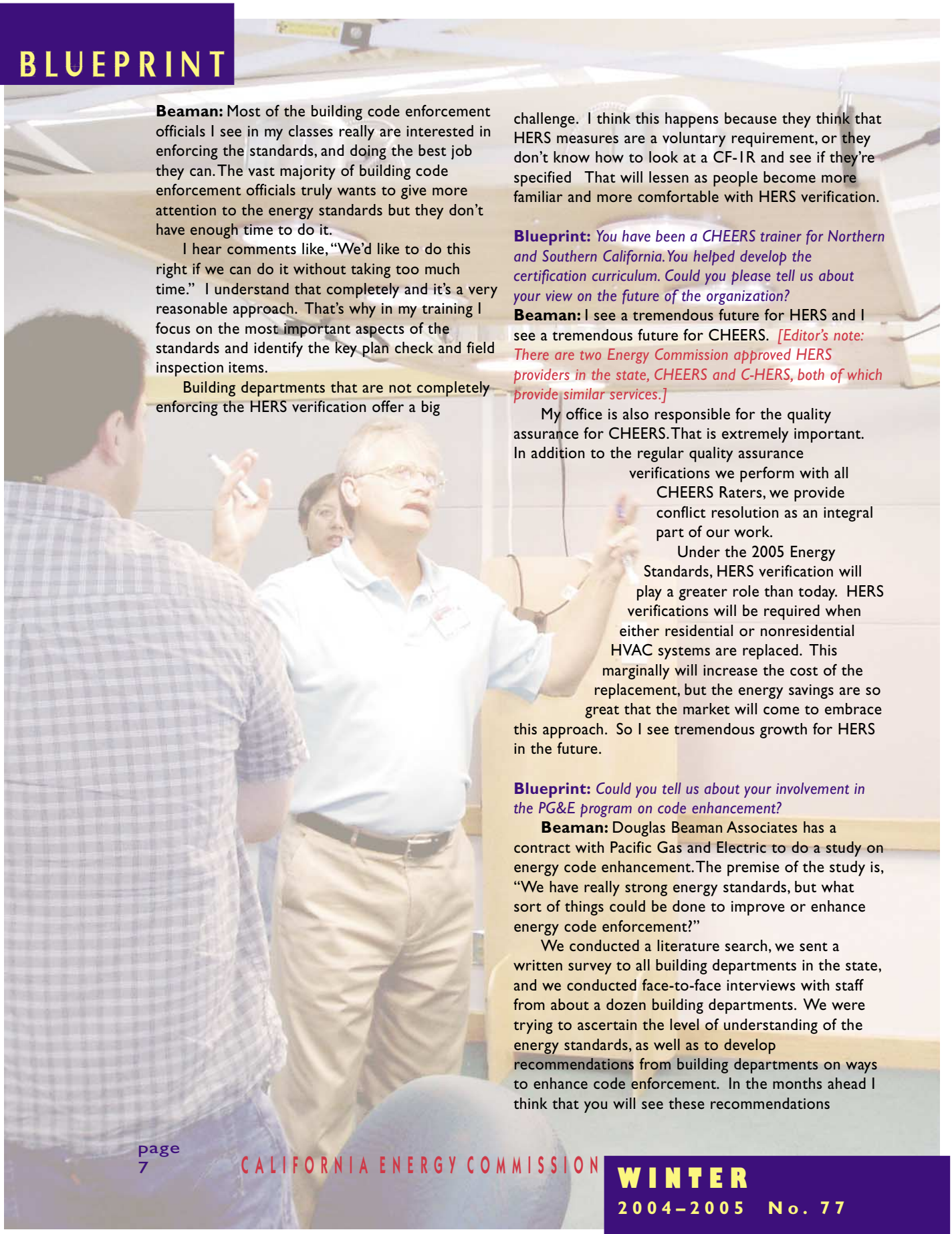
On the positive side, an increasing number of CABEC members have become very active HERS raters. They're doing more HERS verifications now than they are Title 24 calculations. I don't expect everybody to go that route, but I'm looking forward to the day when most CABEC members actively advocate the HERS verification features.

Blueprint: *When you said you promote HERS, how are you doing it?*
Beaman: Since 1998, I have done dozens and dozens of duct leakage classes for CABEC members, HVAC contractors, builders, and building code officials.

My primary focus in these classes is to demonstrate that duct leakage in most untested systems is significant, that duct leakage testing is easy, and that the duct leakage standards are very reasonable. My favorite training situation is to set up a small HVAC system and perform a duct leakage test. After we get the system to the 6% leakage standard, I generate "smoke" that is drawn into the system and out through the leaks so that the participants can see the amount of leakage.

In almost every class, the reaction is the same, "You mean this much leakage still passes?" When participants see how much "smoke" escapes from a system with 6% duct leakage, they realize that the HERS standards are very reasonable.

Blueprint: *What can you tell us about building departments?*



Beaman: Most of the building code enforcement officials I see in my classes really are interested in enforcing the standards, and doing the best job they can. The vast majority of building code enforcement officials truly wants to give more attention to the energy standards but they don't have enough time to do it.

I hear comments like, "We'd like to do this right if we can do it without taking too much time." I understand that completely and it's a very reasonable approach. That's why in my training I focus on the most important aspects of the standards and identify the key plan check and field inspection items.

Building departments that are not completely enforcing the HERS verification offer a big challenge. I think this happens because they think that HERS measures are a voluntary requirement, or they don't know how to look at a CF-1R and see if they're specified That will lessen as people become more familiar and more comfortable with HERS verification.

Blueprint: *You have been a CHEERS trainer for Northern and Southern California. You helped develop the certification curriculum. Could you please tell us about your view on the future of the organization?*

Beaman: I see a tremendous future for HERS and I see a tremendous future for CHEERS. *[Editor's note: There are two Energy Commission approved HERS providers in the state, CHEERS and C-HERS, both of which provide similar services.]*

My office is also responsible for the quality assurance for CHEERS. That is extremely important. In addition to the regular quality assurance verifications we perform with all CHEERS Raters, we provide conflict resolution as an integral part of our work.

Under the 2005 Energy Standards, HERS verification will play a greater role than today. HERS verifications will be required when either residential or nonresidential HVAC systems are replaced. This marginally will increase the cost of the replacement, but the energy savings are so great that the market will come to embrace this approach. So I see tremendous growth for HERS in the future.

Blueprint: *Could you tell us about your involvement in the PG&E program on code enhancement?*

Beaman: Douglas Beaman Associates has a contract with Pacific Gas and Electric to do a study on energy code enhancement. The premise of the study is, "We have really strong energy standards, but what sort of things could be done to improve or enhance energy code enforcement?"

We conducted a literature search, we sent a written survey to all building departments in the state, and we conducted face-to-face interviews with staff from about a dozen building departments. We were trying to ascertain the level of understanding of the energy standards, as well as to develop recommendations from building departments on ways to enhance code enforcement. In the months ahead I think that you will see these recommendations

incorporated into utility and state code enhancement efforts.

Blueprint: *Could you tell us about the planned examination for Certified Energy Plans Examiner?*
Beaman: I have personally been involved with the Certified Energy Plans Examiner (CEPE) process since 1997, when it was funded by the Energy Commission. My firm won the contract for providing the training, writing and administering the test. That was the last year the Commission funded it, so it is now administered by CABEC. CABEC receives funding from the utilities for training, and test fees support the administration of the test.

The CEPE has continued to grow over the years; right now we have 345 individuals who are certified for either residential, nonresidential or both. That's the highest number of people that have ever been Certified Energy Plans Examiners. At the residential training in Stockton this year we actually had to turn people away, the classroom wasn't big enough for everyone.

Our efforts in the years ahead will be to increase the stature of the CEPE program and the individuals that are certified energy plans examiners. Our efforts will be to increase awareness and understanding in building departments about the CEPE. We encourage building departments to use the CEPE as a criteria when they hire new people, or when they hire third party plan checking firms. Energy consultants also use the CEPE as a badge of honor when they're marketing their services to builders, architects, or homeowners.

Blueprint: *Back to training. What do you think about the training that is available now?*
Beaman: I think the training is very good. There are two levels of training. First, there is general introductory overview training. That training is absolutely essential to get people aware of the standards, and it needs to be provided all the time, not just when the standards change, because there are always new hires and new people in the field.

There's another level of training that's needed too, and that's the more in-depth training. "How do I actually read this computer run?" "I've got these forms, and I need to understand them better." Or from a field inspector, "I need more specific knowledge on how to get into an ARI Directory or manufacturer's cutsheets to learn about the efficiency of a piece of equipment." We need more in-depth training. The challenge is that the demand for in-depth training is much smaller, so it's harder to schedule and sponsor in-depth training. The number of people that attend the training is much smaller.

I think the general type of training that's being provided right now is really good. I think one of the things we need though, is a bit more in-depth training. Another challenge is for building department staff to find the time to attend training. Building department staffs are spread really thin, and it's hard for supervisors to give staff time to attend classes.

Blueprint: *What do you see in the future for training and the standards?*
Beaman: It's probably some combination of online training, training similar to the CEC webcast two years ago, and a small amount of in-person training. There will be far fewer classes with an instructor standing in front of a group of ten or twenty people. More likely the participants will be sitting in front of a computer screen, or watching a big screen webcast.

I think this will enhance training overall, but I'm glad that I will be watching from my rocking chair. For me the best part of training is the interaction with the participants: even when some guy in the back of the room starts "barking" at me about something I've said or something in the standards. Clearly that is the most challenging part of training; but it also is the most rewarding if I am able to handle it well.

My greatest strength as a trainer is my ability to engage the participants. I appreciate the give and take when I'm working with a group of folks that truly want to learn more about the energy standards. At the end of a day of training I want my participants to feel that the day has been time well spent for them. If that's true, then it's been time well spent for me.

The California Energy Commission does not endorse any products, supplier, manufacturer or builder. The text in this interview is meant to be informational and not all inclusive.

Energy Commission Approves

NEW ENERGY-SAVING RULES FOR APPLIANCES

Sacramento – At its December 15, 2004 business meeting, the California Energy Commission approved new regulations to make appliances sold in the state the most energy efficient in the nation.

"The result of today's 5-0 vote will be to slow electricity demand in the state and save approximately 100 megawatts of generating capacity every year," said Energy Commissioner Jackalyne Pfannenstiel, presiding member of the Commission's Efficiency Committee. "The energy savings are cumulative, so that in 10 years, because of today's new appliance regulations, we can avoid building three large power plants that would have to generate as much as 1, 000 megawatts."

The new energy standards regulate appliances such as incandescent lamps; audio and video equipment; residential pool pumps and portable electric spas; evaporative coolers; ceiling fans, exhaust fans and whole house fans; commercial ice makers, refrigerators and freezers; vending machines; commercial hot food holding cabinets and water dispensers, among others. The regulations go into effect on a staggered schedule beginning in January, 2006.

The new regulations also cover external power supplies, the small transformers that are used to power answering machines, cell and cordless phones, and a host of other small consumer products and small appliances. These devices draw electricity whenever they are plugged into an electrical socket, even if the product they are powering is not in use.

"Power supplies can waste surprisingly large amounts of electricity around the house," said Energy Commissioner Arthur Rosenfeld. "Informally known as 'energy vampires,' their efficiency varies greatly. Some models draw only one-fifth of a watt to do the same job other models use three watts to do. These new regulations will prevent that sort of needless waste."

The Energy Commission estimates that the average California household has between 10 and 20 external power supplies that cost the homeowner as much as $75 in wasted electricity each year.

Several consumer and environmental organizations spoke in support of the new regulations. Noah Horowitz, Senior Scientist for the Natural Resources Defense Council, noted that "these standards will cut consumer and business electricity bills and reduce the amount of pollution emitted from our power plants. Once fully implemented, along with other measures to be adopted in the spring, the standards will reduce power plant emissions of the global warming pollutant carbon dioxide by two million metric tons per year. This is the equivalent of removing 320,000 cars from California roads each year."

Citing utility industry support for the appliance regulations, Roland Risser, Director of Customer Energy Efficiency for Pacific Gas & Electric, said, "These standards will continue to help improve the environment and grid stability, as they reduce customer costs in the future. PG&E believes strongly in these standards and is committed to assisting in increasing them."

States are allowed to regulate the efficiency level of appliances not covered by national standards. The federal government has already adopted energy efficiency standards for residential refrigerators, clothes washers, dishwashers and other appliances once covered by state regulation. None of the appliances in today's ruling are federally regulated.

FREE Title 24 Training in

NONRESIDENTIAL WINDOWS/ FENESTRATION

NFCI

Nonresidential Fenestration Certification Initiative

This FREE training is provided through a grant from the California Public Utilities Commission to the Nonresidential Fenestration Certification Initiative (NFCI), California State University, Chico.

Who should attend?

- Building Officials
- C-17 (Window) Contractors
- Design Professionals
- Other interested entities

- ***Trainer comes to your site, OR***
- ***Attend a scheduled session***
  (See page 14 of this Blueprint for details)

  Two-hour class covers the 2005 energy efficiency and labeling regulations for site-built fenestration in nonresidential buildings.

TO SET UP TRAINING, REGISTER FOR TRAINING, OR GET FURTHER INFORMATION, CONTACT:

Janet Gouvea
Nonresidential Fenestration Certification Initiative
California State University, Chico
530-898-6297
jgouvea@csuchico.edu

Special Information for Building Officials

"Protect the Consumer – Don't final the house until you have a completed copy of the CF-4R!"

And don't forget - the HERS rater must be independent - not associated with the Project Builder's Company or the HVAC Company!

The *CF-4R* is the form completed by a HERS rater–third party special inspector. It is required whenever the builder chooses to use third party field verification to achieve compliance with the energy code.

The *CF-4R* is very important because compliance credit is given on paper for having systems third party–verified and the *CF-4R* proves that the verification was done.

For a training video on "Enforcement of HERS Ratings" go to:
www.consumerenergycenter.org/videos/residential/CHEERS_HERS/code

Did you know?

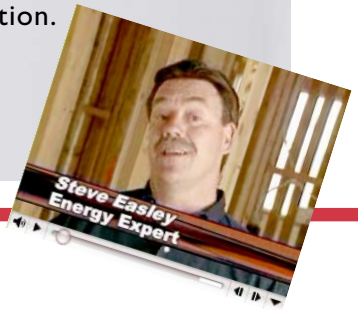
The California Energy Commission, the North American Insulation Manufacturers Association (NAIMA) and Building Media, Inc. (BMI) have teamed up to produce an entertaining, multi-media training CD to help California construction professionals build more energy efficient homes.

The video-based, multi-media training program features building science expert Steve Easley showcasing quality installation procedures by interviewing insulation installation contractors on the job site. Steve takes you "into the field" to show builders, HERS raters and building department staff exactly what has to be done to obtain credit for the 2005 Standard's "High Quality Installation of Insulation" compliance option.

To view the videos go to:
www.energyvideos.com
and click on New! –
"2005 Standards Videos"

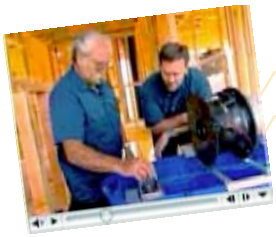
To obtain a CD of the videos, contact the Energy Hotline@
800-772-3300
916-654-5106

Online Energy Training Videos



Over 100 videos on a variety of energy topics are available both at:

www.energyvideos.com or
www.ConsumerEnergyCenter.org/videos/



BLUEPRINT

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TECHNICAL
SERVICES
Website
http://www.energy.ca.gov/

TITLE 24 ENERGY EFFICIENCY STANDARDS TRAINING

Links for training on issues relating to California Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24, Part 6) are available on the Energy Commission's web site at:
www.energy.ca.gov/title24/training

Please see the following websites for training offered by the utility companies and other organizations:

PG&E:
www.pge.com/stockton

SoCal Gas & SDG&E:
www.socalgas.com/business/resource_center/erc_seminar_info.shtml

SCE:
www.sce.com/sc3/002_save_energy/002f_ctac/002f3_work_classes/default.htm

SMUD:
www.smud.org/education/index.html

CALBO Training Institute:
www.calbo.org

CABEC:
2004 CEPE Training & Testing schedule is now posted on the CABEC website at this link:
www.cabec.org/cepetrainandtest.php

***The NFCI** (National Fenestration Certification Initiative at California State University/Chico)*
offers FREE Title 24 Nonresidential training on fenestration
at the following locations and dates:

PG&E Energy Training Center in Stockton
To Register for classes:
e-mail or call Janet Gouvea at
jgouvea@csuchico.edu Phone: 1-530-898-6297

February 17, 2005
8:30-10:00 & 11:00-12:30

March 17, 2005
8:30-10:00 & 11:00-12:30

May 2, 2005
8:30-10:00 & 11:00-12:30

June 20, 2005
8:30-10:00 & 11:00-12:30

SoCal Energy Resource Center
To Register for classes:
Internet: *http://www.socalgas.com/erc* or *ERC@socalgas.com* Fax: 1-562-803-7551
Phone: 1-800-427-6584 - press option one.

January 20, 2005
10:00 to 12:00 and 1:00 to 3:00

February 3, 2005
10:00 to 12:00 and 1:00 to 3:00

May 12, 2005
8:00 to 9:30 and 10:30 to 12:00

June 24, 2005
8:00 to 9:30 and 10:30 to 12:00

San Francisco Pacific Energy Center
To Register for classes:
e-mail or call Janet Gouvea at
jgouvea@csuchico.edu Phone: 1-530-898-6297

February 18, 2005
9:00-11:00

March 18, 2005
9:00-10:30 & 11:00-12:30

May 6, 2005
9:00-10:30 & 11:00-12:30

June 17, 2005
9:00-10:30 & 11:00-12:30

The Blueprint is published electronically and distributed by e-mail or on the web.

To subscribe call the Energy Hotline at: (800) 772-3300 or e-mail us at: CECblueprint@energy.ca.gov

The Blueprint is also currently available on the internet in pdf format at: www.energy.ca.gov/efficiency/blueprint

ENERGY EFFICIENCY AND DEMAND ANALYSIS DIVISION

BLUEPRINT

SEEKING EXCELLENCE

Brad Remp, Ruben Barrera and Mark Berg talk about the Community Energy Efficiency Program. The second in a two-part series **– page 4**

COMPLAINTS

and how the Commission pursues them – page 2

Questions and Answers

Residential

Q *Does fiberglass insulation have to be kraft faced for residential compliance?*

A No. Unfaced insulation is completely satisfactory in most areas of the state, and usually will be easier to install to establish a friction-fit between framing members without leaving gaps. If the insulation is kraft faced, the paper side must face the conditioned space to avoid moisture problems.

Q *I want to remodel the lighting in my kitchen, replacing the old built-in fluorescent "light box" lighting system with recessed can lights. Do the Standards have any requirements for this alteration?*

A Yes. Section 152(b)1 of the Standards requires the newly installed kitchen lighting equipment to meet the applicable requirements of Section 150 (k), including an efficacy of not less than 40 lumens per watt. The lighting must provide a sufficient light level for basic kitchen tasks, and must provide a uniform pattern of illumination. Pin-based fluorescent lighting systems meet the lumens per watt requirements. Screw-based fixtures that accommodate incandescent bulbs, even if they are equipped with screw-in compact fluorescent lamps, do not qualify. Also, the general lighting must be switched on a separate switch from the non-high efficacy lighting. *For additional guidance on general lighting in a kitchen please refer to Blueprint # 62 at:*

www.energy.ca.gov/efficiency/blueprint/pdf/2000_62_SPR_BLUEPRINT.PDF

COMPLAINTS

and How the Commission Pursues Them

A few years ago there was a construction defect lawsuit settled for $55 million in the Coachella Valley. Though the bulk of the money paid by the builder went for things unrelated to the Energy Efficiency Standards, it got started because someone could not cool off a back bedroom. This is a problem that could be avoided through compliance with the Energy Standards, particularly third party verification of duct sealing.

Let's take a look to see how the California Energy Commission is trying to help the industry avoid such unpleasant situations.

Recently, a builder had chosen the option of "sealed ducts" for his compliance with the *Energy Efficiency Standards for Residential and Nonresidential Buildings* at a subdivision, again in the Coachella Valley. In the first phase of the subdivision, the building department inspector had asked the superintendent on the jobsite for information regarding the HERS rater that the builder was planning to use. This is exactly what the inspector should have done. He was attempting to do his job.

Right about that time (March 2004), a staff member of the Commission visited the building department to discuss information received by the Commission that some of the Coachella Valley jurisdictions were not thoroughly enforcing the third party verification requirements. The inspector assured the Commission staff that he, the inspector, was "on top of the situation" and was diligently enforcing the Standards.

In late July the Commission was told by a Coachella valley resident that there were literally thousands of permits — issued or in the process of being issued — in the jurisdiction in question. It was very likely that all or most of those houses would need to use third party verification of duct leakage for compliance credit or they wouldn't comply. We were also told that this particular jurisdiction was not enforcing this code item on any of the houses currently being built.

This obviously conflicted with the information previously given to Commission staff. Therefore, an e-mail was written to the jurisdiction, describing the complaint by the Coachella valley citizen. Notified by the building official, the inspector subsequently called the Commission. The inspector said that he thought the Commission should make duct testing mandatory. He said that as soon as he saw the e-mail from the Commission he went to the job site of the builder who had been non-responsive regarding getting the required HERS rater

verification and the CF-4R signed-off. This time, the inspector said, the builder promised to get a HERS rater and comply with the law.

Knowing that the inspector's time is very valuable and the number of houses under construction was daunting, Commission staff asked if the inspector would agree to having a local HERS rater known to the building department make an appointment, and free of charge, look over all the projects. The HERS rater would make sure that there were no errors on other projects' energy documentation and provide demonstrations, for the inspector and the rest of his staff, of duct blasting and other HERS verification procedures. The inspector agreed.

When informed that the building department would like to have some training, and have the public-record plans reviewed for compliance, the HERS rater was happy to accommodate the request. He set up a demonstration and checked all of the energy documentation for the jurisdiction, making sure that site inspectors were correctly notified by plan check when CF-4R's were required on other projects.

As a result, the rater found out that there were several other subdivisions that required HERS field verification. The inspector and his staff were unaware that it had been missed in plan check and were grateful for the HERS rater's assistance. The HERS rater also demonstrated to the building department his competence, ability, and willingness to be of service to the building department.

Additional notices were given by the inspector and his staff to local builders who had chosen, as an option in the performance compliance approach, to use third party verification to achieve compliance with the Standards. These builders were told to hire an independent third party HERS rater according to the Commission's requirements, and to have the building inspectors notified when the rater was testing so the inspector could observe the tests. The builder was also given the choice of revising the energy calculations to try to achieve compliance in some way other than through measure requiring third party verification.

Everybody won in this complaint investigation. The Commission is not interested in penalizing building departments, only in helping them enforce the Standards. If you are a HERS rater, keep informed of what is happening in your area. If you suspect that a subdivision being built should be getting tested, check with your provider first (CalCerts or CHEERS) to make sure that another rater doesn't already have the job, then check with your local building department.

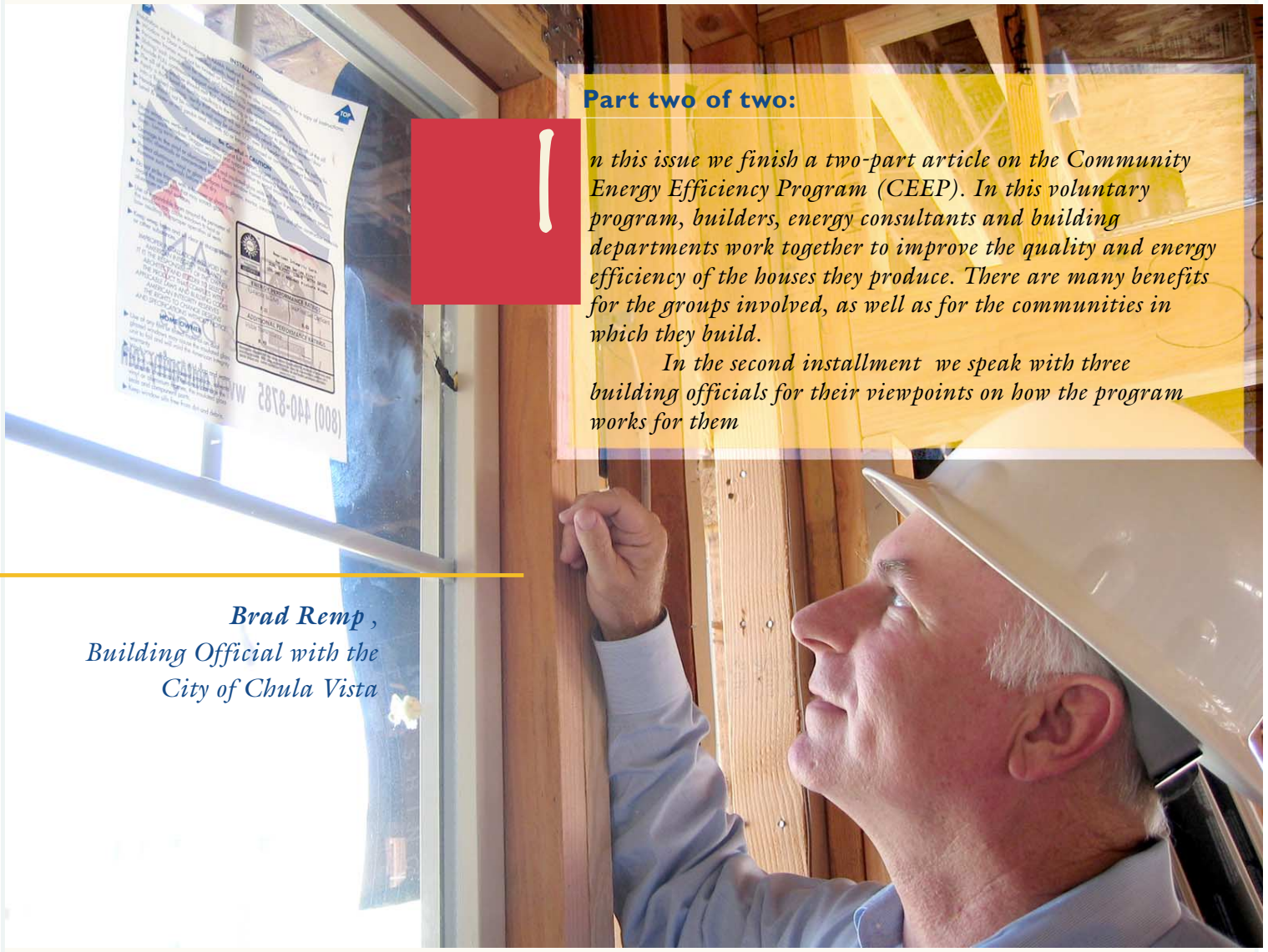
Talk with the building department staff about the importance of third party verification. Offer a free demonstration of the tools you use to verify compliance. Ask if you can look at the documents for the subdivision in question. Help the building department enforce the code. If, for some reason, you are unable to resolve the matter through your own efforts, contact the Energy Commission with your concerns. We will follow up, find out what is going on and assist the jurisdiction to enforce the law.

If, on the other hand, you are a staff person for a building department and you are having difficulty enforcing the third party verification, contact the Commission. We will make an effort to help in any way we can.

For more information, contact the Commission's Hotline at the special telephone number for building departments only, 1-800-PLAN-CHK (800-752-6245) or John Eash at jeash@energy.state.ca.us.

SEEKING EXCELLENCE

The fourth in a series of articles about building department employees, builders, energy consultants, HERS raters and others who are making exemplary efforts to achieve energy efficiency in buildings.



Part two of two:

In this issue we finish a two-part article on the Community Energy Efficiency Program (CEEP). In this voluntary program, builders, energy consultants and building departments work together to improve the quality and energy efficiency of the houses they produce. There are many benefits for the groups involved, as well as for the communities in which they build.

In the second installment we speak with three building officials for their viewpoints on how the program works for them

***Brad Remp**, Building Official with the City of Chula Vista*

Blueprint: *How did the CEEP program come to your attention?*

Remp: First, it is important for us that the City of Chula Vista is recognized as a leader in energy conservation. In fact, we were one of the few cities in the world that was a party to the Kyoto Accord to avoid Global Climate Change by committing to reduce CO_2 emissions. We have an active CO_2 reduction plan that includes energy conservation measures in new construction.

So here's how CEEP came about for Chula Vista: approximately four years ago the city manager's office applied for and received a Federal grant from the EPA to help us move forward on a CO_2 reduction plan. A major component of that was to increase the energy conservation measures that were going to be introduced in new construction, primarily residential. We realized we had some real opportunities because our new residential growth was exploding. We did a little research to figure out who was involved in a program like the one we envisioned. At that point we crossed paths with George Burmeister and the representatives from ConSol, and we found them to be extraordinarily helpful because of the contacts they had, and they were enthusiastic about trying to find a way to help us. We ultimately generated the GreenStar Building Energy Efficiency program, which makes sure that we design buildings and construct them in such a way that they substantially exceed the Title 24 energy requirements. In the beginning we just paired up with ConSol and the CEEP program.

The expertise that ConSol and George brought to the table was particularly beneficial. They offered a number of training programs for us. They were willing to listen to us as building officials, and address our needs to be able to sell a program to builders and to the rest of the community.

Probably the one thing that Chula Vista stands out for is that, as part of the CO_2 reduction program, our planning process includes an air quality management review. As a result, all of our major projects have to put together an air quality management report.

One of the ways in which we were able to help sell the program to developers was to say, if you voluntarily agree to commit to having at least 50 percent of your houses comply with a GreenStar program, then we will automatically consider that the significant portion of your responsibilities on the planning side for air quality management would be met.

What we were really trying to do was start the discussion at the very beginning of the planning process, when more options are available. This meant we had to get outside of our perspective as building officials and really work with our planners and the developers' advance people to encourage them to consider energy conservation at the very beginning of the project. But we had to find some way to reward them for doing it.

Blueprint: *What did you try to accomplish?*
Remp: Well, there wasn't a template to follow, and that's a scary thing in the planning arena. As a developer, you can throw an awful lot of money at something in hopes that ultimately it will be approved. This program gave some predictability. That's what developers really wanted – predictability, so they could anticipate early on what it was going to cost, instead of finding out at the end of the process that they'd committed to something that they really didn't understand and that would have a significant financial impact on them. Predictability was a real reward for them.

Blueprint: *So – predictability – having a concrete plan that guaranteed meeting air quality standards – was a terrific reward for the developers. Did you offer any other incentives?*
Remp: Yes. From the more practical standpoint of the plan check, inspection and approval process, we made a commitment early on that if they conformed with one of our approved programs, we'd expedite plan check. We would take at least a week off plan check.

Blueprint: *Out of how many weeks?*
Remp: Typically, three weeks. We would reduce that to two weeks, and once we started the program, we found we were doing even better than that. That exceeded many builders' expectations. And it wasn't that difficult for us as a city – to get building and planning and engineering and fire, everybody who had to review plans – to get all of them on the same track. The Chula Vista City Council had made it quite clear that we are an environmentally sensitive community; this is one of the ways we could demonstrate that to the people we work with.

Blueprint: *Are there other programs under GreenStar than just CEEP?*
Remp: We've got three different ways to comply: the CEEP program based on ComfortWise was the real kickoff; SDG&E's Energy Star program, which offers a financial rebate; and the third, a custom designed program that documents how the structure will exceed Title 24 requirements by 15 percent.

Blueprint: *How many homes have been built under GreenStar?*
Remp: Over the last approximately three years we've seen 2,400 units, some of which are under construction right now. We have one project where Steve Padilla, Chula Vista's mayor, is buying a house.

Blueprint: *Do you think these programs produce a better built product?*
Remp: Absolutely. And one of the other major benefits — I get feedback from my staff all the time on this — is that staff appreciated the training that was offered through the program.

Blueprint: *That's for both plan checkers and field inspectors?*
Remp: Right. We had ConSol come here and try out their new training program, so we had a chance to participate in how it was crafted. The feedback from the staff — both the plans examiners and inspectors — was very positive. They appreciated the technical way it was presented, and they came away with a much better understanding.

For developers who participate in the program, we also find that the quality of the plans is much greater. Now we're dealing with professionals, in most cases mechanical engineers, so that the level of detail we have to go through in a plan check is significantly less. In the event that we do find issues, they can be resolved very quickly, very professionally. And we appreciate it.

"Too often we don't realize that, from a day-in and day-out standpoint, we can make a much bigger impact on the overall effectiveness of a building by concentrating on things like energy conservation – elements where you don't have to wait for a disaster before you see the benefit."
— Brad Remp

Blueprint: *Did you have someone quantify energy savings and then translate them into CO_2 savings?*

Remp: That's where ConSol really helped us out. We weren't exactly sure how to go, but they put us in touch with some outside consultants. They helped us separate things that were doable from things that were just not worth pursuing.

Blueprint: *And that was important?*
Remp: Yes, we didn't want to over-promise on the program. The guys from ConSol really helped ground us, helped us know that our expectations

in some cases were well beyond anything that could be achieved. As a result, we became more realistic. We ultimately ended up with our GreenStar program, a CEEP-based program, so that we could actually get those kinds of results. They were measurable and we were prepared to do some kind of a monitoring program in the future.

Blueprint: *One thing that George Burmeister brought up: City Councils value programs that cause energy bills to be less, leaving residents with more pocket money. George calls it "money for the malls." Homeowners get to spend more money in the local economy so there's a community benefit. Do you have any sense of that?*
Remp: Anything that cuts the cost of home ownership helps. Many of the lending companies are recognizing this, and will actually give home buyers a larger loan. The lenders realize that with this program the buyer's overall monthly energy payments will be lower.

There's another societal benefit. Much of what we do as building officials, inspectors, and plans examiners is making sure buildings will comply in the event of a major catastrophe – a fire, or an earthquake, or a flood or something like that. Too often we don't realize that, from a day-in and day-out standpoint, we can make a much bigger impact on the overall effectiveness of a building by concentrating on things like energy conservation – elements where you don't have to wait for a disaster before you see the benefit. You see it day in and day out … you could just spend a little more time and get it right.

THE FIVE ELEMENTS OF CEEP

1. The house's HVAC system must be designed to requirements of the Air Conditioning Contractors of America (ACCA), Manuals J, D, and S. The design must be stamped by an engineer registered in California, and the system must be installed according to the design.
2. A computer analysis must show that the house meets Energy Star requirements.
3. The house's ducts must meet the Energy Commission's tight duct requirements.
4. The Building Industry Institute's "Scopes of Work" must be followed for insulation, windows, and HVAC.
5. A third-party verification of all energy features must take place, including duct blaster and blower door tests and inspection of caulking, insulation, water heating, and more.

Ruben Barrera,
Chief Building Official, City of Santa Clarita at "The Colony" – a completed Centex Homes CEEP project in Santa Clarita.

Blueprint: *How did the CEEP program come to your attention?*
Barrera: Before it was officially the CEEP program, I received a call from George Burmeister who was interested in exploring such a program. He asked me if I was interested in participating on the advisory committee for the California Building Industry Association (BIA) group which was thinking about having BIA and building jurisdictions partner in an energy efficient building program.

Blueprint: *Did you already have an interest is such a program?*
Barrera: Yes. The City of Santa Clarita did have a

CALIFORNIA ENERGY COMMISSION

request by the City Council to explore opportunities to create green building programs, or practices, or policies. But we didn't really have anything in the works along the lines of CEEP. When I received this call from George and he explained what they wanted to do, I said, "It fits right in with what we're exploring. It's a perfect opportunity."

"...this is what we intended to do all along: create incentives for developers to participate voluntarily, so that slowly we'd get a lot of participation. As buyers become more aware, market conditions change so that developers will want to build beyond the energy code, only because the market demands it, not because we're creating incentives."

–Ruben Barrera

Blueprint: *How long ago was that?*
Barrera: That must have been five or six years ago, right at the beginning. I shared my ideas and had several meetings with advisory group participants; we felt that if some of those ideas were molded into the program, it would work for us. So we put something together that I took to the City Council and other department heads and got buy-in right away. We also went through the process of taking it before a public meeting of the City Council.

Blueprint: *Did you get much feedback from the public at that meeting?*
Barrera: A few contractors, and developers attended and gave us their insight and their feedback. George Burmeister put together an informational PowerPoint presentation. The developers thought it was an interesting concept. Some said if there were incentives, and those were just right, they would be very interested in participating. They gave us some ideas of what those incentives might be. Reduced plan check time was a big one because it would really save them a lot of money in the end.

Blueprint: *In addition to the reduced plan check time, what other rewards were they interested in?*
Barrera: One of the things we offered was a 10 percent discount on their plan check fees. We limited it to four houses per development or a maximum of $1,000 total plan check fee credit. We did that as an initial incentive program for two years. After that we only maintained our plan check turn around time incentive.
We also said we'd give them recognition through some kind of public event that would acknowledge their efforts. It was free publicity. The main item, though, was the reduction of plan check turn-around-time because that really turned it into dollars.

Blueprint: *By how much were you able to cut that time for them?*
Barrera: Generally speaking, it was by 50 percent or more.

Blueprint: *When you got CEEP under way, did you require all builders in your jurisdiction to be part of the program?*
Barrera: No, we made it strictly voluntary.

Blueprint: *How many homes have been built under the CEEP program in Santa Clarita?*
Barrera: We're estimating between 300 and 400 homes.

Blueprint: *How difficult (or easy) is it for your department to oversee the CEEP requirements?*
Barrera: All of the CEEP requirements were fairly easy from our perspective. We were just looking for reports and completion certificates, and we were done.

Blueprint: *Do things go more smoothly through the permitting and field checking processes?*
Barrera: I think they do because the developer provides very well-detailed plans and mechanical drawings prepared by an engineer. We were a little concerned about that early on. What's this going to do to our process? How's it going to

impact our staff? How much time is it going to demand from our inspectors and plan checkers? After we did our first CEEP home, we realized it was a fairly easy process to implement.

Blueprint: *Do you think the homes in this program were better built than other homes?*
Barrera: I really do think so. I think that the developers that were willing to go with CEEP were looking for more quality in their homes and were willing to spend a little bit of extra time and money to make it happen. I think the incentives helped, but I think, in the end, they realized it was something they wanted.

Blueprint: *Do you know in advance when a CEEP project is coming?*
Barrera: Yes, because we ask the developer to submit a letter of intent to participate in CEEP. If we're going to give them a quick turnaround, we want to make sure that they are committed to it. Once they submit the letter, which comes to me, we start planning ahead to process the project as a CEEP project.

Ruben Barrera and the City of Santa Clarita's ACES (Assuring Compliance with the Energy Standards) award for their pioneering effort to launch CEEP

Blueprint: *We're interested in hearing about success stories that came out of this either for the builders, for your department, or for your community.*
Barrera: Before the real estate market got so hot in Santa Clarita, one CEEP tract really sold out quickly, faster than was expected even by the developer. It ended up being a very high quality construction job. People were just impressed with the homes. The developer used the fact that they were in the CEEP program in the sales literature.

Another success for us was that Santa Clarita was one of the first cities that adopted CEEP, so it made us look very good. It showed we were being proactive with our policies, and I think it put a positive light on our building department. Any positive press we can get is always good; you know, we're in the enforcement business.

Blueprint: *You get knocked around some?*
Barrera: We get knocked around quite a bit. When we originally came to the City Council with the CEEP concept, they really weren't expecting it. I think they felt, 'Wow, we're glad you're doing this, let's approve it." Then of course, the Energy Commission came later (1999) and awarded the city with an ACES award [Assuring Compliance with the Energy Standards] and again that reinforced the whole program and brought to light again to the City Council that it was successful.

There was another good thing that happened. When those blackouts came in 2000 and 2001 with the energy crisis, we were able to say, "We already have CEEP; we've already done something before blackouts even happened." Again, it really made us look proactive … bragging rights, you know? It was a non-tangible benefit that we weren't really anticipating.

Another thing I noticed, maybe a year and a half ago - I was in the LA County unincorporated area, looking at some new model homes. I noticed that a lot of the homes being built in this new tract in the County area (outside of our jurisdiction) were being built to CEEP. At the time the County did not have a formal CEEP program. I think the developer was doing it anyway.

Blueprint: *Do you think the builder was just interested in building that way?*
Barrera: Yes. And this is what we intended to do all along: create incentives for developers to participate voluntarily, so that slowly we'd get a lot of participation. As buyers become more aware, market conditions change so that developers will want to build beyond the energy code, only because the market demands it, not because we're creating incentives. And it seemed that in this development it was beginning to happen.

Mark Berg,

Riverside County Building and Safety, Principal Building Inspector

Blueprint: *How did the CEEP program come to your attention?*
Berg: Approximately two years ago, in 2002, the former Director of Building and Safety came to me about the CEEP program. He had already received approval from both the Board of Supervisors and County Council for joining the CEEP program in February 2001. He asked me to take it over and start working on it.

Blueprint: *How hard was it to 'sell' to the Council and Board of Supervisors?*
Berg: Not hard at all, they wanted the department to explore different opportunities to create a building program to help build more energy efficient communities. We didn't really have anything in the works along the lines of CEEP, other than the ComfortWise program that was already in place. The Board of Supervisors are very customer service oriented, and they really want the department to try to find ways to help the development community out. They tend to do everything they can to get projects going in the right direction from the start.

Blueprint: *The City of Chula Vista offers reduced plan check time to the developers on CEEP projects. Do you at Riverside County do the same?*
Berg: Yes we do. We will expedite the plan check process which will usually cut about a week or two off the plan check process. Our normal plan check is four to six weeks now; cutting that much time off the plan check time really helps out with the schedules of the development community.

Blueprint: *Does it seem that a program like CEEP results in better-built homes?*
Berg: I really think so. I feel that the developers that went with the program were looking for more quality in the homes they were building and were willing to spend a little bit of extra time and money to make it happen. Looking at the five CEEP requirements for the program, which includes tight duct systems and the HVAC system using the ACCA design method, we are getting a better product. Having the HERS verification along the way assures us that we are getting good compliance with the California Energy Standards.

I received a call from George Burmeister after I took over, and he explained to me what they wanted us to do for the program, I said, "It fits right in with what we want to accomplish for the community from the Board's standpoint."

Blueprint: *Do you have any sense that your plan checkers or field inspectors involved with the CEEP program have become more aware of energy features in homes and the quality of*

installation of items such as insulation?
Berg: In my opinion, yes, because CEEP goes above the normal requirements for energy for the state. The plan checkers are required to verify some of the upgrades like better windows, insulation and tight ducts during the plan check process and again in the field during the inspections.

"I can testify myself that the stricter requirements work, I just replaced all the windows in my house, went to low-e vinyl windows, and re-insulated the ceiling. My electricity cost has gone down significantly over the last two months."
— Mark Berg

Blueprint: *Before CEEP, was your jurisdiction as aware of the energy code when your field inspectors and your plan checkers were looking at those features?*
Berg: Yes, especially with AB 970 and new stricter requirements in 2001 Energy Requirements. We started do some ride along with our building inspectors, showing them the proper insulation requirements, making sure we were getting the proper solar heat gain coefficient and U-Factors on the windows; making sure the contractors were placing the polyseal foam in the right locations around windows, doors and plate penetrations into the attic area. At final inspection, we made sure the building inspectors were checking that the proper equipment was being installed according to the CF-6R forms.

We were also requiring that the Insulation certificates were posted in the garages for the building inspector to review. I was hired to be the Chief Plumbing, Mechanical, and T-24 Energy inspector here at the County of Riverside, and we were starting to do a lot of training to raise awareness with our plan checkers, to make sure we got the proper energy documentation at plan check submittal time. So we have been trying to do our "due diligence" to try to meet the strict energy requirements.

Blueprint: *What motivated that?*
Berg: What really brought it to my attention was talking with Scott Johnson approximately 10 years ago. I've known Scott for many years. I first met Scott when I worked for the City of Temecula, and Scott did a demonstration on the duct blasting system and showed us how we were not meeting the minimum state requirements for duct leakage and that insulation installation should be innstalled to achieve it's intended benefit. Several years later I was working for the City of Irvine, and Scott came down several times and provided a lot of teaching about quality home energy construction using diagnostic testing and verification. Scott is very knowledgeable in this area.

Blueprint: *And you do this because you see some benefit?*
Berg: I definitely see benefit. With the increased better insulation in the walls and ceiling, better windows with the low-E glass, etc., this helps reduce the amount of summer heat going into the house, which in turn reduces the energy cost to the homeowner. Because of the reduced heat going into the house, the HVAC mechanical equipment does not have to work as hard to cool down the houses in the heat of the day. With the average temperatures we have during the summer in Riverside County, any reduction of energy cost that we can pass on to the homeowner helps. I can testify myself that the stricter requirements work, I just replaced all the windows in my house, went to low-e vinyl windows, and re-insulated the ceiling. My electricity cost has gone down significantly over the last two months.

Blueprint: F*or air conditioning?*
Berg: Yes my HVAC system does not run as much during the day as it used to before changing the windows and re-insulating the attic. I definitely noticed a difference in my electricity cost, which has gone down significantly over the last two months. I know, I've done it myself and I can tell everyone the benefits of doing the program.

The California Energy Commission does not endorse any products, supplier, manufacturer or builder. The text in this interview is meant to be informational and not all inclusive.

SWITCH!

TO THE 2005 RESIDENTIAL LIGHTING REQUIREMENTS

The Energy Commission and the California Building Industry Association are encouraging builders to be early adopters of the residential lighting portion of the 2005 Energy Efficiency Standards.

Prior to the October 1, 2005 effective date of the new Standards, home builders who comply early with the residential lighting standards portion of the *2005 Building Energy Efficiency Standards* will recieve a performance standards compliance credit. They can use the credit as a trade-off using the Performance method of compliance to compensate for features that would otherwise cause their houses not to comply.

The credit is 1.5 kBtu/ft^2 for eligible residential buildings. To achieve the credit the houses must be field verified by a certified HERS rater to comply with the residential lighting standards portion of the *2005 Building Energy Efficiency Standards,* in combination with the mandatory lighting requirements in the current Standards. The building department should not approve the building until they receive a copy of the Supplement to Form CF-4R that has been signed and dated by the HERS Rater.

The new limited-term Compliance Option for early compliance is available for complying residential lighting systems for which a building permit application is submitted prior to the October 1, 2005, effective date of the 2005 Standards. Information about this option is available on the Commission's website at: http://www.energy.ca.gov/2005_standards/early_compliance/index.html

Air tight requirements: Inspection Protocol for Recessed Luminaires in Insulated Residential Ceilings

Starting on October 1, 2005 for all residential applications, and starting immediately for those projects applying for the residential lighting early compliance credit, luminaires recessed in insulated ceilings must:

- *be IC rated*
- *have a label certifying airtight or similar designation to show air leakage less than 2.0 CFM at 75 Pascals when tested in accordance with ASTM E283. The label must be clearly visible for the building inspector, and*
- *have a gasket or caulking between the housing and ceiling to prevent the flow of heated or cooled air between conditioned and unconditioned spaces.*

The ASTM E283 certification is a laboratory procedure that measures leakage of the luminaire housing or, if applicable, of an airtight trim kit. However, the lab procedure does not guarantee that the luminaire is installed properly to be airtight. The luminaire manufacturer must provide instructions that explain how the entire assembly is required to be installed to achieve an airtight installation.

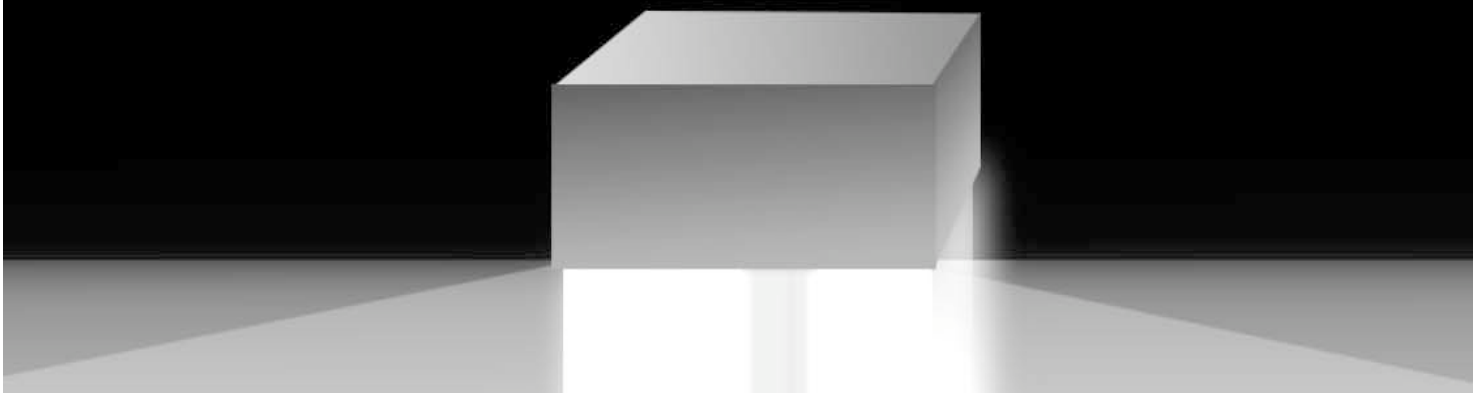
The intent of the Standards requirement is to have certified airtight luminaires installed so as to prevent the flow of heated or cooled air between conditioned and unconditioned spaces. All air leak paths through the luminaire assembly or through the ceiling opening must be sealed. Leak paths in the installation assembly that are not part of the ASTM E283 testing must be sealed with either a gasket or caulk. For example, for assemblies where a certified airtight luminaire housing is installed in an adjustable mounting frame, all air leak paths between the certified airtight luminaire housing and the adjustable mounting frame must be sealed, either with a gasket or caulk.

The poster for the program.

Q ***How does the early compliance option work? Who gets the credit?***

A To qualify for the early compliance credit, one of the Energy Commission approved computer compliance programs must be used. A C-2R form will be generated by the computer program. On the C-2R form a "standard" design will be compared to the "proposed" design. The "standard" design generated by the computer program will establish an energy budget in kBtu per square foot. Without the early compliance credit, the proposed design cannot use more energy (kBtu/ft^2-Yr) than the standard design. However, with the early compliance credit (until October 1, 2005) the proposed design can use as much as 1.5 kBtu per square foot more than the standard design, as long as all of the requirements of the early compliance credit are met.

Submitting Adjustments to Default Outdoor Lighting Zones:



Lighting Zone Adjustments by Local Jurisdiction

The Energy Commission adopted changes to the Title 24, Parts 1 and 6, Building Energy Efficiency Standards on November 5, 2003. These new Standards are scheduled to become effective on October 1, 2005. Included in the changes to the Standards are new requirements for outdoor lighting. The Standards contain lighting power allowances for newly installed equipment and specific alterations that are dependent on which "lighting zone" the project is located. Existing outdoor lighting systems are not required to meet these lighting power allowances. However, alterations to existing outdoor lighting systems, which increase the connected load, or replace more than 50 percent of the existing luminaires, must meet the lighting power allowances for newly installed equipment.

The Standards base the lighting power that is allowed on how bright the surrounding conditions are. As eyes adapt to darker surrounding conditions, less light is needed to properly see; when the surrounding conditions get brighter, more light is needed. The Standards allow the least power in Lighting Zone 1, and increasingly more power in Lighting Zones 2, 3, and 4. It should be recognized that providing greater power than is needed can lead to debilitating glare, and to an increasing spiral of brightness as over-bright projects become the surrounding conditions for future projects. Overly bright conditions cause unnecessarily greater power use and energy waste.

The Energy Commission sets statewide lighting zones. However, local jurisdictions (usually a city or county) may change the zones to accommodate local conditions. When a local jurisdiction adopts changes to the lighting zone boundaries, it must follow a public process that allows for formal public notification, review and comment about the proposed change. The local jurisdiction also must provide the Energy Commission with detailed information about the new Lighting Zone boundaries, and submit a justification that the new lighting zones are consistent with the specifications in Section 10-114 of the Standards. The Energy Commission will maintain on it's website a list of locally adopted adjustments to the lighting zones.

Online Energy Training Videos

Over 100 videos on a variety of energy topics are available both at:

www.energyvideos.com or
www.ConsumerEnergyCenter.org/videos/


BLUEPRINT

SEEKING EXCELLENCE
Brad Kemp, Ruben Barrera and Mark Berg talk about the Community Energy Efficiency Program. The second in a two-part series – page 4

COMPLAINTS
and how the Commission pursues them

Questions and Answers

Residential

Q *Does fiberglass insulation have to be Kraft faced for Residential compliance?*

A No. Unfaced insulation is completely satisfactory in most areas of the State, and usually will be easier to install to establish a friction-fit between framing members without gaps. If the insulation is Kraft faced the paper side must face the conditioned space to avoid moisture problems.

Q *I want to remodel the lighting in my kitchen, replacing the old built-in fluorescent "light box" lighting system with recessed can lights. Do the Standards have any requirements for this alteration?*

A Yes. Section 152 (b) 1 of the Standards requires the newly installed kitchen lighting equipment to meet the applicable requirements of Section 150 (k), including an efficacy of not less than 40 lumens per watt. The lighting must provide a sufficient light level for basic kitchen tasks, and must provide a uniform pattern of illumination. Pin-based fluorescent lighting systems meet the lumens per watt requirements. Screw-based fixtures that accommodate incandescent bulbs, even if they are equipped with screw-in compact fluorescent lamps, do not qualify. Also, the general lighting must be switched on a separate switch from the non-high efficacy lighting. For additional recommendations on general lighting in a kitchen please refer to Blueprint # 62 at: www.energy.ca.gov/efficiency/blueprint/pdf/2000_62_SPR_BLUEPRINT.PDF

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The Blueprint is published now only electronically and distributed by e-mail or on the web.

To subscribe call the Energy Hotline at:
(800) 772-3300 or e-mail us at:
CECblueprint@energy.ca.gov

The Blueprint is also currently available on the internet in pdf format at:
/www.energy.ca.gov/efficiency/blueprint

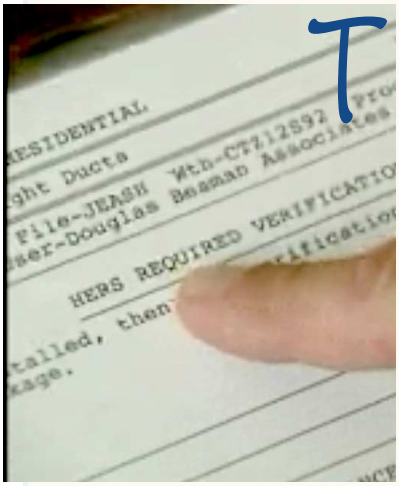
Did you know?

Special information for

Building Officials

"CF-4R – Don't "final" the house until you have a completed copy of it!"

And don't forget - the HERS rater must be independent - not associated with the project builder's company or the HVAC company!



The *CF-4R* is the form completed by a HERS Rater third party special Inspector) – required whenever the builder chooses to use third party field verification to achieve compliance with the Energy Code.

The *CF-4R* is very important because big compliance cedit is given for having systems third party verified and the *CF-4R* proves that verification was done.

Protect the consumer!

The CF-4R

All you need to do is:
Have your inspectors ask the builder for a final copy signed by an approved HERS rater.

For a training video on "Enforcement of HERS Ratings" go to:
http://www.consumerenergycenter.org/videos/residential/CHEERS_HERS/code

BLUEPRINT

TRAINING:

Title 24 Energy Efficiency Standards Training

Links for training on issues relating to California Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24, Part 6) is available on the Energy Commission's web site at:
www.energy.ca.gov/title24/training

For training offered by the utility companies and other organizations please see the following websites for training opportunities.

PG&E: *www.pge.com/stockton*
For information on training in Early Compliance Credits for Residential Lighting conducted by Doug Beaman:
www.pge.com/003_save_energy/003c_edu_train/stockton/programs/res_lighting_credit.pdf

SoCal Gas & SDG&E: *www.socalgas.com/business/resource_center/erc_seminar_info.shtml*

SCE: *www.sce.com/sc3/002_save_energy/002f_ctac/002f3_work_classes/default.htm*

SMUD: *www.smud.org/education/index.html*
E&TC…SMUD Energy & Technology Center Lighting Programs:

Title 24 – 2005 Update on Lighting
Thursday, October 7 8:30 a.m. – 4:00 p.m.
(Pre-registration required) No charge
To register for either of these courses: www.smud.org/etc

CALBO Training Institute

EDUCATION WEEK

North	**South**
October 4 – 8, 2004	November 1 – 5, 2004
Concord Sheraton	Ontario Marriott

For additional information: www.calbo.org

Building Industry Institute (BII)

www.consol.ws/content.asp?sid=46

CABEC: 2004 CEPE Training & Testing schedule is now posted on the CABEC website at this link:
www.cabec.org/cepetrainandtest.php

You can now register for training and/or testing online at:
register.cabec.org/ceperegistration.php

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ENERGY EFFICIENCY AND DEMAND ANALYSIS DIVISION

BLUEPRINT

SEEKING EXCELLENCE

Rob Hammon, George Burmeister and Bob Raymer talk about the Community Energy Efficiency Program. The first in a two-part series – page 6

THE CF-4R

The right form for third-party field verification – page 15

Questions and Answers

Residential

Q *I am installing a fan coil unit in the hallway of a multifamily dwelling unit in a space constructed of sheetrock. The sheetrocked space is formed by the original hallway ceiling at the top, the hallway sidewalls, and sheetrock across the bottom of the space with a return grill mounted in the bottom sheetrock. Does a duct have to be installed connecting the fan coil return to the return register?*

A This type of installation may be used only when a fan coil unit is installed in a sheetrocked space that is constructed and sealed to meet the California Building Code (CBC), Title 24, Part 2, Volume 1. Section 310.2.2 of the CBC states that walls and floors separating dwelling units in the same building "… shall not be of less than one-hour fire-resistance construction between two dwelling units." Section 709.3.2.2 of the CBC states that when fire-resistive floor or floor ceiling assemblies are required, voids and intersections of these assemblies "...shall be sealed with an approved material."

Also, Section 150 (m) of the Building Energy Efficiency Standards states, "Building cavities, support platforms for air handlers, and plenums defined or constructed with materials other than sealed sheet metal, duct board or flexible duct shall not be used for conveying conditioned air."

There are two acceptable methods of complying with Section 150 (m) for the fan coil

Pictured at the right: A fan coil unit before installation and two photos of construction details.

space that is the subject of the question:

1. A return duct is installed between the fan coil and the return register.
2. The builder demonstrates that the sheetrocked space in which the fan coil is installed is not a plenum. In this case the duct in method "1" is not required.

The California Mechanical Code has the following definition of a plenum: "PLENUM is an air compartment or chamber including uninhabited crawl spaces, areas above ceilings or below a floor, including air spaces below raised floors of computer/data processing centers, or attic spaces, to which one or more ducts are connected and which forms part of either the supply air, return air or exhaust air system, other than the occupied space being conditioned."

To demonstrate that the sheetrocked space in which the fan coil is installed is not a plenum, the builder must demonstrate that it is part of the conditioned space. This fan coil space can be considered part of the conditioned space if it is demonstrated that

- the space is within the building envelope, and
- air leakage pathways (e.g., infiltration connections to building cavities) are sealed so that the space is more connected to the inside of the envelope than to the outside of the envelope.

There are two ways of demonstrating that air leakage pathways are properly sealed:

1. Construct the fan coil space so that an inspector is able to visually determine that the space has no leakage paths. No testing is required for this approach. The inspector must be able to inspect all joints and seams in the sheetrock, particularly horizontal seams that are above and below the sheetrocked bottom of the space, and to verify that no horizontal seams are behind the sheetrocked bottom or the mounting supports for the sheetrocked bottom of the space. The supports for the sheetrocked bottom must be mounted on the surface of the walls of the space and have sheetrock between the support and the wall framing.

   Any horizontal seam in the wall-mounted sheetrock must be a minimum of 1/2 inch below the lower surface of the sheetrocked bottom. Also any horizontal seam in the wall of the space above the sheetrocked bottom must be a minimum of 1/2 inch above the top of the mounting wood or metal brackets. This spacing is required to allow adequate room for taping the seam. All vertical sheetrock seams must be taped and sealed with joint compound or equivalent prior to the installation of the wood or metal brackets that support the dropped ceiling.

   All penetrations of this space, for example, refrigerant lines, water lines for hydronic heating, electrical (line voltage and low voltage) lines, sprinkler lines, and ducts, must be sealed with fire caulk or other approved sealing material as required by the building official.

   Ductwork that penetrates the sheetrock must use a collar that goes entirely through the wall cavity. These collars must extend at least two inches past the sheetrock on each side of the wall cavity. The collars must then be sealed to the sheetrock on each side of the wall. The ducts must be attached and sealed to the collar.

2. Show that there is no air leakage pathway that is more connected to the outside than to the inside by testing the leakage of the sheetrocked space as though it were a duct. For this test, seal the space and test it with duct pressurization equipment at a pressure of 25 Pa. If the tested leakage from this space is 10 cubic feet per minute or less, then the space may be considered to have no substantial leakage to outside the conditioned space (effectively zero within the instrumentation accuracy). The results of this test must be reported to the building official.

Please see the figures on the following three pages:

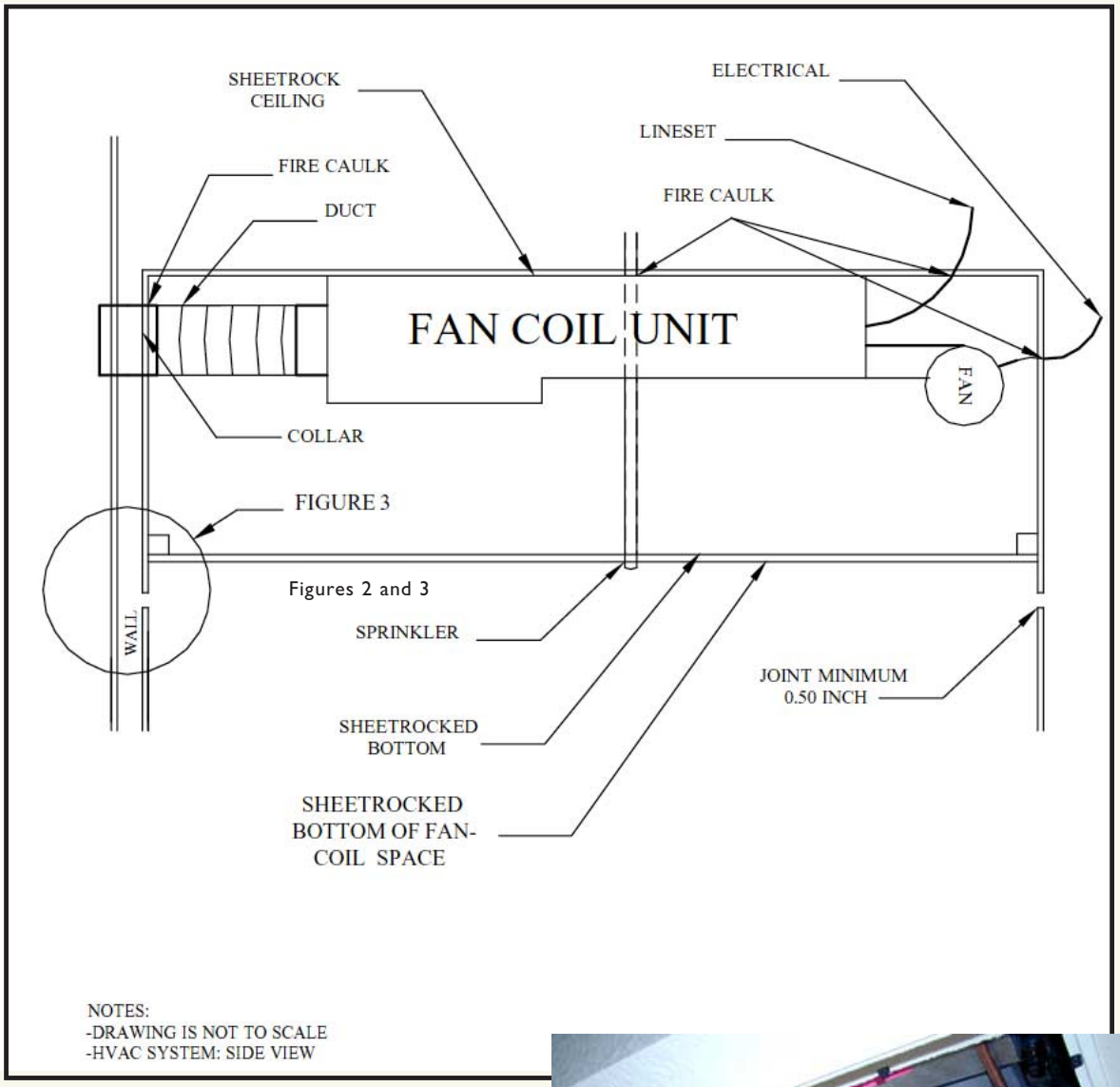


Figure 1. Cross-section drywall detail for fire code separation for multi-family, non-ducted ceiling returns for fan coil units.

Pictured here: A fan coil unit installed.

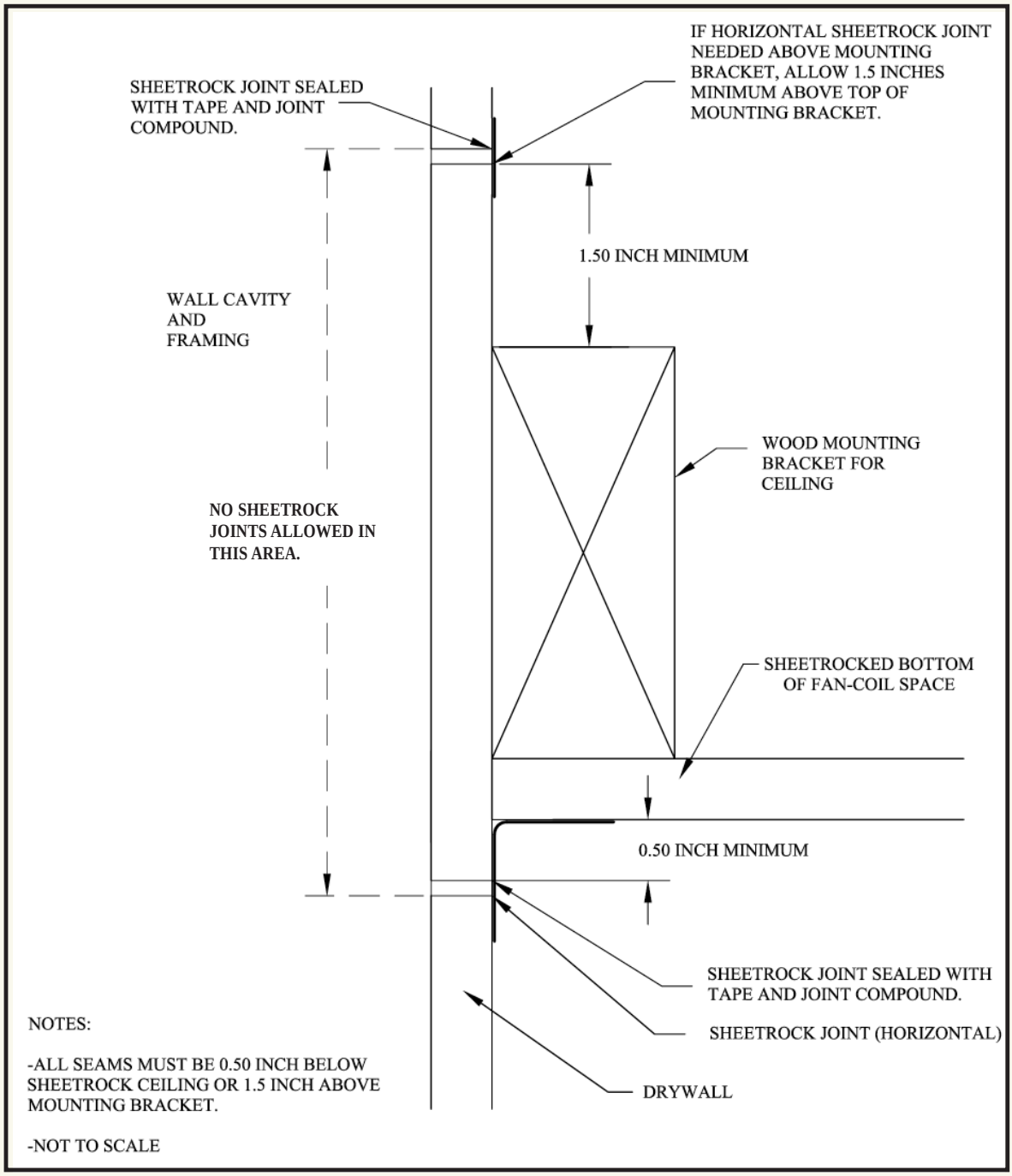


Figure 2. Cross-section drywall details for fire code separation for multi-family, non-ducted ceiling returns for fan coil units – Wood Bracket

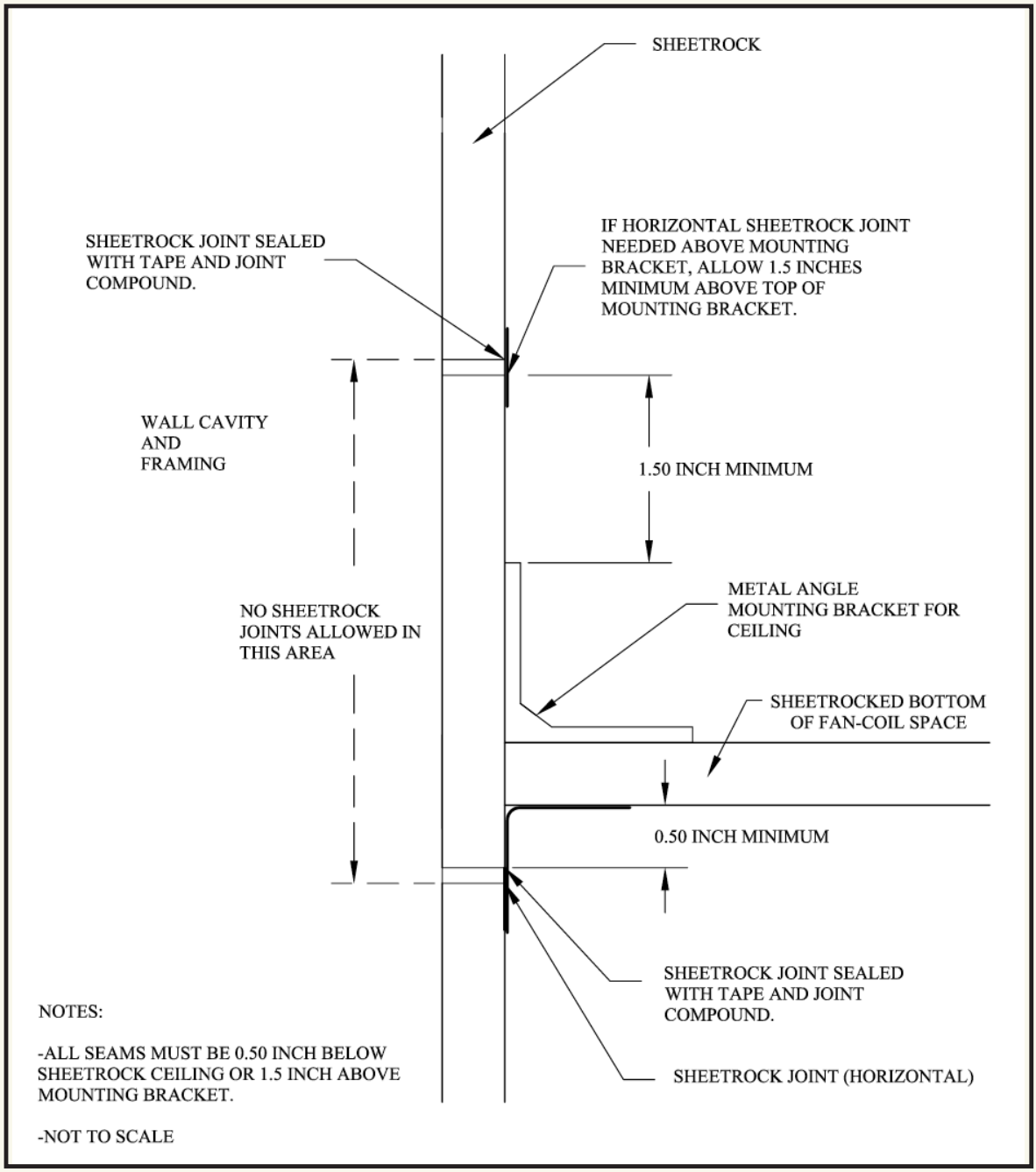


Figure 3. Cross section drywall details for fire code separation for multi-family, non-ducted ceiling returns for fan coil units – Metal Bracket

SEEKING EXCELLENCE

The third in a series of articles about building department employees, builders, energy consultants, HERS raters and others who are making exemplary efforts to achieve energy efficiency in buildings.

Part one of two:

In this issue we begin the first of a two-part article on the Community Energy Efficiency Program (CEEP). In this voluntary program, builders, energy consultants and building departments work together to improve the quality and energy efficiency of the houses they produce. There are many benefits for the individual groups involved, as well as the communities in which they build. Blueprint staff interviewed several participants for these articles. In this first installment we speak with three people: the director of the engineering team that developed the third party field verification program used by CEEP, CEEP's manager, and the Technical Director of the California Building Industry Association , which sponsors the CEEP Progam. In the next issue we will talk with a builder and a building department about how the CEEP program works for them.

Rob Hammon is a principal of ConSol, an energy consulting firm in Stockton, California. ConSol specializes in Title 24 compliance, training, and related builder programs. ConSol developed and administers in many jurisdictions the turnkey, third party field verification system that is at the core of the CEEP program.

Blueprint: What is the purpose of CEEP?
Hammon: CEEP's goal is to encourage builders to construct homes that are field verified by third-party HERS raters to be more energy efficient than the Title-24 Building Energy Effficiency Standards, that meet *Energy Star* requirements and that conform to the design and installation requirements covered by the Building Industry Institute (BII) scope of work protocols. CEEP is a program conducted through the Building Industry Institute(BII). BII is the research and education arm of the California Building Industry Association (CBIA).

Blueprint: How does CEEP work?
Hammon: Once a local jurisdiction adopts the program, the participating builder submits a CEEP documentation package instead of the normal Title 24 compliance documentation. The difference is the CEEP package shows both what the builders do to meet code and what they do to exceed code. They must install tight ducts and spectrally selective glass plus the other measures needed for the house to meet *Energy Star* standards (15% more energy efficient than Title 24). They also must have engineered mechanical system design and third-party HERS rater verification and diagnostic tests for all measures.

Builders have to follow BII's scope of work protocols for installation of insulation, building envelope air sealing, windows, and mechanical systems, which form the basis of what third-party raters need to verify and test. The raters check insulation for quality of installation and do a blower door test to check building envelope air sealing. They do a duct blaster test to check duct air sealing, and measure air flows at the registers and compare the results to the mechanical design to make sure the air flows are correct. They also check to see that air conditioners are "right-sized" to match sizing calculations.

This documentation is submitted to the building department. It documents the Title 24 energy features, the HERS rating for the as-built condition, and all the features that are in the as-built home. There's a section for the scope of work protocols, so that they're included and not just referenced in the document. The field verification guidelines are in the document, and the mechanical design is done in accordance with the Air Conditioning Contractors of America (ACCA) guidelines. So ACCA Manual J load calculations as well as full ACCA Manual D calculations and a duct layout all go into the submittal. It is also required that these mechanical plans be stamped by a mechanical engineer registered in the State of California.

The submittal includes the Energy Commission's Title 24 forms and the HERS rating document. The C2Rs, CF1Rs, and ACCA documents are printed out using CAD. We have our own field verification check list, and we use documents that the building departments have seen before.

"One of the reasons the building departments like this package is that the whole documentation has been reviewed by a licensed mechanical engineer with proper "insurance"- that is, they have errors and omissions (E&O) insurance. We have a well-trained person who's responsible for the package. In other words, we are taking responsibility for this documentation. If it's not right, the preparer of the document is liable for anything that's wrong with it. We take that extra step.

— Rob Hammon

One of the reasons the building departments like this package is that the whole documentation has been reviewed by a licensed mechanical engineer with proper insurance — that is, they have errors and omissions (E&O) insurance. We have a well-trained person who's responsible for the package. In other words, we are taking responsibility for this documentation. If it's not right, the preparer of the document is liable for anything that's wrong with it. We take that extra step.
And that's something the jurisdictions value, because they have found through their experience with us that our submittals tend to be very clean and correct. Having a licensed professional review the document, stamping the mechanical plans just gives building officials the extra sense that they're getting quality work. Because the work is of higher quality than they often see, it takes them less time to review.

The other side of the program is that builders are obligated to build to the submittal because the homes are thoroughly inspected by the HERS raters, and the HERS raters are inspecting all energy efficiency features, not just upgrades. Energy Star requires you to inspect whatever you upgraded. CEEP requires that the builder have a third-party inspect all energy efficiency features. So that's a significant difference.

Blueprint: By taking these extra steps, what are some of the benefits to the builders?
Hammon: The benefits for the builder vary

somewhat by jurisdiction. But high on the list of things that the jurisdictions provide is faster urnaround on the submittals. They may give the submittal a priority or special status – there are different ways the jurisdictions implement this.

Blueprint: How much time does it save, on average?
Hammon: It varies greatly, because the submittal load at different jurisdictions varies dramatically. In some cases, the review time may drop from four weeks to two weeks; in others it may go from four weeks to three weeks; or it may go from six weeks to two weeks. In some jurisdictions where their turnaround is already very good, officials will knock a day or two off of the time, guaranteeing an even better turnaround. So faster turnaround is one key element. I think all jurisdictions offer it to some degree.

The next benefit that CEEP provides is recognition for the builder. That can vary from a public official for the local jurisdiction — be it city or county — attending a grand opening ceremony, to one jurisdiction actually buying advertising in the real estate section of a newspaper for participating CEEP builders.

A very small number of jurisdictions offer reduced fees. They recognize that, because the applications are better than typical, they'll take less time to process, which means the fees can be less. But that's a tough one for the jurisdictions — especially in these hard times — so that isn't found much now.

Another less common benefit but a really good one that we may encourage more in the future is that jurisdictions provide priority field inspections. When we started CEEP, it was strictly to save time on the front end, but then we had a builder who got reduced plan check time and recognition. As the subdivision went up there were the regular building department inspection timing delays, and the builder called us and said, "Gee, we're CEEP, can we get priority field inspections?" We called the jurisdiction, they said, "Sure, good idea," and that happened. It's something that we're going to be promoting in the next few years as a very valuable benefit to the builders.

Blueprint: Why is CEEP good for communities?
Hammon: If homes are built better, they will last longer. Local goals for energy efficiency are usually related to reduced outdoor air pollution emissions, and CEEP helps to provide improved environmental quality and better resource efficiency. A program like this also can lead to improved relations between builders and jurisdictions, and that's a good thing because sometimes those relationships are strained. The jurisdiction can be recognized for having programs for improving the housing stock and community relations.

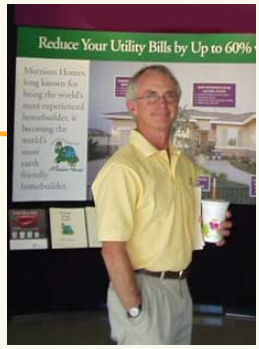
There also may be an economic multiplier effect. If it takes more labor to build these homes due to higher quality construction, the dollars for the extra labor are dollars that stay in the jurisdiction. Those dollars earned for that extra value are spent there in the community.

Blueprint: I would think that, some of the laborers develop better skills for higher quality construction as a result of participating in CEEP.
Hammon: Right. CEEP results in a construction labor force with better skills related to residential energy efficiency.

Blueprint: The Energy Commission wants to promote third-party verification because we like the assurance that the energy efficiency measures built into the houses are high quality and result in the energy savings that are intended. Are the third-party verifiers HERS raters?
Hammon: Yes, and they are critical to the process. They need to be there to perform the field verifications and tests, do them correctly, and make sure that the home passes. They maintain a good working relationship with the builder and the local jurisdiction.

For third-party verification to work for the builder it's critical that the rater completes the verification in a timely fashion, knows what he or she is doing, and gets the verification and testing done without causing unnecessary delays. The rater must be able to relate well to the subcontractor who's doing the work and be able to get the corrections made on schedule with minimal impact on the superintendent and builder. We've managed to do all that.

Blueprint: Let's talk more about field verification. How does it work?
Hammon: Field verification is done at two stages, rough-in and final. We use checklist forms for each stage. The information that can be filled out before the rater goes on site –



At the grand opening of model homes participating in the CEEP program.

identifying the building and location and what the rater is looking for – is completed in advance by computer. We have a checklist form that we use at rough-in for verifying quality installation of wall insulation and windows. There's another form at near final where we do our duct blaster test, where the blower door testing is done, air flows are measured, and ceiling insulation installation quality is verified.

The raters do verification and testing, and fill out the forms. Then the forms come back to us. The data is then entered into the database of CHEERS or CalCERTS, whoever the provider is, after the building passes the final verification. There's no data entered until final verification is completed and passed.

If we go to a house and there are problems with the insulation, with the mechanical or whatever, we have a three-part carbonless copy form that the rater fills out in the field. They give one copy to the builder, a copy to the ConSol office, and the rater keeps a copy. This allows the rater to follow up to make sure that those faults are corrected before moving forward. It's a very important element of the process.

Blueprint: Can you highlight some of the CEEP successes?
Hammon: There was the very first jurisdiction, City of Chula Vista, with Brad Remp as Chief Building Official. Shea Homes submitted the very first CEEP project. We told them that with Brad's help, we were going to try and reduce the plan check time. The Chula Vista plan checker turned it around in roughly half the time that was typical. Shea wasn't ready, but was very surprised and pleased. The project did go faster. Another success was the City of Santa Clarita that, for a while some of their general fund monies were set aside to buy down permit fees. That was great.

Blueprint: Is San Diego Gas & Electric (SDG&E) the only utility that is involved?
Hammon: It started with San Diego Gas & Electric. The initial contract to develop the program came from them; hence the first jurisdiction was Chula Vista. But the long term supporter of the program has been Southern California Edison. Edison has the vision that, through voluntary programs, we can increase compliance, and we can increase the number of builders building above code.

Blueprint: Are the elements of CEEP fixed? Might CEEP evolve?
Hammon: CEEP *will* evolve. It's a stepping stone to a larger program that will provide more societal benefits. Ultimately, we would like to get developers involved. Currently, we have no input on the design of the homes or the layout of the subdivisions to achieve optimal orientation of the streets and houses, but we hope CEEP evolves that way.

Rob Hammon gives an interview to a local radio station about CEEP.

George Burmeister, of the Colorado Energy Group, serves as the CEEP Manager.

> *"If Title 24 does become more stringent in the future, this program will have helped prepare us to be way ahead of the curve."*
>
> *— Southern California Builder Representative as quoted in the 1999 Colorado Energy Group report*

Blueprint: What motivated the formation of CEEP?
Burmeister: CEEP started back in 1999. San Diego Gas & Electric (SDG&E) asked us, the Colorado Energy Group, to go out and interview the leaders of the ten largest green building programs in the country to find out what worked and didn't work in those programs. From that, SDG&E asked us to create a program that worked for California's needs. We wanted to keep it simple for builders. In our research we found green builder programs that had 20 or more pages with boxes to "check." They were not "builder-friendly." The builder got 90 out of 180 points or whatever. With CEEP, it's much simpler.

Blueprint: Who benefits from CEEP?
Burmeister: CEEP is a win-win-win for builders, consumers and the local community. Builders like the program. CEEP allows them to move ahead of the Building Energy Efficiency Standards and even to meet future energy regulations by doing something proactive on the efficiency front. There are reductions in the pollution that results from energy production. The program results in more "money for the malls," more pocket money for people to spend locally, so the local communities also win. Consumers get cleaner air, have a more comfortable home, and they save money on their energy bills.

City Councils and Boards of Supervisors understand that, with the extra dollars not spent on energy, residents are not shipping those dollars off to an out-of-state or out-of-county energy producer; they're keeping the money in their pockets and spending it locally. We talk in terms of the multiplier effects of keeping the local dollars local.

Finally, the builder also wins when plan check gets done faster. If you shave plan check from two months to one month, the builder could sell the house faster, saving $1,800 a month on construction loan interest they don't have to pay on the average California home.

We're trying to help builders differentiate their product. That's what the builder gets, and the city will recognize them and help promote them. The local community gets more money for their citizens to spend, and they get a reputation for being progressive.

The houses are built better and are more energy efficient, and the efficiency generally lasts longer. I saw a house under construction before ConSol went in to teach the builder's superintendent how to install the insulation per the BII scope of work protocols. You could put your fist into some of the gaps that were there. Afterward, you could not believe the improvement; it looked literally like you painted on the insulation. It was beautiful!

Blueprint: Rob Hammon has talked about ways that the jurisdictions encourage builders to participate. Are there any new ways that are coming along?
Burmeister: Yes. If you're building a CEEP home in the City of Riverside for example, the jurisdiction just agreed to defer transportation mitigation fees of $6,600 per home. Every new home is charged this. Usually the City would collect it up front, before issuing the certificate of occupancy, which could be five months later. However, Dan Chudy, the building official there, has agreed not to collect it up front, but to collect it at certificate of occupancy, which saves the homeowner the interest on $6,600 for up to five months. At five to eight percent, every little bit helps.

We may see this type of deferring of fees for CEEP homes start up in other jurisdictions. We expect to see jurisdictions coming up with other innovative ways to encourage builders to participate as well, as CEEP grows.

Bob Raymer is the Technical Director of the California Building Industry Association, CBIA

Blueprint: How did the California Building Industry Association (CBIA) get involved with an energy efficiency program like CEEP?

Raymer: San Diego Gas & Electric approached us about sponsoring a program. They said, "We're having a heck of a time getting a program up and running that local builders and building departments will actively participate in."

At the same time, we were looking for a a way to help the building industry make the transition from one set of Building Energy Efficiency Standards to the next, because these Standards are updated on such a regular basis.

Back in the 80s, if a Standards change raised the cost of housing by $50 to $300 per home, that caused a lot of pain to builders. More often now the real impact is felt if there's a substantial change in common construction design. If all of a sudden something you've been doing on a regular basis is no longer allowed it creates delays. When you've got a hot market like we've been in for the last five years, delays create a huge economic burden on the builder.

So with those two issues coming together, we thought there's a great potential here. CBIA has an incredibly close alliance with California building officials throughout the state, both the counties and the cities. We had the ability to take a program, put it together, and maybe try something different.

The fact of the matter is, while the City Council or Board of Supervisors or the planning or land use divisions of local jurisdictions can take very active roles in looking at whether they want to build green, or want to encourage energy efficiency, it's the building department where the rubber meets the road. With the relationship that we had with California Building Officials (CALBO), we recognized the potential for working together to create, on a case-by-case basis, a program that fit the needs and capabilities of each local jurisdiction.

"By and large, we can now say that, on a statewide basis we build far more energy efficient homes than our neighbors in the rest of the country."

— Bob Raymer

So we went into each and every jurisdiction, and asked, "What are you capable of doing at the local level? Can you help us out with advertising? Is it possible to reduce fees? Can you speed up plan check? Can you speed up inspection? Can you basically overlap certain inspections so it becomes more of an efficient process?"

And a nice after-effect of this is that it gave the local building departments the opportunity to look at how they do energy inspections and plan checks."How can we become more efficient with current inspections? How can we integrate a new program with everything else to make sure that when it gets done, it's done in a quality manner?"

Another unintended plus of CEEP is that, by promoting going beyond the minimum level of efficiency, you pretty much have to use third-party field verification. It's a done deal. That helps us reduce, and in some cases eliminate, the prospect of construction defect litigation down the road.

Quality control verification up front is a low-cost and easy way to get compliance with the energy standards. Engineering the duct system layout and making ducts tight has become a hallmark of this program. It's a low-cost and easy way to get compliance with the Energy Standards. That's why it has become such a fundamental part of this program.

With CEEP, you can get a lot of things done under one program. Effectively you can get

your energy analysis, your plan check, your third party field verifications all wrapped into one service. Instead of creating logistics problems for the builder, it actually reduces them.

I've got to say that while the third-party verification was an option, if it hadn't been for a program like CEEP, it might still have been in the infancy stage. Right now, statewide, the building industry is at sort of an intermediate stage, with builders embracing third-party field verification for maybe 20-30 percent of homes statewide. Now I suspect within two years we're going to be at 80 percent.

Blueprint: Do the jurisdictions talk to each other and influence each other to accept a program like CEEP?
Raymer: You bet! It snowballed. Jurisdictions ask, "Is anyone else doing this around here?" And we can point to five or six nearby jurisdictions. "It's not that tough, see, they're able to do it there." And all of a sudden we see clusters of most of the jurisdictions in an area participating.

The problem we're running into now in Southern California is there are so many jurisdictions that are on board, it's difficult to find new large jurisdictions. As a result, we're focusing more on Northern California, through a contract from the Public Utilities Commission, which is being administered by Pacific Gas & Electric.

Blueprint: Has CEEP been a success for builders?
Raymer: I look at this as the technical director and also as an advocate for the building industry. The success I see is that it's a way to smooth the transition from one set of standards to another. All of a sudden that additional cost doesn't create much of a hurdle.

Blueprint: The builders are perceiving that now?
Raymer: Since CEEP's been in place, we've gone through two updates of the standards, the 1998 and then the emergency AB 970, and we're about to have another one in 2005. CEEP really helped smooth the transition. We used CEEP as a way to implement the energy standards on a massive scale in some of these large, higher volume jurisdictions.

Compared to what used to happen in the 1980s and early 90s when they changed the Standards, I'm not getting calls from builders. I'll have somebody that'll call up and ask me, "Do you have information that explains it?," but as far as people calling up yelling, "This is terrible! How could this happen? This is awful!," I don't get those kinds of calls anymore.

On other regulations, like disabled accessibility, when there's a change for the multi-family market – when there's something else that either comes through the Legislature or some other agency – I still get heated calls. But the number of angry calls related to energy basically dropped. This tells me we must be doing something right.

It's a very nice after-effect. Instead of becoming an obstruction to energy efficiency, we've basically been able to partner. CEEP has helped us smooth this transition.

What's nice is that some builders who normally would have stayed away from third-party field verification until it was forced down their throat, by accident became familiar with it through their introduction into CEEP. Now they're not afraid of using it in other areas where CEEP isn't yet being implemented.

CEEP actually helped in those jurisdictions that aren't using it. KB Homes, Centex Homes, some very large builders, who would normally not have been at all familiar with third-party field verification, now just take it for granted that well, if we're using it over here and we can cut the cost of compliance with the Energy Standards by anywhere from $800 to $1,200 dollars by going third party, it's a huge win.

Blueprint: Are builders seeing long-term benefits?
Raymer: You must understand that there's a 10-year construction defect warranty that applies to California housing. There's a whole industry out there through a segment of the trial lawyers who aggressively pursue construction defect cases. That led to SB 800, the Homebuilder Construction Dispute Resolution Law.

With CEEP's enhanced quality control, the types of callbacks that would normally be common, such as,"My house doesn't get cool enough in the summer or warm enough in the winter," — those have dropped off. That could be attributed at least in part to the application of CEEP.

Blueprint: We had a chance to look at the report that George Burmeister, CEEP's Manager, wrote for the BII in 1999 related to starting the program. One thing it said was that "consumer education and strong marketing help were deemed of great value to the builders involved in 'green' building and community energy building

programs." Can you say a few words about this from BIA's perspective?

Raymer: Participation in CEEP sets your phased subdivision project apart from somebody else's. You're complying with the Energy Commission's regulations and you're going to be going beyond them. You can advertise that to the potential home buyers, and explain to them what the 20 percent more in energy efficiency means. It's not just some nebulous, ambiguous type of a thing. You can explain that in this particular project, instead of slapping in a 10 SEER air conditioner, we're putting in a 13.5 SEER, we've got a much higher efficiency water heater and furnace and tight ducts.

We can explain that houses 20 to 30 years old may have as much as a 50 percent leakage rate in their ducts. In this new house duct leakage is less than six percent, because the house has been tested. Suddenly people know more about energy efficiency.

There's a lot of foot traffic through the models in a new subdivision, and that's a marvelous opportunity to boast about "Well, we've got the upgrade in carpeting, we've got some security systems, and by the way, we've got our tight ducts. We've got this air conditioning system that's immensely more efficient than what the state requires, and you'd be getting that if you buy this home."

By doing that, you're educating consumers on the energy saving aspects of the house.

By and large, we can now say that, on a statewide basis, we build far more energy efficient homes than our neighbors in the rest of the country. Certain jurisdictions in this or that state will have aggressive programs, but on a statewide basis, nobody really touches California; not just because of the Standards, but because our building officials are required to check it. It's part of the Health and Safety Code and Public Resources Code. Before you can sign off on that final occupancy permit, you've got to make sure x, y, and z are done.

The reduction in callbacks is clearly evidence that the quality control measures in the Standards are working. That is definitely a plus.

"...by promoting going beyond the minimum level of efficiency, you pretty much have to use third-party field verification. It's a done deal. That helps us reduce, and in some cases eliminate, the prospect of construction defect litigation down the road."

— Bob Raymer

The California Energy Commission does not endorse any products, supplier, manufacturer or builder. The text in this interview is meant to be informational and not all inclusive.


ENERGY EFFICIENCY AND DEMAND ANALYSIS DIVISION

BLUEPRINT

SEEKING EXCELLENCE
Rob Hammon, George Burmeister and Bob Raymer talk about the Community Energy Efficiency Program. The first in a two-part series – page 6

THE CF-4R
The right form for third-party field verification – page 15

Rob George Bob

Questions and Answers

Residential

Q I am installing a fan coil unit in the hallway of a multifamily dwelling unit in a space constructed of sheetrock. The sheetrocked space is formed by the original hallway ceiling at the top, the hallway sidewalls, and sheetrock across the bottom of the space with a return grill mounted in the bottom sheetrock. Does a duct have to be installed connecting the fan coil return to the return register?

A This type of installation may be used only when a fan coil unit is installed in a sheetrocked space that is constructed and sealed to meet the California Building Code (CBC), Title 24, Part 2, Volume 1. Section 310.2.2 of the CBC states that walls and floors separating dwelling units in the same building "... shall not be of less than one-hour fire-resistance construction between two dwelling units." Section 709.3.2.2 of the CBC states that when fire-resistive floor or floor ceiling assemblies are required, voids and intersections of these assemblies "...shall be sealed with an approved material."

Also, Section 150 (m) of the Building Energy Efficiency Standards states, "Building cavities, support platforms for air handlers, and plenums defined or constructed with materials other than sealed sheet metal, duct board or flexible duct shall not be used for conveying conditioned air."

There are two acceptable methods of complying with Section 150 (m) for the fan coil

Pictured at the right: A fan coil unit before installation and two photos of construction details.

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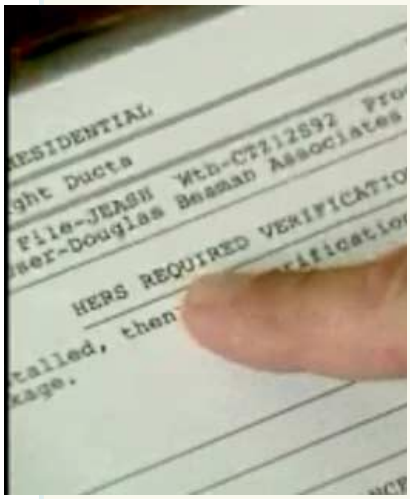

Special information for

Building Officials

The CF-4R !!!

What is it?

Why is it important?

What should I do about it?

Answers:

The *CF-4R* is the form completed by a HERS rater (third-party special inspector). It is required whenever the builder *chooses* to use third-party field verification to achieve compliance with the energy code.

The *CF-4R* is very important because compliance credit is given for having systems third-party verified and the *CF-4R* proves that verification was done.

Protect the Consumer!

All you need to do is:
Have your inspectors ask the builder for a final copy.

"CF-4R – Don't "final" the house until you have a completed copy!"

For a training video on "Enforcement of HERS Ratings" go to:
http://www.consumerenergycenter.org/videos/residential/CHEERS_HERS/code

BLUEPRINT

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Title 24 Energy Efficiency Standards Training

Links for training on issues relating to California Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24, Part 6) is available on the Energy Commission's web site at:
www.energy.ca.gov/title24/training

For training offered by the utility companies. Please see the following websites for possible training sessions within each utility's service area

PG&E
www.pge.com/stockton

For information on training in Early Compliance Credits for Residential Lighting conducted by Doug Beaman:

www.pge.com/003_save_energy/003c_edu_train/stockton/programs/res_lighting_credit.pdf

SoCal Gas & SDG&E

www.socalgas.com/business/resource_center/erc_seminar_info.shtml

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www.sce.com/sc3/002_save_energy/002f_ctac/002f3_work_classes/default.htm

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ENERGY EFFICIENCY AND DEMAND ANALYSIS DIVISION

BLUEPRINT

Questions and Answers

Residential

Q *Are there special Standards requirements when replacing HVAC systems in residences?*

A Yes. New heating and/or air conditioning systems installed in existing buildings are considered alterations. The alteration requirements for low-rise residential buildings are in § 152 (b) of the Standards. That includes the requirements in § 111 that the appliance efficiency regulations must be met. Also, the applicable mandatory requirements for low-rise residential buildings must be met, including §150 (h) that requires that systems be appropriately sized and §150 (i) that requires that the new systems have setback thermostats. For prescriptive compliance, § 152 (b) 1 B i specifies that the prescriptive requirements in §151 (f) 7 be met; this requires that new split system air conditioners or heat pumps installed in existing buildings must either be verified to have a thermostatic expansion valve (TXV) or be diagnostically tested to verify the correct refrigerant charge and airflow, and to provide remediation if needed. As an alternative to the requirements for field verification and diagnostic testing for refrigerant charge and airflow measurement or a TXV, an air conditioner or heat pump with an SEER of 12 or greater may be installed. As an alternative to the prescriptive requirement for a TXV, refrigerant charge and airflow verification, or a SEER 12, compliance may be shown using the "existing plus alteration" performance approach; the mandatory requirements of §'s 111, 150 (h) and 150 (i) must also be met when using the performance approach.

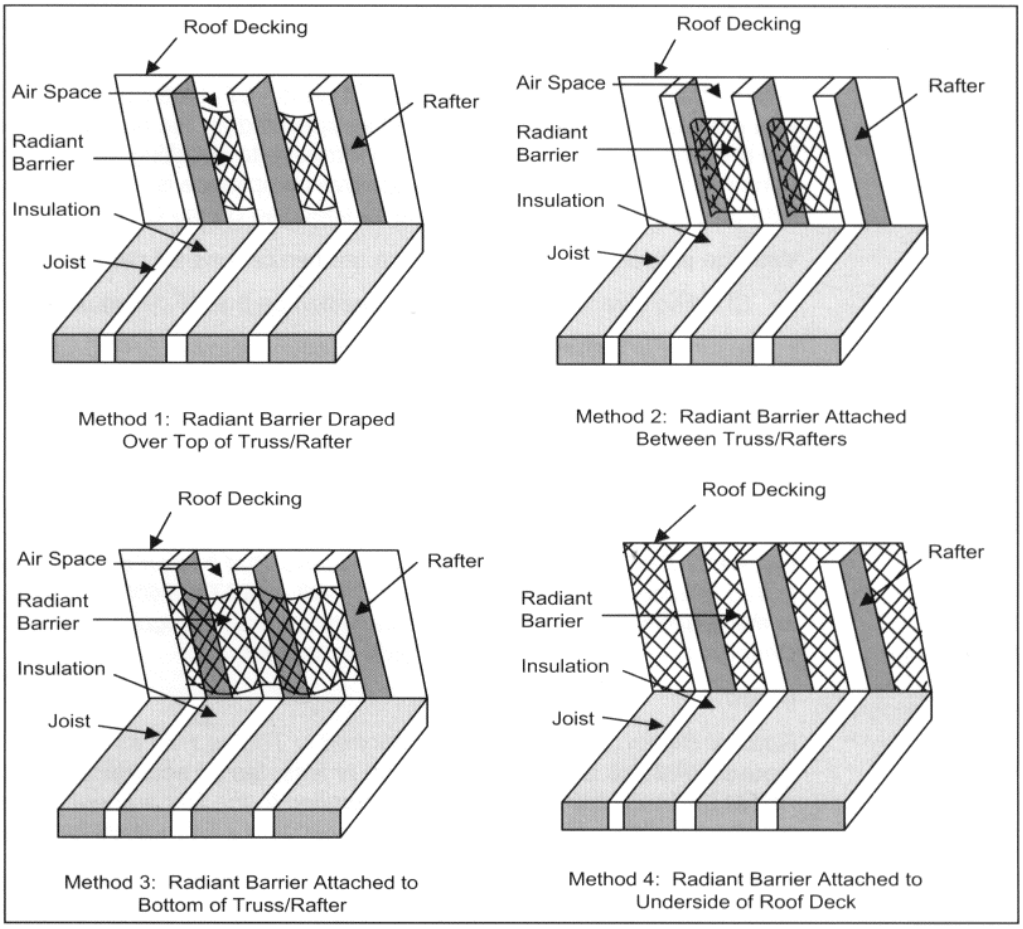
Q *Does electric resistance space heating in a bathroom have to be modeled?*

A Not in most cases. If the bathroom is served by the primary heating system, then the electric resistance heater is considered supplemental and does not have to be modeled. If the bathroom does not have a supply vent from the primary heating system, the need to model the electric resistance heating depends on the types of controls that the electric heater has. If the heater has a timer that limits its operation to 30 minutes or less and there is a primary heating system for the building with sufficient capacity to heat the bathroom, then the electric resistance may be considered supplemental to the primary heating system for the building and does not have to be modeled. If no timer exists, then the heater must be modeled as part of the heating system in the building energy compliance.

Q *When installing a radiant barrier, doesn't the foil side face up towards the shingles?*

A When installing a radiant barrier on the roof truss system, top chords, or other roof support, the shiny foil side faces down toward the attic floor. This seems counterintuitive. Metallic foil has high reflectance but low emittance. It easily reflects most types of heat energy from the roof it contacts and does not easily emit the relatively small amount of heat energy toward the ducts and attic floor it absorbs. This is an advantage in the attic – heat entering a building and passing through the roofing materials will be reflected back outward by a radiant barrier, and what little heat energy is absorbed by the foil barrier will not be transferred downward into the attic space.

The point of a radiant barrier is to keep heat energy from the sun from penetrating the roof, radiating into the attic space and then being transferred into the conditioned space. The reason that you don't want to have the shiny side facing up is that its' surface has the lowest emissivity, and you want to minimize radiant transfer to the ducts and attic floor. The lowest emissivity surface must be on the side of the radiant barrier oriented toward the ducts and attic floor. Dust will accumulate on the top surface of the radiant barrier over time, but not nearly so much on the bottom surface. If a heavy accumulation of dust were to build up on the shiny side (the high reflectance surface), the reflectance would decrease and allow more heat to be absorbed and radiate through to the attic below.



Q The California Building Code (CBC) Section 1202.2.1 requires ventilation of 15 cubic feet per minute (CFM) for each occupant when a building is mechanically ventilated. The CBC also sets maximum occupancy loads for egress purposes (in Section 1003.2.2.2.2 and Table 10-A). However, the Building Energy Efficiency Standards (Section 121(b) 2 B) says that the minimum ventilation requirement for areas without fixed seating is 15 CFM times half the maximum occupancy loads. Are the requirements of the two codes inconsistent?

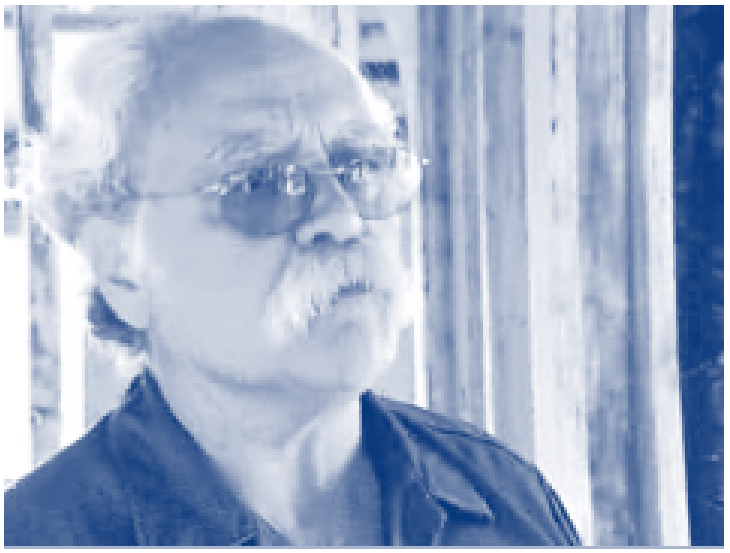
A No. The CBC does not say that the maximum occupancy loads are to be used to determine minimum ventilation rates.

The Building Energy Efficiency Standards recognizes that the number of occupants is a designer decision, and the designed HVAC system has to be capable of providing the ventilation based on that decision. The Standards do set minimum limits on the designer's decision: if there is fixed seating, the designer can't design for less than the number of fixed seats; if there is no fixed seating, the designer can't design for less than one-half the maximum occupant load for egress that is specified in the CBC.

Some people might think that the CBC implies having to meet ventilation rates assuming the maximum occupant load for egress purposes. That would require that the HVAC system be designed not to meet the normal number of occupants but to meet the maximum number of occupants that could exit through the doors in an emergency. That would not be prudent because the maximum occupancy load requirements for egress allow for a lot more people in the space than may be normal. For example, for gymnasiums the maximum occupancy load for egress is one person per 15 square feet; everybody in the gym is allotted a 3 x 5 foot space. Rarely would a gym have this many people in it. It doesn't make sense to size the HVAC system to provide ventilation for that many people every minute that it is on. The Energy Standards designate a reasonable minimum – ventilation for half the maximum number of occupants for egress purposes – and designers can design for more than that minimum if they think that is appropriate.

SEEKING EXCELLENCE

The second in a series of articles about building department employees, builders, energy consultants, HERS raters and others who are making exemplary efforts to achieve energy efficiency in buildings.



Scott Johnson exhibits an unsurpassed enthusiasm for energy efficiency and quality HVAC installation. He continually inspires builders to exceed the requirements in the Energy Efficiency Standards for all of the homes they build.

Scott is an energy consultant, general contractor, Home Energy Rating System (HERS) rater, trainer and HVAC expert, who believes in an integrated systems approach to building houses. He feels strongly that the house is a system, with all of the elements working together based on proper design and installation.

He was the chief third-party inspector for the City of Irvine's voluntary "IQ+" program, which was the prototype for the "sealed ducts" standard. He has provided training and inspections for the Southern California Gas Company in much of Southern California, teaching hundreds of builders, building department staff, HVAC subcontractors and others about the proper installation of HVAC systems.

Scott has also undertaken numerous projects for the Energy Commission and is featured in a number of the Commission's on-line training videos.

Blueprint: Tell us about your background.

Johnson: I grew up in the construction trades and am a third generation contractor in Orange County. Normally kids grow up and have holidays and weekends free, but my free time was spent on construction sites. I was qualified to be a journeyman carpenter by the age of 12, but had to wait until I was 16 to get my union card. By the time I was 25, I had become a journeyman in most of the existing trades. I learned the new trade of installing fiberglass insulation when it started in the late sixties and early seventies. The last trade I learned was HVAC.

Going to HVAC trade school allowed me to be around engineers and scientists, and the mystery of comfort and HVAC performance started to become clear for me. Having built

hundreds of houses, I took my practical background and coupled it with physics. I loved the opportunity to attend PG&E training classes, and then a new thing showed up: the California Home Energy Efficiency Rating System (CHEERS). I was in the first training class open to the public and became a CHEERS rater. I saw that I could take my experience and use CHEERS to put together everything to help people with comfort, health and safety.

I realized the most important thing I could do was to diagnose and fix houses so that they functioned properly. I love to help people be more comfortable, keep more money in their pockets with utility bill savings, and protect the environment all at the same time. This was a turning point for me. This became my mission.

"I realized the most important thing I could do was to diagnose and fix houses so that they functioned properly. I love to help people be more comfortable, keep more money in their pockets with utility bill savings, and protect the environment all at the same time. This was a turning point for me. This became my mission."

PG&E helped CHEERS kick off a program to rate homes by offering rebates. I was audited by PG&E because, "it appeared it was impossible" to perform the quantity of ratings I had on the books. Their audit proved that not only did I actually do all the work, but I also did quite a good job on each home. I went way beyond the call of duty. I was given an award for excellence in performing and producing the highest number of ratings by PG&E and CHEERS in 1993.

After the rebates went away, many people told me that there was no money in this type of work, and that I wouldn't survive. I was concerned, but I loved it and knew that this was the right thing for me to do, so I kept plugging away.

California Pacific Homes (Cal Pac) was the first builder that bought into the IQ+ Program. They believed well-above average quality was not enough for them and that the typical production housing construction process left much room for improvement in occupant comfort and lower utility bills.

Brian Blain with Cal Pac led the charge to produce a top-notch quality product way above and beyond the code. In fact, Cal Pac called me in recently because they want to move forward with fully commissioning homes, which I think is the way of the future. This all got started by the foresight of the City of Irvine and the Energy Commission.

Blueprint: What other builders are you working with?
Johnson: We now work with over 60 builders, on one level or another. Many builders now want to build the "perfect energy efficient house," including ducts in conditioned space.

There is a particular builder that works primarily in the heat of Climate Zone 15. We have been diagnosing problem houses for them for a while now, and they have become ready and willing to participate in a training program. We started with all their staff of 35 people. After the first training session they decided to make changes in their standard practices. They realized that building correctly provides more comfortable homes and lower utility bills. They can promote a lot of sales through word-of-mouth.

Consumers are becoming better educated about energy efficiency and comfort issues. One way this is happening is through the videos on the Energy Commission website. I recommend these videos to everyone.
Also, HVAC subcontractors are starting to take advantage of the training programs offered by the utilities and trade groups. Pro Star Mechanical has asked for a comprehensive HVAC diagnostics training program in their Anaheim and Del Mar locations so they can extend the whole "house as a system" approach and apply it to commercial buildings.

Blueprint: How can the construction industry improve?
Johnson: I've never met with a builder or

subcontractor that does not want to build a better product. Once a builder understands how a house functions with regard to comfort and energy efficiency, they are armed with conceptual tools to build better. Consumers are beginning to see the light and are willing to spend some extra to get the house built right at the outset. Once the consumer understands the "cost effectiveness" of the extra dollars up front, they will insist on the better house.

Blueprint: Are the codes protecting consumers?
Johnson: Yes, the codes are designed to protect them, but the typical inspection process doesn't take into account quality regarding comfort and energy efficiency. If we have return air duct leakage of 25 percent from a 150 degree attic, what happens to comfort and energy efficiency? If an R-30 fiberglass batt is installed in an attic in such a manner that 150 degree attic air is by-passing it and going straight to the drywall, and then conducting into conditioned space, what happens to comfort and energy efficiency?

You can't see air leaking or heat movement. As a HERS Rater, I know where the likely problems will occur, because I understand the physics of air, heat and pressure. I can usually visually find where there will be a problem up front and I have the testing expertise to find a solution. Raters are a major resource to the building departments.

My heart really goes out to the building code enforcement agencies they are very overworked. The Title-24 energy codes are quite specific and the expertise to understand and enforce the codes in their entirety quite a responsibility. New codes and standards in 1998 introduced HERS raters as special inspectors. The building departments don't have time to perform these extra tasks because they are overwhelmed with health and safety issues already. In my opinion the building departments need our help to get the industry back to the intent of the codes and get each house to function as a system.

Unfortunately, there are many buildings out there that are supposed to have HERS verifications, but it is not always happening. One way to ensure HERS verification would be to list "HERS" on the building department's inspection cards. It would be a huge help if the building departments did this.

Blueprint: Does your experience indicate that houses are getting more energy efficient?
Johnson: Yes, there is improvement, and it seems to be accelerating in some geographic areas. It is obvious that the building departments have had a huge impact with energy efficiency when the HERS verifiable measures are enforced. I'm seeing more and more Building Department personnel at seminars and training events, and more and more builders and subs are also becoming aware of available training to help with energy efficiency and comfort issues.

The way we conduct our business, we don't just go out perform a test and then say, "sorry you failed" and then just walk away. We incorporate training into every job. We go through a training process with the builder's superintendent up front, or the HVAC contractor, if it's an HVAC issue. We explain to them what we do and why we do it, and what it means to them. At the beginning of the job we use theatrical smoke during a duct blast test, to help the installers and subcontractor understand where their air leakage points would be. Of course, at the same time, we try to give them a general overview of what we are seeing, as far as restricted ducts, and other possible problems with airflow and insulation. We do as much as we can to make them aware of these issues.

Blueprint: You talk a lot about the whole house working as a system. What kind of problems do you see with the installation of insulation?
Johnson: I seldom see a house that is actually performing precisely to the intent of the design regarding the thermal boundary.

Blueprint: The new 2005 Energy Efficiency Standards give credit for the proper installation of insulation, after field verification. Do you think that will help?
Johnson: It's going to make a huge impact as far as quality of installation! Builders will start paying attention to areas for improvement. They may meet with their insulation subcontractors to discuss if there are any additional costs associated with installing insulation correctly in the manner that all insulation experts agree upon.

Blueprint: So you are saying that it is actually not that costly to install insulation properly?
Johnson: Absolutely not!

Blueprint: What are the typical problems with the installation of attic insulation that you see in the field?

Scott Johnson and energy expert Steve Easley discuss duct testing in one of the Energy Commission's online training videos.

Johnson: In production housing, most of the time there are gaps between the insulation and the air barrier (ceiling drywall). Where gaps do exist, the hot attic air can bypass the insulation and penetrate through to the conditioned surface. This causes a short circuit of the intended thermal boundary. Most of the time, what I see is the insulation in the attic functioning as only a limited or nonexistent thermal boundary. The bottom line is the insulation should be installed so it is functioning as a full thermal boundary, in substantial contact with the conditioned surface – no gaps, no voids, no over-compression.

Blueprint: What about wall insulation?
Johnson: We have the same types of problems. Typically there are voids, gaps, insulation overly compressed, not in contact with the air barrier (wall drywall) and missing support to hold it in place. Unfortunately, missing insulation is a problem throughout the house. The building inspectors come out and inspect, but they really don't have the time needed to see that the job is well done. They inspect and then leave, after that any number of problems can occur. Insulation can get knocked out of the wall, ceiling or floor cavities and before you know it the cavity is covered with sheetrock.

Blueprint: So in a 2000 square foot house it might cost the builder $200 to $300 more to get the insulation right?
Johnson: It takes a minimal amount of money to install the insulation correctly. Especially considering the gigantic cost effectiveness and comfort it produces by getting it in the right way.

Blueprint: It sounds like we still need third-party verification and training because the building department doesn't have the time to do this, right?
Johnson: Correct, Government inspectors have their hands full already. They need all the help they can get.

Blueprint: What about windows, fenestration and glazing? Isn't there a big difference in the energy efficiency of windows being installed these days?
Johnson: Yes, the design and materials used for manufacturing fenestration products has radically improved over the last 10 years. Since the 1998 Standards it is more difficult to achieve minimum compliance, and many builders use better, more energy efficient windows to comply. This is a very good thing. But what I see in the field is that what is actually installed often does not match the design.

Way too often, I see windows, sliding glass doors and French doors without temporary labels. Sometimes I see them come right off the truck without the labels.

I often ask the local inspectors, "Have you inspected the windows yet?" Very often their idea of inspecting the windows is, "Well, it has dual panes with a vinyl frame, there you go!" However, the efficiencies listed in the calculations (CF-1R & or CF-2) need to be matched up with the temporary labels.

Blueprint: One of the things you are saying is

that by training builders, superintendents and subcontractors, change can occur. Correct?
Johnson: Absolutely. But the builder first needs to understand if there is a problem. Nothing can happen without the builders' participation.

Blueprint: How do builders benefit from energy efficiency?
Johnson: The Standards requirements for quality installation and HERS rater field verification will actually help the builders' bottom-line profit in many different ways. Our company, for instance will relieve some of the onsite superintendent's heavy workload. Allowing him to concentrate on the other trades.

Another way it will help the builder is through less call-backs from homeowners. I'm firmly convinced that homeowners will be more satisfied with a house if they are comfortable in it and their energy bills are low. Word of mouth sales referrals from happy homeowners can mean lower marketing costs, and that improves a builderr's bottom-line.

Right now is the perfect time to take advantage of the utilities' "Energy Star Homes Program" to help offset the cost of energy efficiency improvements, and at the same time get into the groove for future code changes. The Energy Star Program, in my opinion, is a great vehicle to start everybody down the road of energy efficiency with overtones of the "House as a System".

Blueprint: Where do you think we're going from here?
Johnson: The energy efficiency codes are going to continue to tighten up to protect the consumer and maintain the reliability of the energy grid. Consumers are going to continue to be better educated, hopefully by such means as more streaming videos on the CEC website. Some builders and contractors are going to continue to blaze a trail for others to follow.

The utilities will continue to implement programs to encourage going beyond the standards. As for houses, it's really a no-brainer: design the house properly, build it to that design, and then verify it through proper diagnostics and inspections. The energy bill guarantee programs have proven over the last 20 years that we can build a house with an effective thermal boundary with excellent results.

Blueprint: How do we get there?
Johnson: There is a lot of discussion, in California and across the nation, that we have a problem with energy and jobs. We could go a long way to solve both problems, at the same time, if we concentrated on where we live, our homes and our work places.

Blueprint: Any final tips to building departments?
Johnson: There is some confusion out there regarding compliance forms. The CF-6R (installation form) has been required at least since the early 1990's. Since the 1998 Standards have been implemented measures that require HERS verification and testing have been added to the CF-6R. The HERS portion of the CF-6R is not valid until a HERS Rater verifies the content and accuracy of the information on the CF-6R and the HERS sampling procedures have been completed.
The CF-6R must be available on site for the HERS Rater. CF-6R's must contain at minimum, required information from the HVAC system, Fenestration, Hot Water System, and the HERS verification and tests (if required). I urge building departments to reach out to HERS raters and ask for help. We are special inspectors to building departments. Find out what we are doing and make sure we are qualified. You as building officials and inspectors are the last line of defense for the consumers.

As soon as the building department sees that HERS verification is required, they should stamp on the plans in red ink that these measures are required. Alert the builder. Some of the time the builder doesn't realize that it's needed. If the building department enforces this, the builder will realize that there is something different going on here.

The California Energy Commission does not endorse any products, supplier, manufacturer or builder. The text in this interview is meant to be informational and not all inclusive.

At its November 5, 2003 meeting, the California Energy Commission adopted the 2005 Energy Efficiency Standards for Residential and Nonresidential Buildings, incorporating new measures to reduce energy use. in this brief overview we explain some of the changes, and some of the next steps that will be taken before the new standards go into effect on October 1, 2005.

One of the most cost-effective, efficient, and environmentally beneficial methods of meeting the state's energy needs is to encourage the efficient use of energy. Governor Schwarzenegger's State of the State address pointed out that California's energy crisis is not over, and that California could face energy shortages as early as 2006. Many of the changes in the Standards are focused on encouraging energy efficiency measures that are particularly effective at reducing peak demand.

A major goal of the 2005 update was to thoroughly review the Standards and supporting documents and to improve their clarity. Many of the sections of the Standards and supporting documents have been substantially re-written and reorganized to make them more understandable.

The Commission completed an extensive public process in developing and adopting these regulations. Utilities, the California Building Industry Association, the California Building Energy Consultants, and the Natural Resources Defense Council, among others, supported the approved changes.

THE MOST SIGNIFICANT CHANGES IN THE PROPOSED 2005 BUILDING ENERGY EFFICIENCY STANDARDS

ALL BUILDINGS:

Time Dependent Valuation – *favors peak energy saving measures over off-peak measures*

New Federal Air Conditioner and Water Heater Standards – *go into effect, basis of the energy budgets (applies to residential and to many commercial buildings that use "residential size" air conditioners)*

NONRESIDENTIAL BUILDINGS:

Cool Roofs – *requires new and reroofing of nonresidential low-slope roofs with highly reflective roofing materials*

Acceptance Requirements – sets guidelines for *basic "building commissioning" for equipment prone to be installed improperly*

Demand Control Ventilation – *allows for sensors that vary ventilation depending on CO2 levels in spaces with varying occupancy like conference rooms, dining rooms, lounges, gyms*

T-bar Ceilings – *prohibits insulation on t-bar ceilings (must be insulated at the roof or on hard ceilings)*

Relocatable Public School Buildings – *establishes special compliance approaches for relocatables so they can be moved anywhere statewide or they can be designed for specific climates*

Duct Efficiency – *requires mandatory R-8 duct insulation, duct sealing with field verification for ducts in unconditioned spaces in new buildings and when air conditioner is replaced*

Indoor Lighting – *sets lower power limits to encourage new efficient equipment*

Skylights in Big Box Buildings – *recommends skylights with controls to shut off the lights when daylight is available (buildings > 25,000 square feet with > 15 foot ceilings)*

Efficient Space Conditioning Systems – *addresses variable air volume, variable speed drives, electronically-commutated motors, better controls, certified cooling towers, have to use efficient cooling towers not air-cooled equipment on large systems*

Unconditioned Buildings – *sets lighting requirements pursuant to SB 5X (e.g., warehouses, parking garages)*

RESIDENTIAL BUILDINGS:

Efficient Lighting – *requires high efficacy (e.g., fluorescent) in all permanent lighting or controls; high efficacy in kitchens; high efficacy or motion sensor in bathrooms, utility rooms, garages, laundry rooms; high efficacy or motion sensor or dimmer in other lighting; high efficacy or combined photo sensor/motion sensor for exterior lights; airtight can lights*

Duct Insulation – *establishes levels depending on climate zone (R-4.2, R-6 or R-8)*

Pipe Insulation – *requires hot water pipes to the kitchen that are $^3/_4$" in diameter or greater have to be insulated*

Replacement Windows – *requires them to be high performance*

Duct Sealing – *requires sealing when air conditioner/furnace is replaced or ducts are replaced*

Compliance Credit – *allows credit for high EER air conditioners, gas cooling, high quality insulation installation, properly sized air conditioners, efficient air conditioner fan motors, ducts buried in attic insulation*

OUTDOOR LIGHTING (SB 5X):

Covered Lighting Applications - *establishes guidelines for lighting for automotive vehicles (e.g., parking lots), hardscape for pedestrian use*

(e.g., walkways, plazas), building entrances, outdoor sales lots (e.g., car lots), vehicle service stations, sales and non-sales areas under canopies, ornamental lighting

Lighting Power Limits – *establishes requirements by lighting zone depending on how much illumination is needed (national and state parks, rural areas, urban areas, highly lit areas)*

Shielding – *allows "cutoff" fixtures to save energy by reducing glare*

Bi-level Controls – *allows lighting to be shut off to half level when not needed*

SIGNS (SB 5X)

Lighting Power Limits *requires efficient lighting sources for indoor and outdoor signs*

Next Steps

The Energy Commission will work closely with building officials, builders, energy consultants and the utilities to provide training for the implementation of the new standards. Residential and Nonresidential manuals are now being readied for publication and should be available by late summer of 2004.

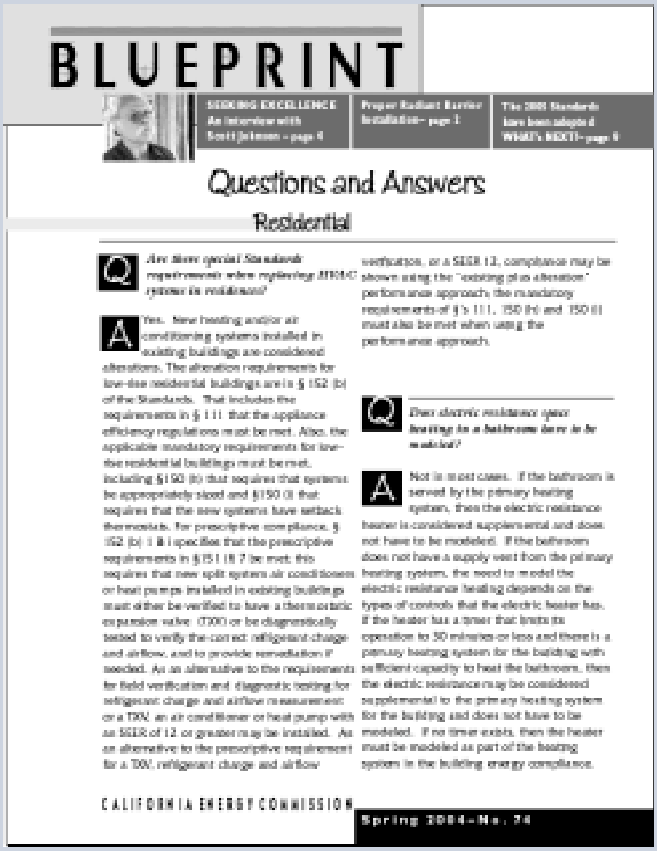
Utilities may provide incentives for early adopters. The Commission also is working on a special compliance credit from now until October 1, 2005 for builders who meet the new residential lighting standards in advance.

The utilities are planning to offer training on the new Standards, and some classes have already been scheduled. Contact your local utility for information. The Blueprint also will keep you updated on training opportunities for the new standards.

A more detailed article on the standards will appear in a future issue of the Blueprint.

CALIFORNIA ENERGY COMMISSION

Did you know?


BLUEPRINT

Questions and Answers

Residential

CALIFORNIA ENERGY COMMISSION

Spring 2004–No. 74

The Blueprint will soon be published electronically and distributed by e-mail.

Our future plans include distribution of this newsletter by e-mail as a pdf. A letter has been sent to you to update our mailing list to add your e-mail addresses. Please respond to the information requested in the letter, or call the Energy Hotline at (800) 772-3300 or e-mail us at *title24@energy.state.ca.us*.

The Blueprint is also currently available on the internet in pdf format at: www.energy.ca.gov/efficiency/blueprint/index.html.

Energy Videos

The Energy Commission Training videos are available both at:
www.energyvideos.com or
www.ConsumerEnergyCenter.org/videos/

THE ENERGY HOTLINE

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BLUEPRINT

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blueprint

Energy Efficiency and Demand Analysis Division

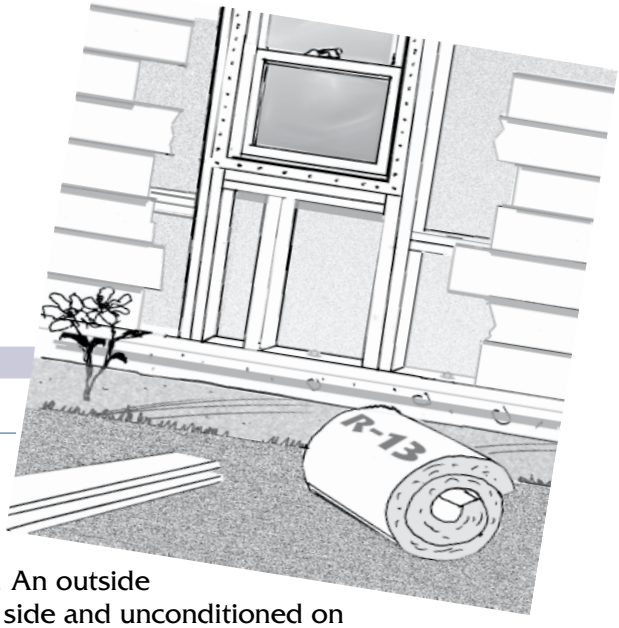
An all Electric Subdivision? – page 2

SEEKING EXCELLENCE A new series of articles – page 2

CalCERTS approved as HERS Provider – page 5

QUESTIONS and ANSWERS

RESIDENTIAL

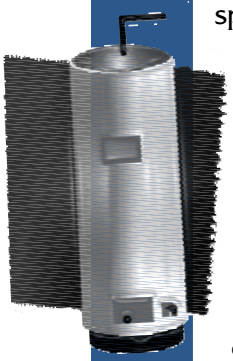


Q **Do I need to insulate when opening the wall cavity of an outside wall?**

A Yes, the insulation level must be a minimum of R-13. An outside wall is one where there is conditioned space on one side and unconditioned on the other. If the outside wall is opened, then insulation must be installed in all accessible areas. Cut the batt insulation when installing to fit the opening as tightly as possible. The insulation should touch all four sides of the framing bay without being compressed. Compressing insulation reduces its ability to provide its rated insulation value. Fit around pipes and wiring by slicing the insulation. See Section 150(c)

Q **I am planning to build a new house. Can I achieve compliance with the Energy Efficiency Standards if I want to install an electric water heater in my new residence?**

A Yes. Compliance with the energy budget can be achieved using electric water heating, but it is difficult. You will need to use the performance compliance approach, or meet all the prescriptive requirements, including those listed in table 3-14 of the Residential Compliance Manual. Check with your energy consultant or call the Commission's hotline for answers to specific scenarios.



Even when using high efficiency (Energy Factor of .93 or better) electric storage tank water heaters or electric instantaneous water heaters, plan on using the performance approach and installing high efficiency heating and air conditioning equipment and other energy efficiency measures to achieve compliance. Consider installing instantaneous electric water heaters at each point of use if the water piping design allows you to take the Point of Use credit.

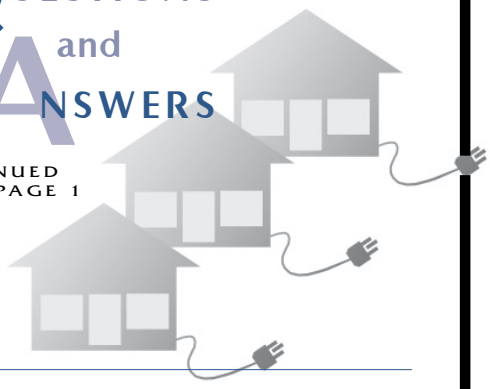
In locations where freezing is not considered a problem, you can use solar hot water systems. Note that this is the only single option for electric water heating where you can achieve equivalency to natural gas with no other tradeoffs required.

...continued on page 2

SEEKING

QUESTIONS and ANSWERS

CONTINUED FROM PAGE 1



Q **I am developing a small subdivision and have been told that it would be less expensive to build "all-electric" homes. Will I be able to achieve compliance with the energy code if I install electric space heating and water heating?**

A Yes, compliance may be achieved but it might cost you more money because of necessary "trade-offs" employing the use of other higher energy efficient systems and devices.

To achieve compliance for an all electric house using the performance approach, first see the answer on electric water heating above. You may need to use either a heat pump or meet the requirements for wood heating as the primary heat source. Check local ordinances related to any prohibition of wood heating if you are considering the wood heating option.

Consider using electric radiant instead of convective heating systems. There is a credit for using electric radiant heating; so if electric space heating is the only option, consider electric radiant panels in the ceiling or walls.

If you are using electricity, choose windows with the lowest U-factor and Solar Heat Gain Coefficient available.

This is the first in a series of articles about building departments, builders, energy consultants, HERS raters and others who are making exemplary efforts to achieve energy efficiency in buildings.

In this issue we talk with Rich Coyle, Purchasing Manager with homebuilder D.R. Horton in Sacramento. Rich's company actively embraces the use of third party testing and verification of duct sealing, building envelope sealing, duct design and quality installation of insulation. Already advocates of installation of ducts in conditioned space, they are experimenting with ducts buried in attic insulation. For the past two years they have participated in the "Environments for Living™" program, and are beginning to work with "Building America." The company continues to search for other leading edge energy efficiency improvements they can incorporate into the homes they build.

The California Energy Commission does not endorse any products, supplier, manufacturer or builder. The text in this interview is meant to be informational and not all inclusive.

EXCELLENCE

BLUEPRINT: Why is the Sacramento Division of your company so interested in building homes that are more energy efficient?

COYLE – Once we learned that there was a better way to build and insulate a house, it didn't make sense to return to the way we had been doing it. D.R. Horton is a unique builder. We have to turn a profit obviously. We have to compete with the other large builders, but at Horton we're fortunate enough to have a division president, Tom Harding, who has embraced energy efficiency as a niche for us. He has encouraged his staff to explore new ways of improving the energy efficiency, comfort and the value of the homes our company builds and sells.

> *"The homeowner can log in their monthly bills on an internet website and at the end of 12 months, if their utility bill is higher than we promised, we will pay the difference.*

BLUEPRINT: How much more does it cost you?

COYLE: It probably costs about $1,500 to $2,500 more per house. We plan to have seventy-one houses in Rocklin that will be "Building America" houses. Each house will be 31% to 37% more efficient than Title 24.

BLUEPRINT – What do your customers think about the energy efficiency built into your homes?

COYLE: Recently I asked a buyer in our Woodcreek subdivision how he liked his new home. "Oh," he said, "I love it." I asked him if the "Environments for Living™" program was a factor in his decision to buy. He said, "It wasn't the only reason, but it was a great bonus." We are beginning to get people to understand the difference, and this helps differentiate us from other builders and provides a better deal for the homebuyers.

BLUEPRINT: Could you tell us about your energy guarantee?

COYLE: We give the homebuyer a three-year energy guarantee. In the "Environments for Living™" program it's called the"Gold Plus" level. We perform duct blasting and blower door testing in every "Gold Plus" house. These tests verify duct and building envelope leakage levels. When these tested features are used for compliance credit with the code, only one out of seven houses must be tested. But we decided to just spend the money to test every house. This allows us to be confident that all our houses are highly energy efficient and will perform correctly with very low duct and envelope leakage.

BLUEPRINT: Do you tell the homeowners that all the houses are tested?

COYLE: Yes.

BLUEPRINT: We noticed there is a sign posted in front of each model home that lists exactly how much the energy costs should be for that model for a year. How does the guarantee work?

COYLE: The homeowner can log in their monthly bills on an internet website and at the end of 12 months, if their utility bill is higher than we promised, we will pay the difference.

BLUEPRINT: What other things do you do to save

"Environments for Living™" is an energy efficiency program of Masco Contractor Services (MCS), which helps builders to achieve higher performing, more energy-efficient homes that are comfortable, durable, healthy and safe. The program utilizes the advanced principles of building science for stringent requirements that focus on specific areas of the home.

"Building America℠" is a program of the U.S. Department of Energy. "Building America℠" works with members of the home-building industry to produce quality homes that use less energy .

SEEKING EXCELLENCE continued

energy beyond the Standards?
COYLE: We are trying hard to go beyond code. We take special care installing insulation. The insulation is not compressed, has no voids and is installed so that it is in contact with the air barrier. In some places like Woodcreek Executive, and the Sierra Valley Oaks that are part of the "Building America" program, we will be installing, as the standard, a special blown-in fiberglass that provides an R-value of R-23 in a 6-inch wall (not counting the framing or foam under the stucco).
BLUEPRINT: Can you explain that insulation a little more?
COYLE: It is a blown-in insulation system. After the framing inspection has been completed, the wall is covered with a gauze-like material. Then a specially formulated fiberglass 3 times denser than the fiberglass found in an R-19 batt is blown into the wall cavity. It's more costly than installing batts, but combined with the special stucco we use that has foam on the outside of the studs, it makes a tremendous difference. This is standard for our executive series homes.

The first blower door tests that were performed on these new houses confirmed that there was very low building envelope leakage. These houses were significantly tighter than previous houses where we did not use this insulation method. Even though it takes a certified technician to install the insulation and it takes longer to do, it is well worth it. Not only do we know that the house will perform better and be more comfortable for our buyers, but we will be less likely to have to pay the difference between what we promised and what the actual utility bill is.

BLUEPRINT: Quality installation of insulation is part of the 2005 standards as a compliance option, so you are already ahead of the curve. What caused the change?
COYLE: We have always attempted to provide the best possible, state-of-the-art, energy efficient home. We have provided quality installation of insulation throughout the history of D.R. Horton, but we were always looking to improve our methods and the final product. When we found out that there were better ways, we decided to adopt those new methods.

BLUEPRINT: You are also installing ducts in conditioned space?
COYLE: Yes, in our "Building America" houses we have begun to locate the furnace in an interior closet instead of in the attic. In one-story homes we're furring the hall ceiling down a foot, and installing the ducts in the furred space. In two-story houses we're using 16-inch deep, open-web floor joists and placing all the duct work in the space between the two floors.
BLUEPRINT: Are you using mechanical ventilation?
COYLE: Yes. With the very tight building envelopes we are building, we're using air cyclers for fresh air ventilation. The cycler will bring fresh air into the house for 10 minutes every 30 minutes. That helps circulate the air in the house and it also helps with our energy guarantee, because we not only guarantee utility bills, but we also have a comfort guarantee. We guarantee that the center of any room in the house will be within 3 degrees of the thermostat setting.
BLUEPRINT: Any other special attention to ventilation?
COYLE: Yes. We also started putting in 90 cubic feet per minute (cfm) quiet exhaust fans in the master suite instead of the little noise makers that you usually see in production homes.
We also have a humidistat switch so that when high humidity is sensed, the fan is activated. We talked to buyers and they said, "You know we love that, but can you do it in the secondary bath because the kids never turn the fan on?" So now I've found an all-in-one unit with a fan and light that has a built-in humidistat switch. On the new projects coming out we'll start using that in the secondary bath as well.
BLUEPRINT: Are these units using fluorescent lights?
COYLE: Yes. We're doing that and we're using tight ducts, jumper or transfer ducts in every bedroom. We have duct blaster and blower door testing in every house. We have gas fireplaces everywhere, and we right-size for the HVAC system.
BLUEPRINT: Tell us about right-sizing.
COYLE: We're using the Air

Conditioning Contractors of America (ACCA) Manual J and Manual D in every house that we build. The design calculations from our mechanical contractor are reviewed by "Environments for Living™" and/or "Building America," to confirm the correct sizing for each model.

BLUEPRINT: So when you do right-sizing to figure out the air conditioner size, is the right-sizing done from a given floor plan or is it modeled for that floor plan on its given orientation?

COYLE: It's sized for the worst orientation because we're building production homes and the Energy Standards allow us the option of complying in all four cardinal orientations as opposed to calculating the exact orientation of each home.

BLUEPRINT: So in the case where you calculate for the worst orientation and you have a house with the best orientation, doesn't it actually end up a little bit oversized?

COYLE: Yes, on some. I was telling you about the "Environments for Living™" program. There are the different levels of energy efficiency offered. We are currently using the "Gold Plus" level because we're testing every house. When you get to the "Platinum" level the major difference is that the ducts must be in conditioned space. We will be using the "Platinum" level for the Sierra Valley Oaks subdivision in Rocklin.

BLUEPRINT: Do all D.R. Horton homes in California follow this or is it just your division?

COYLE: So far just our Sacramento Division. The way D.R. Horton is structured, each Division is somewhat autonomous. In our annual plan, we reported building 513 houses this year, and we anticipate building 625 homes next year. Last year 435 of the homes were "Environments for Living." Next year all 625 homes will be "Environments for Living™" Gold and Platinum levels, including our first "Building America" homes after that.

BLUEPRINT: Do you think you are leading the way in the Sacramento area?

COYLE: Yes I do. I believe what's happening now is that, slowly but surely, we are influencing the Sacramento market. I recently talked with Sacramento Building Products, one of our insulation subcontractors. The manager said he got a call from another builder asking, "How can I do those guarantees that Horton's doing down the street?" So people are talking.

There are also other builders who are doing this. Pulte has been a pioneer in "Building America" and "Environments for Living," and they have been doing it for years in different parts of the country. I went back to New Hampshire last month for a building science symposium, and there were people there from both Ryland and Pulte. In different regions within California they are doing a lot of different things. I think that people are starting to pay attention.

Ryland Homes in San Antonio is participating in the "Environments for Living" program and are doing a great job. Once a month, they provide a seminar on "Environments for Living™." They make it fun; a guy puts on a lab coat and pretends he's a mad scientist. I've also been told that Ryland does a very good job of marketing these programs.

We plan to enhance our marketing of energy efficiency. One garage at each subdivision will be devoted to how we achieve energy efficiency. We'll create samples, including a cross section of how we construct a wall. PG&E has agreed to help out with some brochures, and perhaps some wall displays. Obviously we want to make a sale, but one of our goals is also to get buyers to remember, "Oh yeah, there's one builder who is doing it differently." If we can better educate buyers, they'll remember us, even if they go through a dozen model complexes before they make their purchasing decision.

BLUEPRINT Do you think other builders will notice?

COYLE: As consumers become more educated and demand better performing homes, other people and builders will pay attention too.

SEEKING EXCELLENCE continued

Builders need to be aware that Title 24 is going to be more stringent and they are going to have to comply. We want to be ahead of the curve.

BLUEPRINT: What features are tested in the house to verify quality and efficiency?

COYLE: We are using HERS raters to verify at several different stages. This goes beyond what is required by the code, which requires HERS raters to just do testing and field verification after the sheetrock is installed. We have HERS raters come in and perform duct blaster tests first at the rough-in stage. They make sure at that point that we have our air barriers in place around the tubs; these have to be insulated before the tub can be installed. They verify that all of those are in place, that the ducts are properly installed, and that they don't leak. After the house is insulated, they verify that it is done correctly. We have a walk- though with our home owners, usually before the drywall has been installed. The superintendent explains all the mechanical systems, and how the house works. They talk about how we are building the house, and check that everything the customer ordered has been provided. It's a learning process. Not every crew is qualified for the insulation part. If every builder in Sacramento said, "Hey, we're going to do that," there would not be enough qualified installers. That is one of the reasons I like being on the leading edge.

> *"If we are going to provide a three-year guarantee for people, and we didn't test, just think of the problems we'd have with our customer service. It would be a real hassle to go to a house that is already occupied and try and find out what was wrong. We decided to spend the extra money and test every house to be sure everything is in order. It is not a hassle, simply part of our process, and built into the schedule."*

BLUEPRINT: Many builders think that testing their systems while they're trying to build houses is a big hassle. Are you finding it easy to work with the HERS raters?

COYLE: Very easy, and it is smart business. If we are going to provide a three-year guarantee for people, and we didn't test, just think of the problems we'd have with our customer service. It would be a real hassle to go to a house that is already occupied and try and find out what was wrong. We decided to spend the extra money and test every house to be sure everything is in order. It is not a hassle, simply part of our process, and built into the schedule.

BLUEPRINT: Can you tell us about designed duct systems?

COYLE: It has been a learning curve for us and our contractors. We went though a lot of iterations to get that right. It takes more planning, supervision and cooperation between all parties to improve the system. It was not as smooth as I hoped it would be, but it is getting better. As time progresses I believe it will be very easy.

BLUEPRINT: How do you feel about what you are doing and would you encourage other builders to follow your lead, in building energy efficient, comfortable homes?

COYLE: We feel great! We are doing a better job of building our homes and helping our homeowners save more per month on energy bills. It's a good feeling. We'd definitely encourage other builders to follow.

Did you know?

CalCERTS

Now there are two HERS Providers approved by the Energy Commission. On October 8, 2003, the Commission approved CalCERTS as a Home Energy Rating System (HERS) Provider. CalCERTS can authenticate compliance with the 2001 Building Energy Efficiency Standards when measures requiring third party field verification and diagnostic testing are used. Until now, the California Home Energy Efficiency Rating System (CHEERS) has been the only Energy Commission-approved HERS Provider for Standards compliance purposes. Among other duties, HERS Providers are responsible for training, certifiying and overseeing HERS Raters.

HERS Raters serve a critically important function by insuring high quality installation of energy efficiency features in California homes. As special inspectors, they work hand-in-hand with local building departments. Building departments are legally required to receive a CF-4R form signed by an approved HERS Rater before final approval of any building that uses measures requiring field verification and diagnostic testing to show compliance.

Contact information for the two HERS Providers approved by Commission:

CalCERTS
200 Crestridge Lane
Folsom, CA 95630-2109
916-987-9444
www.calcerts.com

CHEERS
9400 Topanga Canyon Boulevard, Suite 220
Chatsworth, CA 91311
800-4 (CHEERS) (1-800-424-3377)
www.cheers.org

Compliance Forms in Auto Cad Format

The compliance forms are now available in auto cad format for:

Nonresidential buildings at:

www.energy.ca.gov/title24/nonresidential_manual/index.html#complianceforms

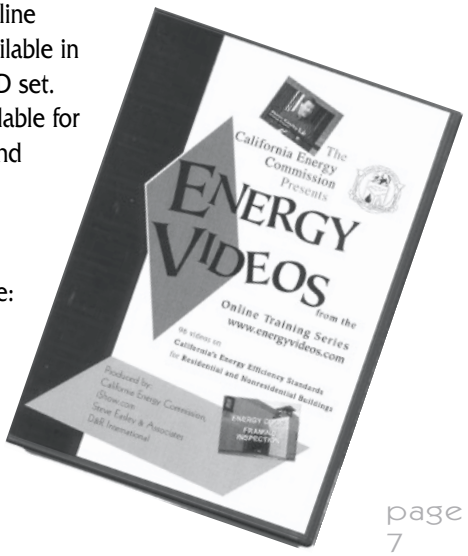
Residential buildings at:

www.energy.ca.gov/title24/residential_manual/index.html#complianceforms

Energy Videos

The Energy Commission's Training videos are now available at: *www.energyvideos.com* or *www.ConsumerEnergyCenter.org/videos/*

The 96 videos from the Online Training series are now available in limited supply in a two DVD set. These publications are available for $12.95. Building officials and jurisdictions can order complementary copies. To order, call the Energy Commission Hotline: 1-800-772-3300 and ask for publication # 400-03-010S1.



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Beverly Duffy
Editor

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Fall – Winter 2003 - # 73 **blueprint**

Energy Efficiency and Demand Analysis Division

The inside story:

#73

RESIDENTIAL

SEEKING EXCELLENCE

The first in a series of articles about building departments, builders, energy consultants, HERS raters and others who are making exemplary efforts to achieve energy efficiency in buildings.

DID YOU KNOW?

For any questions or additional information relating to the Standards contact the Energy Hotline at (800) 772-3300.

Summer 2003 - # 72

blueprint

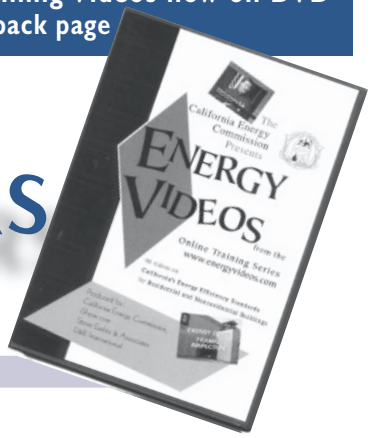
Energy Efficiency and Demand Analysis Division

Our Hotline – page 2

The Current Energy Code – page 3

On-line Energy Training Videos now on DVD – See back page

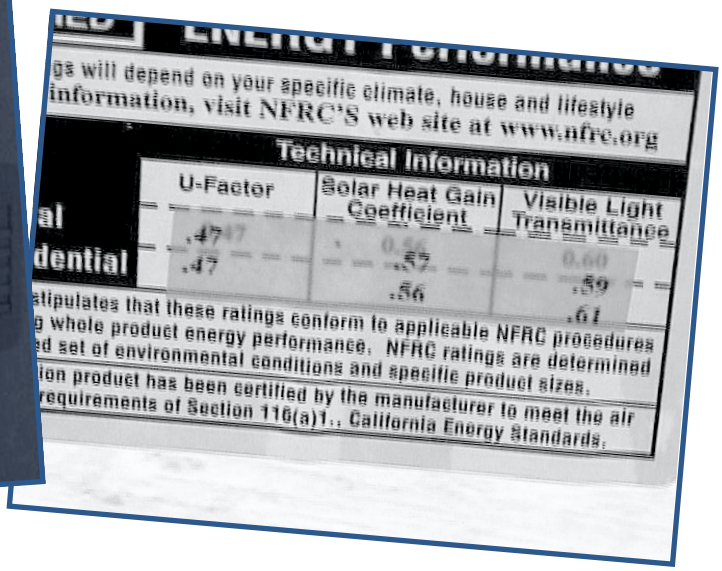
QUESTIONS and ANSWERS



RESIDENTIAL

What are the penalties for altering a National Fenestration Rating Council (NFRC) label?

Altering an NFRC label is strictly prohibited and can result in revocation of a fenestration manufacturer's licensing and labeling agreement with the NFRC if the label was altered by the manufacturer or its agent. In addition, a fine of up to $2,000 may be levied against the manufacturer for each label found to be altered. Tampering is an issue in the field, because in some cases NFRC labels have been altered on site. In one case a white sticky typewritten label was patched onto the NFRC label (see photos) and in another case, the added sticky label was lettered by hand with a marker. Field tampering or alteration by a vendor or contractor can result in action and possible serious sanctions under the California Business and Professions Code Sections 17200, et seq. (Unfair Competition), and 17500, et seq. (Fraud and Misleading Facts). Fenestration labeling is addressed in the Standards in Sections 10-111 and 116(a)2.A.



Some examples of unauthorized alterations. The name of the manufacturer on the left has been removed.

...continued on page 2

Questions and Answers

CONTINUED FROM PAGE 1

Q

When I make an alteration to my building, do I have to comply with the energy code?

A

Yes, if a permit is required by the building department and the type of alteration made is covered by the energy code. See Section 152(b) of the *Energy Efficiency Standards for Residential and Nonresidential Buildings*.

NONRESIDENTIAL

Q

What is the enforcement agency for State buildings? Do the Energy Efficiency Standards requirements apply?

A

The enforcement agency for State buildings is the Real Estate Division, Professional Services Branch, Construction Services part of the Department of General Services (DGS). State buildings must comply with all Parts of Title 24, including Part 6, the energy code.

Plans and specifications must be submitted to DGS. The local jurisdiction does not get involved. A State professional engineer must sign off or stamp the documents to indicate compliance with the energy code.

The Energy Commission's ENERGY HOTLINE

Five students and four professional staff members operate our Energy Hotline. They research and answer questions regarding Title 24 energy efficiency issues.

Most of our callers are building officials, energy consultants and engineers. We also help some home owners with questions about their energy forms for home additions.

About half the calls to the Hotline are residential questions, while the other calls concern nonresidential and other issues. We get inquiries about appliances and insulation requirements, as well as heating, ventilation and air conditioning (HVAC) issues.

Many of the questions the Hotline staff answer are published in the "Blueprint." We encourage you to participate by calling or submitting written questions, information or photographs for inclusion in future issues. Our goal is to serve your needs.

Please contact the Hotline with comments or questions regarding the energy efficiency standards.

The Hotline hours are from 8:00 a.m. to 12:00 p.m. and 1:00 p.m. to 4:30 p.m. Monday through Friday, except on holidays. For any questions or additional information relating to the Standards contact the Energy Hotline at (800) 772-3300.

A NOTE ON THE CURRENT ENERGY CODE

With all the talk about the 2005 energy code changes, it's easy to forget that the current 2001 energy code is effective until the new 2005 Standards go into effect.

The current code is the **2001 Energy Efficiency Standards for Residential and Nonresidential Buildings** and was adopted as emergency legislation under Assembly Bill 970 following an electricity crisis in California. If you're working from an older code, the 2001 Standards are available free in hard copy and in electronic versions as follows:

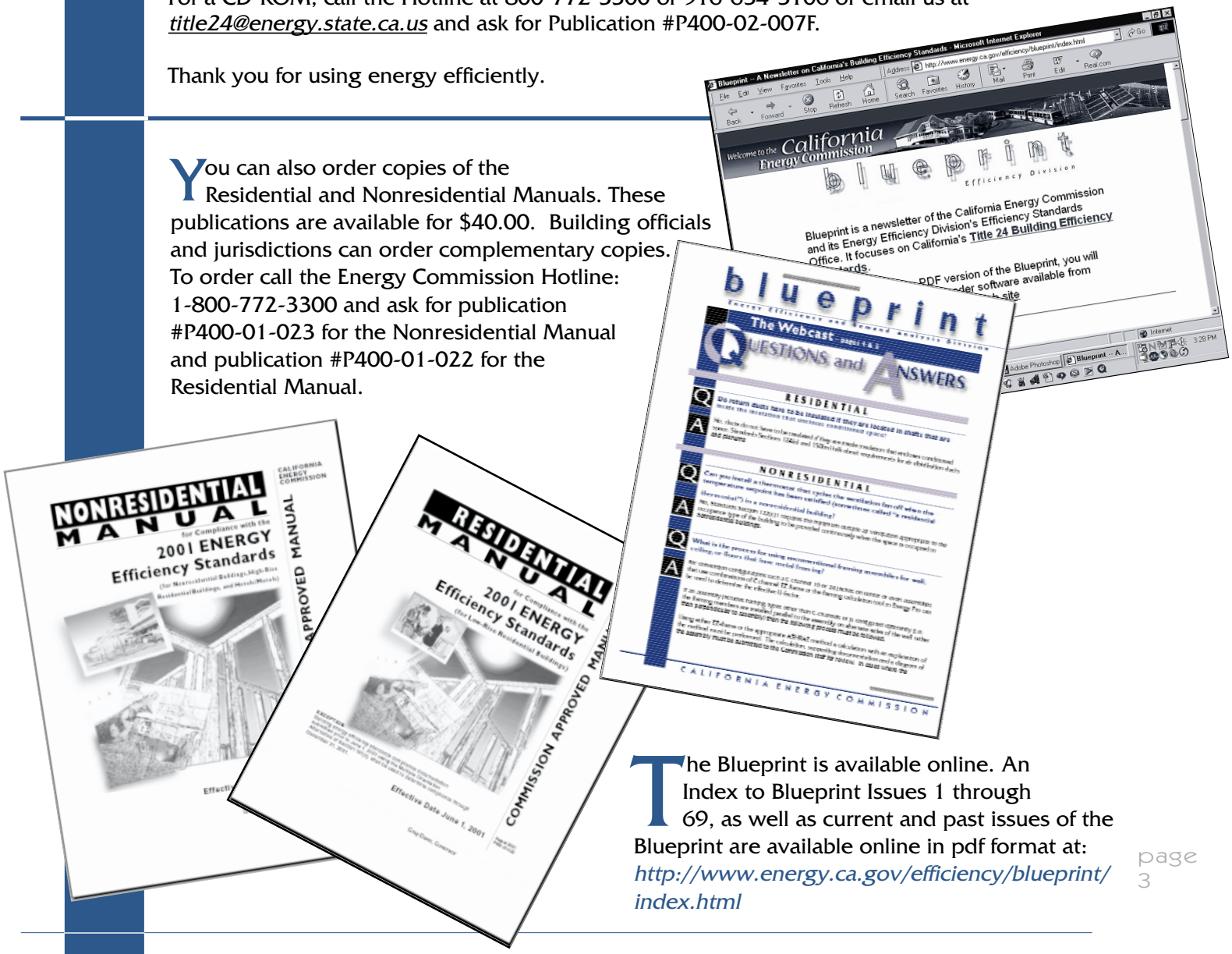
For hard-copy versions, please call the Energy Standards Hotline toll-free from inside California at 800-772-3300 or 916-654-5106 and ask for Publication #P400-01-022.

On the Internet, visit www.energy.ca.gov/title24/standards and download the standards in pdf format;

For a CD-ROM, call the Hotline at 800-772-3300 or 916-654-5106 or email us at *title24@energy.state.ca.us* and ask for Publication #P400-02-007F.

Thank you for using energy efficiently.

You can also order copies of the Residential and Nonresidential Manuals. These publications are available for $40.00. Building officials and jurisdictions can order complementary copies. To order call the Energy Commission Hotline: 1-800-772-3300 and ask for publication #P400-01-023 for the Nonresidential Manual and publication #P400-01-022 for the Residential Manual.



The Blueprint is available online. An Index to Blueprint Issues 1 through 69, as well as current and past issues of the Blueprint are available online in pdf format at: *http://www.energy.ca.gov/efficiency/blueprint/index.html*

TRAINING

Class Schedule for Southern California Edison and San Diego Gas & Electric:

SOUTHERN CALIFORNIA EDISON

Date and Time	Seminar Location	Description	Registration Contact
Thursday, September 25, 2003	Irvine Operations Center 23 Parker Street Irvine, CA 92718	2005 Standards Introduction	phone: (626) 812-7537 or (800) 336-2822
Thursday, September 25, 2003	CTAC 6090 N. Irwindale Ave. Irwindale, CA 91702	2005 Standards Introduction	Course Registration: 626-812-7537 www.sce.com/ctac

SAN DIEGO GAS & ELECTRIC

Date and Time	Seminar Location	Description	Registration Contact
Tuesday, September 9, 2003 8:30 am - 4:40 pm	National University Room 124 9388 Lightwave Avenue San Diego, CA 92123 (858) 541-7700	Non-Res High-performance design strategies for lighting and building envelopes with EnergyPro	Call Virginia (Ginny) Vaplon at (858) 636-5726 Or E-mail: vvaplon@semprautilities.com
Wednesday, September 10, 2003 8:30 am - 12:00 pm	National University Room 124 9388 Lightwave Avenue San Diego, CA 92123 (858) 541-7700	Non-Res Advanced Building Modeling with EnergyPro	Call Virginia (Ginny) Vaplon at (858) 636-5726 Or E-mail: vvaplon@semprautilities.com
Thursday, September 11, 2003 8:30 am - 12:00 pm	National University Room 124 9388 Lightwave Avenue San Diego, CA 92123 (858) 541-7700	Non-Res Mechanical System design strategies with EnergyPro	Call Virginia (Ginny) Vaplon at (858) 636-5726 Or E-mail: vvaplon@semprautilities.com
Thursday, October 2, 2003 9:00 am - 3:00 pm	National University Room 123 9388 Lightwave Avenue San Diego, CA 92123 (858) 541-7700	Preview of 2005 Title 24 Standards	Call Virginia (Ginny) Vaplon at (858) 636-5726 Or E-mail: vvaplon@semprautilities.com

CONTACT INFORMATION FOR OTHER ENERGY RELATED GROUPS:

THE BUILDING INDUSTRY INSTITUTE (BII)

www.thebii.org
1215 K Street, Suite 1200
Sacramento, CA 95814
(916) 443-7933
The Institute was founded by the California Building Industry Association (CBIA) to develop, implement and administer research and educational programs for homebuilders, developers, and the general public.

CABEC

California Association of Building Energy Consultants
www.cabec.org
P.O. Box 892975, Temecula, CA 92589-2975
1-866-360-4002
A nonprofit organization, CABEC members include energy consultants, architects, and engineers actively participating in compliance work with the California Building Energy Efficiency standards, Title 24.

CALBO (California Building Officials)

www.calbo.org
2215 21st Street.
Sacramento, CA. 95818
(916) 457-1103
FAX: (916) 456-7672
A nonprofit organization dedicated to promoting public health and safety in building construction.

CALIFORNIA BUILDING INDUSTRY ASSOCIATION (CBIA)

www.cbia.org
1215 K Street, Suite 1200
Sacramento, CA 95814
Phone: (916) 443-7933
Fax: (916) 443-1960
A statewide trade association representing nearly 6,000 businesses – homebuilders, remodelers, subcontractors, architects, engineers, designers, and other industry professionals.

CALIFORNIA BUREAU OF HOME FURNISHINGS AND THERMAL INSULATION (BHFTI)

www.bhfti.ca.gov
3485 Orange Grove Avenue
North Highlands, CA 95660
(916) 574-2041

OPPORTUNITIES

Class Schedule for Southern California Gas & Electric:

SOUTHERN CALIFORNIA GAS COMPANY

Date and Time	Seminar Location	Description	Registration Contact
Monday, September 8, 2003	National University 16875 West Bernardo Dr. Rancho Bernardo , CA	EnergyPro Residential	Call 800-427-6584 Or E-mail: erc@socalgas.com
Wednesday, October 1, 2003	National University Kearny Mesa Learning Center 3580 Aero Ct. San Diego , CA	EnergyPro Residential	Call 800-427-6584 Or E-mail: erc@socalgas.com
Friday, November 7, 2003	Energy Resource Center 9240 Firestone Blvd. Downey , CA 90241	EnergyPro Residential	Call 800-427-6584 Or E-mail: erc@socalgas.com

Title 24 Builder Energy Code Training

Learn about compliance for residential buildings with the latest energy codes. This free training is sponsored by the California Energy Commission and the Department of Energy (DOE). Training is provided by the Building Industry Institute (BII) and taught by Consol.

Date:	Location:
July 16-18	Riverside
July 23-25	San Diego2
August 6-8	Las Vegas
August 20-22	Sacramento
August 27-29	Orange County

For more information and registration, please call Consol at (209) 473-5000

Licensing: (916) 574-0280
fax: (916) 574-2043
E-mail: contactbhfti@dca.ca.gov
The Bureau regulates upholstered furniture and bedding products sold in California to make sure they meet health, fire safety, and labeling standards.

CHEERS

(California Home Energy Efficiency Rating System, Inc.)

www.cheers.org
9400 Topanga Canyon Boulevard
Suite 220
Chatsworth, CA 91311
(800) 4• CHEERS (1-800-424-3377)
fax: (818) 407-1188
E-mail: info@cheers.org
A California Statewide non-profit organization dedicated to promoting energy efficiency. CHEERS was created to provide a simple, accurate and reliable method of measuring the existing energy efficiency of a home, estimate its annual energy costs and provide a list of energy saving recommendations for improvements.

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

www.nfrc.org
8484 Georgia Avenue, Suite 320
Silver Spring, Maryland 20910
(301) 589-1776 extension 204
E-mail: info@nfrc.org
Its mission is to establish a fair, accurate, and credible national energy rating system for fenestration products and to ensure that the rating system is uniformly employed.

THE COOL ROOF RATING COUNCIL (CRRC)

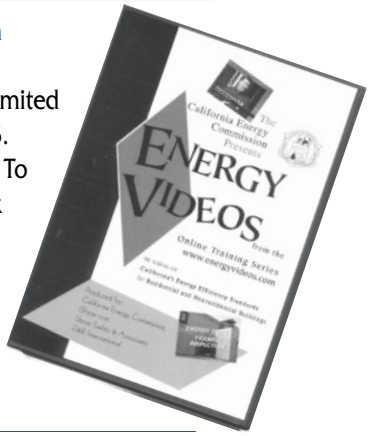
www.coolroofs.org
1738 Excelsior Avenue
Oakland, CA 94602
Tel: (866) 465-2523 (toll free)
Fax: (510) 482-4421
E-mail: info@coolroofs.org
An independent and non-biased organization that has established a system for providing accurate radiative property data on roof surfaces that may improve the energy efficiency of buildings.

Summer 2003 - # 72 blueprint
Energy Efficiency and Demand Analysis Division

The inside story:

#72

The New URL for Online Training Videos is: www.energyvideos.com



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Beverly Duffy
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(916) 654-5106

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blueprint

Energy Efficiency and Demand Analysis Division

New NFRC Label – page 3 / The Webcast – pages 4 & 5

QUESTIONS and ANSWERS

RESIDENTIAL

Q **Do return ducts have to be insulated if they are located in shafts that are inside the buildings thermal envelope?**

A No, ducts do not need to be insulated if they are inside the buildings thermal envelope. Standards Sections 124(a) and 150(m) talks about requirements for air distribution ducts and plenums.

NONRESIDENTIAL

Q **Can you install a thermostat that cycles the ventilation fan off when the temperature setpoint has been satisfied (sometimes called "a residential thermostat") in a nonresidential building?**

A No, Standards Section 122(c)1 requires the minimum outside air ventilation, appropriate to the occupancy type of the building, to be provided continuously when the space is occupied in nonresidential buildings.

Q **Do the Energy Commission's Building and Appliance Standards apply to federal military bases?**

A **Building Standards** Construction on federal land (bases, federally-owned office buildings, etc.) does not have to comply with the building standards. Buildings that are leased by the federal government, however must comply with the building standards.

Appliance Standards The appliance standards apply if the appliance is sold or offered for sale in California.

...continued on page 2

Questions and Answers

NONRESIDENTIAL

CONTINUED FROM PAGE 1

Q

What are the new requirements for distribution transformers?

A

Enforcement of the energy efficiency standards for distribution transformers is within the authority of both the California Energy Commission and local building officials. The Commission enforces the standards at the point of retail sale through appliance regulations found in Title 20. Local building officials enforce the standards through their authority over "Title 24 construction." That is, local building officials are responsible for enforcing the state's energy efficiency standards for buildings, which are found in Title 24 of the California Code of Regulations.

In 2002 the Energy Commission adopted Appliance Efficiency Standards for such devices. The standards appear in Section 1605.3(t) of Title 20 of the California Code of Regulations. The standards apply only if the transformer is a "low-voltage dry-type distribution transformer," which is defined as "a transformer that has an input voltage of 600 volts or less, that is air cooled, and that does not use oil as a coolant." The standards apply only to units manufactured on or after March 1, 2003.

More than a dozen types of transformers are excluded from the definition of "low voltage dry-type distribution transformer." These excluded types are defined in Section 1602(t) of the Commission's Appliance Efficiency Regulations (Title 20). To locate excluded transformers go to: *www.energy.ca.gov/appliances_rulemaking/notices/index.html* and click on the link for *"April 16, 2003 Appliance Efficiency Regulations (Adobe Acrobat PDF file)."*

Did You Know?

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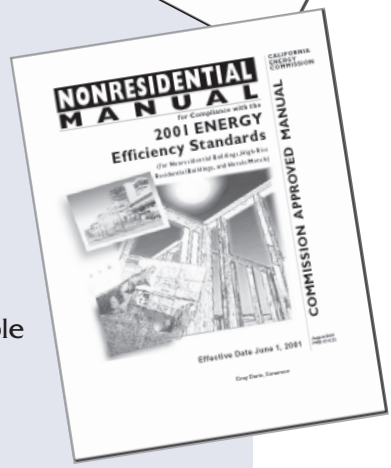

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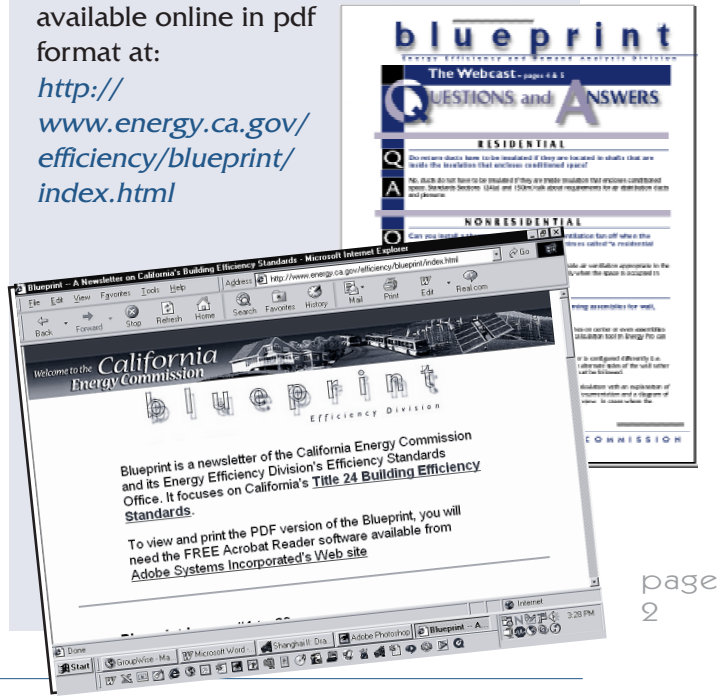

Everything You Need To Know About NFRC's New Label

By James Benney, NFRC Director of Education

Since its inception in 1989, the National Fenestration Rating Council (NFRC) has developed many industry standards and administered a program that has provided labels to communicate energy ratings for literally millions of windows, doors, skylights and curtain wall systems. NFRC is the organization recognized by the U.S. Department of Energy – and the State of California – for determining the energy performance ratings of fenestration products.

The fenestration industry has embraced new technology (glass coatings, gas fills, warm-edge spacers, thermally improved materials, etc.); as well as using computer programs for evaluating new products and materials.

The cornerstone for communicating the performance of windows and these advances in technology remains the use of the NFRC label. Manufacturers need to be able to show how the new technology has improved their products performance. It should be noted that these improvements are not visible to the naked eye. No one can see a low-e coating or an argon filled IGU. No one can tell the thermal effectiveness of a framing system or spacer system by just looking at it! It was important to have a label to show customers (architects, homebuilders, homebuyers and building officials) the value-added performance of these products.

Changes to the NFRC Label

It should be noted that NFRC ratings are based on specific product sizes, depending upon the product type and operator (a swinging patio door vs. a casement window, for example). Product ratings were developed for specific sizes for two reasons – To allow for an apples-to-apples comparison of similar products in the marketplace; and for a simple determination for code compliance. It would be impossible to develop prescriptive fenestration requirements without standard size ratings.

It was well understood in the industry that window performance changes with product size. So what should that standard size be? When NFRC first developed the label, the fenestration industry was fragmented. There were strong feelings one way or the other – (i.e., large size vs. small size vs. typical product size). Without a single mandate, NFRC compromised and came up with two sizes - one smaller, one larger. This of course meant that each label would show two performance ratings for a product. While this compromise helped to ease the struggle at NFRC, it certainly was not helpful in the marketplace. NFRC was constantly barraged with questions from customer groups over why there were two ratings on the label.

Finally, in 2002, after years of discussion, the industry agreed upon one rating size for each type of product. As a result, NFRC approved a new label design. The new label will greatly assist code officials and energy service providers with a tool for determining compliance with code or program requirements.

Of course there will be an interim period where both labels will be seen in the marketplace; but in the near future, coming to a market near you, will be the new and improved NFRC Label.

The January 15th Live Webcast from SMUD was a true success!

Commissioner Robert Pernell from the Energy Commission led off the day's events

During the Webcast on Residential Energy Efficiency Standards more than 500 computers with multiple viewers were logged on, and about 100 people were in attendance at Utility and Commission-sponsored off-sites around California. It is estimated that 1000 or more different people actually viewed part or all of the day long training event. Many building departments and other groups showed the Webcast in their training rooms or break rooms.

We have received enthusiastic feedback on the presentations made by the instructors, Doug Beaman, John Proctor, Rick Chitwood, Scott Johnson, Tom Hamilton and Rob Hammon. These expert energy consultants provided timely information on the Standards for building department personnel and others who were online and at all of the off-site locations.

The Webcast host was Steve Easley. The presentations featured on the Webcast on Residential Energy Efficiency Standards were:

- Overview of the 2001 Residential Standards – Major Changes with Douglas Beaman.
- HVAC, TXV, Refrigerant Charge, and Air Flow, presented by John Proctor.
- Plan Check – Overview with Douglas Beaman.
- CHEERS presented by Tom Hamilton & Scott Johnson.
- Insulation (co-funded by NAIMA) with Rick Chitwood.
- Inspection – Getting the "Big" items presented by Douglas Beaman.
- Fenestration by Douglas Beaman.
- The Building Industry and Building Departments –"Working Together for the Solutions" by Rob Hammon.
- Update on 2005 Standards by John Eash.

Various streaming videos from the Commission's Online Training Series were featured throughout the day.

The entire Webcast audio/video was recorded along with the synchronized Power Point presentations. The Webcast has had viewers from interesting places such as Poland, Brussels, Belguim; Anchorage, Alaska; Tehran, Iran ; Nanjing, China; Mililani, Hawaii; Wausau, Wisconsin; Old Hickory, Connecticut; Austin, Texas and Chicago, Ill.

Part of Scott Johnson's presentation on ducts.

Steve Easley worked hard all day as the Moderator and Host of the Webcast.

The Recorded Webcast is Now Available Online at www.energyvideos.com

The Webcast, including the online quizzes, can be viewed at www.energyvideos.com, at least until the end of June 2003. Just follow the instructions at the website. If you have difficulty viewing the webcast contact John Eash at jeash@energy.state.ca.us or the Energy Hotline at (800) 772-3300.

You can also view the more than 100 training videos located at the same website. You can download any of the videos (except the Webcast) by viewing in "Quicktime" and right-clicking where directed. These videos are intended for use by building departments, builders and consumers.

Some of the technical equipment used by ishow and D&R International to make the Webcast possible.

Stay Tuned...

Let us know if you would like us to provide another Webcast. We are considering a webcast on the Nonresidential Energy Efficiency Standards but need your input to determine if a demand exists for this kind of training. You can e-mail John Eash at jeash@energy.state.ca.us to comment or for information on the Online Training Series or Webcast.

The Commission's John Eash, who was the driving force behind the event.

"Congratulations on getting the webcast on-line! It's really, really neat! And we are posting a counter notice that the site is available and open for business! Great work! Cutting edge but approachable and easy to use. For those of us that don't have streaming video access to all parts of our buildings, will the new videos be available sometime on CD or for actual download from the website? Again, thank you for your work. It has really made a difference in the way we do things."

– Gerry Quast
Plans Examiner/Training Coordinator
for the Building Division
of the City of Anaheim
in an e-mail.

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Beverly Duffy
Editor

Special Thanks to:
Suzie Chan, Tav Commins, John Eash, Gary Flamm, Valerie Hall, Elaine Hebert, Rob Hudler, Bill Pennington, Betty Chrisman, Jim Holland, Bryan Alcorn, Maxine Botti, Rob Schlichting, and Mazi Shirakh for all their help in creating this edition of the *Blueprint*.

CHANGE OF ADDRESS

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Energy Efficiency and Demand Analysis Division

The inside story:

QUESTIONS & ANSWERS

The New URL for Online Training Videos is www.energyvideos.com

For any questions or additional information relating to the new Standards contact the Energy Hotline at (800) 772-3300.

#71

Winter 2002 - # 70

blueprint

Energy Efficiency and Demand Analysis Division

TITLE 24 RESIDENTIAL ANSWERS

The California Energy Commission will provide a FREE "Webcast" on January 15, 2003, from the headquarters of the Sacramento Municipal Utility District (SMUD). The Webcast is an all-day (8:00 a.m.-5:00 p.m.) **live**, online, real-time, interactive training session on the Energy Standards for residential buildings. The event will include several expert instructors, pre-recorded videos, Power Point presentations, and answers to e-mail questions from participants.

You can view the Webcast on any personal computer from anywhere, providing you have a high-speed connection such as T-1 line, Cable Modem or DSL. You can also view the training sessions on screens at locations throughout California where the major California Utilities (Southern California Edison, Southern California Gas, San Diego Gas and Electric and Pacific Gas and Electric) will be co-hosting the sessions. They will provide rooms and refreshments to local participants in Downey, Irwindale, San Francisco, Stockton and San Diego. Participants can e-mail questions to the instructors for immediate answers.

Pre-register at www.energyvideos.com

Special WEBCAST EDITION
FROM SMUD ON JANUARY 15, 2003
8:00 A.M. – 5:00 P.M.

Webcast Agenda – January 15, 2003 from SMUD

Agenda subject to change without notice
Steve Easley will be the Moderator for the day

Segment	Time of Day	Topics (Are all Residential)	Instructor
Getting Started	8:00 to 8:30	Streaming videos from the Commission's Online Training Series	Various
1	8:30 to 9:00	Welcome	Steve Easley
2	9:00 to 10:00	Overview 2001 Residential Standards – Major Changes	Douglas Beaman
3	10:00 to 11:00	HVAC, TXV, Refrig. Charge, Air Flow,	John Proctor
4	11:00 to Noon	Plan Check – Overview	Douglas Beaman
5	12:00 to 12:30 Lunch Break	Streaming videos from the Commission's Online Training Series	Various
6	12:30 to 1:30	CHEERS	Tom Hamilton & Scott Johnson
7	1:30 to 2:30	Insulation	Rick Chitwood
8	2:30 to 3:15	Inspection – Getting the "Big" items	Douglas Beaman
9	3:15 to 4:00	Fenestration	Douglas Beaman
10	4:00 to 4:30	The Building Industry and Building Departments – "Working Together for the Solutions"	Rob Hammon
11	4:30 to 5:00	Update on 2005 Standards & Close	John Eash, Steve Easley

...continued on page 2

WEBCAST ...continued from page 1

Sites where Building Department staff can participate are:

- **SMUD, contact www.smud.org or call 916-732-6738**
- **SoCal Gas/SDG&E @ Downey and San Diego, contact jeash@energy.state.ca.us.**
- **PG&E @ Stockton and San Francisco, contact KML2@pge.com**
- **SCE @ C-TAC contact jeash@energy.state.ca.us.**
- **Energy Commission-Hearing Room A, contact jeash@energy.state.ca.us.**

The entire recorded Webcast will be available on the Commission's Consumer Energy Center site (www.energyvideos.com) for viewing at a later date (via streaming video or download). This site currently links to more than 100 (Commission contracted) energy-related training streaming videos. All questions received (including those answered live), along with answers, will be posted on the website by February 1, 2003. Participants may also take an online test on the training and receive credit from the California Building Officials' (CALBO) training arm, the California Training Institute (CTI).

QUESTIONS and ANSWERS

RESIDENTIAL

Q: May HVAC subcontractors test at rough-in for system leakage when "duct sealing" is required by the energy calculations?

A: Yes. Subcontractors are allowed, for purposes of the CF-6R testing and certification, to test at rough-in. Note that the installer must insure that the spaces between the register boots and the wallboard are sealed after the drywall is installed. Also, the installer is obligated to revisit every applicable house after the drywall is installed to check to see that no leaks have developed since the testing at rough-in. It is prudent for the subcontractor to lower their leakage targets (below 6%) at rough-in so that they will not conflict with the HERS rater's testing that must be done after the drywall is installed.

Q: May a certified HERS rater, who does the field verification and completes and signs the CF-4R, do the testing required for the builder or installer to certify compliance with Title 24 installation requirements on the CF-6R?

A: Yes. This approach only works where the certified HERS rater is doing field verification for every house. It is not allowable in the case where the HERS rater is doing field verification only on a sample of homes.

The builder or the installer must sign the CF-6R certifying compliance. The HERS rater may not sign the CF-6R. However, the builder or installer can rely on the HERS rater's diagnostic test results when the builder or installer signs the certification statement on the CF-6R. Of course, if the HERS rater determines that the compliance requirements are not met, the builder or installer may not

sign the CF-6R until action is taken to make whatever corrections are necessary. Once corrections have been made, and the HERS rater determines that all compliance requirements are met, the builder or installer may certify the work by completing and signing the applicable section of the CF-6R. The rater then must complete and sign the CF-4R for this building.

Note that HERS rater must complete diagnostic testing and field verification (as documented and certified on the CF-4R) after the measure is completely installed. For duct sealing, drywall must be completely intalled before testing. A builder may contract with a certified HERS rater to complete testing at rough-in for quality control purposes, but such testing is not sufficient for meeting compliance requirements and certifications on the CF-4R.

NONRESIDENTIAL

Did one of the options expire for NFRC certification of manufactured windows used for nonresidential buildings?

Yes, after October 1, 2002 SHGC values for manufactured windows can no longer be calculated based on center of glass values. Now the SHGC must be based on NFRC 200 testing and labeling or obtained from the default table, Table 3-12 of the Nonresidential Manual. SHGC values for site-assembled windows in buildings less than 100,000 square feet or with less than 10,000 square feet of site-assembled windows can still be calculated based on center of glass values. See Table 3-11 of the Nonresidential Manual.

Check the training calendars of utilities through the Energy Commission link! Go to: www.energy.ca.gov/title24/ and select Builder Training & CEPE Exam.

Did You Know?

RATER VERIFICATION OF THERMOSTATIC EXPANSION VALVES (TXVs)

Effective immediately, the Commission has approved two methods of field verifying the presence of a TXV. These methods are options to having a removable door or access panel to verify the TXV. These procedures may be used in lieu of the guidelines described in Section 3.6.7 of the Residential Manual.

Option 1:
Visually verify that a sensing bulb is running from inside the coil and that it is visible outside of the coil. You do not need to open the coil to complete this verification.

Please note *that the sensing bulb will be attached to the suction line and should be covered by insulation. You will need to verify the sensing bulb by either removing sufficient insulation to see it or by feel.*

Option 2:
This option is designed to allow a Rater to verify a TXV based upon manufacturer's nameplate data. To use this option three steps must be completed.

Step One:
Observe that for a particular brand and model that the manufacturer has installed a TXV at the factory.

Step Two:
The manufacturer's nameplate on the coil indicates that a TXV has been factory installed. The Rater may ask for clarification of the nameplate information from the distributor.

Step Three:
The Rater verifies that the nameplate information on the coil being inspected indicates that a TXV has been installed in that coil.

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Beverly Duffy
Editor

Special Thanks to:
Suzie Chan, Tav Commins, John Eash, Gary Flamm, Valerie Hall, Elaine Hebert, Rob Hudler, Bill Pennington, Rob Schlichting, and Mazi Shirakh for all their help in creating this edition of the *Blueprint*.

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The inside story:

The Webcast is an all-day live, online, real-time, interactive training session on the Energy Standards for residential buildings, utilizing several expert instructors, pre-recorded videos, Power Point presentations, e-mail (questions from participants), and survey software (test).

#70

QUESTIONS & ANSWERS

The New URL for Online Training Videos is www.energyvideos.com

For any questions or additional information relating to the new Standards contact the Energy Hotline at (800) 772-3300.

EFFICIENCY · ENERGY FOR THE FUTURE ·

Special WEBCAST EDITION

LIVE FROM SMUD ON
JANUARY 15, 2003
8:00 A.M. – 5:00 P.M.

blueprint

Fall 2002 - # 69

Energy Efficiency and Demand Analysis Division

Special Insert on Enforcing HERS inside

QUESTIONS and ANSWERS

NONRESIDENTIAL

A nonresidential building is built without tenants to occupy it. The building has a common area and spaces for tenants. The builder installs the HVAC system chiller, boiler, fans and controls. They also install the distribution system for the common area, but do not run the HVAC system until the first tenant spaces are occupied. The builder does not install insulation at the time of construction, preferring to wait until tenants move in. Must the inspector write this up as non-complying with the energy efficiency code?

No. The energy efficiency code allows for speculative ("spec") buildings that are not occupied upon completion of the shell. Note that for common areas, where the HVAC system is fully installed, the envelope compliance must be completed. Not complying with the code at the time of initial construction carries consequences. For example, tenants located in areas of the building with large percentages of glass, or the last tenant to move in, may find that there is insufficient HVAC capacity to serve their area.

Buildings can comply on a component-by-component basis with mandatory and prescriptive measures. For example, if just the building's central mechanical plant is completed, it must comply with the applicable mandatory and prescriptive measures by using either the prescriptive or performance approach. Envelope, lighting and water heating compliance can wait until tenants move in. The prescriptive or performance approaches (except for lighting only, which is limited to the prescriptive approach) could be used. Under either of these options, lighting can achieve compliance by using the prescriptive options (whole building, area method or tailored lighting). For more information, see Section 2.2.2F, of the *Nonresidential Manual*.

...continued on page 2

QUESTIONS and ANSWERS

NONRESIDENTIAL (continued)

Do the building energy efficiency standards apply to boilers, heat exchangers and related equipment that serve a process load?

No. The standards do not apply to equipment that serves a process load where that process load - or any recovered waste energy from that equipment - is not being used for space conditioning.

The standards apply **only** if the following conditions are met. First, the enclosed space is being heated or mechanically cooled by this process energy or by associated recovered waste energy. Second, the occupancy type of the building (type A, B, E, F, H, R, or S) is included in the energy standard. If either of these conditions is not met, then energy compliance does not have to be done.

Note that the equipment may need to comply with appliance standards requirements, depending on the type of equipment.

RESIDENTIAL

Do electric resistance floor heating systems need to be certified to the Energy Commission, and if not, are there other requirements?

No. There are no California requirements for electric resistance heating to be certified. An efficiency value is still required for compliance purposes, however, and may be acquired from the manufacturer's specification sheet.

RESIDENTIAL AND NONRESIDENTIAL

Do solar daylighting tubes need to meet the same requirements as skylights?

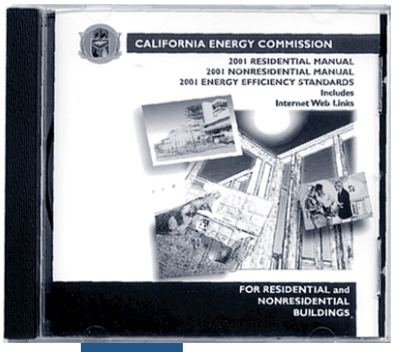
A. No. The National Fenestration Rating Council (NFRC) now has an available methodology to standardize testing of solar daylighting tubing. For more information on the NFRC test method, phone (301) 589-1776.

For non-NFRC labeled solar daylighting tubes, use the Energy Commission's Default Table for the default thermal performance. If the diffuser is single pane, use the single pane default values. If the diffuser is double pane, use the double pane default values. (The diffuser is the piece that is attached to the conditioned side of the ceiling that helps distribute daylight into the space. The diffuser must be sealed and caulked to prevent infiltration into the conditioned space [Section 117 of the Standards]).

Special Thanks to:

Suzie Chan, Tav Commins, John Eash, Gary Flamm, Al Garcia, Valerie Hall, Elaine Hebert, Rob Hudler, Bruce Maeda, Nelson Peña, Bill Pennington, Rob Schlichting, Mazi Shirakh, and Beverly Duffy for all their help in creating this edition of the *Blueprint*.

Did You Know?



The Energy Efficiency Standards, Residential and Nonresidential Manuals, Adobe Acrobat software, and a link to the online training videos are now available on a single CD ROM. The cost for the general public is $12 per CD. To obtain the CD using *VISA* or *MasterCard*, please call the Energy Commission's Publications Unit at (916) 654-5200 and request publication number P400-02-007F. You may also pay by check by writing to:

California Energy Commission
Publications Unit, MS-13
1516 Ninth Street
Sacramento, CA 95814-5512

One free CD is available for building departments by contacting the Energy Commission's Publications Unit at the above number!

Since 1975, California building and appliance standards have saved over $33 billion in energy bills and the costs associated with building 46 –700 megawatt power plants. In energy terms, this represents 200 billion kilowatt hours of electricity use, plus 33 billion therms of natural gas, and a reduction of the peak load of over 5.6 million kilowatts.

The Energy Commission maintains a web site with information on energy-related rebates and other incentives available to individuals, businesses and builders. The information can be found at *www.consumerenergycenter.org*

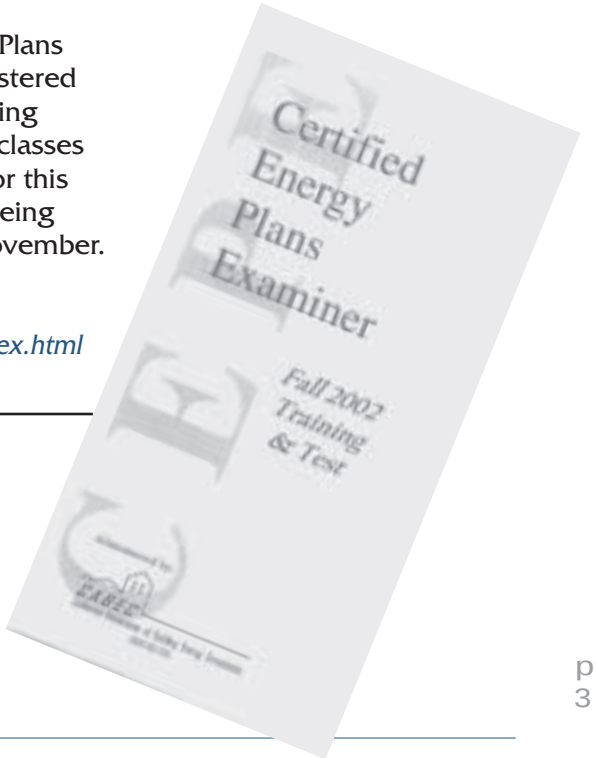
You can receive automated electronic messages of activities at the Energy Commission by signing up on a list server. List server topics include the building energy efficiency standards, appliance standards, Title 24 field verification, HERS, new publications, and many other subjects. To sign up:

- go to *www.energy.ca.gov*
- click on "list servers" (bottom left of the page) follow the on screen instructions
- click on "send subscription"

Energy Training

Training to pass the Certified Energy Plans Examiner (CEPE) test is being administered by the California Association of Building Energy Consultants (CABEC). While classes for residential certification are over for this year, nonresidential classes are still being offered in October with testing in November. For class schedules and registration information go to: *www.cabec.org/* or *www.energy.ca.gov/title24/training/index.html* or contact CABEC at 1 (909) 763-1234

Check the training calendars of utilities through the Energy Commission link! Go to: www.energy.ca.gov/title24/ and select Builder Training & CEPE Exam.



The New URL for Online Training Videos is www.energyvideos.com

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(916) 654-4064

Dale Trenschel
Editor

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The inside story:

QUESTIONS & ANSWERS

For any questions or additional information relating to the new Standards contact the Energy Hotline at (800) 772-3300.

#69

Special Insert on Enforcing HERS inside

Enforcing HERS Third Party Field Verification

How should building departments enforce any required "HERS Ratings?"
To correctly enforce the Third Party Field Verification requirements of the Title 24 Energy Standards, the building official should ensure that the following steps are taken:

1. KNOW YOUR RATERS

HERS raters are considered special inspectors and are responsible to the building department. You should be satisfied with their competence and that they meet Energy Commission conflict of interest requirements.

2. PLAN CHECK

- ✔ Locate the "HERS Verification" section on the CF-1R to see if a HERS rater is required for the project.
- ✔ Mark the plans to make sure that the Building Inspector knows that a HERS rater is required (such as circling the "HERS Verification" section of the CF-1R on the field set of plans – or red ink stamping on those plans, "HERS Rater/CF-4R Required," or just "HERS"

BACK CHECK

- ✔ Make sure that the builder has a HERS rater lined up at the beginning of the project.
- ✔ Ask the builder to identify the HERS rater that is going to be used. Are you satisfied with this HERS rater? You can require a different certified rater if you wish. If the builder doesn't have a HERS rater lined up, get the builder to contact CHEERS to identify a HERS rater for the project.
- ✔ If the builder does not want to use a HERS rater, have them resubmit new energy calculations showing how compliance is achieved without measures that require third party field verification.

3. BUILDING INSPECTION

- ✔ Remind the field superintendent early on that you will need to see the CF-6R (completed and signed by the installer for every building) and the CF-4R (signed by the HERS Rater – builder may do "sampling" in production homes).
- ✔ If you have not already seen them, add the CF-6R and CF-4R to your "Final" punch list and encourage the superintendent to line up a HERS rater if that has not already occurred.

When you enforce the HERS rating law, you are helping to reduce the peak electricity load and lower utility bills for homeowners, while ensuring that people are getting what they paid for and helping the builder avoid construction defect liability.

See the Residential Manual, Chapter 4 – Compliance through Quality Construction, for more information about HERS requirements. *http://www.energy.ca.gov/title24/residential_manual/index.html*

For more information about HERS raters contact CHEERS at
www.cheers.org ***or call 1-800-4CHEERS (424-3377)***

PG&E's Energy Training Center-Stockton
1129 Enterprise Street, Stockton, CA 95204 – (800) 244-9912 – (209) 932-2502 fax

Residential Courses

October - December 2002

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FAX: 209.932-2502 – E-MAIL: pge.com/stockton

Pacific Gas and Electric Company's Energy Training Center, Stockton—formerly called the Stockton Training Center—offers professional training courses for HVAC, window, and insulation contractors, as well as general contractors, builders, architects/engineers, and design community.

All courses are free of charge.

Class size is limited, so early registration is encouraged. Simply fax or mail the registration form on the back of this flyer. Note that extra sessions may be added based on demand; so if you can't make a date, check in with the office later in the season.

For more information, call 1-800-244-9912 or visit our website at www.pge.com/stockton

Pacific Gas and Electric Company™

Title 24 – Compliance Series

2001 Energy Standards Update for Residential Construction

This review and update will address changes as well as review new forms and documentation, new mandatory measures, and third party verifications. Session includes duct testing, radiant barrier, and high performance glazing demonstrations.

LENGTH: HALF DAY
TIMEFRAME: 9 A.M. TO 2 P.M.
WED., 10/30
TUES., 11/19
TUES., 12/10

Air Distribution Diagnostic Testing

Review of Title 24 test and documentation requirements, plus hands-on experience operating duct tester, flow hood, digital manometer, and blower door equipment.

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 5 P.M.
Tues., 10/1 or Thurs., 10/24
Thurs., 11/7 or Thurs., 11/21
Thurs., 12/5

Duct Design

Review of ACCA Residential Design System and approved software, Manual D procedure, and proper documentation. Learn how to achieve efficiency compliance while optimizing ductwork for competitive price and comfort.

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 5 P.M.
Tues., 10/22
Tues., 11/5 or Tues., 11/19
Tues., 12/3

Equipment Sizing & Selecting

This course will review the following: ACCA load calculation and equipment selection process; room by room loads that lead into Manual D Duct Design (compliance credit component); safeguards for "right" sizing while avoiding undersizing; and ACCA-approved software.

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 5 P.M.
Wed., 10/2 or Mon., 10/21
Mon., 11/4 or Mon., 11/18
Mon., 12/2

Whole House Issues

Advanced AC/HP Diagnostic Tune-Up Overview

This one-day course will provide HVAC contractors with a detailed review of checking refrigerant charge. This course will be taught by Terry Norris of Advanced Energy Corporation of North Carolina. Terry is a former manufacturer's representative, and a national expert in the field of residential HVAC system installations.

LENGTH: ONE DAY
TIMEFRAME: 8:30 A.M. TO 5 P.M.
ENROLLMENT: 20 MAX
TUES., 10/22 OR WED., 10/23
WED., 11/13 OR THURS., 11/14
TUES., 12/10 OR WED., 12/11

Biggest Energy Mistakes Made in Residential Construction

A home's energy performance often looks good on paper, but does not always meet the customer's expectations with regard to comfort and energy costs. This presentation, developed from working with field problems, focuses on technologies and installation practices that provide the "biggest bang for the buck" when it comes to making homes more energy efficient. Instructor Steve Easley, a Discovery Channel television personality, uses field slides to illustrate cost effective solutions to building energy efficient homes that are practical and long lasting.

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 5 P.M.
MON., 11/25

House as a System

Taught by national building performance experts, this course addresses the interaction of the HVAC system, the building envelope, and the rest of the house. Learn to test and verify the performance of the whole house as a system, and understand the interrelationships among comfort, energy efficiency, durability, and health and safety.

LENGTH: THREE DAYS
TIMEFRAME: 9 A.M. TO 5 P.M.
Tues. – Thurs., 11/19-21

House as a System Overview

If you have reservations about attending the three-day House as a System course, this one-day overview offers highlights of the whole house approach.

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 5 P.M.
Mon., 11/18

HVAC Quality Installation

Training details national standards for "quality installation" of HVAC systems and offers tips from nationally renowned experts. John Krigger and Rick Falke will present valuable information to HVAC contractors. Don't miss this free opportunity.

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 5 P.M.
Tues., 10/8 or Wed., 10/9
Thurs., 11/14 or Fri., 11/15

Insulate Right!

Learn about installation techniques and inspection criteria for both ceiling and wall insulation, including laboratory instruction in the Energy Training Center's on-site attic.

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 3 P.M.
Thurs., 10/10
Wed., 11/13
Tues., 12/10

Informational Sessions

2002 Home Energy Efficiency Rebate Program

Details regarding rebate amounts, product/equipment specifications, and application and documentation requirements for the current rebate programs.

These informational sessions are optional, and are not required for your customers to receive a rebate.

LENGTH: ONE AND A HALF HOURS
TIMEFRAME: 9 A.M. TO 10:30 A.M. AND REPEATED AT 2 P.M. TO 3:30 P.M. EVERY WEDNESDAY STARTING 9/18/02 AND ENDING 10/30/02

Title 24 – Compliance Series

Duct Installation Standards

Review of the latest Title 24 standards for airtight ducts. Full explanation of UL181 requirements, approved materials, installation criteria, sealing and testing requirements, and duct insulation. Students receive binder with resource materials.

LENGTH: HALF DAY
TIMEFRAME: 9 A.M. TO 12 P.M.
Fri., 10/25
Fri., 11/8 or Fri., 11/22
Fri., 12/6

Zoning Loads & Duct Design

This one-day program will build upon the knowledge gained in the T-24 Equipment Sizing & Selecting and T-24 Duct Design courses (prerequisites for this course). Students will learn how to successfully solve residential comfort and energy problems using zoned systems. The class will include "real world" examples with results of zoning solutions that work. The types of zoning hardware and Title 24 credit for zoning will also be reviewed.

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 5 P.M.
Wed., 10/23
Wed., 11/6 or Wed., 11/20
Wed., 12/4

Windows

High Performance Windows

Learn all about the benefits of high-performance fenestration products. Lecture and demonstrations address cost, energy savings, comfort, air quality, and Title 24 compliance.

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 5 P.M.
Thurs., 10/17
Thurs., 11/14
Thurs., 12/5

Training Location

All classes will be offered at: **Pacific Gas and Electric Company's Energy Training Center**, 1129 Enterprise Street in Stockton.

New Courses

Controlled Ventilation

National building science expert Dr. Joseph Lstiburek presents a one-day course on mechanical ventilation systems in residential buildings. Topics include:

- How tight is too tight?
- Natural versus mechanical ventilation
- Ventilation system sizing
- Sources of indoor air pollution

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 5 P.M.
Fri., 11/22

Pool Filtration at Half the Cost

This class focuses on pool pumping technology that can reduce a pool owner's filtration cost by 50%. Find out how to keep your customers happy and save them a bundle in the process. Give them a better option than resetting their timers. Yes, it is possible to have both clean pools and big dollar savings!

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 5 P.M.
WED., 10/16
WED., 11/6

Principles of Energy

What is the difference between a kilowatt and a kilowatt hour? Why is gas measured in therms? How do you determine if HVAC equipment is energy efficient? Why is the customer still cold when the thermostat says 78°? If heat doesn't rise, why is the ceiling warm? Find out the answers to these and other energy principles in this half-day class.

LENGTH: HALF DAY
TIMEFRAME: 9 A.M. TO 12 P.M. AND REPEATED AT 1 P.M. TO 4 P.M.
Thurs., 11/7
Tues., 12/3

The Geoexchange Alternative

Geoexchange systems (ground source heat pumps) use the earth's energy as a heat source in the winter and a heat sink in the summer. In California, geoexchange savings can exceed 50% for heating and 30% for cooling. A proven energy efficient technology, such systems have been installed throughout Northern California. Take this opportunity to learn about geoexchange systems!

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 5 P.M.
Wed., 10/30

The Truth About Motors, Fans & Pumps

Motors, fans and pumps in residential applications represent an area in which significant opportunities exist to reduce inefficient energy use. Come and learn more about ways of reducing energy usage.

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 5 P.M.
Thurs., 10/10

* * * * * * * * * * * * * * * * * * * *

Turn Trash Into Cash!

De-Construction is a cost-effective way to remove residential and commercial structures to maximize material recovery. De-Construction is an alternative to traditional demolition methods by:

- ***Reducing*** costs of removal and volume of waste compared to demolition and securing tax benefits from donations.
- ***Recycling*** up to 85% of a building's material for reuse, thus reducing tipping fees and environmental impact of construction practices.
- ***Reusing*** building materials, by taking them out of the waste stream and creating job opportunities in a developing field.

LENGTH: TWO HOURS
TIMEFRAME: 9:30 A.M. TO 12 P.M. AND REPEATING AT 1:30 P.M. TO 4 P.M.
Wed., 10/2

* * * * * * * * * * * * * * * * * * * *

See the Heat!

The actual energy performance of residential thermal envelopes is getting worse, not better. Homes are getting more and more architecturally complex with: arches, columns, thick walls, plan shelves, attic kneewalls, etc. This class demonstrates how to assess the performance of existing and new construction using infrared cameras, non-contact thermometers, visual inspection and blower doors.

LENGTH: ONE DAY
TIMEFRAME: 9 A.M. TO 5 P.M.
Tues., 10/29

Registration

To enroll, fax this form to **209-932-2502** or mail it to the **Energy Training Center, 1129 Enterprise Street, Stockton, CA 95204**. If you have any questions, please call **1-800-244-9912**.

PLEASE PRINT

Course

Date

Course

Date

Course

Date

Course

Date

Course

Date

Name

Phone

Fax

E-Mail

Company Name

Company Address

City State Zip

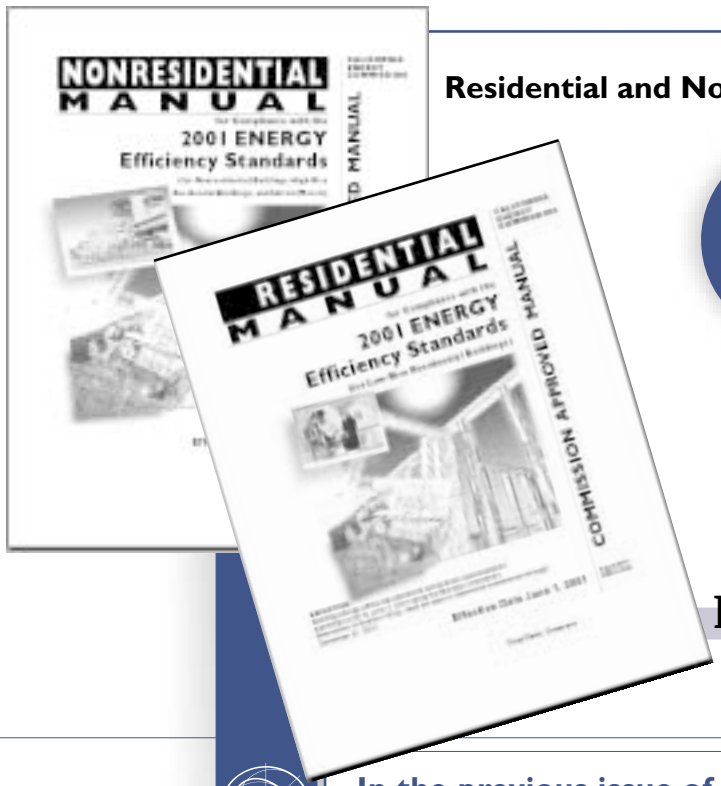
You will receive a confirmation letter, including a map to the training location, before the day of the class. If you are unable to attend or need to reschedule, please let our office know as soon as possible as we are making every effort to keep our costs down. Your cooperation is greatly appreciated.

The Energy Training Center, Stockton, is funded by California utility customers and administered by Pacific Gas and Electric Company under the auspices of the California Public Utilities Commission.

blueprint

Summer 2002 - # 6 8

Energy Efficiency and Demand Analysis Division



Residential and Nonresidential Manuals now available – see page 4

QUESTIONS and ANSWERS

RESIDENTIAL

In the previous issue of the *Blueprint*, you explained how to calculate the required pipe insulation thickness to comply with R-value requirements. For pipe diameters less than two inches, commonly available 3/4-inch and one-inch-thick pipe insulation products may not quite meet the R-value requirements for refrigerant and hot water lines. Are there other acceptable ways to determine compliance when pipe insulation does not meet required R-values?

Yes. For example, if piping with 3/4-inch (refrigerant lines) or one-inch (hot water lines) pipe insulation is run through the attic in a manner which will allow the ceiling insulation to fully cover the insulated refrigerant lines or hot water pipes, then the pipe insulation requirement in Table 1-T, Section 150(j) 2 has been met. If the piping is run in an exterior wall that is adjacent to conditioned space, the wall and pipe insulation together may be sufficient. For this installation to be acceptable, care must be taken to enclose the insulated pipe in the wall insulation without compromising the wall insulation effectiveness. The following steps should be taken:

- Piping must be installed so that the wall insulation is between the piping and the outside surface of the wall, minimizing wall insulation compression.

...continued on page 2

QUESTIONS and ANSWERS

RESIDENTIAL (continued)

- If blown in wall insulation is used, then the piping must be fully enclosed in wall insulation.
- For hot water pipes with one-inch-thick insulation, if batt insulation is used, it must be split and fitted around the insulated hot water pipes so that the insulated pipes are fully enclosed in wall insulation.
- For refrigerant lines with 3/4-inch-thick insulation, if batt insulation is used, it must either be split and fitted around the insulated refrigerant line, or two batts of insulation must be used, one installed on the outside and one on the inside of the insulated refrigerant line.
- If piping is run in an exterior wall that is not adjacent to conditioned space or in a wall that has conditioned space on both sides of the wall, then the cavity must be filled with insulation on both sides of the pipe. The minimal certified R-value for each side must be R-2.

Note that for pipe diameters over two inches, the pipe insulation must meet the requirements of Table 1-T in the Standards. Also note that pipe insulation thicknesses are actual, not nominal thicknesses.

Q **If I am doing an addition but am not replacing my air conditioner, can I use the "Alternative to Package D?"**

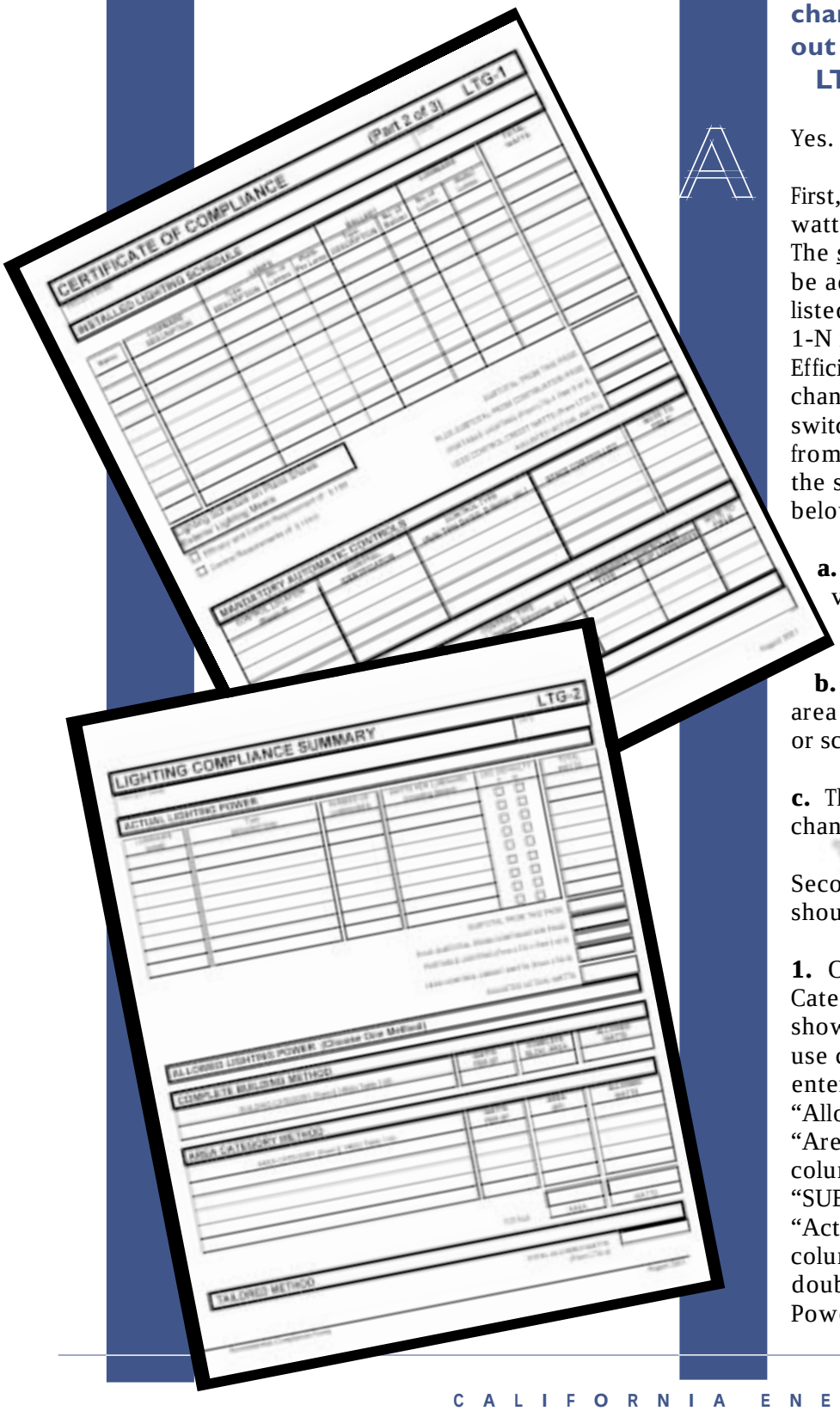
A No. The "Alternative to Package D" can not be used unless all of the requirements specified in the "Alternative to Package D" are met, including the SEER 11, 12 or 13 air conditioner requirement depending on climate zone. If the air conditioner is not being replaced, the only prescriptive option that is available is Package D.

Q **If I am building an addition less than 500 square feet, do I only have to meet the 0.75 glazing U-factor requirement if I am using the "Alternative to Package D?"**

A No. The "Alternative to Package D" can not be used unless all of the requirements specified in the "Alternative to Package D" are met, including the 0.55 or 0.40 glazing U-factor requirement depending on climate zone. If you want to install windows that only have to meet a 0.75 U-factor, the only prescriptive option that is available is Package D.

Please note that "Prescriptive Requirements for Additions" are explained on pp. 7-6 to 7-8 of the *Residential Manual.*

NONRESIDENTIAL



Is there a recommended method to account for additional chandelier wattage and for filling out the related lighting forms LTG-1 and LTG-2?

Yes. To account for chandelier wattage:

First, determine the allowed chandelier wattage:
The smallest of the following values may be added to the allowed lighting power listed in "Area Category Method," Table 1-N in Section 146(b) 2 of the 2001 Efficiency Standards. For ornamental chandeliers and sconces that are switched or dimmed on circuits different from the circuits for general lighting, use the smallest of either a, b, or c listed below.

a. 20 watts per cubic foot times the volume of the chandelier or sconce; or

b. One watt per square foot times the area of the task space that the chandelier or sconce is in; or

c. The actual design wattage of the chandelier or sconce

Second, the LTG-2 and LTG-1 forms should be filled out as follows:

1. On the LTG-2 form, under the "Area Category Method," on a separate line show the calculations for a or b above or use c(the actual design wattage) and enter the resulting wattage in the "Allowed Watts" column. Subtotal the "Area Category Method, Allowed Watts" column and include that value in the "SUBTOTAL FROM THIS PAGE" box in the "Actual Lighting Power, Total Watts" column of the form. Be careful not to double count the "Allowed Lighting Power" with the "Actual Lighting Power."

2. On the LTG-1 form enter the additional wattage in the "Installed Lighting Schedule" section, "SUBTOTAL FROM THIS PAGE" box of the form.

RESIDENTIAL & NONRESIDENTIAL

Did the Commission change the energy code requirements that prohibited the use of cloth backed rubber adhesive duct tape unless it is installed with mastic and mechanical fasteners?

No. This prohibition has been in effect for the tight duct credit since 1999. In the 2001 Standards, the Commission made the prohibition mandatory for all residential and nonresidential duct systems. Two cloth duct tape manufacturers petitioned the Commission to reconsider the prohibition, resulting in a special rulemaking proceeding on the issue. The information submitted during this proceeding, including laboratory testing results, expert testimony and written and oral comments, reinforced the appropriateness of the existing prohibition. The Commission's decision to NOT change the Standards was supported by the California Building Officials, California Building Industry Association, Insulation Contractors Association, Pacific Gas and Electric Company, Lawrence Berkeley National Laboratory, Proctor Engineering Group, and Intertape Polymer Group (a cloth duct tape manufacturer). You can review the Notice of Committee Conclusions that explains the reasons for continuing the prohibition at: *www.energy.ca.gov/title24/ducttape/notices/2002-03-26_COM_CONCLUSIONS.PDF*

Are the residential and nonresidential manuals for the 2001 Energy Efficiency Standards available in hardcopy, and if so, how do I obtain them?

Yes. If you prefer hard copies of the manuals they are now available from the Energy Commission's Publications Unit. These are identical to the manuals that have been accessible on the web at *www.energy.ca.gov/title24/*

To obtain a hard copy using *VISA* or *MasterCard*, please call (916) 654-5200 and request publication number P400-01-022 for the *Residential Manual* and P400-01-023 for the *Nonresidential Manual.* The cost of the manuals is $40 and $35, respectively. You may also pay by check by writing to:

California Energy Commission
Publications Unit, MS-13
1516 Ninth Street
Sacramento, CA 95814-5512

Is laminated glass that is sandwiched by two outer layers of glass with an inner layer material considered a double pane window?

No. To be considered a double pane window an air space must exist between the two glass panes, regardless of lamination and coating. The space between the two panes needs to be hermetically dry and sealed airtight. The air space is commonly 3/16-inches to 3/4-inches wide.

CALIFORNIA COMMUNITY ENERGY EFFICIENCY PROGRAM

California's Community Energy Efficiency Program (CEEP), designed by the Building Industry Institute and local building departments, is a voluntary effort to improve the energy efficiency of new homes by at least 15 percent more than required by the California Energy Standards. Over 40 local jurisdictions including eight counties, primarily in Southern California, currently participate. The program offers homebuilders incentives such as expedited plan checks, fee reductions, and waivers, all of which save money in exchange for homes that surpass the energy code requirements and reduce resource wastes. The program includes a strong third party-quality assurance process that ensures compliance with the Standards and Quality Home construction practices.

Participating builders may also receive marketing benefits and award recognition while achieving fewer callbacks and increased consumer satisfaction. Some builders also see great value in being "ahead of the curve" of future, more energy efficient, regulations. Building departments benefit from a lesser burden on inspectors and plan checkers confronted with pressing workloads generated by increasing new residential construction rates.

For additional information on CEEP go to:

www.thebii.org/ and select CEEP

the BUILDING INDUSTRY INSTITUTE

TITLE 24 ENERGY TRAINING

San Diego Gas and Electric Company is sponsoring training on Title 24 residential construction and encouraging builders to do more than required by Title 24.

Classes are being offered on:

- EnergyPro (fee required)
- HVAC - Manual D Duct Design
- HVAC - Manual J
- High Performance Duct Systems and 2001 Residential Energy Standards
- Lighting Design
- Title 24 Compliance Using Micropas (fee required)
- High Performance Windows

For more information contact Deborah Newell at (858) 636-5730 or e-mail *dnewell@sdge.com*

The Energy Commission continues to sponsor Building Energy Code training. Classes will be starting up in August 2002. For the schedule, class locations and registration visit: *www.calbo.org* and select *Education*

CHEERS training for HERS raters is coming up. See *www.cheers.org* for more information.

Don't miss the Commission's Online Training Series. View more than 40 videos online at a new web address: *cec.ishow.com/*

Check out the utilities training calendars. www.energy.ca.gov/title24/ and select *Builder Training Calendar.*

Special Thanks to:

Suzie Chan, Tav Commins, John Eash, Gary Flamm, Al Garcia, Valerie Hall, Rob Hudler, Nelson Peña, Bill Pennington, Kurt Pisor, Rob Schlichting, Mazi Shirakh, Chris Wardhall, Kate Zocchetti and Beverly Duffy for all their help in creating this edition of the *Blueprint*.

Did You Know?

More and more solar photovoltaic systems converting sunlight directly into electricity are being installed on new buildings. The Energy Commission encourages greater use of the technology through its Renewable Energy Program, offering rebates on solar photovoltaic systems of $4.50 per watt or 50 percent off the installed cost, whichever is less. To keep the costs down, buildings should first be made very energy efficient so that a smaller photovoltaic system can be used.

The program also funds training workshops for *National Electrical Code* compliance and proper installation practices for local building inspectors and system installers, reaching more than 700 installers and nearly 700 building inspectors last year. For consumers the program provides buying guides, a computer-based tool to estimate the costs and benefits of a system, fact sheets and answers to frequently-asked questions.

For up-to-date workshop information, visit: *www.endecon.com* and select *training.*

For a guide to photovoltaic system design and installation visit: *www.energy.ca.gov/reports/2001-09-04_500-01-020.PDF*

To contact Energy Commission Renewable Energy Program staff, call toll free at 800-555-7794, or e-mail *Renewable@energy.state.ca.us*

The Commission's Online Training Series will soon include three videos on photovoltaics.

The *Blueprint* can also be found in electronic form at: *www.energy.ca.gov/efficiency/blueprint*

The Energy Commission maintains an index of Blueprints that includes questions and answers of previous editions by topic.
For residential questions and answers go to: *www.energy.ca.gov/efficiency/blueprint/pdf/BLUEPRINT_RES_INDEX.PDF*

For nonresidential questions and answers go to: *www.energy.ca.gov/efficiency/blueprint/pdf/BLUEPRINT_NONRES_INDEX.PDF*

Residential Buildings and
Appliances Office
1516 Ninth Street, MS-25
Sacramento, CA 95814-5512
(916) 654-4064

Dale Trenschel
Editor

CHANGE OF ADDRESS

Send old and new addresses, with the five-digit ID number (appears above name on mailing label) to above address.

TECHNICAL SERVICES
Web Site

www.energy.ca.gov/efficiency

Hotline

(800) 772-3300
(916) 654-5106

Publication number P400-02-002

Printed on recycled paper

blueprint

Summer 2002 - # 68

Energy Efficiency and Demand Analysis Division

The inside story:

QUESTIONS & ANSWERS

For any questions or additional information relating to the new Standards contact the Energy Hotline at (800) 772-3300.

#68

blueprint

Winter / Spring 2002 - # 6 7

Energy Efficiency and Demand Analysis Division

Special Issue on Duct Sealing

See Page 4

Title 24 Training now available:

See page 3 for Videos online

See page 7 for Training by Utilities

QUESTIONS and ANSWERS

RESIDENTIAL

What are the Title 24 requirements related to changing out my split system HVAC equipment at my house?

The *Residential Manual*, Chapter 7, page 7-27 explains the requirements. See the text preceding Example 7-17 under the heading, "New Space Conditioning Equipment." New heating and/or air conditioning systems installed in existing buildings are considered alterations. The appliance standards regulate the efficiency of new residential heating and air conditioning equipment at the point of sale. However, the mandatory requirements for low-rise residential buildings also apply. In particular, Section 150(h) requires that systems be appropriately sized and Section 150(i) requires that the new systems have setback thermostats (see the *Residential Manual*, Section 2.5.3). The prescriptive requirements of Section 151(f) 7 specify that new split system air conditioners or heat pumps installed in alterations must either be:

- verified by a HERS rater to have a thermostatic expansion valve (TXV), or
- diagnostically tested by a HERS rater to verify the correct refrigerant charge and airflow

As an alternative to TXV or the requirements for field verification and diagnostic testing for refrigerant charge and airflow measurement, an air conditioner or heat pump with a SEER of 12 or greater may be installed. The Package D requirement for diagnostic testing of ducts does not apply to alterations.

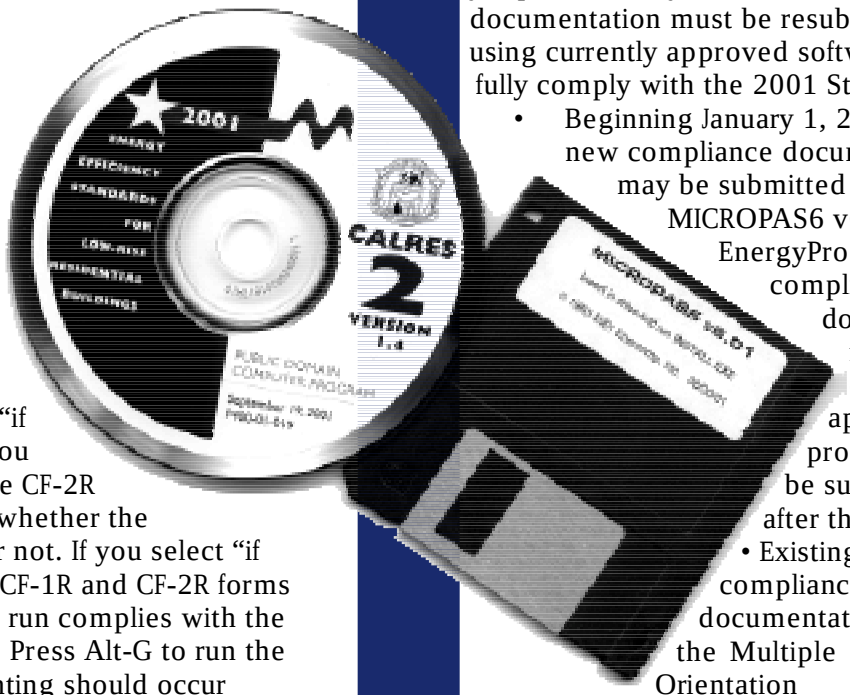
...continued on page 2

QUESTIONS and ANSWERS

RESIDENTIAL (continued)

Do I need to run a calculation before I can get a complete printout from CALRES2, version 1.4?

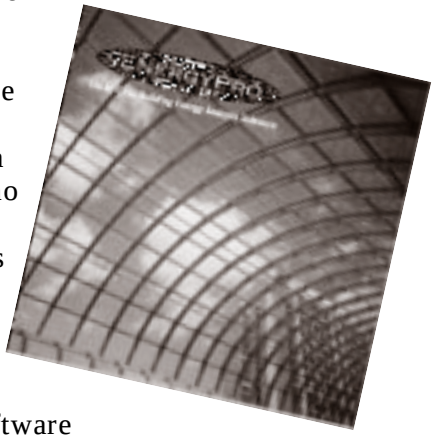
Yes. Go to the CALCS tab and change the "Set Report" section to include the CF-1R and CF-2R forms. The "print" section needs to say either "yes" or "if complies." If you select "yes," the CF-2R form will print whether the run complies or not. If you select "if complies," the CF-1R and CF-2R forms print only if the run complies with the energy budget. Press Alt-G to run the calculation. Printing should occur automatically when the calculation finishes. If it does not print, check the completeness of the file and/or the printer settings and try again. If you continue to have problems printing, please contact the Energy Commission's Hotline at 1-800-772-3300.



What versions of compliance documentation are now acceptable and when did they take effect?

In the months following the adoption of the 2001 Standards, several versions of compliance software were approved for use with the new standards. Several of these versions were decertified, but were allowed for use before January 1, 2002. The following guidance indicates how to treat compliance documentation and specifies currently approved software.

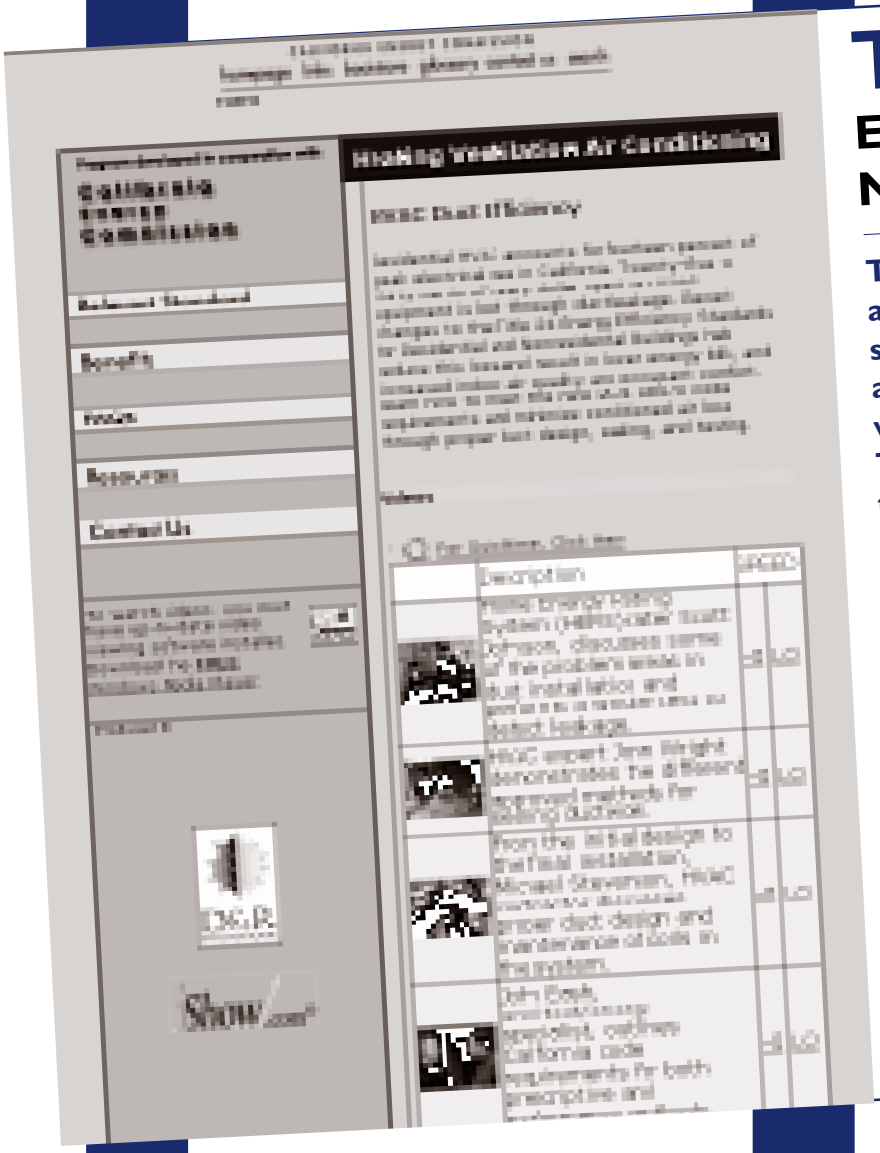
- Beginning January 1, 2002, old compliance documentation from 1998 Standards on file at building departments is no longer acceptable. For buildings not yet permitted by this date, the documentation must be resubmitted using currently approved software and fully comply with the 2001 Standards.
- Beginning January 1, 2002, no new compliance documentation may be submitted with MICROPAS6 v6.00 or EnergyPro 3.0. Only compliance documentation from currently approved programs may be submitted after this date.
- Existing compliance documentation using the Multiple Orientation Alternative with MICROPAS6 v6.00 or EnergyPro 3.0 after June 1, 2001 and before January 1, 2002 remain acceptable as long as no changes are made to energy-related features of buildings covered by that compliance documentation.



Currently approved software includes MICROPAS6 v6.01, EnergyPro 3.1 and CALRES2 v.1.4.

Q **The suction line of a new split system air conditioner in a low-rise residential building must be insulated. If I know the thermal conductivity, or k-factor, of the pipe insulation, must I determine the required thickness to comply with the R-value requirement specified in Table 1-T, Section 150(j) 2 of the Residential Standards?**

A Yes. To determine the thickness of material needed to meet a specific R-value, multiply the k-factor by the required R-value. For example, if the k-factor is 0.27 (Btu-inch per hour per square foot per °F) and the required R-value is 3, the required pipe insulation thickness is 3 times 0.27, or 0.81 inches. Likewise, if you know the k-factor and thickness of the insulation (in inches), you can determine the R-value by dividing the insulation thickness by the k-factor.



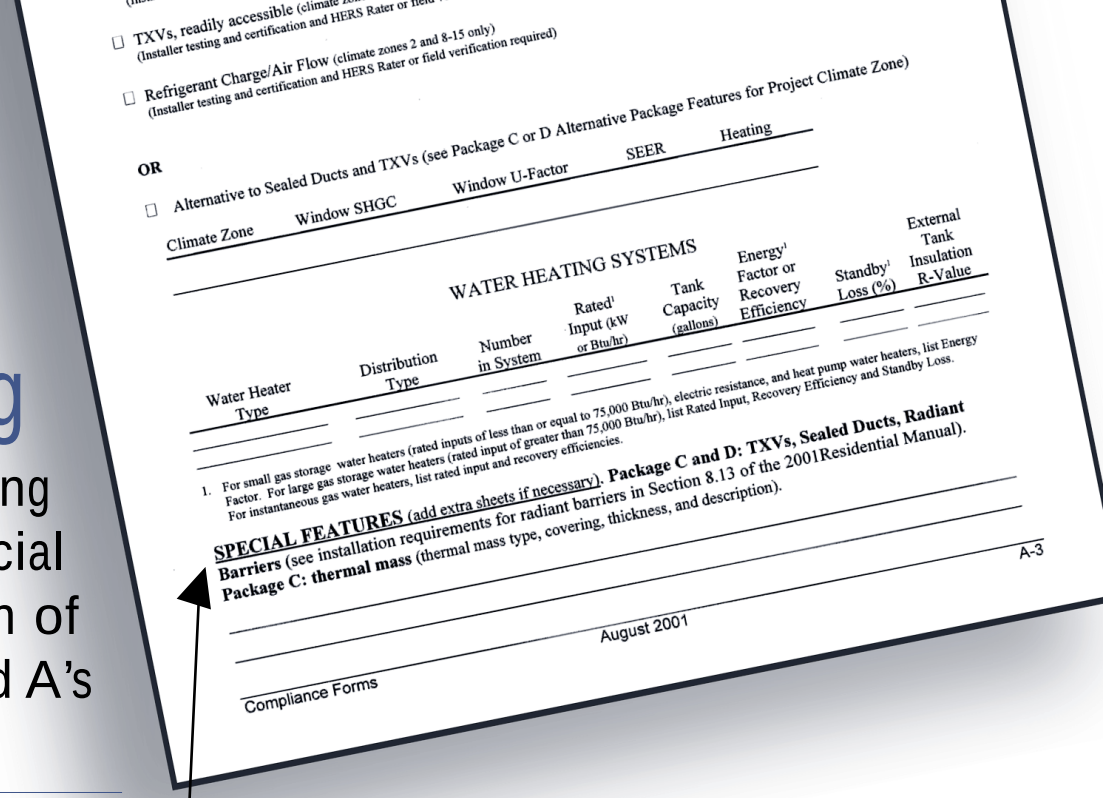
Title 24

Energy Training Videos Now Available Online!

The California Energy Commission announces that 28 streaming video segments ranging from 3 to 8 minutes are now online at: www.consumerenergycenter.org/videos. These videos show how to inspect for the energy code, how to install the energy efficient devices or systems, and delineate the benefits of complying with the code. Also included is accompanying text on Frequently Asked Questions (FAQ's), Benefits, Relevant Standard (with links to the *Residential Manual* and Standards), Resources, and a link to contact the Energy Commission. Please take a look at these videos and tell us what you think! The Energy Commission has just approved a new contract to produce an additional 45 segments on the *2001 Energy Efficiency Standards for Residential and Nonresidential Buildings*.

Duct Sealing

The following is a special section of Q's and A's


TXVs, readily accessible (climate zones 2 and 8-15 only)
(Installer testing and certification and HERS Rater or field verification required)

Refrigerant Charge/Air Flow (climate zones 2 and 8-15 only)
(Installer testing and certification and HERS Rater or field verification required)

OR

Alternative to Sealed Ducts and TXVs (see Package C or D Alternative Package Features for Project Climate Zone)

Climate Zone | Window SHGC | Window U-Factor | SEER | Heating

WATER HEATING SYSTEMS

Water Heater Type	Distribution Type	Number in System	Rated[1] Input (kW or Btu/hr)	Tank Capacity (gallons)	Energy[1] Factor or Recovery Efficiency	Standby[1] Loss (%)	External Tank Insulation R-Value

1. For small gas storage water heaters (rated inputs of less than or equal to 75,000 Btu/hr), electric resistance, and heat pump water heaters, list Energy Factor. For large gas storage water heaters (rated input of greater than 75,000 Btu/hr), list Rated Input, Recovery Efficiency and Standby Loss. For instantaneous gas water heaters, list rated input and recovery efficiencies.

SPECIAL FEATURES (add extra sheets if necessary). **Package C and D: TXVs, Sealed Ducts, Radiant Barriers** (see installation requirements for radiant barriers in Section 8.13 of the 2001Residential Manual). **Package C: thermal mass** (thermal mass type, covering, thickness, and description).

A-3

Compliance Forms August 2001

As a plan checker, can I tell if credit has been taken for "tight ducts" or "sealed ducts" and if the HERS rater verification is required?

Yes. Look on the CF-1R under "Special Features, Remarks and Notes" and/or "Field Verification and Diagnostic Testing Required." If credit has been taken for sealed ducts, it will be shown there.

Is there an easy way to find a certified HERS rater?

Yes. You can find a certified HERS rater on the Internet at http://www.cheers.org/cheers_rater.php or by calling 1-800-4 CHEERS (1-800-424-3377).

If I am building a house in a city that requires outside air to be mechanically provided, could this impact whether or not I can take credit for sealed ducts?

Yes. If the outside air is provided by attaching a duct to the outside to the space conditioning duct system, it probably will be difficult to meet the "sealed duct" maximum leakage requirement. You may not seal off the outside air portion of the system during the "sealed duct" test. It may be possible for the outside air duct to have a damper and pass the test, but the damper would have to allow very little leakage. The "sealed duct" test must be made with the damper in its default position, and the system must pass all the requirements for the sealed ducts test. See the *Residential Manual*, Chapter 4 for specific duct testing requirements.

Another solution to provide the outside air would be to use mechanical ventilation that is completely separate from the space conditioning system. In most cases, separate mechanical ventilation would use a much smaller fan to provide the ventilation and would use considerably less fan energy. Also see our "Ventilation Protocol" at:

http://www.energy.ca.gov/efficiency/qualityhomes/mechanical_ventilation.html

If a single family house has two separate space conditioning systems, do both systems have to be tested by the HERS rater if the "sealed duct" credit is taken?

Yes. The HERS rater must test both systems if credit is claimed for duct sealing in the Performance Method or to comply with the Prescriptive Compliance Method.

When considering duct leakage, are ducts located between floors considered to be located inside conditioned space for conduction purposes?

Yes. The portion of the ducts located between floors is considered to have no conduction losses. However, as explained in the following question and answer, duct leakage is considered to be to the outside.

In multifamily and single family residences, does the HERS rater have to verify the duct leakage to get full credit for ducts in conditioned space?

Yes. If duct leakage is not tested, then ducts are assumed to be at the high leakage point for modeling whether or not the ducts are located in conditioned space. This requirement applies to single and multifamily buildings. The reasoning behind the requirement is that leakage pathways tend to lead to outside the building envelope, even when ducts appear to be physically located inside the conditioned space. Only testing of duct leakage can assure this is minimized. Also see the *Residential Manual*, Section 8, page 8-4.

When insulation is installed on top of the ducts in the attic, are the ducts in conditioned space?

No. It is not acceptable to place attic insulation on top of the attic ducts and then claim credit for ducts in conditioned space. The ducts must be inside the building envelope, which must be well sealed to prevent infiltration. The proper order is: living space, ducts, building envelope, and insulation.

Do I have to meet the duct sealing and TXV requirements for an addition under 100 square feet if I am using the Prescriptive Compliance Approach?

No. If the addition is less than 100 square feet, then you are exempt from the duct sealing and TXV requirements.

For an addition over 100 square feet, if I am installing a new air conditioner and using the Prescriptive Compliance Approach, do I have to meet the duct sealing and TXV requirements or the Alternative to Package D requirements?

Yes. If the addition is over 100 square feet, then you have the choice of meeting the duct sealing requirements or using the Alternative to Package D requirements (see Table 3-2, page 3-3 of the *Residential Manual*). The requirements for testing refrigerant charge and air flow (or installing a TXV) apply only if a new split system air conditioner or heat pump is installed as part of the addition. If a separate air distribution system is installed for the addition, then this new

system must be tested and sealed to have a leakage less than or equal to 6 percent of the fan airflow. If an existing air distribution system is extended to serve the addition, this too must be tested, but the tested target duct leakage depends on the size of the addition and other factors discussed in the *Residential Manual*, Section 7.2.3, *Determining the Target Percent Leakage*. In lieu of testing duct leakage, refrigerant charge and airflow (or installing and verifying a TXV), the builder can choose to meet the Alternative to Package D requirements. See Table 3-2 in the *Residential Manual*. Note that Radiant Barriers are required in some climate zones when using the prescriptive packages.

NONRESIDENTIAL

Do occupancy sensor devices have to be certified, and if so, how can I tell if they are certified?

Yes. You may use occupancy sensors only if their manufacturers have certified to the Energy Commission that their products meet the requirements of Section 119 of the Standards. To determine if they are certified, contact the Energy Commission Hotline at 1 (800) 772-3300.

Is equation 1A for adjusting the thickness of pipe insulation in Section 123 of the *Nonresidential Building Efficiency Standards* publication number P400-01-024 correct?

No. There is a typographical error in this publication that also occurred in the publication of the 1998 Standards. The equation is correctly expressed in the Commission's 1998 and upcoming 2001 *Nonresidential Manual* and the *California Building Code* published by the ICBO.

The correct equation is:

$$T = PR\left[\left(1+\frac{t}{PR}\right)^{\frac{K}{k}}-1\right]$$

EQUATION 1-A—INSULATION THICKNESS EQUATION

WHERE:

T = Minimum insulation thickness for material with conductivity *K*, inches.

PR = Pipe actual outside radius, inches.

t = Insulation thickness from Table 1-G, inches.

K = Conductivity of alternate material at the mean rating temperature indicated in Table 1-G for the applicable fluid temperature range, in Btu-inch per hour per square foot per °F.

k = The lower value of the conductivity range listed in Table 1-G for the applicable fluid temperature range, Btu-inch per hour per square foot per °F.

Special Thanks:
Tav Commins, Gary Flamm, Valerie Hall, Jon Leber, Bill Pennington, Elaine Hebert, Kurt Pisor, Mazi Shirakh and Beverly Duffy for all of their help in creating this edition of the Blueprint.

Training Now Available

Utilities Offering Title 24 Energy Training

Some utilities are currently offering training on issues relating to the AB970 2001 Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24 Energy Code). Details are available at the following websites:

For PG&E
http://www.pge.com/003_save_energy/003c3_stockton.shtml

For SoCal Gas and SDG&E
http://www.socalgas.com/business/resource_center/erc_seminar_info.shtml

For more information, contact John Eash of the Energy Commission at jeash@energy.state.ca.us

Did You Know?

- Work has started on the 2005 Building Energy Efficiency Standards. For more information on changes being considered, go to the following website:

  http://www.energy.ca.gov/2005_standards/index.html

- The California Legislature has directed the Energy Commission to adopt energy standards for outdoor lighting. The Energy Commission intends to develop and adopt lighting standards for all outdoor lighting applications. Those portions of the standards that are adopted in Title 24 are expected to go into effect in 2005 with the next triennial update of the California Building Code. The Energy Commission has established a proceeding to identify, discuss, and evaluate measures that would be incorporated into the 2005 Outdoor Lighting Standards. Details about the outdoor lighting proceeding are available on the Energy Commission website at the following address:

  http://www.energy.ca.gov/outdoor_lighting/

- Energy Fact Sheets are available on the web. The U.S. Department of Energy website has fact sheets and brochures on energy topics including Air Sealing, Ceilings and Attics, Crawlspace Insulation, Energy Efficiency Pays, Passive Solar Design, Improving the Efficiency of Your Duct System, Slab Insulation, Wall Insulation, Weather-Resistive Barriers, and Whole House Fans. Visit http://www.eren.doe.gov/buildings/documents. The sketches of construction details are excellent.

Corrections

A correction to the answer from Blueprint #66's first question regarding conflict of interest requirements for HERS raters: A "three party contract" is only acceptable if 100 percent of the homes are tested (i.e. this approach cannot be used when sampling is done). Also, increased HERS monitoring is needed, and the rater needs to check the air flow of the system to make sure the duct system is unobstructed and unaltered. In addition, the raters must use their own equipment not the contractor's testing equipment.

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1516 Ninth Street, MS-25
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John Eash
Dale Trenschel
Editors

CHANGE OF ADDRESS

Send old and new addresses, with the five-digit ID number (appears above name on mailing label) to above address, Attn: MIS, MS 7.

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blueprint

Winter / Spring 2002 - # 67

Energy Efficiency and Demand Analysis Division

The inside story: Special Issue on Duct Sealing

See Page 4

QUESTIONS & ANSWERS

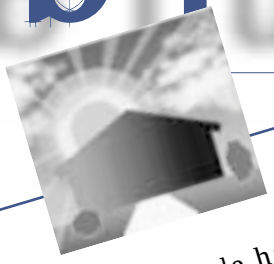
For any questions or additional information relating to the new Standards contact the Energy Hotline at (800) 772-3300.

#67

SUMMER/FALL 2001 - #66

blueprint

Energy Efficiency Division



Many people have contacted us, asking if they can use the "Six Steps to an Energy Efficient Addition" booklet in order to do prescriptive calculations for additions. The new "Six Steps" booklet is currently being revised and will be coming out as soon as possible. Until this new publication is released, we recommend using the Standards Section 152 for information regarding additions.

The New Energy Standards went into effect June 1, 2001

QUESTIONS and ANSWERS

RESIDENTIAL

I heard that there are conflict-of-interest requirements that HERS Raters must abide by when doing field verification and diagnostic testing. What are these requirements?

By law, HERS raters must be independent from the builder or subcontractor installer of the energy efficiency features being tested and verified. They can have no financial interest in the installation of the improvements. HERS raters can not be employees of the builder or subcontractor whose work they are verifying. Also, HERS raters cannot have financial interest in the builder's or contractor's business, nor can they advocate or recommend the use of any product or service that they are verifying. Section 106.3.5 of the California Building Code prohibits a special inspector from being employed (by contract or other means) by the contractor who performed the work that is being inspected.

The Commission expects HERS raters to enter into a contract with the builder (not with sub-contractors) to provide independent, third party diagnostic testing and field verification. The

...continued on page 2

QUESTIONS and ANSWERS

RESIDENTIAL (continued)

procedures adopted by the Commission call for direct reporting of results to the builder, the HERS provider and the building official.

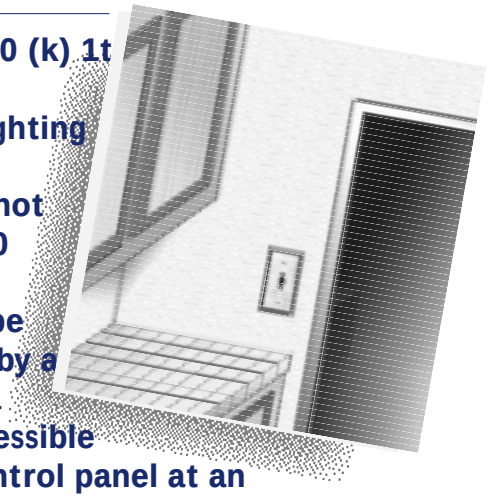
Although they are not recommended by the Commission, "three party contracts" are possible with builders, provided the contract delineates the responsibilities of both the HERS rater to remain independent and the sub-contractor to take corrective action if deficiencies are found. Serving as the contract administor on such contracts, the sub-contractor may schedule, invoice and pay the HERS rater, provided the money paid by the builder to the rater can be traced through audit. It is critical, however, that these contracts preserve the rater's ability to independently complete the field verification procedures that have been adopted by the Energy Commission.

While "three party contracts" may not actually violate the requirements of the Commission, they offer a greater potential for compromising the independence of the HERS rater, since they set up a closer working relationship between the rater and the sub-contractor whose work is being inspected.

The Energy Commission has approved the California Home Energy Efficiency Rating System (CHEERS) to certify and oversee HERS raters throughout the State. In that role, CHEERS monitors the propriety and accuracy of work completed by HERS raters and responds to any complaints received. If the independence of a rater is questioned, CHEERS scrutinizes the rater's performance to insure that the results of field verification and diagnostic tests are objective, accurate and comply with procedures adopted by the Commission.

Building officials have the authority to require HERS raters to demonstrate their competence, to the satisfaction of that building official. Therefore, in situations where the independence of a rater is in question, building officials can prohibit a particular HERS rater from being used in their jurisdiction. They can also disallow any practices they feel will compromise the independence of a HERS rater.

Q **Section 150 (k) 1t states that " general lighting having an efficacy of not less than 40 lumens per watt shall be controlled by a switch on a readily accessible lighting control panel at an entrance to the kitchen" . Does this mean that if a kitchen has more than one entrance that only one of the entrances must have the switching for fluorescent?**



A Yes. Only one entrance to a kitchen is required to have the lighting control panel for the fluorescent fixtures.

Does the suction line to the air conditioning equipment have to meet the piping insulation requirements?

Yes. Since the suction line is considered part of the "cooling piping" and is below 55 degrees Fahrenheit, it must be insulated. According to Table 1-T, R-3 insulation is required for piping less than 2 inches in diameter.

If I am using package D for a residential addition of 900 square feet, can I remove a window from the previously existing wall and count that amount of glazing as credit for the room addition?

Yes. You can take credit for glass removed in an addition as long as you are meeting the requirements of Package D. This credit is allowed for all additions less than one thousand square feet. Once your addition is greater than 1000 square feet, you can not exceed the new fenestration allowed in Alternative Package D.

I have a home with a wood stove as the primary heat source and electric heating as the secondary source. Since I do not have any ductwork, should I model the system based upon the assumption that I have tight ducts?

Yes. The proposed design for houses with wood heating systems is modeled the same as the standard design, so if the software does not have an option for wood heat, then the compliance author should assume a gas furnace with an AFUE of 78 percent and sealed R-4.2 ducts in the attic.

Do I have to meet the Duct Sealing, TXV, and Radiant Barrier requirements for an 88-square-foot addition if I am using the Prescriptive Compliance Approach?

No, additions less than 100 square feet are exempt from the Duct Sealing, TXVs, and Radiant Barrier requirements when using Prescriptive Package D for compliance. If you are adding new split system HVAC equipment, you will then be meeting the definition of an alteration and will have to meet the TXV requirement.

Is there an exemption to duct testing, a TXV, and/or Radiant Barriers if you are using Package D for prescriptive compliance for an addition greater than 100 square feet?

No. If the addition is greater than 100 square feet and a duct is extended from the existing duct system, then there is not an exemption to meeting the Duct Sealing requirements.

The test requirements for the installation are described in the Residential Manual for Compliance with the 2001 Energy Efficiency Standards. If new space conditioning equipment is installed, then there is also no exemption from the field verification requirements for TXV or proper refrigerant charge and airflow measurements. The alternative, described in a footnote to each of the Tables 1-Z1 through 1-Z6 in Section 151 (f) of the Standards, substitutes additional energy efficiency features for the Duct Sealing and refrigerant charge and airflow or TXV features. These substitute features do not require field verification and diagnostic testing, and still provide a way to comply with the Standards. Radiant Barriers are required when using Prescriptive Package D, regardless of whether or not you are using the Alternative Components.

Can I replace an electric 40-gallon water heater with two electric 40-gallon water heaters and still comply with the Title 24 Standards?

Yes. It would be considered an alteration. See section 152 of the Standards for specifications.

Can I place an open-ended fan coil in a plenum when I am building an apartment complex?

Yes, plenums can be used to hold fan coils as long as they meet the requirements of a duct. They must be constructed of either sheet metal or ductboard, and sealed completely to avoid air leakage. Ducting the entire system is an alternative to installing a system that uses a plenum.

What is a Radiant Barrier?

A radiant barrier is a reflective material that has an emittance of 0.05 or less and is used to reflect and inhibit the emission of radiant heat into or out of a space. In the Standards, it is primarily used to reduce the radiant transfer of heat from a hot roof to the ceiling and to ducts that are in the attic. For more information on radiant barriers, please visit our new online "Training Videos" located on our web site at<www.energy.ca.gov/title24>.

How do I determine the U-factor and Solar Heat Gain Coefficient for a Bay window?

Bay windows may either have a unit NFRC rating, an NFRC rating for the window only, or no NFRC rating.

For windows that come with an NFRC rating for the entire unit, you should determine compliance based on the rough opening and the given information. If the unit U-factor and SHGC do not meet the package requirements, the project must show compliance using the performance approach. When using the performance approach, the area and orientation of the glazing is based on each individual window in the bay window.

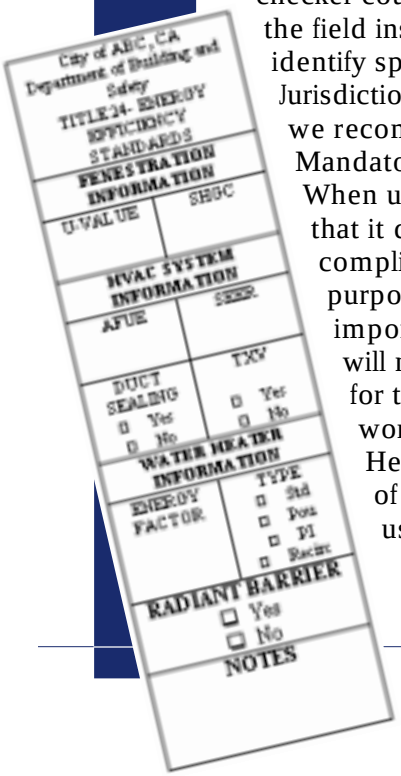
Bay windows that do not come with a

rating for the entire unit but do come with insulation must comply by accounting for the performance characteristics of each component separately. Opaque portions must meet the Mandatory Measures minimum insulation requirements (i.e. R-19 ceiling, R-13 walls, R-13 floor). For prescriptive compliance, the opaque portion must meet the minimum insulation requirements of the packages for the applicable climate zone. For the windows, the U-factor and SHGC values may be determined either from an NFRC rating, or by using default values. If the window's U-factor and SHGC meet the package requirements, the bay window complies prescriptively. Bay window fenestration area is based on each individual window in the bay window.

Do you have any suggestions as to how a plan checker can ensure that the field inspector will see special energy features for a project?

In order to increase clarity, the plan checker could make a stamp so that the field inspector can readily identify special construction. Jurisdiction can design a stamp that we recommend contains the Mandatory Feature information. When using a stamp, remember that it does NOT replace the compliance forms. It serves the purpose of accentuating important information, but it will not serve as a substitute for the mandatory paper work.

Here is a sample formatting of a stamp that you could use:



NONRESIDENTIAL

The Standards state that lighting for theme parks is excluded from the lighting power density of the building (Section 146 (a) 5). Does this mean that all lighting within the theme park, including offices and retail shops, is excluded?

No. A theme park is a large amusement park which includes carnival rides, shows, and exhibits. Only specialty lighting within theme parks are exempt from the lighting power density calculations. All other lighting must comply with the Nonresidential Energy Efficiency Standards.

This includes, retail spaces, restrooms, restaurants, lobbies, ballrooms, theaters and other primary function areas. The treatment of these primary function areas are no different for theme parks than for other building projects. Lighting that is designed strictly for entertainment however, such as the production lighting used to present the theme of the park, may be exempted from Title 24 lighting power density compliance.

I am building a Speculative Occupancy building. How would you recommend that I meet mechanical and lighting compliance?

A

You have a couple of options. The first is to only complete the envelope portion of compliance and leave the lighting and mechanical compliance to the future tenants. If you can anticipate what type of occupancy you will have (for example, when building a strip mall you can anticipate that the tenants will be retail), you can install the lighting and/or mechanical that you expect they will need. Finally, if you are using the performance approach for compliance, use the default values for any feature that is not included in the permit. Using the complete building approach, the default value for retail lighting using complete building method would be 1.7 watts/ square foot.

Q

To determine if an appliance is certified, can I use an industry directory like GAMA or ARI?

A

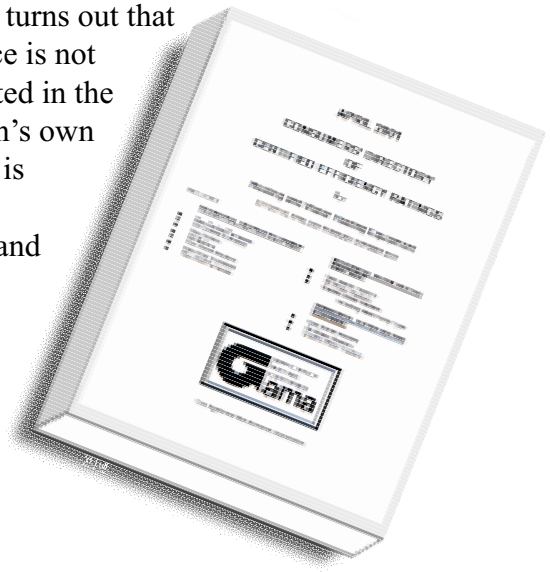
Yes, but only if the appliance is listed in one of the following chapters of the following directories:

GAMA Directory of Certified Efficiency Ratings for Residential Heating and Water Heating Equipment:
Chapter 1:
Section 1: Residential Gas Central Furnaces
Section 2: Residential Oil Central Furnaces
Section 3: Residential Gas Boilers
Section 4: Residential Oil Boilers
Chapter III:
Section 1: Gas Water Heaters
Section 2: Oil Water Heaters
Section 3: Electric Water Heaters

ARI (Applied Air-Conditioning Products Directory)
Sections: GSHP, GWHP, PTAC, PTHP, ULE, and WSHP only
ARI (Unitary Directory)

Also, not all manufacturers participate in the GAMA or ARI directories, so if an appliance is not listed in a GAMA or ARI directory, please check with the Commission to see if the manufacturer has certified the appliance directly to us.

Finally, if it turns out that the appliance is not properly listed in the Commission's own directory, it is considered uncertified and may not be installed.



FOR A CURRENT LIST OF ***HERS RATERS:***

http://www.cheers.org/cheers_raters.php
- note that there is an underscore between cheers and raters - Editor

For any questions or additional information relating to the new Standards contact the Energy Hotline at (800) 772-3300.

Special Thanks:
Stacey Jo Ross, Student Editor; Beverly Duffy, Art Director; Kurt Pisor, Graphic Artist; and Jon Leber, Technical Advisor; Bill Pennington, Valerie Hall, Mazi Shirakh, and Rob Hudler for all of their help in creating this edition of the Blueprints.

Training on 2001 AB 970 Energy Efficiency Standards

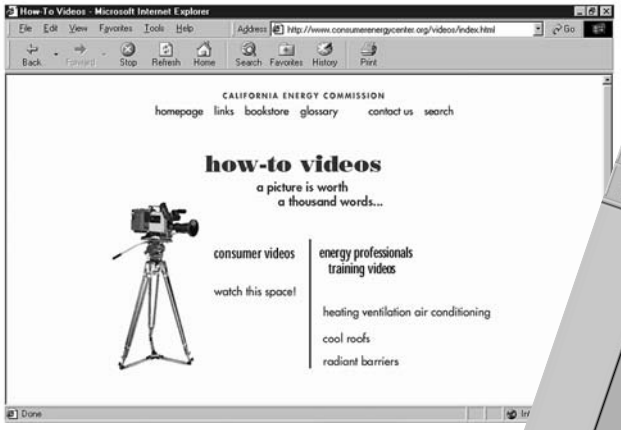
The California Energy Commission encourages you to contact the sponsoring agency as soon as possible to obtain more information on the classes listed below. You may also call the Commission Hotline, (800) 772-3300 or (916) 654-5106. The listing provided here is based upon our most current information. Dates, topics and locations may be tentative and might vary from those shown below.

Date	Location	Class	Contact	Co-sponsor	Telephone/e-mail/fax	
10-15-01 (3days)	Stockton	CHEERS	Vicki Levy	CHEERS	1-800-424-3377	thamilton@cheers.org
10-17-01	San Diego	R	Deborah Newell		1-800-424-3377	thamilton@cheers.org
11-13-01 (4days)	Stockton	CHEERS	Vicki Levy	CHEERS	1-800-424-3377	thamilton@cheers.org
12-5-01	Los Angeles	CHEERS	Vicki Levy	CHEERS	1-800-424-3377	thamilton@cheers.org
12-6-01	Los Angeles	CHEERS	Vicki Levy	CHEERS	1-800-424-3377	thamilton@cheers.org
12-7-01	Los Angeles	CHEERS	Vicki Levy	CHEERS	1-800-424-3377	thamilton@cheers.org

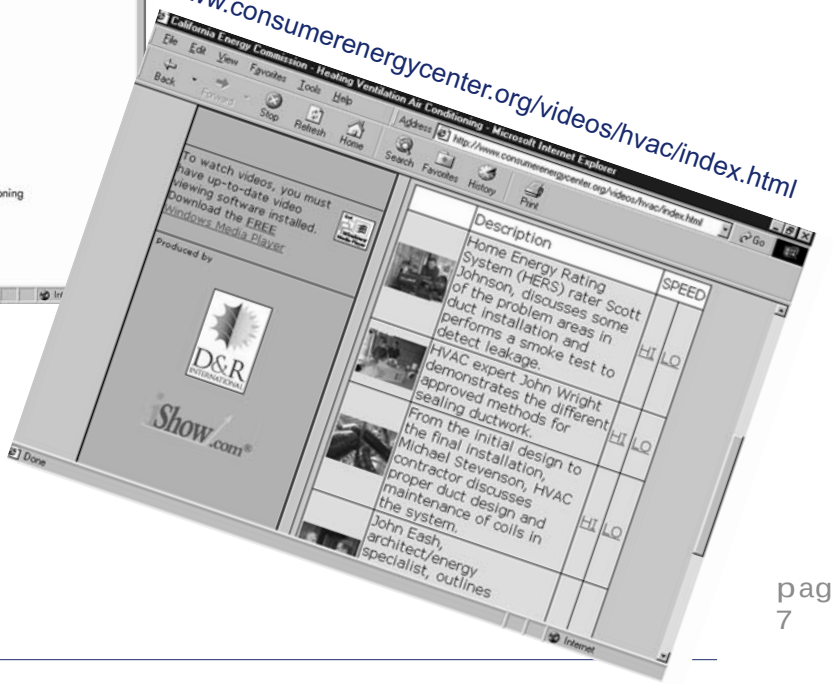
Note: Potential participants must register and confirm the date, times & exact locations of classes. Most are all day classes (from9 AM to 3 PM). Some classes are Residential (R) or Nonresidential (NR) only. Space is limited. R.S.V.P. as soon as possible. Fees may be required. Dates and locations subject to change. Instructors will be provided by the co-sponsoring utility. Thanks to BIA & ICBO for partnering with SCE on this project. California Energy Commission staff will also be available at the training site.

Commission Contact: John Eash 916-653-7181 e-mail: jeash@energy.state.ca.us

www.consumerenergycenter.org/videos/index.html



www.consumerenergycenter.org/videos/hvac/index.html



Publication number P400-01-026

SUMMER/FALL 2001
blueprint
Energy Efficiency Division

The inside story:

http://www.energy.ca.gov/ab970_standards/documents/index.html

For any questions or additional information relating to the new Standards contact the Energy Hotline at (800) 772-3300.

#66

EFFICIENCY · ENERGY FOR THE FUTURE ·

SPRING 2001 - #65

blueprint

Energy Efficiency Division

New Energy Standards in Effect June 1, 2001

On January 3, 2001, the *2001 AB 970 Residential and Nonresidential Energy Efficiency Standards* were adopted by the California Energy Commission at a public Business Meeting. This blueprint briefly summarizes the key changes made to the Standards, both Residential and Nonresidential. This publication is intended to be used solely for informative purposes; for complete information on design, construction and enforcement of building construction, please refer to the Standards. Copies of the Residential and Nonresidential Building Manual Supplements can be found on the California Energy Commission web site at:

http://www.energy.ca.gov/ab970_standards/documents/index.html

The Commission anticipates new Residential and Nonresidential Manuals will be available in August 2001. Until the new manuals are available, refer to the Manual Supplements (available at the Website address above), publication numbers 400-01-002S and 400-01-005S.

QUESTIONS and ANSWERS ABOUT THE NEW STANDARDS

When do the new *2001 AB 970 Residential and Nonresidential Energy Efficiency Standards* take effect?

The Effective date is **June 1, 2001** for all nonresidential buildings and those residential buildings that do not fall under the exception for the Multiple Orientation Alternative approach.

...continued on page 2

QUESTIONS and ANSWERS

ABOUT THE NEW STANDARDS

The following is the actual code language.

"Effective Date: The effective date of the AB 970 Building Energy Efficiency Standards amendments shall be June 1, 2001.
Exception:
Building energy efficiency standards compliance documentation submitted prior to June 1, 2001, using the Multiple Orientation Alternative of Section 151(c), shall be used to determine compliance through December 31, 2001."

The following information is a clarification of the actual code language:

Existing subdivisions: Applications for permits for individual homes that are part of an existing Master Plan can be *submitted* through the end of December 2001 based on existing compliance documentation using the Multiple Orientation Alternative approach. Applications for permits for individual homes that are part of an existing Master Plan that are submitted after December 31, 2001 must use the 2001 AB970 Standards to determine compliance.

New subdivisions:

Before June 1, 2001: Applications for new subdivisions with Multiple Orientation Alternative approach compliance documentation *submitted* into plan check before June 1, 2001 can comply under existing Standards; applications for permits for individual homes using this Multiple Orientation Alternative compliance documentation must be *submitted* prior to December 31, 2001.

After June 1, 2001: Applications for new subdivisions *submitted* on or after June 1, 2001 must comply under AB 970 Amendments to Standards.

Recommended procedure for builders: The procedure that is recommended (by CBIA and the Commission) to builders for determining which standard to use for new subdivisions that will be submitted for master plan approval between now and June 1 is dependent upon when the majority of the homes will be built. For a small subdivision that will be completed or almost completed by the end of 2001, then it is reasonable to submit under the current (1998) Standards. If the subdivision will have a substantial number of starts constructed after 2001, then it is advisable to submit under the 2001 AB 970 Standards so that energy features do not change mid-construction.

Q: Can builders still use building cavities or plenums, such as those under an air handler support platform, instead of ducts?

A: No. Although the Mandatory Measures remain pretty much the same as in the 1998 Standards, there have been some changes. One of the most noteworthy changes is to section 150(m), which has been modified as follows: "...Building cavities, support platforms for air handlers, and plenums defined or constructed with materials other than sealed sheet metal, ductboard or flexible duct, shall not be used for conveying conditioned air. Building cavities and

support platforms may contain ducts. Ducts installed in cavities and support platforms shall not be compressed to cause reductions in the cross sectional area of the ducts."

Because return air is "conditioned air," "platform returns" complying with the 2001 AB 970 Standards must be fully ducted.

Section 150(m) also contains the requirement that "Joints and seams of duct systems and their components shall not be sealed with cloth backed rubber adhesive duct tapes unless such tape is used in combination with mastic and drawbands."

I heard that the Commission completely changed compliance methods and approaches and made duct sealing and testing, radiant barriers and thermostatic expansion valves mandatory. Is that true?

No. The compliance approaches and methods to achieve compliance with the Energy Budget remain essentially the same. General procedures associated with energy design, plan checking and inspection are unchanged. Builders must still comply with the Mandatory Measures and the Energy Budget.

To answer the question further, a short description of compliance approaches is needed to clarify what is "mandatory," and what is optional.

To comply with the Energy Budget, the builder may choose to use the Prescriptive Approach or the Performance Approach. The Prescriptive Approach requires the builder to construct strictly according to the requirements of Tables 1-Z1 through 1-Z16, the "Alternative Component Packages" (for Climate Zones 1 through 16).

The Prescriptive Approach is similar to a prescription one gets at the drugstore. When a pharmacist fills the prescription he cannot vary the ingredients. Similarly, when a builder chooses to use the prescriptive approach, he cannot trade-off elements of the requirements. For example, if the Prescriptive Package requires R-38 attic insulation, the builder must provide R-38 in all the attics. If the Package limits the amount of glazing (fenestration) to 16% of the floor area, then the builder can use no more than 16%. So, many building designs are unable to achieve compliance using the Prescriptive Packages due to these prescribed requirements.

When adopting new Standards, the Commission is required to determine that the requirements are cost effective. The Commission then applies these cost effective energy efficient devices and systems to modify Alternative Component Package D in each of the 16 California climate zones. The revised prescriptive packages result in a buildings that are more energy efficient than ones using the previous version of the Package.

Because of the nature of the Prescriptive Packages, most builders use the Performance approach to compy with the Standards. In each case, the design for the proposed building must be compared with the energy budget for that building, determined by modeling the energy use of the Package D features in the proposed building. The proposed design must show that no more energy will be used than the energy budget for the proposed building. The difference between the Prescriptive and Performance approach is that the builder may make trade-offs to

achieve compliance when using the Performance approach. The builder may, for instance, use a more efficient water heater, more efficient windows or design the duct system to ACCA Manual D in trade for having more glazing in the proposed house.

In the new 2001 AB 970 Standards, Prescriptive Packages A & B are eliminated. Prescriptive Package D has been modified to make new homes more energy efficient. The Commission determined, after much consultation with private sector energy efficiency experts, the California Building Officials (CALBO) and the California Building Industry Association (CBIA), that more energy efficient glazing, duct sealing, radiant barriers, and thermostatic expansion valves (TXVs) would be applied to the Base Case house.

Therefore, the builder who uses the Prescriptive Approach will be required to use those features listed above in order to achieve compliance. In Prescriptive Package D, there is an alternative to duct sealing and TXVs.

Using Package D for compliance, the builder may choose an alternative of more efficient glazing , and in some climate zones, more efficient air conditioning or heating equipment and more efficient glazing to avoid the special inspection required for duct sealing and TXV's. The Commission has also allowed for an alternative to the TXV but that alternative has yet to be determined (at the time this article went to print).

The builder who uses the Performance Approach has the option of using those systems and devices listed above. In order to achieve compliance, he may choose, as in the past, any of the available features to trade-off between the building envelope, space conditioning and water heating.

What is the difference under the new Standards? The builder must build a more energy efficient house. The state-wide difference in heating and cooling energy between the 1998 Standards and the 2001 Standards is about 12 percent. In climate zones where cooling loads are dominant, the difference approaches 23%.

Q

What are the most significant changes to the Residential Standards?

A

The most significant changes to the residential portion of the Standards are:

Duct sealing is required in all climate zones when using Prescriptive Package D. HERS raters must use duct blasters to verify the the HVAC system has leakage less than 6 per cent of the fan flow. HERS raters are considered to be Special Inspectors by the Building Department. The HERS rater must demonstrate competence to the satisfaction of the Building Department.

Spectrally Selective glazing is required in Package D.

Radiant Barriers are required in Package D.

Thermostatic Expansion Valves (TXVs) are required for split-system central air-conditioners in specified climate zones when using Prescriptive Package D for compliance. TXVs are installed on the indoor unit next to the coil.
They help regulate the refrigerant flow so that the unit performs more efficiently. TXVs must be accessible and require field verification (visual

confirmation) by a certified Home Energy Rating System (HERS) rater. The Commission is working on an alternative to TXVs.
Compliance credit for interior shading (such as roller shades and mini-blinds) has been eliminated and designers may no longer move shading devices for compliance credit to different orientations when using the Multiple Orientation Alternative.
Compliance credit is available for "cool roofs" (roofs that reflect rather than absorb the sun's rays).

Prescriptive packages A and B have been deleted.

See Commission Publication 400-01-002S, the Residential Manual Supplement, for all changes to the Residential Energy Efficiency Standards.

NONRESIDENTIAL CHANGES

What are the most significant changes to the Nonresidential Standards?

The most significant changes effect glazing and lighting requirements. Additional changes will impact space conditioning, cool roofs and other aspects of the nonresidential energy code. The next blueprint issue will include more of the nonresidential topics.

Glazing: In many climate zones, nonresidential buildings that complied using single glazing under the 1998 Standards may need to have dual glazed, high performance windows to comply with the new 2001 Standards.

Section 143 - Prescriptive Requirements for Building Envelopes Tables 1-H and 1-I include new requirements for windows and skylights. U-factor and SHGC values are set lower: for vertical glazing, the values depend on the window-to-wall ratio, and for skylights the values depend on the type of skylight construction.

Climate zones have been regrouped to form groups with the same glazing and other prescriptive envelope requirements.

In Section 143(b), the overall heat gain tradeoff equation has been changed to add a cool roof alternative.

Lighting Systems and Controls

Section 130 (c) states that all permanently installed exterior luminaries attached to or powered by the electrical service in the building must either have a minimum efficacy value of 60 lumens/watt or be controlled by a motion sensor.

Section 131 says there are no longer exceptions for occupancy sensors or automatic time switches with manual override from the bi-level control requirement. Bi-level controls are required in all spaces larger than 100 ft^2 and having a lighting load greater than 0.8 Watts/ft^2. Buildings or separately metered spaces with less than 5000 ft^2 of conditioned space are no longer exempt from the automatic shutoff control requirement.

Section 146 requires portable lighting to be included when determining the actual lighting power. If no specific plans for spaces larger than 250 square feet are provided for portable lighting, the standards specify a value of 0.2 Watts/ft^2 to be used for determining the actual lighting power density. The actual lighting power for portable lighting may be used if sufficient supporting evidence is provided on the plans.

HELP CALIFORNIA CONQUER THE ENERGY CHALLENGE!

The energy challenge facing California and the West is real.

California continues to be threatened by electrical shortages and rolling blackouts. The State is attacking the problem in three ways.

First, the Governor and leaders of the California Legislature are working with utility companies, generators and consumer groups to develop long-term solutions for reliable and affordable electricity for Californians.

At the same time, we are working diligently to add as much new electrical generation to the system as quickly as we can, while still protecting California's environment. In September 2000 the Governor signed legislation that established 2 new stream-lined power plant licensing processes for summertime peaking units and for larger plants that meet environmental, and public health and safety issues in their applications. From April 1999 to April 2001, the Energy Commission has licensed 13 power plants that will add approximately 8,464 megawatts to the electricity supply system and six of these plants are under construction now.

You're our third key to success. The State plans to reduce the demand for energy by eight percent. To reduce the risk of power outages, the most important thing Californians can do is to reduce our demand for electricity by using energy more efficiently.

With nearly 35 million people in California, we are the sixth largest economy in the world. By reducing our electricity demand, we can help to avoid shortages, lower energy bills and reduce the stress on the power grid in the entire Western United States.

All you have to do is

To contact the *Blueprint* editor, please send e-mail to: jeash@energy.state.ca.us.

Special Thanks go out to Stacey Jo Ross, Student Editor; Beverly Duffy, Art Director; Jon Leber, Technical Advisor; Merry Bronson, Photographer, Valerie Hall, Maxine Botti and Tony Rygg for all of their help in creating this edition of the Blueprint.

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Date	Location	Class	Contact	Co-sponsor	Telephone/e-mail/fax
4-03-01	Irwindale	R	CTAC	SCE	626-812-7537
4-04-01	Ventura	R	CTAC	SCE	626-812-7537
4-07-01	San Jose	R&NR	Bob Adler	PG&E	408-277-4541 bob.adler@ci.sj.ca.us
4-10-01	San Diego	R&NR	Deborah Newell	SDG&E	858-636-5730 dnewell@sdge.com
4-11-01	San Diego	R&NR	Deborah Newell	SDG&E	858-636-5730
4-13-01	San Francisco	R&NR	PG&E	PG&E	800-244-9912
4-17-01	Irvine	R	CTAC	SCE	626-812-7537
4-18-01	Irvine	R	CTAC	SCE	626-812-7537
4-21-01	Bakersfield	R&NR	Russ Johnson	PG&E	661-326-3935
4-24-01	Tuolumne Co.	R	Pat Wiley or	PG&E	209-588-0191
			Greg Lamb		209-533-5633
4-27-01	Stanislaus Co.	R&NR	Joanne Nash	PG&E	209-668-5560
5-01-01	Fontana	R	CTAC	SCE	626-812-7537
5-02-01	Lancaster	R	CTAC	SCE	626-812-7537
5-02-01	Turlock	NR	Joanne Nash	PG&E	209-668-5560
5-04-01	Turlock	R	Joanne Nash	PG&E	209-668-5560
5-09-01	Redding	R&NR	Jim Wright	PG&E	530-225-4099
5-17-01	Benicia	R&NR	Harvey Higgs	PG&E	707-746-4230
5-22-01	Fontana	R	CTAC	SCE	626-812-7537
5-23-01	Romoland	R	CTAC	SCE	626-812-7537
5-31-01	Santa Cruz	R&NR	PG&E	PG&E	800-244-9912
6-06-01	Visalia	R&NR	Dennis Lehman or	PG&E	559-738-3495
			Gene Long		559-804-4765
6-07-01	San Luis Obispo	R&NR	PG&E	PG&E	800-244-9912
6-13-01	Corona	R&NR	Jim Miyao	SoCal Gas	714-634-5039 jmiyao@socalgas.com
6-14-01	Los Angeles Co	R&NR	Jim Miyao	SoCal Gas	714-634-5039
6-20-01	Palm Desert	R&NR	Jim Miyao	SoCal Gas	714-634-5039
6-26-01	Thousand Oaks	R&NR	Jim Miyao	SoCal Gas	714-634-5039
6-27-01	Santa Barbara	R&NR	Jim Miyao	SoCal Gas	714-634-5039

Note: Potential participants must register and confirm; date, times & exact location. Most classes are all day classes (9 AM to 3 PM). Some classes are Residential (R) or Nonresidential (NR) only. Space is limited. R.S.V.P as soon as possible. Fees may be required. Dates and locations subject to change. Instructors will be provided by the co-sponsoring Utility. Thanks also go to BIA & ICBO for partnering with SCE on this project. California Energy Commission staff will also be available at the training site.

Commission Contact: John Eash 916-653-7181 e-mail: jeash@energy.state.ca.us

SPRING 2001
blueprint
Energy Efficiency Division

The inside story:

http://www.energy.ca.gov/ab970_standards/documents/index.html

For any questions or additional information relating to the new Standards contact the Energy Hotline at (800) 772-3300.

#65

Publication number P400-00-010

WINTER 2000 - #64

blueprint

Energy Efficiency Division

BUILDING STANDARDS

- AB 970 Part of the Solution

During the recent summer months, California experienced a number of "power watch" days in which consumers and businesses were asked to reduce their electricity use to avoid power outages. Customers in the San Diego area saw their utility bills rise over 200 percent. California will continue to face considerable risk of ongoing high electricity prices and outages, depending on our weather in the next few summers.

On September 6th Governor Davis signed the new California Energy Security and Reliability Act of 2000. This act, also known as Assembly Bill AB 970, presents a balanced response to the electricity problems facing the state. The act will result in expedited power plant permits, "fast track" new energy standards for buildings and appliances, and a $50 million grant program to reduce peak electricity demand. The Energy Commission and the Public Utilities Commission will work together to implement these and related programs.

The Energy Commission is directed by AB 970 to adopt and implement building and appliance standards within 120 days (January 4, 2001) that result in "maximum feasible reductions in wasteful, uneconomic, inefficient or unnecessary consumption of electricity." The Commission's rulemaking for residential and nonresidential building standards is underway. For more information regarding the building standards contact Don Kazama at dkazama@energy.state.ca.us. For appliance standards information contact Valerie Hall at vhall@energy.state.ca.us.

The grant program described in the bill addresses price-responsive HVAC and lighting systems, cool communities, public universities, State buildings and facilities, LED traffic signals, and water/wastewater treatment pumps and equipment. For information on these grant programs, contact Mike Sloss at msloss@energy.state.ca.us.

QUESTIONS and ANSWERS

RESIDENTIAL

I am having trouble with my CALRES program. I finished entering all of my information, but I have an error saying, "undefined volume". The only place I can find to enter the volume is under BUILDING INFO at the bottom of the page, but I can't access that portion of the screen. What can I do?

A

You should begin your data entry in a different manner. An error message often means that you didn't follow the correct procedure for modeling a home using the CALRES program. Whenever you use CALRES, you must start with an existing file. To do this you go into the FILE menu and choose RETRIEVE. Every program has a file named SAMPLE. Start by using this existing program, and then change the information so that it corresponds to your work. Following this procedure ensures that the volume information at the bottom of the BUILDING INFO page will be automatically filled-in based upon the information entered in the ZONES section. Remember that when you have completed your data entry, you must save it under a new file name.

NON-RESIDENTIAL

I am interested in relocating a register within a room of a nonresidential building. At the same time, I will be increasing the occupant density. Do I need to meet the ventilation (outdoor air) requirements?

A

No, the standards include an exception for relocating components. For any nonresidential mechanical alterations see section 149 (b) of the *Energy Efficiency Standards for Residential and Nonresidential Buildings.*

"Exception 2 to Section 149 (b): When existing heating, cooling, or service water heating systems or components are moved within a building, the existing systems or components need not comply."

I have an existing retail space that I am converting into an office. I want to remove the existing track-lighting fixtures and install new fluorescent lighting fixtures by extending the tracks and moving the heads. Do I have to comply with the lighting requirements?

Yes, by extending the track you are increasing the lighting load and must comply with the standards. The track itself, and not the track heads, is considered the lighting fixture, and extending the track is considered to be adding more lighting fixtures. Since you are increasing the lighting load, it is considered an alteration and according to Section 149, you must follow the requirements set forth in the Energy Efficiency Standards.

"Alterations to existing lighting systems that increase the connected lighting load or replace more than 50 percent of the lighting fixtures shall meet the requirements of Section 146."

I have an existing building in which I want to change the heads of the track lighting from incandescent to fluorescent. I am only making this change in one room, but I have permitted the entire building for alterations not involving the lighting. Do I have to comply with the Standards?

No, since your alteration is less than 50 percent of the permitted area, you do not have to comply with the Standards for lighting if you are only changing the heads on the track. The amount of energy that is attributed to a track lighting system is based upon how many linear feet of track there are, and not how many, or what kind of track heads are connected to the track. You may increase the connected lighting load on the existing track up to its rated capacity; however, you cannot increase the length of the track unless a current limiter is used to regulate the total volt-amperes available to the track system so that the total wattage for the new system is equal to or less than the original track lighting system.
(See previous question/answer).

When determining compliance with the lighting part of the nonresidential standards, should I include planned plug-in lighting as part of the Actual Lighting Power Density?

Yes, Section 146 (a) of the Standards states,

"*The actual lighting power density of the proposed building is the total watts*

of all planned permanent lighting systems (including, but not limited to track and flexible lighting systems, lighting that is integral with modular furniture, movable displays and cabinets, and internally illuminated case work for task or display purposes) minus any adjustments allowed under Subsections 1 through 4."

The parenthetical portion of this excerpt helps define "planned permanent" lighting. Check to see if the lighting in question is listed in Section 146 (a) 3 as being excluded from the actual lighting power density. If plug-in lighting will be installed to meet the lighting needs of the occupants, it should be shown on the plans. If the plug-in lighting is shown on the plans, and is not listed as an exemption in Section 146, it must be counted as part of the actual lighting power. If an increase or change in the type of lighting happens prior to final inspection, the building inspector should determine compliance based upon confirmation that the lighting power density of the actual constructed building does not exceed the lighting power density shown on the plans.

Building departments perform both a plan check and field inspection to determine whether or not the building complies with the Energy Efficiency Standards

Correction to Blueprint 63.
Contact for CHEERS is:
Tom Hamilton, Executive Director
Thamilton@CHEERS.org
1-800-424-3377

Did you know?

Standards, Manuals, Forms, Computer Compliance, Conferences and Training Calendars, Energy Efficiency Information and Resources, and MORE

Did you know that the Energy Commission Web Site contains all of the Title 24 information that you could possibly want? Where else can you get copies of the Residential and Nonresidential Manuals, Standards, and all of the compliance forms for FREE? Nowhere! Not only does the Commission Web Site have all of this information, it has lots more. All of the approved computer programs for energy analysis and Alternative Calculation Manuals for both Residential and Nonresidential can be accessed via the Internet. Also, you can find the update to version 1.35 of the CalRes software. The Web Site can even keep you up to date on possible changes to the Standards being developed in response to AB 970. For information on Blueprints, appliances, additions and energy saving ideas, visit the California Energy Commission's Web Site!

www.energy.ca.gov/title 24/

New SDG&E Program Offers Free Services and Cash Incentives

Launched Sept. 1, 2000, SDG&E's Home Energy Partnership offers free services and cash incentives to home builders, energy consultants and allied professionals who incorporate energy-efficiency upgrades in new residential developments. Single- and multi-family projects located in the utility's service area are eligible.

The program offers a $400 incentive for each single-family home that meets the Energy Star® performance target and a $500 incentive if performance is 10 percent better than the target. Multi-family projects may qualify for incentives of $60 per housing unit, plus an energy support team incentive of $750 to $2,000. In addition, the program offers design assistance, free training, marketing support and appliance rebates.

For details, contact Julieann Summerford, program manager, at (619) 641-7103 or <*jsummerford@sdge.com*>.

How to choose your HVAC system

Upgrading the equipment in a residential HVAC system may only capture a fraction of the potential energy savings. Up to 35 percent of additional energy savings can be achieved through proper selection, sizing, installation and maintenance.

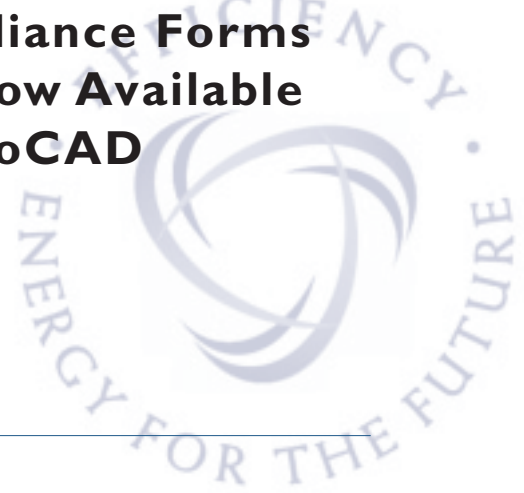
Where does one go to get all of the above information? It's currently available (at no charge) in a comprehensive, easy-to-understand document recently completed by the Consortium for Energy Efficiency (CEE), a national non-profit energy organization. This document, entitled Specification of Energy-Efficient Installation and Maintenance for Residential HVAC Systems, can be found on the CEE Web Site at www.ceeformt.org. It includes performance specifications, step-by-step procedures, verification protocols and dozens of illustrations.

The specification can be used as a training document, an installation field guide and a platform for energy-efficiency programs, both on the national and regional levels. These energy-efficiency practices can be incorporated into national certification programs for contractors. CEE is currently discussing this option with North American Technician Excellent (NATE).

For additional information about CEE's Residential HVAC Specification, contact Denise Rouleau at 617-589-3949, ext. 204, or <drouleau@ceeformt.org>.

Many Energy Commission staff help produce this publication. Among those providing expertise for this edition are: Stacey Jo Ross, Student Editor; Beverly Duffy, Graphic Artist; Elaine Hebert; Advisor to the Editor; Jon Leber, Technical Advisor; Rob Schlichting, Media and Public Communications; Merry Bronson, Photographer. Thanks also to: Valerie Hall; Rob Hudler; Tav Commins; Nelson Peña; Bruce Maeda; Gary Flamm; Mazi Shirakh; Tony Rygg; Debbie Friese, Chris Fultz; Suzie Chan; Claude Heiney; David Lopez; Linda Comie'r; Joey Swiencki.

Nonresidential Compliance Forms Are Now Available in AutoCAD



To contact the *Blueprint* editor, please send e-mail to: jeash@energy.state.ca.us.

WINTER 2000
blueprint
Energy Efficiency Division

The inside story:

#64

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Efficiency Division

SPRING 2000

RESIDENTIAL & NONRESIDENTIAL

QUESTIONS and ANSWERS

RESIDENTIAL

Q *I want to design and provide an energy efficient kitchen. I especially want the lighting design to provide an aesthetically pleasing appearance, sufficient light for basic kitchen tasks, and be energy efficient while also complying with the Energy Efficiency Standards. How can I achieve my goal?*

A Section 150(k) of the 1999 Energy Efficiency Standards for Residential and Nonresidential Buildings (Standards) states:

> "Luminaires for general lighting in kitchens shall have lamps with an efficacy of not less than 40 lumens per watt. General lighting must provide a sufficient light level for basic kitchen tasks and provide a uniform pattern of illumination. A luminaire(s) that is (are) the only lighting in a kitchen will be considered general lighting. General lighting shall be controlled by a switch on a readily accessible lighting control panel at an entrance to the kitchen.
>
> Additional luminaires to be used only for specific decorative effects need not meet this requirement."

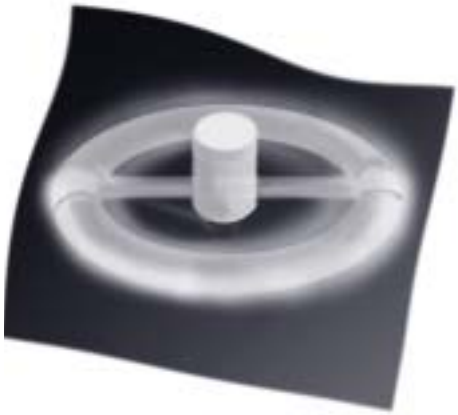
...continued on page 2

WELCOME

to the new blueprint!

In keeping with the optimism associated with the new century and millennium, we have developed a new format for this publication. We anticipate quarterly publication and encourage you to participate by submitting questions, information or photographs for inclusion in these pages. Our goal is to serve your needs. Please feel free to contact the Hotline or me with comments or questions regarding energy efficiency.

John Easch
blueprint editor
Jeash@energy.state.ca.us



...continued from page 1

The intent of the kitchen lighting code is not to increase the number of light fixtures and/or watts used by the occupant but rather to insure the builder provides — and the occupant uses — energy efficient lighting.

General lighting — the lighting that the occupant will typically use on a regular basis — is required to be high-efficacy (normally, fluorescent lighting). "Efficacy" is defined in Section 101(b) of the Standards as, "…the ratio of light from a lamp to the electrical power consumed (including ballast losses) expressed in lumens per watt."

Section 150(k) requires that the general lighting be switched at the kitchen entrance. It also emphasizes that the high-efficacy lighting must provide sufficient light level for basic kitchen tasks and that this lighting must be uniform. The fluorescent fixtures installed may be of varying designs and shapes (i.e., recessed or surface mounted four-foot long tubes, round circline style with flat or convex plastic or glass diffusers, recessed hard-wired "can" downlights, etc.).

Energy Commission staff recommends the builder use one of the following four ways to show compliance:

1. Design and install only high-efficacy luminaires in the kitchen. This scenario meets the code requirement in the most straightforward manner.

   When kitchen lighting includes both high-efficacy sources and low-efficacy sources, the design may not meet these requirements. The second through fourth ways of showing

compliance apply to kitchens with both high- and low-efficacy sources.

2. Provide at least 1.2 Watts per square foot (total square feet of the accessible kitchen floor and countertop areas) of light from high-efficacy sources, and insure that, in the judgment of the building department plan checker, the lamps in those fixtures produce a substantially uniform pattern of lighting on kitchen work surfaces (Please note that this is not a code requirement but is a Commission staff recommendation).

3. Make sure that at least 50 percent of the kitchen lighting wattage is high-efficacy, and that, in the judgment of the building department plan checker, the lamps in those fixtures produce a substantially uniform pattern of lighting on kitchen work surfaces (Please note that this is not a code requirement but is an option recommended by Commission staff).

4. If you wish to be certain you have provided an "energy efficient kitchen…an aesthetically pleasing appearance…sufficient light for basic kitchen tasks…while also complying with the Energy Efficiency Standards," the Energy Commission staff recommends you use the same procedures used by professional lighting designers (staff does not intend that these procedures become a standard part of builder submittals, but rather that they are used to provide the best possible solutions for builders who wish to provide high quality lighting designs).

These procedures account for the characteristics of the room and the design and location of the specific high-efficacy luminaires that will be installed as the best method to determine if there is both sufficient and uniform light. A recognized lighting authority, the Illuminating Engineers Society (IES), provides guidelines for good lighting design in their *Lighting Handbook, Reference & Application, 8th Edition.*

IES guidelines recommend that at least 30 footcandles of light be provided for seeing tasks in kitchens. Seeing tasks include, but are not limited to, the basic kitchen tasks that are described in the Energy Commission's *Residential Manual* as preparing meals and washing dishes. These tasks typically occur on accessible kitchen countertops, the tops of ranges and in sinks, where food preparation, recipe reading, cooking, cleaning and related meal preparation activities take place, as well as at the front of kitchen cabinets so that the contents of the cabinet are discernable.

To clearly demonstrate compliance with the Standards to a building department, the builder may provide a lighting layout design that includes a point-by-point illuminance grid for the high-efficacy lighting. To do this properly, this grid must account for the room geometry, fixture placement, coefficient of utilization (CU) of the fixtures, lamp lumens, lamp lumen depreciation, and reflectivity of all of the surfaces in the kitchen.

Uniform lighting assures that the minimum amount of light is available on all the work surfaces used in meal preparation and cleanup. Although the design should achieve 30 footcandles on most counter-height, horizontal work surfaces, there may be a few work surfaces where the lighting levels fall below this value and the fronts of kitchen cabinets may also be below this value. Even in these locations, the lighting level provided by the high-efficacy source should not fall below the IES-recommended lower value for non-critical seeing tasks of 20 footcandles. Parts of counters that are not work surfaces, such as a corner underneath a cabinet, may have a lighting level below 20 footcandles and still meet the requirements of the standard, because meal preparation is unlikely to occur in those areas.

Manufacturers and lighting fixture representatives can often provide such a grid for a specified design. Electrical engineers who do lighting designs and professional lighting designers also often provide designs with a point-by-point illuminance grid.

The plans should identify the type of luminaire and maximum Underwriters Laboratory (UL)-rated lamp watts for each luminaire and should include dimensions and tolerances of each luminaire so that the installer, plan checker, and field inspector can all determine when the lighting installation matches the plan checker's judgement. When calculating the kitchen lighting wattage, the builder should be certain to use the maximum UL-rated wattage for each fixture.

Energy Commission staff hopes that this information provides homeowners/builders, designers, builders, and building department personnel a better understanding of how to provide high quality kitchen lighting.

RES 00-1-Lighting

Q A Q A Q A

When replacing an electric resistance heating unit, the Standards seems to indicate that I have to install one that is more efficient. Can't I use the same type and size?

Yes, you can replace an electric resistance heating unit with one of the same type and size. However, if the size is increased, load calculations are required. The words "or the existing fuel type" in Section 152(b)1Bii apply to replacement of an electric resistance heater.

RES 00-2-HVAC

How do I model (in the CALRES computer compliance approach) the heat distribution of a non-central space heater? Do I select the choice "R4.2 in the attic"? Do I select "Ducts in conditioned space"? Do I select "Special" or "Crawl Space" or "Basement"?

When specifying a non-central heating system, "None" should be entered as the selection for the "HVAC System Distribution Schedule" in CALRES. The type of system and efficiency should also be changed to reflect the non-central space heater being installed. R4.2 ducts in the attic should be modeled for non-central cooling systems.

RES 00-3-HVAC

How do I model (in a compliance approach) a door with a large amount of glass in it?

You must model either the square feet of the door itself, or the square feet of glass plus an area that includes a two inch frame extension on all sides of the glass. All glazing in doors must have either an NFRC label or use the default U-value and Solar Heat Gain Coefficient from Tables 1-D and 1-E in Section 116 of the Energy Efficiency Standards. The area to be considered a "fenestration product"

Q A Q A Q A Q A

is either the whole door or the glass area plus a two inch frame extension area on all sides.

RES 00-4-Glass

I am converting a garage into a room addition. The new floor will consist of two-inch sleepers directly on the existing slab, plywood, carpet padding, and carpeting. How would the new floor be modeled in a computer program?

This type of floor assembly is not found in Table G-13, which lists materials acceptable as exposed mass. Therefore, the floor would be considered a covered slab construction. The construction assembly, as it will be built, should be modeled in the computer program using the U-value for each material. You must prepare a Form 3 showing the assembly and calculate a U-value for the total assembly. Also, be sure to check with your local building department regarding the Uniform Building Code requirements for wood on concrete and for other life-safety issues.

RES 00-5-Addition

Is the volume of a small water heater (rated input less than or equal to 75,000 Btu/hr) required in a residential computer method?

Yes. In performance methods, the volume is one of the required inputs.

RES 00-6-Water heater

I want to replace my central gas heating system with a central electric heat pump. Section 152 (b) of the standards includes some limitations on electric systems. Am I allowed to install a heat pump? What must I do to show that I comply with the Energy Efficiency Standards?

Yes, you can replace your gas furnace with a central electric heat pump having a minimum HSPF of 6.6 (single package) or 6.8 (split system). Minor repairs such as replacement of the fan motor need not meet the requirements of Section 152(b). If you are replacing an existing system, you may find it beneficial to install a heat pump with an efficiency considerably higher than these minimums. To perform properly, heat pumps need to move substantially more air than a furnace to provide the same amount of heat. This may require a larger duct system than was originally used for a gas furnace. Contact your local building department, mechanical engineer or contractor for more advice.

RES 00-7-Heat pump

When an existing central heating unit will also serve a new addition to a home, how would the existing central heating unit be modeled, using the "existing plus addition" computer compliance method?

You should model the equipment using a 78 percent AFUE central furnace and a 10 SEER air conditioner with R-4.2 ducts in the attic, in the "existing" and "existing plus addition" computer runs, regardless of actual conditions. However, if the HVAC unit is being replaced during the addition construction, credit is gained by using the values from Table 7-3 (Default Assumptions for Existing Buildings) to establish the existing efficiencies if they are unknown for the existing home calculation. Then the new unit's efficiency would be used in the "existing plus addition" calculation.

RES 00-8-HVAC

Q A Q A Q A Q A

NONRESIDENTIAL

In the Nonresidential Manual, page 5-42, it states the wattage for track lighting is calculated using "…45 watts per foot, which is 50 percent of the lighting power rating by the National Electric Code (90 watts per foot)." If the California Energy Commission adopted the 1996 NEC values for track lighting which is now 150 watts per two feet instead of 180, this would change the Energy Commission default value of 45 to 37.5 watts/linear foot of track. Which values should be used?

45 Watts /linear foot of track is the formal interpretation of the Energy Commission as published in its Nonresidential Manual; therefore, 45 watts per linear foot should be used.
Note that the Nonresidential Manual (page 5-42) also states:

> Tracks serviced through permanent, installed transformers for low voltage lighting may use the volt ampere (VA) rating of the transformer as the Actual Lighting Power of the track. Standard voltage tracks equipped with current limiters may use the actual volt-ampere (VA) rating of the current limiter as the Actual Lighting Power of the track if (a) The current limiter is an integral part of the track and can only be replaced by manufacturer authorized technicians, and (b) The VA rating of the current limiter is clearly marked on the track and is readily available for the building officials' field inspection without opening the fixture or panels.

NONRES 00 - 1 -Lighting

What energy code comes into effect for tents, if any? Does this conditioned space still invoke Title 24? Does the fire marshal handle this?

If the building official considers the tent to be an occupancy within the scope of Section 100 (a) of the standards and the tent is conditioned, then it must comply with the requirements of the energy code. Note that exception 2 to Section 100(a) states: Building departments, at their discretion, may exempt temporary buildings or structures erected in response to a natural disaster. Temporary buildings or structures shall be completely removed upon the expiration of the time limit stated in the permit.

NONRES 00 - 2 - Tents

Can a building department plan checker or inspector ask for further documentation and additional information (other than standard forms) to verify compliance with the Standards?

Section 10-103(a)3.B states: "The enforcement agency may require the person with overall responsibility for the construction to provide any reasonable information to determine that the building as constructed is consistent with approved plans and specifications and complies with Part 6" (of the Standards). Section 10-103(a)2.B. states: "If any characteristic is materially changed before final construction and installation, such that the building may no longer comply with Part 6, the building must be brought back into compliance, and so indicated on amended plans, specifications, and Certificate(s) of Compliance and shall be submitted to the enforcement agency."

NONRES 00 - 3 - Compliance

How do I model (for compliance with the Standards) Residential Care Facilities for the Elderly (R2) buildings having both residential and nonresidential components?

Section 100(e) states: "When a building is designed and constructed for more than one type of occupancy, the space for each occupancy shall meet the provisions of Title 24, Part 6, applicable to that occupancy." Exception to Section 100(e) states: "If one occupancy constitutes at least 90

percent of the conditioned floor area of the building, the entire building may comply with the provisions of Title 24, Part 6, applicable to that occupancy, provided that the applicable mandatory measures in Sections 110 through 139, and 150, are met for each occupancy."

NONRES 00-1-Lighting

DID YOU KNOW?

- The new guide for Residential Additions, "Six Steps to an Energy Efficient Addition" is now available from the Hotline 1-800-772-3300, or from our Web Site at <www.energy.ca.gov/title24>.

- CALRES version 1.34 has been updated to version 1.35 and the fix is available from our Web Site.

- EZ-Frame has an updated version available on the Energy Commission's Web Site. The update corrects a problem EZ-Frame has traditionally had running on fast processors. If your version is functional, an upgrade is not required.

Go to: <www.energy.ca.gov/pub/efftech/Ezframe>.

- The California Energy Commission Publications Office now accepts VISA and MASTERCARD. Orders may be placed in person at:

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CORRECTIONS /TYPOS

Nonresidential Manual

1. Tables 3-20 and 3-21: In the section for skylights there are two rows for 'Transparent' skylights. The 'Transparent' row lower on the page in both Tables should read 'Translucent.' The Standards are correct.

2. In the Overall Envelope Method ENV-2, Part 1: In the section for WINDOW AREA TEST; Entry 2. IF LESS THAN C, the first blank is supposed to be MINIMUM STANDARD AREA.

Building Efficiency Standards

1. Standards Table 1-L, Sec 146(a)2: The Window Wall Ratio for VLT ≥ 60 percent and Window Wall Ratios of 20 percent to 40 percent should have the decimal point shifted to the right so that the correct value is 0.30/0.40.

2. In Section 100 (d) 2. D., EXCEPTION 1 and EXCEPTION 2 refer to Section 100 (d) 2. D. ii. **b.** only.

3. The residential prescriptive requirement table for CZ 5. Maximum Glazing U-value for Package D should be 0.75, not 0.7

4. The residential prescriptive requirement table for CZ 10. Maximum Glazing U-value for Package D should be 0.75, not 075

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John Eash
Editor

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(916) 654-5106

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Energy Efficiency Division

blueprint

SPRING 2000

The inside story:

The nonresidential compliance forms are now available in AUTOCAD format. They can be down loaded from our web site at www.energy.ca.gov/title24

Front cover photographs courtesy of Lithonia Lighting.

Illustrations used throughout are from the new "Home Energy Guide," published by the California Energy Commission (Publication number P400-99-003).

Energy Efficiency Division

Blueprint

FALL 1999, NO 61

California Energy Commission

Questions and Answers

NONRESIDENTIAL

I can't find information about Solar Heat Gain Coefficients (SHGC) for the windows in my nonresidential building. Where do I find the SHGC information?

Call the California Energy Commission's Energy Hotline at 1-800-772-3300. All the information you need should be found in the Notice on the Alternative Calculation Method for Nonresidential Buildings-Solar Heat Gain Coefficient Compliance.

On the ENV-1, part 2 of 2 in the azimuth columns, do I need to enter N, S, E, W, or exact degrees from North? The instructions are unclear.

You can use either method. For compliance with the prescriptive standards, N, S, E, and W (for North facing, South facing, East facing, and West facing) are acceptable as those terms are defined in the *Energy Efficiency Standards for Residential and Nonresidential Buildings* (Standards), Section 101(b) Definitions. Entering the exact degrees from North is also acceptable.

I am trying to comply using the Prescriptive approach. I will be using a computer room air conditioner with electric resistance reheat for dehumidification. Section 144(g) states that electric resistance heating cannot be used for space heating. Am I exempt because I am not using the electric heating for "Space Heating"?

It depends. Electric resistance heating for reheat purposes must comply with exceptions in Sections 144(d) and 144(g). A gas-fired boiler may be used for all of the reheat. A water coil from a gas-fired boiler can be used as the primary heating with supplementary electric resistance if the design complies with the exceptions in Sections 144(d) and 144(g).

In Table 5-3 of the Nonresidential Manual (Complete Building Method Lighting Power Density Values), what do the designations "high" and "low" mean when referring to the Lighting Power Density (LPD) for "General Commercial and Industrial Work Buildings"?

The term "high" refers to "high bay" (where the luminaire is 25 feet or higher from the floor), and the term "low" refers to "low bay" (where the luminaire is less than 25 feet from the floor).

I have a project where a space previously defined as unconditioned would now become semiconditioned. What are the lighting requirements?

If changes in an existing unconditioned building result in a space becoming semiconditioned, the Efficiency Standards have no requirements for lighting (Nonresidential Manual, Sec. 2.2.2). However, if an alteration results in a change to the lighting, as described in Section 149 (Standards), you must comply with the Standards.

If I am going to convert a building from semiconditioned space to directly conditioned space, what are the requirements?

The building would be treated as if it was a whole new building. The entire building would have to comply.

RESIDENTIAL

I am building a home in which the only space conditioning will be wood heating. Do I have to comply with the Standards? Is wood considered a depletable energy source?

Wood heating is not considered a depletable energy source. If a home has no depletable energy sources connected to it, it would not need to comply with the Standards. However, all of the energy used in the home must be from non-depletable sources to avoid having to comply with the Standards. This standard requirement includes lighting, water heating, and space cooling. The use of propane, oil, natural gas, or electricity purchased from a public utility for any purpose in the home invokes the Standards. The local building department may also require a back-up heating system.

I want to replace my central gas heating system with a central electric heat pump. Section 152 (b) of the standards includes some limitations on electric systems. Am I allowed to install a heat pump? If so, what must I do to show that I comply with the Standards?

Yes, you can replace your gas furnace with a central electric heat pump that has a minimum HSPF of 6.6 (single package) or 6.8 (split system). An electric resistance central heating system would also be compared to a central heat pump with an HSPF of 6.6 (single package) or 6.8 (split system). Minor repairs such as replacement of the electric resistance controls, elements, or fan motor need not meet the requirements of Section 152(b).

When I try to run CALRES2 Version 1.34.XX (where XX refers to all versions of 1.34), some outputs seem wrong and sometimes I get errors. What can I do?

First, as with every other computer program, you should save files often, especially before each *CALRES2* run. Second, the Commission has issued a bug fix which repairs many of the reported problems with *CALRES2* Version 1.34.XX. This fix may be downloaded at <ftp://energy.ca.gov/pub/efftech>.

I want to use the Point System. Why can't I find that chapter in the 1999 Manual?

Since July 1999, the Point System is no longer an approved method of compliance. A new compliance method called Flexible Approach, Simple Trade-offs (FAST) will be introduced as soon as possible. Until FAST is available, you must use either the Prescriptive or currently approved computerized Performance approaches to show how compliance is achieved. Certified computer software programs that may be used for the Performance approach are CALRES2, EnergyPro and MICROPAS. Call the California Energy Commission's Energy Hotline at 1-800-772-3300 for information on how to obtain the current certified software versions.

I am using the Prescriptive approach to show compliance on an addition but I am unfamiliar with the changes concerning interior shading. Can I take credit for interior shading devices?

No. Effective July 1, 1999, credits for interior shading devices are not allowed in Prescriptive compliance. Credit for roller shades may be taken using the Performance compliance method until December 31, 2001. Beginning January 1, 2002, roller shades cannot be used at all for compliance. However, specific exterior shading devices are allowed, if the Form S is completed. For Form S, look in Appendix A of the Residential Manual – or call the Energy Hotline.

Q *What in the world is "Solar Heat Gain Coefficient (SHGC)"? How is it defined and where can I find information about it?*

Solar Heat Gain Coefficient, refered to as SHGC, replaces the Shading Coefficient (SC) used in the 1995 Standards, but the terms are not interchangeable. This new term, SHGC, better defines the performance of windows. A definition is: the SHGC is the ratio of the solar heat gain entering the space through a fenestration product to the incident solar radiation. Shading Coefficient, on the other hand, is the ratio of the solar heat gain through a fenestration product to the solar heat gain through a nonshaded 1/8-inch-thick clear double strength glass under the same set of conditions. Exterior shading devices can influence the SHGC value for the fenestration assembly, and the SHGC values can be adjusted to take such devices into account. A Form S (see above Q/A) must be completed to find the total effective SHGC for a specific combination of window and exterior shade. Still confused? For more information on SHGC, see pages 2-15 through 2-20 and 3-9, 3-10 in the Residential Manual; visit the Commission's Web Site and search the "Other Links"; or call the Commission's Energy Hotline.

Q *What are the regulations associated with continuous burning pilot lights?*

These regulations are contained in the Appliance Efficiency Regulations (Section 1605) and the Building Standards (Section 150(e)2).

Constant burning pilot lights are prohibited in the following:

(A) Fan type central furnaces.
(B) Fan type wall furnaces.
(C) Fan type central furnaces designed solely for installation in mobile homes.
(D) Household cooking appliances.
(E) Pool heaters.
(F) Fireplaces.
(G) Decorative Gas Appliances.
(H) Gas Logs.

This restriction shall not apply to:

(1) Appliances designed to burn only liquefied petroleum gases (not applicable to fireplaces).
(2) Appliances designed expressly for use in mobile homes and recreational vehicles.
(3) Cooking appliances which do not have an electrical line voltage supply connection.

Q *I have multiple bathrooms and I don't want to use fluorescent fixtures in any of them. Can I do anything else instead?*

As an alternative, both of the following are required:

1. A luminaire with 40 lumens/watt lamps must be installed in a laundry room, utility room or garage for each bathroom that does not have a high efficacy luminaire; and

2. All permanently mounted outside lighting must either be at least 40 lumens/watt or equipped with a motion sensor.
   Example: In a two-bathroom home in which the owners do not want to put fluorescents in the bathrooms, they would have to follow the above requirements. They could put a fluorescent fixture in their laundry room, a fluorescent fixture in their garage, as well as motion sensors on their exterior lights.

DID YOU KNOW?

The fax server is no longer in service because it is not Y2K compliant. You may access most of the same information from our Web Site:

<*www.energy.ca.gov/title24*>

Energy Efficiency Division Homepage:
<*www.energy.ca.gov/efficiency*>

Building Standards Information:
<*www.energy.ca.gov/title24*>

- Full text of Standards, effective 7/1/99
- Compliance Forms, effective 7/1/99
- Manuals, effective 7/1/99
- Blueprints
- Most efficient appliances
- Certified Plans Examiners Roster
- Approved Computer Programs

EZ Frame
<*ftp://energy.ca.gov/pub/efftech*>

Certified Appliance Directory
<ftp://energy.ca.gov/pub/efftech>

Standards and Manual Typographical Corrections
effective 7/1/99:

Building Standards:
- Building Standards: Section 141(a)1B. Table "1-I or 1-J" should be "1-H or 1-I".

Nonresidential Manual:
- On page 4-61, there is an ENV form. Please ignore it.
- Table 5-10 for Daylighting Controls was not printed correctly. Table 1-L in the Standards is correct.
- Form LTG-4, in the TAILORED LPD-Public Area Displays section, the formula for calculating ALLOTTED WATTS should be (D x E), not (E x F).
- Figure 2-1, the "NO" arrow coming into the bottom left block of the flowchart should be reversed to point away from that box.

Residential Manual:
- The words "measured or" should be deleted from the HVAC Fan air flow line under the"Duct Sealing" portion of page 3 of the CF-6R.

PUBLICATION ORDERS

For additional copies of the Blueprint contact the Energy Efficiency Hotline. Copies can also be downloaded from our Web Site @ <*www.energy.ca.gov/efficiency/blueprint*>

CHANGE OF ADDRESS

Send old and new addresses, with the five-digit ID number (appears above name on mailing label) to address below, Attn: MS 5.

TECHNICAL SERVICES

Web Site

www.energy.ca.gov/efficiency

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EFFICIENCY

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Blueprint Index Residential Standards

P 4 0 0 - 0 0 - 0 0 5

HVAC continued…

Insulation

Lighting

Mandatory Measures

Opaque Surfaces

Scope/Signature

Scope/Signature continued…

Thermal Mass

Water Heating

Residential Blueprints

Blueprint # 1

Q: Do relocated residential buildings have to comply with the standards when no conditioned space is added?

A: No, the standards do not apply to relocated buildings. The standards do not consider a relocated existing building a new building and compliance is not required. The standards would apply only to "new" building construction and to buildings where new conditioned floor area is added to the existing building. You may be required to comply with local energy conservation ordinances. You should contact the local enforcement agency to verify if these ordinances will affect the relocated project. The Energy Commission recommends that all energy conservation measures that are cost-effective and feasible be installed during the reconstruction of your building.

Q: What are the new residential building standards compliance requirements for an unconditioned solarium / greenhouse?

A: None, provided that the solarium / greenhouse will remain unconditioned; for example, a "thermal break" is maintained between the conditioned living spaces and the unconditioned solarium / greenhouse. A "thermal break" may be accomplished by a door or a sliding glass door to maintain the thermal integrity of the building envelope. Also, there should be no ducts joining the two spaces together which would allow for the conditioning of the solarium / greenhouse unless dampers are installed that would allow for the conditioning of the solarium / greenhouse. Additionally, you should consult with the local enforcement agency to confirm any local codes or ordinances that may affect the installation of a solarium / greenhouse.

Q: For residential buildings how are the correct glazing areas determined?

A: Use the "rough opening" to determine the glazing area for all compliance methods.

Blueprint # 2

Q: If a duplex is being modeled on a unit by unit basis, should the building comply with the single-family budgets or the multi-family budgets?

A: If the units of the duplex share a common wall, they must comply with the multi- family budgets.

If the units are "zero lot line" buildings that do not share a common wall, they must comply with the single-family budgets.

Blueprint # 18

Q: Should kneewalls be insulated as walls or attics when located adjacent to an attic space?

A: Kneewalls are walls and should be insulated as walls as specified by the chosen method of compliance.

Blueprint # 19

Q: The Energy Conservation Manual says that worksheets must be submitted whenever a water heater other than a 50 gallon or less gas non-recirculating water heater is installed, but the computer programs don't produce the worksheets. Do I need to fill out and submit a worksheet?

A: No. The worksheet calculations are internal to the approved computer programs. The system characteristics will appear on the CF-1R and C-2R automatically and, therefore, no separate worksheet is required.

Blueprint # 20

Q: What can I do if the only rating available on my certified equipment is an EER (for example, air conditioners over 65,000 Btu), but the compliance approaches all require as SEER?

A: In this case use the EER in lieu of the SEER. This is only acceptable for equipment not required to be tested for an SEER rating. Use the appropriate duct efficiency factor.

Q: Is there any way to determine an HSPF for certified equipment that only has a COP (for example, through-the-wall heat pumps)?

A: At this time you should assume that through-the-wall heat pumps meet the minimum HSPF (6.6). Duct efficiency credits may not be taken, so you should assume the default (ducts in attic).

However, for central air conditioning heat pumps, calculate the HSPF as: HSPF = (3.2 x COP) – 2.4. Use the appropriate duct efficiency factor.

Blueprint # 23

Q: I am using the performance compliance approach for a 7-unit apartment complex. Each unit has its own water heater and there is an unconditioned laundry room with its own water heater. Should I model 7 or 8 water heaters?

A: Model 7 water heaters. The building standards do not regulate a water heater serving an unconditioned space.

Q: I'm using a computer program to model a slab on grade house. Do I use the nominal mass thickness or the actual thickness?

A: Model the actual thickness. For example, for a nominal 4 inch slab, enter 3.5 inches.

Blueprint # 24

Q: Do the standards require insulation on rim joists located between the stories of a multi-story building? If so, should they be insulated as floors or walls?

A: Rim joists are part of the wall and should be insulated to the same level as the wall.

Blueprint # 25

Q: Package D in Climate Zones 1 and 16 requires R-7 slab edge insulation. I understand that I can treat garages and entry areas (such as steps or a porch) as if they had R-7 insulation. If I add concrete around the house (for example, a walkway) would this also eliminate the need for R-7 insulation?

A: No. Garages and entry areas are the only areas that are treated as having R-7 slab edge insulation.

Blueprint # 26

Q: What must be included as indirectly conditioned space when calculating the conditioned floor area?

A: Any area that meets the definition of indirectly conditioned space (see Energy Conservation Manual) must be included. Examples of areas that may be indirectly conditioned space include enclosed porches, enclosed sunrooms, laundry rooms, and furnace rooms.

Blueprint # 27

Q: One of the mandatory requirements of the standards is equipment sizing. Why doesn't the Energy Commission provide the means to comply with this requirement? Where can I get help?

A: The Commission does not provide more information on equipment sizing because the Business and Professions Code restricts who may perform this function. While the energy standards limit the oversizing of heating equipment, a well designed HVAC system will also be based on the orientation and features of the house, duct design, and placement for registers. The system design, and equipment sizing and selection should be done by a professional engineer or otherwise qualified individual using an approved sizing method.

Q: I'm building a two-story house, the bottom floor of which is slab. Do I consider this slab or raised floor construction?

A: Most likely it is slab. However the conditioned footprint determines the type of construction. If more than 50% of the conditioned footprint is slab, consider it slab floor construction. If it is 50% or more raised floor, consider it raised floor construction. In other words, unless the house you're building has twice as much conditioned space on the second floor as it does on the first floor, consider it slab floor construction.

Blueprint # 28

Q: Does putting a mobile home on a permanent foundation make it subject to the residential energy standards?

A: No. According to the Department of Housing and Community Development (which enforces state and federal standards applicable to manufactured, or mobile homes) putting a mobile home on a permanent foundation does not change its status as a manufactured home.

Q: What is the difference between a manufactured (or mobile) home and a factory-built home?

A: A factory-built home is one that is delivered in pre-assembled parts, either walls or rooms. Factory-built homes must comply with the energy standards. A manufactured home is built in one or more sections and requires a highway use permit to transport it. Manufactured homes are built to a federally preemptive standard which is enforced by HUD-approved inspection entitles. Manufactured homes have a federal certification label ("HUD label") on them indicating that they may have met the applicable federal standards. Manufactured homes are not subject to the state energy efficiency standards. Questions regarding standards applicable to manufactured homes can be directed to the Manufactured Housing Section of the Department of Housing and Community Development (916) 445-3338.

Q: I install greenhouses with a curved glass panel at the intersection of the wall and roof planes. Is there a simple way to figure out how much of the glass is vertical glazing and how much is skylight?

A: The portion of glazing that has a tilt of less than 60 degrees from the horizontal is considered to be in the roof and therefore a skylight. One of the simplest ways to determine how much is vertical glass and how much is skylight is to simply extend the lines of the wall and roof planes until they intersect and measure them to that point.

Q: Should moveable exterior shading devices (i.e. shade screens) be considered in place year round, or are they given the same operating schedule as interior shades?

A: In all the performance methods exterior shading devices are assumed to be in place year round.

Blueprint # 29

Q: I'm adding a bedroom on one side of my house, and putting a sliding glass door in the family room. I'm using the "addition alone" compliance procedure. Does the area of this glass door figure into my compliance calculations?

A: No. The sliding glass door is considered to be an alteration that "does not create conditioned space," and is subject only to mandatory requirements. Only alterations to water heating and heating, ventilation and air conditioning (HVAC) systems that are in conjunction with the addition must be included in compliance calculations.

Blueprint # 30

Q: According to the Uniform Mechanical Code (UMC), Section 803, when a gas log is installed in a

fireplace, the damper must be permanently blocked open. Yet, the Building Energy Efficiency

Standards require fireplaces to have an "operable" damper. How can I install a gas log in the

fireplace of my new home?

A: You cannot install a gas log in the fireplace in your new home. The energy standards require that

fireplaces have an operable damper so that the occupant can stop the flow of conditioned air out the chimney when the fireplace is not in use. The UMC requirement that the damper be permanently blocked open if a gas log is installed directly conflicts with the intent of the energy standards and would result in significant loss of conditioned air. Note that the UMC requirement for a permanently open damper applies to gas logs but not to gas-fueled log lighters. However, any gas installation is a fireplace poses a potential safety hazard when the damper is closed. We recommend caution in the use of log lighters. In addition, if building officials encounter gas log installations in retrofit situations, they should be certain the installation meets the UMC requirements.

Blueprint # 32

Q: In the HVAC systems I've designed for a tract of homes, the furnaces meet all the criteria for

zonal control credit, and a cooling system is optional. Can I take zonal control credit for both heating and cooling systems, even though the cooling system may not be installed?

A: You can take credit for both heating and cooling systems as long as you meet all the zonal control

criteria and the system (i.e. designed to be interconnected with the central furnace and with ducts sized for the air flow required for cooling). Additionally, the following should be noted at the time of inspections: • Common ducts are sized to handle the cooling air flow (cubic feet per minute) • Location of the outdoor compressor is identified • Electrical panel is prepared to handle the load for a future air conditioner.

Q: I am showing compliance for a one-room residential addition. The addition is served by its own

heating system. Can I take zonal control credit?

A: Only if the entire house is zonally controlled (i.e. all sleeping zones are controlled separately

from all living zones) and you are showing compliance using an "existing plus addition" approach.

Blueprint # 33

Q: My building department is holding up the final inspection on a house because the window

coverings haven't been installed. Why did this happen? What can I do to avoid this delay in the future?

A: This could happen if your energy compliance calculations indicate exterior shading or an interior

shading device that is more efficient than the default non-white drapery. If this is the case, then these devices must be installed prior to final inspection. The way to avoid this delay in the future is to demonstrate compliance without calling for special

shading devices (non-white draperies do not need to be installed before final inspection) or install the devices specified in compliance calculations.

Q: I am preparing energy compliance calculations for a loft area (conditioned attic). In some areas of the loft, the ceiling slopes down to within 1 foot of the floor. Is this part of the conditioned floor area?

A: Yes, this area is part of the conditioned floor area. For energy compliance calculations the definition of conditioned floor area is not limited to a specific ceiling height; rather, it is determined by the enclosed area of conditioned space.

Q: I am trying to determine if the following arrangement of rooms meets the requirements for zonal control credit. The upstairs of a two-story house has its own HVAC system and contains bedrooms and bathrooms. The downstairs contains a dining room, kitchen, living room and a bedroom, and also has its own HVAC system. Does this meet the zoning requirements?

A: No, this separation of rooms would not qualify for zonal control credit. A zone is defined as a group of spaces with "sufficiently similar comfort conditioning requirements." In order to qualify for zonal control credit, the living and sleeping zones must be separately controlled.

Q: I am doing the energy calculations for a two-story home that has some HVAC ducts in the attic and some in the crawlspace. Can I average the duct efficiencies by length of duct for these two conditions? Is any additional documentation required?

A: You can weight average duct conditions. The weighting method depends on whether there are multiple HVAC units. If there is one HVAC unit, the weighting is by length of duct. If there are multiple HVAC units, the averaging of ducts is by floor area served by each system. When averaging ducts by length, the documentation required is a mechanical plan indicating the location and length of duct in each condition.

Q: Can I take credit for the equivalent of R-7 slab edge insulation for the length of slab between conditioned and unconditioned spaces (i.e. between garage and house)? If so, what is the depth of the insulation that I should assume?

A: Yes, you can take this credit. You should take the appropriate slab edge heat loss rate (F2 Factor") for covered or exposed slab insulated, depending on the slab condition, to a depth of 18 inches.

Blueprint # 35

Q: Can trees be counted as shading in my compliance calculations?

A: Although trees can be helpful in reducing your cooling load, they are not changeless and may not be permanent. Therefore, as beneficial as they are, trees cannot be counted as exterior shading in compliance calculations.

Q: Is the Insulation Certificate (IC-1) submitted with energy compliance calculations?

A: No. This form is not submitted with compliance documentation. After the insulation is installed this certificate must be posted in a conspicuous location in the building.

Blueprint # 36

Q: Do the standards allow fluorescent "general" lighting to be activated from the same switch as incandescent "task" lighting?

A: No. That would defeat the purpose of having fluorescent lighting. Fluorescents can be made up to five times more effective than incandescent, and the general lighting requirement for fluorescent fixtures give homeowners the ability to use this most efficient light source. Having both light sources on when one is sufficient would negate the benefits of the more efficient light source.

Q: When I'm preparing a Form 3R, can I count the R-Value of air space above the insulation in a vented attic?

A: Yes. Use the R-values listed.

Q: I am designing a house that will have an HVAC system installed in the attic. Ceiling insulation will not be installed under the unit. How do I meet the mandatory minimum ceiling insulation requirement of R-19 when there is no insulation in this area?

A: While typically an entire ceiling is insulated to the same level, the standards allow an area-weighted average U-value to achieve compliance with the R-19 minimum ceiling insulation requirement.

Q: When I'm using the CALRES program for compliance and I enter the orientation for each of the walls, the program output shows different orientations than I entered. Is there something wrong with my copy of the program?

A: There isn't anything wrong with your copy of the CALRES program. The "Building Front Orientation" in the building information list is the "actual" direction the front entry faces. The user inputs the orientation of opaque surfaces "relative to the front entry" of the building (see chapter 4 of the CALRES User's Manual). Therefore, regardless of the orientation of the front of a house, the front wall always has an orientation of 0, left is 90, back is 180, and right is 270. When you run the program it will adjust all of the wall orientations to the "true azimuth" for C-2R.

Blueprint # 37

Q: Do the standards for new buildings preclude me from installing electric resistance \ strip heating with a heat pump, or do I just need special controls?

A: You need temperature-based controls which can "prevent electric resistance supplementary heater operation when the heating load can be met by the heat pump alone." Therefore, electric resistance strip heating is allowed as long as it is equipped with adequate controls to prevent unnecessary operation of this back-up heating source, which is less efficient than the heat pump.

Q: If I decide to install a recirculating hot water system to save water, does this have to be included in my energy calculations?

A: Yes. Recirculating systems can use a significant amount of energy, especially if they are not equipped with either a time clock or a demand pump. Because of its energy impact, a recirculating system must be included in the energy use calculations, despite its potential to save water.

Q: When preparing a compliance submittal for an addition using "existing-plus- addition" compliance, do I need to submit plans for the existing house?

A: Yes. While they may be simple, there should be enough detail to allow the building department to verify the calculations. This includes floor area calculations, window and door sizes, ceiling height, as well as wall, roof and floor assemblies.

Blueprint # 38

Q: I use CALRES for my compliance work. I find myself having to input the same window sizes, assemblies and equipment lists for every project. Is there any way to keep these "schedules" for future use?

A: Yes. When you first access the CALRES program, create your own schedules of user-defined wall / ceiling / floor assemblies, window sizes, equipment lists (water heaters, furnaces). You can then save this library file using a name you can easily remember (NOTE: Always use the "Files" / "Save" menu option rather than the F2 key to save files). Each time you access CALRES, retrieve this library file, being sure to rename it for the project you're working on so the existing file will remain intact.

Q: What is the correct slab edge condition (installation requirement and modeling assumption) for a hydronic radiant slab?

A: The exceptional method for hydronic heating systems with a radiant slab requires that R-10 slab edge insulation be installed. No credit for slab edge insulation can be taken.

Q: Does the Commission require original, or "wet", signatures on the certificate of compliance? Can an energy consultant sign building plans?

A: Title 20 (California Code of Regulations), which contains the administrative requirements of the standards, does not state that a wet signature is required. This is left to the discretion of the building department. Other than "Documentation Author" on the Certificate of Compliance (which must be on the plans), an energy consultant should not sign plans unless that person is also the designer, contractor, or building owner (as required by the Business and Professions Code).

Blueprint # 43

Q: Does the requirement that recessed lighting fixtures be approved for "zero-clearance insulation cover" apply to recessed fluorescent lights also?

A: No, this requirement applies to recessed incandescent lights only (Energy Efficiency Standards,

Section 150(k)4.). However, if a fluorescent fixture has no insulation over it, this condition must be accounted for when calculating the U-value of the roof/ceiling assembly.

Blueprint # 44

Q: Is it true that if the water heater I want to install has R-16 internal insulation I can't take credit for it?

A: You won't receive any credit for having "insulation," but the overall efficiency of the water heater (energy factor) will be higher because of this insulation. This means that if you do not choose to externally wrap the tank with R-12, the effect on compliance won't be as great as with a water heater with a lower energy factor. Therefore, you indirectly receive credit.

Q: Are the requirements different for piping insulation for a recirculating versus a non-recirculating water heater?

A: Yes. Section 150(j)2. of the Energy Efficiency Standards specifies that piping for a non-recirculating water heater must have a minimum of R-4 (R-6 for a pipe diameter greater than 2") insulation on the first 5 feet of hot and cold water pipes from the storage tank. (The cold water pipe requires insulation because it acts as a heat sink, drawing hot water out of the tank.) For recirculating systems, the recirculating sections of hot water piping must be insulated to a minimum R-4 (R-6 for a pipe diameter greater than 2") for the entire length of the piping, regardless of its location (conditioned space, unconditioned space, buried, in slab or under slab).

Q: If my water heater is located within the conditioned space, must I comply with the piping and tank insulation requirements (Energy Efficiency Standards, Section 150(j)2., 151(b)1.)?

A: Yes. As water and space temperatures are quite different (120-140° vs. 68-72°), insulation is still beneficial and thus required inside conditioned space.

Blueprint # 45

Q: Do decorative gas appliances need glass or metal doors?

A: As defined in the Energy Efficiency Standards, Section 101, decorative gas appliances do not need doors. The door requirement applies to masonry or factory-built fireplaces only (Section 150(e)1). Note: If a decorative gas appliance is installed inside a fireplace, the fireplace needs doors. Consult the manufacturer of the decorative gas appliance regarding combustion air requirements as well as health and safety considerations before placing such an appliance in a fireplace with doors.

Q: When do the Uniform Mechanical Code (UMC) guidelines for duct installation apply, and when

do the Energy Efficiency Standards (Section 150(m)) apply?

A: Both apply concurrently. The UMC, adopted by reference in the Energy Efficiency Standards,
covers thermal performance, installation and sealing requirements. The Energy Efficiency Standards set a minimum thermal performance requirement for duct insulation (R-4.2 minimum) which usually supersedes the insulation requirements from UMC Section 1005 (higher insulation levels may be required by the UMC in areas with 8,000 or more degree days, depending on duct location). [Note: This information is Energy Commission staff's summary of UMC requirements. Commission staff are not authorized to interpret the UMC or any codes other than the Energy Efficiency Standards and its administrative requirements.]

Q: What are the compliance requirements for replacing equipment such as air conditioning systems
or water heaters that are not part of an addition? What if the replacement unit is bigger?

A: Replacing equipment is considered an alteration and the replacement unit must meet applicable
mandatory requirements (Energy Efficiency Standards Sections 110-118 and 150). In the case of HVAC systems, the equipment must be certified and any new ducts require R-4.2 insulation. Load calculations may be required by the building department (particularly when the replacement unit is larger). A setback thermostat for specific system types is only required if the thermostat is being replaced. Replacement water heaters (which can be larger) must be certified and, if new pipes are installed, have the appropriate pipe insulation as required by Section 150(j).

Q: Is a detached addition to an existing residence (with no breezeway) an addition or a new building?

A: This depends on the type of permit issued by the local building department. If the permit is for an
addition, you can use compliance approaches approved for additions. If the permit type is for a new residential building, then you must use compliance approaches appropriate for new buildings.

Blueprint # 46

Q: The 1992 Energy Efficiency Standards don't specify whether buildings damaged by natural
disasters can be reconstructed to their original energy performance specifications. What requirements apply under these circumstances?

A: Buildings destroyed or damaged by natural disasters must comply with the energy code requirements in effect when the builder or owner applies for a permit to rebuild. The requirements that apply will depend on whether the scope of work is an addition, alteration or new building.

Q: How can I determine if the scope of work is an addition, alteration or new building? And what
requirements apply?

A: Section 100 of the Energy Efficiency Standards ("Standards") indicates that the standards apply

to buildings "for which an application for a building permit or renewal of an existing permit is filed (or required by law to be filed)." It comes down to whether the change is an "addition" or an "alteration." Changes that require a building permit for an increase in conditioned floor area and conditioned volume are "additions." An addition meets the requirements found in Standards Section 152(a). Changes that require a building permit but do not add conditioned floor area and conditioned volume are "alterations." An alteration is any change to an existing buildings water heating, space conditioning or lighting system or to the envelope that is not an addition. Alterations must meet any mandatory requirements that apply to the specific component being changed (Standards Section 152(b)). Rebuilding after a natural disaster (if a permit is required) will likely be either an alteration (Standards Section 152(b)) or a new building (Standards Section 152(d)). Requirements for new buildings apply if the local building official determines that the reconstruction is so extensive it is a new building. Repairs and maintenance work that do not require a building permit are not covered by the Standards.

Q: If I am simply replacing the windows in a home with new windows of the same size, do I have to meet a specific U-value requirement? When would I have to meet a maximum U-value for an alteration?

A: On June 9, 1993, the Energy Commission confirmed an interpretation stating that simply replacing windows with the same size window does not trigger a U-value requirement. Energy Efficiency Standards Section 152(b) provides that windows replaced or added "as part of an alteration" must meet a 0.75 maximum U-value. In an alteration requiring a building permit, any replaced window within the area being altered must have a maximum U-value of 0.75. Also, the 0.75 maximum U-value applies to any window added where one did not previously exist, or when an existing window opening is enlarged. This requirement does not apply to any windows in other areas of the house that are being replaced at the same time.

Q: What is a CF-6R and why is it required?

A: The CF-6R is an installation certification for manufactured devices regulated by the appliance standards (Part 6 of Title 24, Energy Efficiency Standards). The certification must include a statement indicating that installed devices conform to appliance and building standards and to any additional requirements contained in the plans and specifications. The certificate must be signed by the person with overall responsibility for construction or the person(s) responsible for installing the certified devices and / or appliances. This certificate must be posted to the building permit. Prior to January 1, 1993, some of the information required on the CF-6R (e.g., manufacturer, model number, and efficiency) was shown on the CF-1R (Certificate of Compliance). This information, however, was not always at the time of permit application, of different models were substituted when actually installed. The CF-6R will help ensure that installed devices conform to specifications and meet or exceed minimum efficiency requirements.

Q: What are the plan checking / field inspection requirements related to the CF-6R?

A: The CF-6R (Installation Certificate) is not required to be submitted with other compliance documentation at the time of permit application, but rather is posted for field inspection. A field inspector will want to check the equipment installed against what is listed on the CF-6R and compare the CF-6R and CF-1R for consistent equipment characteristics. California Code of Regulations Section 10-103(a)(3)(B) allows the enforcement agency to request additional information to determine that the building is constructed consistent with approved plans and specifications. When equipment

efficiencies above the minimum requirements are shown on the CF-1R (e.g., 12 SEER cooling equipment; 0.63 energy factor water heater), the building department should have procedures in place to verify efficiency. Requiring proof of efficiency from the installer, such as a copy of the appropriate page from the directory of certified equipment, is one possibility. Another possibility is to require that the applicant send a duplicate of the CF-6R through plan check for verification.

Q: What happens to the CF-6R after the final inspection?

A: California Code of Regulations Section 10-103(b) requires that the builder provide to the "building owner, manager, and the *original occupants* the appropriate Certificate(s) of Compliance and a list of the features, materials, components, and mechanical devices installed in the building, and instructions on how to use them efficiently" (italics added). At a minimum, the information on the CF-6R and CF-1R must be provided to the original-building occupants.

Q: Is it possible to receive infiltration and duct efficiency credits (i.e., ducts in conditioned space) for a central furnace, specifically where the furnace closet is either within the conditioned space or is in an indirectly conditioned space and the ducts are located inside the furnace closet?

A: It is not possible to get infiltration credit ("no ducts in unconditioned space") or duct efficiency credit unless you have either a pulse or condensing furnace with all of the duct work, including plenums, located within conditioned space, or a ductless heating system. Although pulse and condensing furnace technologies duct the combustion supply and exhaust air from the outdoors, typical furnaces require vented outdoor air for combustion. Once a furnace closet is vented to allow for outside combustion air, the supply and return plenums are no longer in conditioned space.

Q: If insulation is installed between floors of an apartment building (sound-proofing), can I install incandescent fixtures that are not IC-rated?

A: No. Although this isn't part of the building envelope, the Energy Efficiency Standards Section 150(k) state that any incandescent fixture recessed into an insulated ceiling must be approved for zero-clearance insulation cover.

Q: The 1991 Uniform Building Code has a newly defined occupancy category called "congregate residence" that is neither an R-1 nor an R-3. Which standards apply?

A: The UBC definition indicates that convents, monasteries and dormitories may be a "congregate residence." Since these building types are typically R-1 occupancies, congregate residences with three or fewer stories should meet the requirements found in the Residential Manual. A congregate residence with four or more stories must meet the requirements found in the Nonresidential Manual.

Blueprint # 47

Q: Is it true walls in new homes can no longer be insulated with R-11?

A: The minimum mandatory requirement for walls in new residential construction is R- 13 (or a U-value equivalent to an R-13 wall). Whether this is achieved with R-11 insulation combined with rigid insulation, or with R-13 insulation, is up to the owner and / or builder. NOTE: Although R-13 is the minimum insulation level, compliance with the standards may require a higher R-value.

Q: Water heating energy use often has a large impact on compliance with the Energy Efficiency Standards. Is there any reason I shouldn't specify the highest energy factor I can find in the Directory of Certified Water Heaters?

A: Yes, product availability. Manufacturers sometimes discontinue models and if you have specified a model with a high-energy factor you may have a problem obtaining that model. To avoid problems during plan check, or at installation, it is probably a better idea to specify an efficiency level available from several different manufacturers (NOTE: Check the cross reference in the back of the water heater directory because water heaters with different brand names may be produced by the same manufacturer).

Q: Is electric heating allowed in a pool or spa?

A: Section 114(a)4 of the Energy Efficiency Standards states that electric resistance heating cannot be used in a pool or spa, with two exceptions. One exception is where 60 percent of the heating energy is from solar or site recovered energy. The other exception is for spas that are package units with fully insulated enclosures and tight-fitting covers insulated to at least R-6.

Q: Is there a default U-value for the glass in sunrooms?

A: For the horizontal portion of the sunroom, use the U-value for skylights. For the vertical portion, use the U-values for either fixed, operable or patio doors, as appropriate. Use either default or NFRC-rated U-values. As a simplifying alternative, the manufacturer may label the entire sunroom with the highest U-value of any of the individual fenestration types within the assembly.

Q: How are French doors treated in compliance documentation, for example the U- value and dimensions?

A: French doors are fenestration products and are covered by the National Fenestration Rating Council (NFRC) Rating and Certification Program. You may use either an NFRC-rated U-value or a default (patio doors) U-value. The fenestration area for compliance documentation is the entire rough opening of the door (not just the glass area).

Q: Are pellet stoves treated the same as wood stoves for the purposes of energy standards compliance?

A: Yes.

Q: If a wood stove is installed in a wall, does it have to meet the fireplace requirements of Energy Efficiency Standards Section 150(e)?

A: No. A wood stove that meets EPA certification requirements, whether it is free standing or installed in a wall, does not have to meet any requirements applicable to fireplaces.

Q: If I want to have a gas log or some other device in the fireplace of my home, can I block open the damper? Can it have a standing pilot light?

A: Section 150(e)1 of the Energy Efficiency Standards (which contains the requirements for fireplaces, decorative gas appliances, and gas logs), allows the flue damper to be blocked open if it is required by either the manufacturer's instructions or the State

Mechanical Code. Continuously burning pilot lights in these appliances are prohibited by Section 150(e)2.

Q: Section 150(e)2 of the Energy Efficiency Standards states that no fireplace, decorative gas appliance or gas log can be installed if it has a continuously burning pilot light. The Uniform Mechanical Code requires all gas hearth appliances installed in California to have a manually operated shut-off valve, accessible to the inhabited space. Does this shut-off valve meet the intent of this section?

A: Not if the pilot light must be manually extinguished when the appliance is off. A unit which meets the intent of this section is one with a pilot light that cannot stay on when the unit is off.

Q: The 1988 standards had an exception to the requirement for fireplace doors if the doors would interfere with a heat distribution device. Was this inadvertently omitted?

A: No. The exemption was an interim solution to allow manufacturers of heat distribution devices to redesign them so that fireplace doors and these devices did not interfere with each other's operation.

Blueprint # 48

Q: Does a CF-1R need to be signed and submitted for alterations?

A: Yes. All building permit applications must include a Certificate of Compliance (CF-1R).

Q: Why do the standards prohibit the use of medium-base incandescent lamp sockets in some bathroom and kitchen lighting fixtures? Doesn't this rule out all other types of lighting sources including metal halide lamps?

A: The Energy Efficiency Standards (Section 150(k)3) do not allow medium-base incandescent lamp sockets for those fixtures providing general or high efficacy lighting. This is to prevent high efficacy lamps from being replaced with less efficient screw-in bulbs. HID lamps can be obtained with various bases which may fit in the socket. * Note: If you want to design kitchens and baths with HID lamps, be selective because most HIDs take some time to start up or "fully light."

Q: Do new residential buildings or additions consisting of block walls (for example, converting a garage into living space) have to comply with the R-13 minimum wall insulation requirement? If not, what insulation R-value do they need?

A: No, the mandatory wall insulation requirement for R-13 applies to frame walls only. The amount of insulation needed, if any, will vary depending on the compliance approach selected. Performance compliance (computer) with the standards may not require any additional insulation if the overall compliance is achieved without insulation in that space. Prescriptive compliance may require some level of insulation, depending on the climate zone, package selected, and whether the walls are light (block) or heavy mass. Use Residential Manual Appendix B, Materials Reference, to determine the R-value of the mass wall alone. If additional insulation is required, it must be integral with the wall or installed on the outside of the mass wall (Energy Efficiency Standards, Section 151(f), Tables No. 1-Z1 through 1-Z16, Note 2).

Q: What U-value do I use for glass block? Does it need a label?

A: The default U-value for an unframed product is 0.57 (if the product is operable, the U-value is 0.60); for a product with metal framing the default U-value is 0.72 (if the product is operable, the U-value is 0.87). A product label is required.

Q: What solar heat gain coefficient do I use for glass block?

A: Either (1) use a default value from Table No. 1-E, for dual glazing with the appropriate frame type (for no frame use "non-metal"), or (2) obtain the manufacturer's published SHGC for the product.

Q: My home will have a combination of fixed and operable windows. In determining the appropriate U-value for fenestration products, can I assume all windows are "fixed" in my compliance calculations?

A: You may assume the more conservative of the default values listed for fixed and operable windows. (Operable windows generally have a more conservative default value but this is not always the case with site built fenestration products.) Alternatively, you may calculate a weighted average U-value based on the actual condition of the windows. NOTE: Typical windows with a fixed portion and an operable portion are operable.

Blueprint # 50

Q: If I remove a window from the existing house while doing an addition, can I re-use this window in the addition, or does it need to meet a certain U-value?

A: You can use this existing window in the addition; however, you must use a compliance approach that allows you to account for the actual U-value of this window, which may eliminate prescriptive compliance (see default values in Table 7-3). Window certification and labeling requirements (Section 116(a)) do not apply to these used windows.

Q: If I am doing an alteration, can I move an existing window to another location? Does it need to meet a 0.75 U-value?

A: Once you move the window to a location where a window did not previously exist, it must meet the 0.75 U-value requirement because it is added fenestration rather than a window replacement.

Blueprint # 51

Q: Am I exempt from the requirement for a setback thermostat if I have a gravity wall heater or any of the equipment types listed in the exception to Section 150(I)?

A: Exemption from the requirement depends on the compliance approach you are using. The latter

part of the exception indicates that "the resulting increase in energy use due to the elimination of the setback thermostat shall be factored into the compliance analysis." The only compliance approach which can model this condition is the computer performance compliance approach. To be exempt from the setback thermostat requirement, the building/space must be modeled with "non-setback." Any time the alternative component packages are used for compliance, a setback thermostat is required, regardless of the type of heating/cooling system (except wood stoves).

Q: Can you explain the criteria for installing loose fill insulation--the Residential Manual contains considerably more information than the Energy Efficiency Standards (Section 150(b)), which only require that the installation conform to manufacturer's specifications for achieving the labeled R-value?

A: The three criteria to consider are: (1) roof slope, (2) ceiling slope, and (3) clearance. All of the criteria are recommendations to ensure even distribution and that insulation installed on a sloped surface doesn't settle to the extent that it becomes ineffective as a barrier between the conditioned and unconditioned space. (1) For a fairly typical situation where the ceiling is flat and the roof is sloped, the recommendation is that the roof slope be a at least 2-1/2-foot rise in a 12-foot run, but the slope can be greater. This is to allow enough room between the ceiling and roof for sufficient insulation thickness. (2) If the ceiling is sloped, loose fill can be used if the slope is no more than a 6-foot rise in a 12-foot run and manufacturer's restrictions are not exceeded. If, however, the ceiling slope is steep (greater than 6 in 12 feet), you should not use loose fill insulation. (3) The recommendation of a 30-inch clearance from the top of the bottom chord of the truss or ceiling joists to the underside of the roof sheathing is to facilitate installation and inspection.

Q: In defining the living and sleeping zones for a home with a zonal controlled HVAC system, can laundry rooms and bathrooms (which are not habitable spaces) be included on whichever zone they are most suited to geographically (e.g., a bathroom located near bedrooms)?

A: Yes. For computer modeling, include the square footage of any non-habitable or indirectly conditioned spaces with the closest zone.

Blueprint # 52

Q: When preparing compliance calculations for a three-story apartment complex, I have the option of showing compliance for each dwelling unit or for the entire building. If I use the individual dwelling unit approach, do I need to provide calculations for every dwelling unit?

A: Each dwelling unit must comply with the standards when using this approach. When dwelling units have identical conditions the calculations may be combined. This means you will show separate compliance for all unique conditions, such as: • Front facing North • Front facing West • Front/side walls facing East and North • Front/side walls facing East and South • Exterior roof, no exterior floor • Exterior floor, no exterior roof Surfaces separating two conditioned spaces (such as common walls) have no heat transfer and can be disregarded in the compliance calculations. Alternatively, you can model the entire building.

Q: I've seen a unique type of wall construction assembly, which consists of both concrete and framing. How do I determine if this wall, or other unique construction assemblies, are "framed walls" which require wall insulation to meet the mandatory requirement (Energy Efficiency Standards, Section 150(c))?

A: If the wall is an exterior partition, first determine if it has structural members (studs or hat channels) spaced not more than 32-inches on center (Section 101(b)). Second, determine whether the framing is supporting the load of the building. If both of these criteria are met, the wall is framed and must meet mandatory wall insulation requirements.

Blueprint # 53

Q: Are closable glass or metal doors required for decorative gas appliances?

A: No. The only requirement of standards Section 150(e) that applies to decorative gas appliances is the prohibition on continuously burning pilot lights (Section 150(e)2). If there is a question about whether a device is a fireplace, which requires glass doors, the distinction is that a fireplace has a hearth, chamber or other place in which a solid fuel fire or a decorative gas log set may be burned, while a decorative gas appliance is for visual effect only and merely simulates a fire in a fireplace (Section 101.)

Q: Although decorative gas appliances with continuously burning pilot lights are prohibited by the standards (Section 150(e)2), are they legal to sell in California?

A: Yes. These appliances can be sold for installation in existing residential buildings, hotels / motels, high-rise residential buildings and nonresidential buildings.

Blueprint # 54

Q: I am using computer compliance for a new residence with two rooms in a separate building. Should I model these as separate buildings, each meeting compliance with the standards?

A: No. Modeling as separate buildings skews the water heating energy, water heating credits, and internal gains. Model the residence, including the detached building, as one dwelling unit. Be sure to include all exterior surfaces of both buildings.

Q: Do the energy requirements of Title 24, Part 6, apply to an addition to a mobile home?

A: No. Title 25 requirements, not Title 24, govern mobile homes, including additions to the unit. Jurisdiction in a mobile home park comes under the authority of Housing and Community Development. Jurisdiction of a mobile home on private property may come under the authority of the local building department.

Q: There is a new occupancy group R classification in the California Building Code-Division 2 for care homes (residential facilities and residential care facilities for the elderly). Which standards apply to these occupancies?

A: Although this new occupancy group is not defined in the Energy Efficiency Standards, the scope of the Standards includes all R occupancies (Section 100). Any R-2 occupancy with three or fewer habitable stories must comply with the low-rise residential standards. High-rise residential standards apply to an R-2 occupancy with four or more habitable stories.

Q: What framing factor should I use for wood joist I-beams with wood webs and wood flanges?

A: Use the nominal dimensions and treat these beams like typical lumber (i.e., 2x4, 2x8).

Blueprint # 55

Q: If I build a steel-framed wall with R-13 insulation between the framing, does this comply with mandatory wall insulation requirements?

A: No. The wall must have the equivalent U-value as a wood framed wall with R-13 insulation, which is 0.088 U-value or better (lower) (Section 150(c)2). To determine if a steel frame assembly meets this U-value, you have several options. • Use one of the pre-calculated assemblies found in Appendix I of the Residential Manual. • Calculate the U-value using an ENV-3 for steel frame construction (from Appendix I) or from the Nonresidential Manual. • Calculate the U-value using EZFRAME or another method based on ASHRAE zone method. You cannot use any of the following to document the U-value of a steel frame wall: • Form 3R or any parallel path method, values from Chapter 4, Table 4-4, in the Residential Manual which exceed 0.088 U-value, or any U-value which is more than 10 percent different than values found in or calculated using one of the above referenced sources.

Q: If a customer asks me not to install fluorescent lights in their home, are there any other light sources I can use to meet the kitchen lighting requirements?

A: Yes, although they may not be readily available, there are products other than fluorescent which meet the lighting requirements of the standards, Section 150(k). The two criteria for the kitchen and bathroom general lighting are (1) a lamp with an efficacy of 40 lumen / watt or more, and (2) the fixtures cannot contain a medium base incandescent lamp socket. Table 2-2 indicates the typical lumens / watt of several common products, some of which meet the required lumens / watt. Specifications from a product's manufacturer can also be used to verify that a product has at least 40 lumens / watt.

Q: Is a custom window "field-fabricated" for purposes of meeting air infiltration requirements?

A: No. Most custom windows are manufactured and delivered to the site either completely assembled or knocked down, which means they are a manufactured product. A window is considered field fabricated when the windows are assembled at the building site from the various elements, which are not sold together as a fenestration product (i.e., glazing, framing and weather-stripping). As stated in the definition, "field fabricated does not include site assembled frame components that were manufactured elsewhere with the intention of being assembled on site (such as knocked down products, sunspace kits and curtainwalls)."

Q: I build some multi-family buildings and have some questions about the information I must provide (as required by Administrative Regulations, Section 10-103). Specifically: (1) If the building is a condominium, can I photocopy the same information for all units?

A: Photocopied information is acceptable. It must be obvious that the documentation applies to that dwelling unit-- that is, the features installed must match the features shown on the Installation Certificate. If compliance documentation is for a "building," a photocopy of the compliance forms for that building must be provided. If individual compliance is shown for each unique dwelling unit, a photocopy of the documentation which applies to that dwelling unit must be provided. (2) When the building is an apartment complex (not individually owned units), who gets the documentation?

Q: The documentation and operating information is provided to whomever is responsible for operating the feature, equipment or device (typically the occupant). Maintenance information is provided to whomever is responsible for maintaining the feature, equipment or device. This is either the owner or a building manager. (Section 10-103(b)(1)-(2).) (3) If an apartment is converted to condominiums, does each owner/occupant receive copies of the documentation?

A: If, during construction, the building changes from an apartment to condominiums, each owner at occupancy would receive the documentation. If an existing apartment building changes to condominiums at a later date, the documentation requirements are triggered only by a building permit application requiring compliance with the Energy Efficiency Standards. (Changing occupancy does not trigger compliance with the standards.)

Q: What is my responsibility with respect to the CF-6R (Installation Certificate) (a) as an inspector? And (b) as a builder?

A: The building inspector is responsible for checking the CF-6R at appropriate inspections to be sure it is filled out and signed for the completed work. Inspectors can verify that the installed features are "consistent with approved plans," as indicated on the Certificate of Compliance (CF-1R) form. Since the CF-6R may be posted at the job site or kept with the building permit, the inspector can request that this form be made available for each appropriate inspection. It is not advisable to wait until the final inspection to check the CF-6R. (Section 10-103(d)(2).) The general contractor, or his/her agent (such as the installing contractor), takes responsibility for completing and signing the form for the work performed. (A homeowner acting as the general contractor for a project may sign the CF-6R.) The compliance statement for their signature indicates that the equipment or feature: is what was installed; is equivalent or more efficient than required by the approved plans (as indicated on the CF-1R); and meets any certification or performance requirements. (Section 10-103(a)(3)(A).)

Q: When plan checking a computer compliance submittal for a high rise residential building, I was surprised that it complied with electric resistance heating. Then I found the heating modeled as an appliance load. Is this the correct way to model space conditioning?

A: No. Heating equipment cannot be modeled as an appliance load in the load calculations. If there is additional load caused solely by a process, it is modeled as a process load. For a residence, however, the heating load is for human comfort and is not a process load. It is rare that a building can comply with the energy budget with electric resistance heating as its sole space-conditioning source.

Blueprint # 56

Q: I think the Standards are now clear that documentation authors are not regulated by the Business and Professions Code. I am unclear, however, as to the meaning of the sentence in Section 10-103(a)(1) which states "Subject to the proceeding paragraph, persons who prepare energy compliance documentation shall sign a statement that the documentation is accurate and complete" (Title 24, Part 1). What does the phrase "subject to the preceding paragraph" mean?

A: This phrase is to emphasize that the documentation author is performing a service under the authority and responsibility of the person with overall project responsibility. The documentation author is only responsible for the accuracy of the energy compliance documentation. The ultimate responsibility for compliance with the Energy Efficiency Standards remains with the person who is authorized by the Business and Professions Code to take responsibility for the project.

Q: When is an historical building exempt from the Energy Efficiency Standards (Title 24, Part 6)?

Are additions to historical buildings also exempt?

A: A building is exempt from Part 6 when it is a "qualified historical- building." This term is defined in Section 8-218 of Title 24, Part 8 as a "structure or collection of structures, and their associated sites, deemed of importance to the history, architecture, or culture of an area by an appropriate local, state or federal governmental jurisdiction. This shall include designated structures on official existing or future national, state or local historical registers or official inventories, such as the National Register of Historic Places, State Historical Landmarks, State Points of Historical Interest, and officially adopted city or county registers or inventories of historical or architecturally significant sites, places or landmarks." "Additions which are structurally separated" from the historical building are not exempt from the Energy Efficiency Standards and must comply with current building codes (Historical Building Code, Title 24, Part 8, Section 8-704).

Q: As a manufacturer of fenestration products, I place a temporary label with the air infiltration rates on my products (Section 116(a)). Can you clarify which products must be tested and certified?

A: Each product line must be tested and certified for air infiltration rates. Features such as weather seal, frame design, operator type, and direction of operation all effect air leakage. Every product must have a temporary label certifying that the air infiltration

requirements are met. This temporary label may be combined with the temporary U-value label.

Q: I thought I was supposed to insulate the water heater pipes for either the first five feet or the length of piping before coming to a wall, whichever is greater. Did I misunderstand?

A: Yes. The requirement is that you must insulate the entire length of the first five feet, regardless of whether there is a wall (Standards, Section 150(j)2). You have two options: (1) interrupt insulation for a fire wall and continue it on the other side of the wall, or (2) run the pipe through an insulated wall, making sure that the wall insulation completely surrounds the pipe.

Q: When insulating the water heater-piping, do I need to put insulation on the first five feet of cold water pipe?

A: Yes. Section 150(j)2 requires insulation on the cold water pipes also. When heated, the water expands and pushes hot water out the cold water line. This can start thermosyphoning, which continues to remove heat from the stored water. The insulation helps reduce this effect.

Q: Can I get pipe insulation credit for a recirculating water-heating system?

A: No. Recirculating water-heating systems have a mandatory insulation requirement for the recirculating sections of hot water pipes. Pipes less than or equal to 2 inches must be insulated to R-4 and pipes greater than 2 inches need R-6 insulation.

Q: If the plans show an electric resistance heater in the bathroom, do I have to include this heater in the energy compliance calculations?

A: If the bathroom has a supply duct from the main space conditioning system (typically gas-fired), you can ignore the electric space heating. If the room, however, does not have a supply vent from the main system, the supplemental electric resistance is the heat source for the space. In this latter case you must use a performance compliance approach and model two systems-the main system for the house and the electric system for the bathroom. NOTE: Consult the Residential Manual or your program User's Manual for guidance in modeling multiple zones that are not zonally controlled.

Blueprint # 57

Q: Can I use single-pane windows or skylights?

A: New buildings or additions using performance approach (computer) may be able to achieve compliance with single-pane glass. How easy or difficult it is to make up the lost energy efficiency will depend on the climate zone and building design. New buildings, additions or alterations showing compliance using prescriptive standards are limited to a maximum U-value for fenestration products which prevents the use of single pane glass.

Q: Do replacement windows have to meet any specific U-value? When does the 0.75 maximum U-value for fenestration products mentioned in Energy Efficiency Standards, Section 152(b) apply?

A: When replacing windows with the same size window opening there is no maximum U-value requirement. If windows are added (new or different size opening) or replaced "as part of an alteration" (Section 152(b)), then the maximum U-value of 0.75 applies. Thus, if an alteration apart from the fenestration change, requires a building permit, then any replaced fenestration within the area being altered must have a maximum U-value of 0.75; fenestration being replaced in unaltered areas of the house does not need to meet a maximum U-value. For example, if an east wall is being altered at the same time windows on the west are being replaced, only windows affected by the alteration to the east wall must meet the 0.75 maximum U-value requirement.

Q: Under what circumstances is a constantly (or continuously) burning pilot light prohibited on certain appliances?

A: For compliance with the Energy Efficiency Standards, Section 115 prohibits continuously burning pilot lights for some natural gas burning equipment (this does not include liquefied petroleum gas burning appliances). The equipment types are: * Household cooking appliances with an electrical supply voltage connection in which each pilot consumes 150 Btu / hr or more * Pool heaters * Spa heaters * Fan type central furnaces Section 150(e) prohibits continuously burning pilot lights for: * Fireplaces * Decorative gas appliances * Gas logs For compliance with federal and state appliance regulations (which apply to any appliance sold or offered for sale in California), a constant burning pilot light is prohibited on: * Gas kitchen ranges and ovens with an electric supply cord * Pool heaters, except those that burn liquefied petroleum gas.

Q: One of my clients wants to use a product that is installed on the hot water pipes and uses electricity to heat the water (in addition to the storage tank). It is not a recirculating system but the end result is the same--no waiting for hot water. The building department told me I need to account for the energy use of this product. How do I include it in the compliance calculations?

A: There is currently no approved method for accounting for the energy use of a heat cable on water heating pipes. Therefore, it cannot be used in new construction if compliance with the water heating budget is required (Energy Efficiency Standards, Section 151(b)(1)). This product should not be confused with heat tape used for freeze protection. Freeze protection products activate the electric resistance heating tape only when temperatures drop to a point where freezing of pipes could occur. Freeze protection products are not prohibited by the Standards, and need not be included in the water heating compliance calculations. Pipe insulation, whether mandatory or for credit, is still required.

Blueprint # 58

Q: I've seen products that permanently convert a medium-base down-light socket to a fixture. Can these be used to meet the lighting requirements for bathrooms and kitchens?

A: Yes, but the conversion must be permanent; i.e., the fixture cannot be changed back to accept medium base incandescent bulbs without destroying the socket. There are products that screw into a medium base product which cannot be removed, thus leaving a different socket which accepts only fluorescent bulbs. Since the bulb can be replaced with a fluorescent bulb only, the fixture effectively does not contain a medium base incandescent lamp socket. These permanent products will provide a new alternative for builders to consider for meeting the high efficacy requirements of the standards (Energy Efficiency Standards, Section 150(k)). Caution: Using these devices can change the dimensions of the fixture and lamp, creating an awkward fit and look (i.e., the lamp may extend outward from the fixture).

Q: What are the duct insulation requirements for residential mechanical systems?

A: Section 150(m) of the Energy Efficiency Standards requires the greater of R-4.2 or the level required by Uniform Mechanical Code (UMC) Section 604. UMC Section 604 requires R-6.3 duct insulation in two cases: 1. When cooling system ducts are installed on the roof or exterior of the building. 2. When heating system ducts are installed on the roof (exterior) of the building in an area with greater than 8,000 heating degree days. NOTE: These insulation levels are the mandatory minimum levels. If compliance calculations show a higher R-value is being used for credit, the higher value is required.

Q: I know that R-4 pipe insulation is mandatory for a recirculating water heating system (on the entire length of recirculating pipe), but is it true that if there is also a demand control system you can get credit for the R-4 pipe insulation? If so, why?

A: Yes, this is true. A demand pumping system activates the recirculating pump only when the occupant indicates a need for hot water. Since hot water will not be continuously recirculating through the pipes, the R-4 is not a mandatory requirement and is eligible for pipe insulation credit. A recirculating system with a demand pump and pipe insulation is the only type of system that is eligible for two credits--one for the demand control and one for the pipe insulation.

Q: When insulating pipes for a recirculating water heating system, I insulate the entire length of hot water pipes, but do I need to insulate runouts?

A: No. Since the water in runouts does not recirculate, they do not need to be insulated.

Blueprint # 59

Q: I'd like to know if it is possible to use non-IC rated incandescent fixtures recessed in an insulated ceiling. Although I've never been able to find a bulb heater (heat lamp) that is IC-rated [approved for insulation cover], they are very popular with my customers. Can I use this product?

A: It is possible to build a box of gypsum board or wire mesh over the fixture in the attic, which can then be insulated. By separating the insulation from the fixture, the fixture is not recessed into the insulated ceiling. As long as there is sufficient clearance between the fixture and the insulation to prevent a fire hazard, this assembly is acceptable for meeting Section 150(k)4 of the standards. NOTE: Recessed fluorescent fixtures do not need to be IC-rated.

Q: Do I need check boxes on the MF-1R form (Mandatory Measures Checklist)?

A: Any version of the mandatory measures checklist form, whether or not it contains boxes or lines, still indicates the responsibility the applicant is taking for complying with the mandatory features listed on the form. If the building department's policy is to take this form into the field and check off the "enforcement" column as each measure is inspected, the applicant should adhere to their request to use a form with spaces for "designer" and "enforcement" to indicate compliance with the mandatory requirement.

Q: Can R-16 internal insulation be used as a substitute for R-12 external insulation on a storage water heater?

A: No.

Blueprint # 60

Q: Do the Energy Efficiency Standards require an original, or "wet" signature on the Certificate of Compliance?

A: Section 10-103 does not specify that a "wet" signature is required. This is left to the discretion of the building department.

Q: If I am adding windows to a house (no other work is being done), is there a limit to the amount of glass I can add?

A: The only requirements are that windows and skylights (fenestration products) must have a U-value of 0.75 or lower.

Q: Are there restrictions on the maximum or minimum size for heating and cooling equipment in the Energy Efficiency Standards? What are the sizing and selection criteria?

A: There are no restrictions on the size of equipment in the Energy Efficiency Standards. Section 150(h) requires load calculations using one of the three listed methods to determine the heat loss and heat gain rates. (The three methods include American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE), Sheet Metal Air Conditioning Contractors National Association (SMACNA) Load Calculation Manual, or Air Conditioning Contractors of America (ACCA) Manual J.) The sizing calculations can be prepared by the documentation author, the mechanical contractor doing the installation, or a mechanical engineer. The equipment selection, which is based on several criteria other than the heat gain and loss rates, must be made by an individual authorized by the Business and Professions Code, such as a mechanical engineer or the installing contractor. It is the mechanical contractor who is ultimately responsible for proper sizing and equipment selection.

Q: What type of pool covers may be used on heated pools and spas to comply with the Energy Efficiency Standards?

A: Section 114(b)2 does not specify any criteria for the pool or spa cover. Any cover will limit heat loss from the surface of the water. It is advisable to use a non-permeable cover.

Q: I was checking on the certification of a liquefied petroleum gas (LPG) water heater. I could not find this model, but I found the natural gas equivalent model (same model number). Can I assume the model is certified?

A: Yes. For boilers, furnaces, gas space heaters, and pool heaters, the Appliance Efficiency Regulations (Sections 1603(e) and (f), state that "models … intended for use either with natural gas or liquefied petroleum gases may be tested with natural gas and the results applied to both fuel types." Listing the appliances with their LPG efficiency is voluntary on the part of the manufacturer.

Q: I build in climate zone 14 where vapor barriers are a mandatory requirement [also required in zone 16]. Can a moisture barrier be used as a vapor barrier?

A: Only if it has a permeance of one perm or less. (A perm is equal to one grain of water vapor transmitted per square foot per hour per inch of mercury pressure difference.) Typically a plastic membrane must be used. Although products such as a continuous polyethylene sheet or wall board with foil backing and any product that meets the vapor barrier permeance rating of one perm or less may be used. Kraft paper backing on batt insulation may qualify if it is installed properly and the paper backing meets the vapor barrier permeance rating. For proper installation, the Kraft paper tabs on each side of the insulation batt must be fastened to the face of the conditioned side of the framing member. At the edge of the insulated cavity, the Kraft paper must overlap the framing members to create a continuous barrier at the cavity. The Kraft paper cannot be stapled to the sides of the framing members.

Blueprint # 61

Q: I am building a home in which the only space conditioning will be wood heating. Do I have to comply with the Standards? Is wood considered a depletable energy source?

A: Wood heating is not considered a depletable energy source, and if a home has no depletable energy sources connected to it, the home would not need to comply with the Standards. However, all of the energy used in the home must be from non-depletable sources to avoid having to comply with the Standards. This includes lighting, water heating, and space cooling. The use of propane, oil, natural gas, or electricity purchased from a public utility for any purpose in the home invokes the Standards. The local building department may also require a back-up heating system.

Q: I want to replace my central gas heating system with a central electric heat pump. Section 152 (b) of the standards includes some limitations on electric systems. Am I allowed to install a heat pump? If so, what must I do to show that I comply with the standards?

A: Yes, you can replace your gas furnace with a central electric heat pump that has a minimum HSPF of 6.6 (single package) or 6.8 (split system). An electric resistance central heating system would also be compared to a central heat pump with an HSPF of 6.6 (single package) or 6.8 (split system). Minor repairs such as replacement of the electric resistance controls, elements, or fan motor need not meet the requirements of Section 152(b).

Q: I want to use the Point System and I can not find that chapter in the 1999 manual.

A: Since July 1999, the Point System is no longer an approved method of compliance. A new

compliance method called Flexible Approach, Simple Trade-offs (FAST) will be introduced as soon as possible. Until FAST is available you must use either the Prescriptive or currently approved computerized Performance approaches to show how compliance is achieved. Certified Computer software programs that may be used for the Performance approach are *CALRES2, EnergyPro* and *MICROPAS*. Call the California Energy Commission's Energy Hotline at 1-800-772-3300 for information on how to obtain the current certified software versions.

Q: I am using the Prescriptive approach to show compliance on an addition and I am unfamiliar with the changes concerning interior shading. Can I take credit for interior shading devices?

A: No. Effective July 1, 1999 , credits for interior shading devices are not allowed in Prescriptive compliance. Credit for roller shades may be taken using the Performance compliance method until December 31, 2001. Beginning January 1, 2002, roller shades cannot be used at all for compliance. However, specific exterior shading devices are allowed, if the Form S is completed. For Form S, look in Appendix A of the Residential Manual – or call the Energy Hotline.

Q: What in the world is "Solar Heat Gain Coefficient (SHGC)"? How is it defined and where can I find information about it?

A: Solar Heat Gain Coefficient, refered to as SHGC, replaces the Shading Coefficient (SC) used in the 1995 Standards, but the terms are not interchangeable. This new term, SHGC, better defines the performance of windows. A definition is: the SHGC is the ratio of the solar heat gain entering the space through a fenestration product to the incident solar radiation. Shading Coefficient, on the other hand, is the ratio of the solar heat gain through a fenestration product to the solar heat gain through a nonshaded 1/8-inch-thick clear double strength glass under the same set of conditions. Exterior shading devices can influence the SHGC value for the fenestration assembly and the SHGC values can be adjusted to take such devices into account. A Form S (see above Q/A) must be completed to find the total effective SHGC for a specific combination of window and exterior shade. Still confused? For more information on SHGC; see pages 2-15 through 2-20 and 3-9, 3-10 in the Residential Manual; visit the Commission's web site and search the "Other Links"; or call the Commission's Energy Hotline.

Q: What are the regulations associated with continuous burning pilot lights?

A: These regulations are contained in the Appliance Efficiency Regulations (Section 1605) and the Building Standards (Section 150e2) Constant burning pilot lights are prohibited in the following: (A) Fan type central furnaces. (B) Fan type wall furnaces. (C) Fan type central furnaces designed solely for installation in mobile homes. (D) Household cooking appliances. (E) Pool heaters. (F) Fireplaces. (G) Decorative Gas Appliances. (H) Gas Logs. EXEMPTION: This restriction shall not apply to: (A) Appliances designed to burn only liquefied petroleum gases (Not applicable to fireplaces). (B) Appliances designed expressly for use in mobile homes and recreational vehicles. (C) Cooking appliances which do not have an electrical line voltage supply connection.

Q: I have multiple bathrooms and I don't want to use fluorescent fixtures in any of them. Can I do anything instead?

A: As an alternative, both of the following are required: 1. A luminaire with 40 lumens / watt lamps must be installed in another room with utilitarian functions such as a laundry room, utility room, or garage for each bathroom that does not have a high efficacy luminaire; and 2. All permanently mounted outside lighting must either be at least 40 lumens / watts or equipped with a motion sensor. Example: In a two-bathroom home in which the owners do not want to put fluorescents in the bathrooms, they would have to follow the above requirements. They could put a fluorescent fixture in their laundry room, a fluorescent fixture in their garage, as well as motion sensors on their exterior lights.

Blueprint #62

Q: I want to design and provide an energy efficient kitchen. I especially want the lighting design to provide an aesthetically pleasing appearance, sufficient light for basic kitchen tasks, and be energy efficient while also complying with the Energy Efficiency Standards. How can I achieve my goal?

A: Section 150(k) of the 1999 Energy Efficiency Standards for Residential and Nonresidential Buildings (Standards) states: "Luminaires for general lighting in kitchens shall have lamps with an efficacy of not less than 40 lumens per watt. General lighting must provide a sufficient light level for basic kitchen tasks and provide a uniform pattern of illumination. A luminaire(s) that is (are) the only lighting in a kitchen will be considered general lighting. General lighting shall be controlled by a switch on a readily accessible lighting control panel at an entrance to the kitchen. Additional luminaires to be used only for specific decorative effects need not meet this requirement." The intent of the kitchen lighting code is not to increase the number of light fixtures and / or watts used by the occupant but rather to insure the builder provides — and the occupant uses — energy efficient lighting. General lighting — the lighting that the occupant will typically use on a regular basis — is required to be high-efficacy (normally, fluorescent lighting). "Efficacy" is defined in Section 101(b) of the Standards as, "…the ratio of light from a lamp to the electrical power consumed (including ballast losses) expressed in lumens per watt." Section 150(k) requires that the general lighting be switched at the kitchen entrance. It also emphasizes that the high-efficacy lighting must provide sufficient light level for basic kitchen tasks and that this lighting must be uniform. The fluorescent fixtures installed may be of varying designs and shapes (i.e., recessed or surface mounted four-foot long tubes, round circline style with flat or convex plastic or glass diffusers, recessed hard-wired "can" downlights, etc.). Energy Commission staff recommends the builder use one of the following four ways to show compliance: 1. Design and install only high-efficacy luminaires in the kitchen. This scenario meets the code requirement in the most straightforward manner. When kitchen lighting includes both high-efficacy sources and low-efficacy sources, the design may not meet these requirements. The second through fourth ways of showing compliance apply to kitchens with both high- and low-efficacy sources. 2. Provide at least 1.2 Watts per square foot (total square feet of the accessible kitchen floor and countertop areas) of light from high-efficacy sources, and insure that, in the judgement of the building department plan checker, the lamps in those fixtures produce a substantially uniform pattern of lighting on kitchen work surfaces (Please note that this is not a code requirement but is a Commission staff recommendation). 3. Make sure that at least 50 percent of the kitchen lighting wattage is high-efficacy, and that, in the judgement of the building department plan checker, the lamps in those fixtures produce a substantially uniform pattern of lighting on kitchen work surfaces (Please note that

this is not a code requirement but is an option recommended by Commission staff).
4. If you wish to be certain you have provided an "energy efficient kitchen…an aesthetically pleasing appearance…sufficient light for basic kitchen tasks…while also complying with the Energy Efficiency Standards," the Energy Commission staff recommends you use the same procedures used by professional lighting designers (staff does not intend that these procedures become a standard part of builder submittals, but rather that they are used to provide the best possible solutions for builders who wish to provide high quality lighting designs). These procedures account for the characteristics of the room and the design and location of the specific high-efficacy luminaires that will be installed as the best method to determine if there is both sufficient and uniform light. A recognized lighting authority, the Illuminating Engineers Society (IES), provides guidelines for good lighting design in their *Lighting Handbook, Reference & Application, 8th Edition*. IES guidelines recommend that at least 30 footcandles of light be provided for seeing tasks in kitchens. Seeing tasks include, but are not limited to, the basic kitchen tasks that are described in the Energy Commission's *Residential Manual* as preparing meals and washing dishes. These tasks typically occur on accessible kitchen countertops, the tops of ranges and in sinks, where food preparation, recipe reading, cooking, cleaning and related meal preparation activities take place, as well as at the front of kitchen cabinets so that the contents of the cabinet are discernable. To clearly demonstrate compliance with the Standards to a building department, the builder may provide a lighting layout design that includes a point-by-point illuminance grid for the high-efficacy lighting. To do this properly, this grid must account for the room geometry, fixture placement, coefficient of utilization (CU) of the fixtures, lamp lumens, lamp lumen depreciation, and reflectivity of all of the surfaces in the kitchen. Uniform lighting assures that the minimum amount of light is available on all the work surfaces used in meal preparation and cleanup. Although the design should achieve 30 footcandles on most counter-height, horizontal work surfaces, there may be a few work surfaces where the lighting levels fall below this value and the fronts of kitchen cabinets may also be below this value. Even in these locations, the lighting level provided by the high-efficacy source should not fall below the IES-recommended lower value for non-critical seeing tasks of 20 footcandles. Parts of counters that are not work surfaces, such as a
corner underneath a cabinet, may have a lighting level below 20 footcandles and still meet the requirements of the standard, because meal preparation is unlikely to occur in those areas. Manufacturers and lighting fixture representatives can often provide such a grid for a specified design. Electrical engineers who do lighting designs and professional lighting designers also often provide designs with a point-by-point illuminance grid. The plans should identify the type of luminaire and maximum Underwriters Laboratory (UL)-rated lamp watts for each luminaire, and should include dimensions and tolerances of each luminaire so that the installer, plan checker, and field inspector can all determine when the lighting installation matches the plan checker's judgement. When calculating the kitchen lighting wattage, the builder should be certain to use the maximum UL-rated wattage for each fixture. Energy Commission staff hopes that this information provides homeowners/builders, designers, builders, and building department personnel a better understanding of how to provide high quality kitchen lighting.

Q: When replacing an electric resistance heating unit, the Standards seems to indicate that I have to install one that is more efficient. Can't I use the same type and size?

A: Yes, you can replace an electric resistance heating unit with one of the same type and size. However, if the size is increased, load calculations are required. The words, "or the existing fuel type" in Section 152(b)1Bii apply to replacement of an electric resistance heater.

Q: How do I model (in the CALRES computer compliance approach) the heat distribution

of a non-central space heater? Do I select the choice "R4.2 in the attic?" Do I select "Ducts in conditioned space?" Do I select "Special" or "Crawl Space" or "Basement?"

A: When specifying a non-central heating system, "None" should be entered as the selection for the "HVAC System Distribution Schedule" in CALRES. The type of system and efficiency should also be changed to reflect the non-central space heater being installed. R4.2 ducts in the attic should be modeled for non-central cooling systems.

Q: How do I model (in a compliance approach) a door with a large amount of glass in it?

A: You must model either the square feet of the door itself, or the square feet of glass plus an area that includes a two inch frame extension on all sides of the glass. All glazing in doors must have either an NFRC label or use the default U-value and Solar Heat Gain Coefficient from Tables 1-D and 1-E in Section 116 of the Energy Efficiency Standards. The area to be considered a "fenestration product" is either the whole door or the glass area plus a two inch frame extension area on all sides.

Q: I am converting a garage into a room addition. The new floor will consist of two- inch sleepers directly on the existing slab, plywood, carpet padding, and carpeting. How would the new floor be modeled in a computer program?

A: This type of floor assembly is not found in Table G-13, which lists materials acceptable as exposed mass. Therefore, the floor would be considered a covered slab construction. The construction assembly, as it will be built, should be modeled in the computer program using the U-value for each material. You must prepare a Form 3 showing the assembly and calculate a U-value for the total assembly. Also, be sure to check with your local building department regarding the Uniform Building Code requirements for wood on concrete and for other life-safety issues.

Q: Is the volume of a small water heater (rated input less than or equal to 75,000 Btu / hr) required in a residential computer method?

A: Yes. In performance methods the volume is one of the required inputs.

Q: I want to replace my central gas heating system with a central electric heat pump. Section 152 (b) of the standards includes some limitations on electric systems. Am I allowed to install a heat pump? What must I do to show that I comply with the Energy Efficiency Standards?

A: Yes, you can replace your gas furnace with a central electric heat pump having a minimum HSPF of 6.6 (single package) or 6.8 (split system). Minor repairs such as replacement of the fan motor need not meet the requirements of Section 152(b). If you are replacing an existing system, you may find it beneficial to install a heat pump with an efficiency considerably higher than these minimums. To perform properly, heat pumps need to move substantially more air than a furnace to provide the same amount of heat. This may require a larger duct system than was originally used for a gas furnace. Contact your local building department, mechanical engineer or contractor for more advice.

Q: When an existing central heating unit will also serve a new addition to a home, how would the existing central heating unit be modeled, using the "existing plus addition" computer compliance method?

A: You should model the equipment using a 78 percent AFUE central furnace and a 10 SEER air conditioner, with R-4.2 ducts in the attic, in the "existing" and "existing plus addition" computer runs, regardless of actual conditions. However, if the HVAC unit is being replaced during the addition construction, credit is gained by using the values from Table 7-3 (Default Assumptions for Existing Buildings) to establish the existing efficiencies if they are unknown for the existing home

calculation. Then the new unit's efficiency would be used in the "existing plus addition" calculation.

Blueprint #63

Q: I'm a building official. On a permit application I have received, the compliance documentation shows a special report saying the builder used reduced duct leakage to achieve compliance. Why does the builder have this option? Where can I find information on ACM duct credits and what is my role?

A: ACM (Alternative Calculation Method) duct credits were established in the 1998 Standards (effective July 1, 1999). Chapter 4 of the *Residential Manual* provides an in-depth discussion of the requirements for using duct and building envelope credits to achieve compliance with the Standards. The Manual (Section 4.3F.) describes the documentation requirements and the responsibilities of the Builder, the Home Energy Rating System (HERS) provider and rater, and the building department. Currently CHEERS (California Home Energy Efficiency System) is the only certified provider. CHEERS can be reached at 209-536-2860 or by E-mail at rscott@cheers.org. The California Energy Commission determined that HVAC duct systems installed in new residential construction typically have more than 20 percent air leakage. Duct leakage significantly contributes to wasted energy, peak electricity demand and occupant discomfort. The Commission, working with the building industry, enforcement agencies, national laboratories and others, developed protocols for HVAC and building envelope installation that reduce air leakage and assure the efficient use of energy. New options for Standards' compliance credit are now in effect for HVAC system improvements that will increase actual duct efficiency. Compliance credit for many of the duct efficiency improvements require field diagnostic testing and verification by a HERS rater who is trained and certified by a Commission-approved HERS provider. Diagnostics include using a Duct Blaster ™ and Blower Door to test actual duct and building envelope air leakage. The default duct air leakage is set at 22 percent of fan flow. Compliance credit can be taken for reduced duct leakage if duct leakage is diagnostically measured and verified to be less than 6 percent of fan flow. This new option allows builders to gain compliance credit by verifying the actual performance of the system. This credit can be used in the computer calculations like any other credit (higher than default HVAC equipment efficiency, higher than default water heater efficiency, high efficiency fenestration, etc.). It can be traded off between envelope, space heating and cooling, and water heating to achieve compliance. The credit is substantial. In some climate zones a significant amount of glazing could be added to the building in exchange for using the ACM duct credit and still comply with the energy budget in the Standards. The building department should plan check the project and verify that the credit has been taken. This can be accomplished by checking the C-2R Form "Special Features and Notes" section located at the end of the form. If applicable, information will appear in the section indicating that duct testing is required. The Building Department's responsibility is noted in the *Residential Manual,* Chapter 4, Section 4.3F. as follows: ***Building Department*** "The building department at its discretion may require independent testing and field verification in conjunction with the building department's required inspections, and / or observe the diagnostic testing and field verification performed by builder employees or subcontractors and the certified HERS rater in conjunction with the building department's required inspections to corroborate the results documented on installer certifications, and in the *Certificate of Field Verification and Diagnostic Testing*. For houses that have used a compliance alternative that requires field verification and diagnostic testing, the building department shall not approve a house for occupancy until the building department has received from the builder a *Certificate of Field Verification and Diagnostic Testing* signed and dated by the HERS rater. The building department at its discretion may request that the HERS provider report failures, corrective actions, need for full testing and homeowner declines for testing, verification and corrective action." When issuing permits, it is recommended that building department staff remind a

builder who uses the ACM tight duct credit (or other ACM credits requiring field tests) that test results must be submitted prior to final "signoff" of the building.

Q: Can I use low-voltage light fixtures to achieve compliance with the kitchen and bathroom lighting requirements of Section 150k?

A: Only luminaire systems that meet the high efficacy requirements of 40 lumens / watt or greater may be installed. All Low-voltage lights available today use less than 40 lumens / watt.

Q: When a homeowner replaces a water heater, is it considered to be a "repair" to the water heating system or an "alteration" to the building?

A: Replacing a water heater in a residential building is considered a "repair" with some exceptions. Section 101(b), Definitions, states as follows: **"Terms, phrases, words and their derivatives in Title 24, Part 6, shall be defined as specified in Section 101."** The definitions in question are below (from Title 24, Part 6): ALTERATION is any change to a building's water-heating system, space-conditioning system, lighting system, or envelope that is not an addition. (ADDITION is any change to a building that increases conditioned floor area and conditioned volume.) **REPAIR is the reconstruction or renewal of any part of an existing building for the purpose of its maintenance (BUILDING is any structure or space for which a permit is sought.).** Several building officials have indicated that they consider, for permitting purposes, a water heater replacement to be a "Repair." Commission staff agrees. However, calculations must be submitted if the fuel source is changed. In this case, the builder must show that the new water heating system is at least as efficient as the old one. *Energy Efficiency Standards for Residential and Nonresidential Buildings*, Section 152(b) 1. C. (ii).

Q: When replacing a residential water heater, what are the energy code requirements?

A: In addition to the information given in the question / answer above, replacement water heaters having an "Energy Factor" (EF) of less than .58 must have an R-12 external insulation blanket.

Blueprint #64

Q: I am having trouble with my CALRES program. I finished entering all of my information, but I have an error saying, "undefined volume". The only place I can find to enter the volume is under BUILDING INFO at the bottom of the page, but I can't access that portion of the screen. What can I do?

A: You should begin your data entry in a different manner. An error message often means that you didn't follow the correct procedure for modeling a home using the CALRES program. Whenever you use CALRES, you must start with an existing file. To do this you go into the FILE menu and choose RETRIEVE. Every program has a file named SAMPLE. Start by using this existing program, and then change the information so that it corresponds to your work. Following this procedure ensures that the volume information at the bottom of the BUILDING INFO page will be automatically filled-in based upon the information entered in the ZONES section. Remember that when you have completed your data entry, you must save it under a new file name.

Blueprint #65

Q: **When do the new *2001 AB 970 Residential and Nonresidential Energy Efficiency Standards* take effect?**

A: The Effective date is **June 1, 2001** for all nonresidential buildings and those residential buildings that do not fall under the exception for the Multiple Orientation Alternative approach. The following is the actual code language. **"Effective Dat**e: The effective date of the AB 970 Building Energy Efficiency Standards amendments shall be June 1, 2001. Exception: Building energy efficiency standards compliance documentation submitted prior to June 1, 2001, using the Multiple Orientation Alternative of Section 151(c), shall be used to determine compliance through December 31, 2001." **The following information is a clarification of the actual code language: Existing subdivisions:** Applications for permits for individual homes that are part of an existing Master Plan can be submitted through the end of December 2001 based on existing compliance documentation using the Multiple Orientation Alternative approach. Applications for permits for individual homes that are part of an existing Master Plan that are submitted after December 31, 2001 must use the 2001 AB970 Standards to determine compliance. **New subdivisions: Before June 1, 2001:** Applications for new subdivisions with Multiple Orientation Alternative approach compliance documentation submitted into plan check before June 1, 2001 can comply under existing Standards; applications for permits for individual homes using this Multiple Orientation Alternative compliance documentation must be submitted prior to December 31, 2001. **After June 1, 2001:** Applications for new subdivisions submitted on or after June 1, 2001 must comply under AB 970 Amendments to Standards. **Recommended procedure for builders:** The procedure that is recommended (by CBIA and the Commission) to builders for determining which standard to use for new subdivisions that will be submitted for master plan approval between now and June 1 is dependent upon when the majority of the homes will be built. For a small subdivision that will be completed or almost completed by the end of 2001, then it is reasonable to submit under the current (1998) Standards. If the subdivision will have a substantial number of starts constructed after 2001, then it is advisable to submit under the 2001 AB 970 Standards so that energy features do not change mid-construction.

Q: **Can builders still use building cavities or plenums, such as those under an air handler support platform, instead of ducts?**

A: No. Although the Mandatory Measures remain pretty much the same as in the 1998 Standards, there have been some changes. One of the most noteworthy changes is to section 150(m), which has been modified as follows: "…Building cavities, support platforms for air handlers, and plenums defined or constructed with materials other than sealed sheet metal, ductboard or flexible duct, shall not be used for conveying conditioned air. Building cavities and support platforms may contain ducts. Ducts installed in cavities and support platforms shall not be compressed to cause reductions in the cross sectional area of the ducts." Because return air is "conditioned air," "platform returns" complying with the 2001 AB 970 Standards must be fully ducted. Section 150(m) also contains the requirement that "Joints and seams of duct systems and their components shall not be sealed **Blueprint # 65** continued… with cloth backed rubber adhesive duct tapes unless such tape is used in combination with mastic and drawbands."

Q: **I heard that the Commission completely changed compliance methods and**

approaches and made duct sealing and testing, radiant barriers and thermostatic expansion valves mandatory. Is that true?

A: No. The compliance approaches and methods to achieve compliance with the Energy Budget remain essentially the same. General procedures associated with energy design, plan checking and inspection are unchanged. Builders must still comply with the Mandatory Measures and the Energy Budget. To answer the question further, a short description of compliance approaches is needed to clarify what is "mandatory," and what is optional. To comply with the Energy Budget, the builder may choose to use the Prescriptive Approach or the Performance Approach. The Prescriptive Approach requires the builder to construct strictly according to the requirements of Tables 1-Z1 through 1-Z16, the "Alternative Component Packages" (for Climate Zones 1 through 16). The Prescriptive Approach is similar to a prescription one gets at the drugstore. When a pharmacist fills the prescription he cannot vary the ingredients. Similarly, when a builder chooses to use the prescriptive approach, he cannot trade-off elements of the requirements. For example, if the Prescriptive Package requires R-38 attic insulation, the builder must provide R-38 in all the attics. If the Package limits the amount of glazing (fenestration) to 16% of the floor area, then the builder can use no more than 16%. So, many building designs are unable to achieve compliance using the Prescriptive Packages due to these prescribed requirements. When adopting new Standards, the Commission is required to determine that the requirements are cost effective. The Commission then applies these cost effective energy efficient devices and systems to modify Alternative Component Package D in each of the 16 California climate zones. The revised prescriptive packages result in a buildings that are more energy efficient than ones using the previous version of the Package. Because of the nature of the Prescriptive Packages, most builders use the Performance approach to compy with the Standards. In each case, the design for the proposed building must be compared with the energy budget for that building, determined by modeling the energy use of the Package D features in the proposed building. The proposed design must show that no more energy will be used than the energy budget for the proposed building. The difference between the Prescriptive and Performance approach is that the builder may make trade-offs to achieve compliance when using the Performance approach. The builder may, for instance, use a more efficient water heater, more efficient windows or design the duct system to ACCA Manual D in trade for having more glazing in the proposed house. In the new 2001 AB 970 Standards, Prescriptive Packages A & B are eliminated. Prescriptive Package D has been modified to make new homes more energy efficient. The Commission determined, after much consultation with private sector energy efficiency experts, the California Building Officials (CALBO) and the California Building Industry Association (CBIA), that more energy efficient glazing, duct sealing, radiant barriers, and thermostatic expansion valves (TXVs) would be applied to the Base Case house. Therefore, the builder who uses the Prescriptive Approach will be required to use those features listed above in order to achieve compliance. In Prescriptive Package D, there is an alternative to duct sealing and TXVs. Using Package D for compliance, the builder may choose an alternative of more efficient glazing , and in some climate zones, more efficient air conditioning or heating equipment and more efficient glazing to avoid the special inspection required for duct sealing and TXV's. The Commission has also allowed for an alternative to the TXV but that alternative has yet to be determined (at the time this article went to print). The builder who uses the Performance Approach has the option of using those systems and devices listed above. In order to achieve compliance, he may choose, as in the past, any of the available features to trade-off between the building envelope, space conditioning and water heating. What is the difference under the new Standards? The builder must build a more energy efficient house. The state-wide difference in heating and cooling energy between the 1998

Standards and the 2001 Standards is about 12 percent. In climate zones where cooling loads are dominant, the difference approaches 23%.

Q: **What are the most significant changes to the Residential Standards?**

A: The most significant changes to the residential portion of the Standards are: Duct sealing is required in all climate zones when using Prescriptive Package D. HERS raters must use duct blasters to verify the HVAC system has leakage less than 6 percent of the fan flow. HERS raters are considered to be Special Inspectors by the Building Department. The HERS rater must demonstrate competence to the satisfaction of the Building Department. Spectrally Selective glazing is required in Package D. Radiant Barriers are required in Package D. Thermostatic Expansion Valves (TXVs) are required for split-system central air-conditioners in specified climate zones when using Prescriptive Package D for compliance. TXVs are installed on the indoor unit next to the coil. They help regulate the refrigerant flow so that the unit performs more efficiently. TXVs must be accessible and require field verification (visual confirmation) by a certified Home Energy Rating System (HERS) rater. The Commission is working on an alternative to TXVs. Compliance credit for interior shading (such as roller shades and mini-blinds) has been eliminated and designers may no longer move shading devices for compliance credit to different orientations when using the Multiple Orientation Alternative. Compliance credit is available for "cool roofs" (roofs that reflect rather than absorb the sun's rays). Prescriptive packages A and B have been deleted. See Commission Publication 400-01- 002S, the Residential Manual Supplement, for all changes to the Residential Energy Efficiency Standards.

Blueprint #66

Q: **I heard that there are conflict-of-interest requirements that HERS Raters must abide by when doing field verification and diagnostic testing. What are these requirements?**

A: By law, HERS raters must be independent from the builder or subcontractor installer of the energy efficiency features being tested and verified. They can have no financial interest in the installation of the improvements. HERS raters can not be employees of the builder or subcontractor whose work they are verifying. Also, HERS raters cannot have financial interest in the builder's or contractor's business, nor can they advocate or recommend the use of any product or service that they are verifying. Section 106.3.5 of the California Building Code prohibits a special inspector from being employed (by contract or other means) by the contractor who performed the work that is being inspected. The Commission expects HERS raters to enter into a contract with the builder (not with sub-contractors) to provide independent, third party diagnostic testing and field verification. The procedures adopted by the Commission call for direct reporting of results the builder, the HERS provider and the building official. Although they are not recommended by the Commission, "three party contracts" are possible with builders, provided the contract delineates the responsibilities of both the HERS rater to remain independent and the sub-contractor to take corrective action if deficiencies are found. Serving as the contract administrator on such contracts, the sub-contractor may schedule, invoice and pay the HERS rater, provided that the money paid by the builder can be traced by audit. It is critical, however, that these contracts preserve the rater's ability to independently complete the verification procedures that have been adopted by the Energy Commission. While "three party contracts" may not actually violate the requirements of the Commission, they offer a greater potential for compromising the independence of the HERS rater, since they set-up a closer working relationship

between the rater and the sub-contractor whose work is being inspected. The Energy Commission has approved the California Home Energy Efficiency Rating System (CHEERS) to certify and oversee HERS raters throughout the state. In that role, CHEERS monitors the propriety and accuracy of the work completed by the HERS raters and responds to any complaints received. If the independence of a rater is questioned, CHEERS scrutinizes the rater's performance to insure that the results of the field verification and diagnostic tests are objective, accurate and comply with procedures adopted by the Commission. Building officials have the authority to require HERS to demonstrate their competence, to the satisfaction of that building official. Therefore, in situations where independence of a rater is in question, building officials can prohibit a particular HERS rater from being used in their jurisdiction. They can also disallow any practices they feel will compromise the independence of a HERS rater.

Q: **Section 150 (k) states that "general lighting having an efficacy of not less than 40 lumens per watt shall be controlled by a switch on a readily accessible lighting control panel at an entrance to the kitchen". Does this mean that if a kitchen has more than one entrance that only one of the entrances must have the switching for fluorescent?**

A: Yes. Only one entrance to a kitchen is required to have the lighting control panel for t he fluorescent fixtures.

Q: **Does the suction line to the air conditioning equipment have to meet the piping insulation requirements?**

A: Yes. Since the suction line is considered part of the "cooling piping" and is below 55 degrees Fahrenheit, it must be insulated. According to Table 1T, R-3 insulation is required for piping less than 2 inches in diameter.

Q : **If I am using package D for a residential addition of 900 square feet, can I remove a window from the previously existing wall and count that amount of glazing as credit for the room addition?**

A: Yes. You can take credit for the glass removed in an addition as long as you are meeting the requirements of Package D. This credit is allowed for all additions less than one thousand square feet. Once your addition is greater than 1000 square feet, you can not exceed the new fenestration allowed in Alternative Package D.

Q: **I have a home with a wood stove as the primary heat source and electric heating as the secondary source. Since I do not have any ductwork, should I model the system based upon the assumption that I have tight ducts ?**

A: Yes. The proposed design for houses with wood heating systems is modeled the same as the standard design, so if the software does not have an option for wood heat, then the compliance author should assume a gas furnace with an AFUE of 78 percent and sealed R-4.2 ducts in the attic.

Q: **Do I have to meet the Duct Sealing, TXV, and Radiant Barrier requirements for an 88 square foot addition if I am using the Prescriptive Compliance Approach?**

A: No, additions less than 100 square feet are exempt from the Duct Sealing, TXVs, and Radiant Barrier requirements when using Prescriptive Package D for compliance. If you are adding new split system HVAC equipment, you will then be meeting the definition of an alteration and will have to meet the TXV requirement.

Q: **Is there an exemption to duct testing, a TXV, and/or Radiant Barriers if you are using Package D for prescriptive compliance for an addition greater than 100 square feet?**

A: No. If the addition is greater than 100 square feet and a duct is extended from the existing duct system, then there is not an exemption to meeting the Duct Sealing requirements which include testing of the duct system. The test requirements for the installation are described in the Residential Manual for Compliance with the 2001 Energy Efficiency Standards. If new space conditioning equipment is installed, then there is also no exemption from the field verification requirements for TXV or proper refrigerant charge and airflow measurements. The alternative described in a footnote to each of the Tables 1-Z1 through 1-Z16 in Section 151 (f) of the Standards, substitutes additional energy efficiency features for the Duct Sealing and refrigerant charge and airflow or TXV features. These substitute features do not require field verification and diagnostic testing, and still provide a way to comply with the Standards. Radiant Barriers are required when using Presciptive Package D, regardless of whether or not you are using the Alternative Components. **Comment:** It is not true that any circumstances where there are no ducts would be modeled as tight. The wording I propose is from the Note 1 of Table 5-4 from the latest working draft of the Residential Manual. **Comment:** Radiant barriers are not mandatory. They are a part of Package D or Package C compliance. However, the "less than 100 sf" additions path (§152 (a) 1 A) does not reference Package D for anything other than the SHGC requirements. Therefore, radiant barriers are not required for additions "less than 100 sf" using §152 (a) 1 A for compliance.**Comment:** This question was much too broad. There were numerous alternatives as it was worded. I have tried to narrow the question to match a "No" answer. **Comment:** I don't think you should mix questions with very different answers. **Comment:** I don't think we should refer to the supplements at this late date. Also, there is a different leakage level target than for a completely new building which is described in the new manual.

Q: **Can I replace an electric 40-gallon water heater with two electric 40-gallon water heaters and still comply with the Title 24 Standards?**

A: Yes. It would be considered an alteration. See section 152 of the Standards for specifications.

Q: **Can I place an open-ended fan coil in a plenum when I am building an apartment complex?** A: Yes, plenums can be used to hold fan coils as long as they meet the requirements of a duct. They must be constructed of either sheet metal or ductboard, and is sealed completely to avoid air leakage. Ducting the entire system is an alternative to installing a system that uses a plenum.

Q: **What is a Radiant Barrier?**

A: A radiant barrier is a reflective material that has an emittance of 0.05 or less and is used to reflect and inhibit the emission of radiant heat into or out of a space. In the Standards, it is primarily used to reduce the radiant transfer of heat from a hot roof to the ceiling and to ducts that are in the attic. For more information on radiant barriers, please visit our new online "Training Videos" located on our web site at www.energy.ca.gov/title24 .

Q: **How do I determine the U-factor and Solar Heat Gain Coefficient for a Bay window?**

A: Bay windows may either have a unit NFRC rating, an NFRC rating for the window only, or no NRFC rating. For bay windows that come with an NFRC rating for the entire unit, you should determine compliance based on the rough opening and the given information. If the unit U-factor and SHGC do not meet the Package requirements, the project must show compliance using the Performance approach. When using the **Blueprint # 66** continued… performance approach, the area and orientation of the glazing is based on each individual window in the bay window. Bay windows

that do not come with a rating for the entire unit but do come with insulation must comply accounting for the performance characteristics of each component separately. Opaque portions must meet the Mandatory Measures minimum insulation requirements (i.e. R-19 ceiling, R-13 walls, R-13 floor). For prescriptive compliance, the opaque portion must meet the minimum insulation requirements of the packages for the applicable climate zone. For the windows, the U-factor and SHGC values may be determined either from an NFRC rating, or by using default values. If the window's U-factor and SHGC meet the package requirements, the bay window complies prescriptively. Bay window fenestration area is based on each individual window in the bay window. **Comment:** I thought the draft response was misleading and suggest modified language.

Blueprint #67

Q: **What are the Title 24 requirements related to changing out my split system HVAC equipment at my house?**

A: The *Residential Manual*, Chapter 7, page 7-27 explains the requirements. See the text preceding Example 7-17 under the heading, "New Space Conditioning Equipment." New heating and/or air conditioning systems installed in existing buildings are considered alterations. The appliance standards regulate the efficiency of new residential heating and air conditioning equipment at the point of sale. However, the mandatory requirements for low-rise residential buildings also apply. In particular, Section 150(h) requires that systems be appropriately sized and Section 150(i) requires that the new systems have setback thermostats (see the *Residential Manual*, Section 2.5.3). The prescriptive requirements of Section 151(f) 7 specify that new split system air conditioners or heat pumps installed in alterations must either be: • verified by a HERS rater to have a thermostatic expansion valve (TXV), or • **diagnostically tested by a HERS rater to verify the correct refrigerant charge and airflow** As an alternative to TXV or the requirements for field verification and diagnostic testing for refrigerant charge and airflow measurement, an air conditioner or heat pump with a SEER of 12 or greater may be installed. The Package D requirement for diagnostic testing of ducts does not apply to alterations.

Q: **Do I need to run a calculation before I can get a complete printout from CALRES2, version 1.4?**

A: Yes. Go to the CALCS tab and change the "Set Report" section to include the CF- 1R and CF-2R forms. The "print" section needs to say either "yes" or "if complies." If you select "yes," the CF-2R form will print whether the run complies or not. If you select "if complies," the CF-1R and CF-2R forms print only if the run complies with the energy budget. Press Alt-G to run the calculation. Printing should occur automatically when the calculation finishes. If it does not print, check the completeness of the file and/or the printer settings and try again. If you continue to have problems printing, please contact the Energy Commission's Hotline at 1-800-772-3300.

Q: ***What versions of compliance documentation are now acceptable and when did they take effect?***

A: *In the months following the adoption of the 2001 Standards, several versions of compliance software were approved for use with the new standards. Several of these versions were decertified, but were allowed for use before January 1, 2002. The following guidance*

indicates how to treat compliance documentation and specifies currently approved software. • Beginning January 1, 2002, old compliance documentation from 1998 Standards on file at building departments is no longer acceptable. For buildings not yet permitted by this date, the documentation must be resubmitted using currently approved software and fully comply with the 2001 Standards. • Beginning January 1, 2002, no new compliance documentation may be submitted with MICROPAS6 v6.00 or EnergyPro 3.0. Only compliance documentation from currently approved programs may be submitted after this date. • Existing compliance documentation using the Multiple Orientation Alternative with MICROPAS6 v6.00 or EnergyPro 3.0 after June 1, 2001 and before January 1, 2002 remain acceptable as long as no changes are made to energy-related features of buildings covered by that compliance documentation. *Currently approved software includes MICROPAS6 v6.01, EnergyPro 3.1 and CALRES2 v.1.4.*

Q: **The suction line of a new split air conditioner in a low-rise residential building must be**

insulated. If I know the thermal conductivity, or k-factor, of the pipe insulation, must I determine the required thickness to comply with the R-value requirement specified in Table 1-T, Section 150(j) 2 of the Residential Standards?

A: Yes. To determine the thickness of material needed to meet a specific R-value, multiply the k-

factor by the required R-value. For example, if the k-factor is 0.27 (Btu-inch per hour per square foot per °F) and the required R-value is 3, the required pipe insulation thickness is 3 times 0.27, or 0.81 inches. Likewise, if you know the *K-factor* and thickness of the insulation (in inches), you can determine the R-value by dividing the insulation thickness by the k-factor. The following information on John's training videos should be a sidebar box with a title within the Blueprint - somewhere: ***Title 24 Energy Training Videos Now Online!*** and with a graphic such as a video camera (maybe right from the splash page at the URL listed below.) *The California Energy Commission announces that 28 streaming video segments ranging from 3 to 8 minutes are now online at www.consumerenergycenter.org/videos. These videos show how to inspect for the energy code, how to install the energy efficient devices or systems, and delineate the benefits of complying with the code. Also included is accompanying text on Frequently Asked Questions (FAQ's), Benefits, Relevant Standard (with links to the* Residential Manual *and Standards), Resources, and a link to contact the Energy Commission. Please take a look at these videos and tell us what you think! The Energy Commission has just approved a new contract to produce an additional 45 segments on the* 2001 Energy Efficiency Standards for Residential and Nonresidential Buildings. *The following duct sealing Q and A's to be inside on a face to face spread of 2 sheets*

Q: **As a plan checker, can I tell if credit has been taken for "tight ducts" or "sealed ducts" and**

if the HERS rater verification is required?

A: Yes. Look on the CF-1R under "Special Features, Remarks and Notes" and/or "Field Verification

and Diagnostic Testing Required." If credit has been taken for sealed ducts, it will be shown there.

Q: **Is there an easy way to find a certified HERS rater?**

A: Yes. You can find a certified HERS rater on the Internet at

http://www.cheers.org/cheers_rater.php or by calling 1-800-4 CHEERS (1-800-4 24 - 3377).

Q: **If I am building a house in a city that requires outside air to be mechanically provided,**

could this impact whether or not I can take credit for sealed ducts?

A: Yes. If the outside air is provided by attaching a duct to the outside to the space conditioning duct
system, it probably will be difficult to meet the "sealed duct" maximum leakage requirement. You may not seal off the outside air portion of the system during the "sealed duct" test. It may be possible for the outside air duct to have a damper and pass the test, but the damper would have to allow very little leakage. The "sealed duct" test must be made with the damper in its default position, and the system must pass all the requirements for the sealed ducts test. See the *Residential Manual*, Chapter 4 for specific duct testing requirements. Another solution to provide the outside air would be to use mechanical ventilation that is completely separate from the space conditioning system. In most cases, separate mechanical ventilation would use a much smaller fan to provide the ventilation and would use considerably less fan energy. Also see our "Ventilation Protocol" at:
http://www.energy.ca.gov/efficiency/qualityhomes/mechanical_ventilation.html

Q: **If a single family house has two separate space conditioning systems, do both systems have**
to be tested by the HERS rater if the "sealed duct" credit is taken?

A: Yes. The HERS rater must test both systems if credit is claimed for duct sealing in the Performance Method or to comply with the Prescriptive Compliance Method.

Q: **When considering duct leakage, are ducts located between floors considered to be located**
inside conditioned space for conduction purposes?

A: Yes. The portion of the ducts located between floors is considered to have no conduction losses.
However, as explained in the following question and answer, duct leakage is considered to be to the outside.

Q: **In multifamily and single family residences, does the HERS rater have to verify the duct**
leakage to get full credit for ducts in conditioned space?

A: Yes. If duct leakage is not tested, then ducts are assumed to be at the high leakage point for
modeling whether or not the ducts are located in conditioned space. This requirement applies to single and multifamily buildings. The reasoning behind the requirement is that leakage pathways tend to lead to outside the building envelope, even when ducts appear to be physically located inside the conditioned space. Only testing of duct leakage can assure this is minimized. Also see the *Residential Manual*, Section 8, page 8-4.

Q: **When insulation is installed on top of the ducts in the attic, are the ducts in conditioned**
space?

A: No. It is not acceptable to place attic insulation on top of the attic ducts and then claim credit for
ducts in conditioned space. The ducts must be inside the building envelope, which must be well sealed to prevent infiltration. The proper order is: living space, ducts, building envelope, and insulation.

Q: **Do I have to meet the duct sealing and TXV requirements for an addition under 100 square**

feet if I am using the Prescriptive Compliance Approach?

A: No. If the addition is less than 100 square feet, then you are exempt from the duct sealing and TXV requirements.

Q: **For an addition over 100 square feet, if I am installing a new air conditioner and using the Prescriptive Compliance Approach, do I have to meet the duct sealing and TXV requirements or the Alternative to Package D requirements?**

A: Yes. If the addition is over 100 square feet, then you have the choice of meeting the duct sealing requirements or using the Alternative to Package D requirements (see Table 3-2, page 3-3 of the *Residential Manual*). The requirements for testing refrigerant charge and air flow (or installing a TXV) apply only if a new split system air conditioner or heat pump is installed as part of the addition. If a separate air distribution system is installed for the addition, then this new system must be tested and sealed to have a leakage less than or equal to 6 percent of the fan airflow. If an existing air distribution system is extended to serve the addition, this too must be tested, but the tested target duct leakage depends on the size of the addition and other factors discussed in the *Residential Manual*, Section 7.2.3, *Determining the Target Percent Leakage*. In lieu of testing duct leakage, refrigerant charge and airflow (or installing and verifying a TXV), the builder can choose to meet the Alternative to Package D requirements. See Table 3-2 in the *Residential Manual*. Note that Radiant Barriers are required in some climate zones when using the prescriptive packages.

Blueprint #68

Q: **In the previous issue of the Blueprint, you explained how to calculate the required pipe insulation thickness to comply with R-value requirements. For pipe insulation thickness to comply with R-value requirements. For pipe diameters less than two inches, commonly available _-inch and one-inch-think pipe insulation products may not quite meet the R-value requirements for refrigerant and hot water lines. Are there other acceptable ways to determine compliance when pipe insulation does not meet required R-values?**

A: Yes. For example, if piping with 3/4 –inch (refrigerant lines) or one-inch (hot water lines) pipe insulation is run through the attic in a manner which will allow the ceiling insulation to fully cover the insulated refrigerant lines or hot water pipes, then the pipe insulation requirement in Table 1-T, Section 150(j)2 has been met. If the piping is run in an exterior wall that is adjacent to conditioned space, the wall and pipe insulation together may be sufficient. For this installation to be acceptable, care must be taken to enclose the insulated pipe in the wall insulation without compromising the call insulation effectiveness. The following steps should be taken: • Piping must be installed so that the wall insulation is between the piping and the outside surface of the wall, minimizing wall insulation compression. • If blown in wall insulation is used, then the piping must be fully enclosed in wall insulation. • For hot water pipes with one-inch-thick insulation, if batt insulation is used, it must be split and fitted around the insulated hot water pipes so that the insulated pipes are fully enclosed in wall insulation. • For refrigerant lines with _-inch-thick insulation , if batt insulation is used, it must either be split and fitted around the insulated refrigerant line, or two batts of insulated must be used, one installed on the outside and one on the inside of the insulated refrigerant line. • If piping is run in an exterior wall that is not adjacent to conditioned space or in a wall that has conditioned space on both sides of the wall,

then the cavity must be filled with insulation on both sides of the pipe. The minimal certified R-value for each side must be R-2. Note that for pipe diameters over two inches, the pipe insulation must meet the requirements of Table 1-T in the Standards. Also note that pipe insulation thicknesses are actual, not nominal thicknesses.

Q: If I am doing an addition but am not replacing my air conditioner, can I used the "Alternative to Package D?"

A: No. The "Alternative to Package D" can not be used unless all of the requirements specified in the "Alternative to Package D" are met, including the SEER 11, 12 or 13 air conditioner requirement depending on climate zone. If the air conditioner is not being replaced, the only prescriptive option that is available is Package D.

Q: If I am building an addition less than 500 square feet, do I only have to meet the 0.75 glazing U-factor requirement if I an using the "Alternative to Package D?"

A: No. The "Alternative to Package D" can not be used unless all of the requirements specified in the "Alternative to Package D" are met, including the 0.55 or 0.40 glazing U-factor requirement depending on climate zone. If you want to install windows that only have to meet a 0.75 U-factor, the only prescriptive option that is available is Package D. Please note that "Prescriptive Requirement for Additions" are explained on pp. 7-6 to 7-8 of the Residential Manual.

Q: Did the Commission change the energy code requirements that prohibited the use of cloth backed rubber adhesive duct tape unless it is installed with mastic and mechanical fasteners?

A: No. This prohibition has been in effect for the tight duct credit since 1999. in the 2001 Standards, the Commission made the prohibition mandatory for all residential and nonresidential duct systems. Two cloth duct tape manufactures petitioned the Commission to reconsider the prohibition, resulting in a special rule making proceeding on the issue. The information submitted during this proceeding, including laboratory testing results, expert testimony and written and oral comments, reinforced the appropriateness of the existing prohibition. The Commission's decision to NOT change the Standards was supported by the California Building Officials, California Building Industry Association, Insulation Contractors Association, Pacific Gas and Electric Company, Lawrence Berkeley National Laboratory, Proctor Engineering Group and Intertape Polymer Group (a cloth duct tape manufacturer). You can review the Notice of Committee Conclusions that explains the reasons for continuing the prohibition at: www.energy.ca.gov/title24/ducttape/notices/2002-03-26_COM_CONCLUSIONS.PDF.

Q: Is laminated glass that is sandwiched by two outer layers of glass with an inner layer material considered a double pane window?

A: No. To be considered a double pane window an air space must exist between the two glass panes,

regardless of lamination and coating. The space between the two panes needs to be hermetically dry and sealed airtight. The airspace is commonly 3/16-inches to 3/4 –inches wide.

Blueprint #69

Q: Do electric resistance floor heating systems need to be certified to the Energy Commission,
and if not, are there other requirements?

A: No. There are not California requirements for electric resistance heating to be certified. An efficiency value is still required for compliance purposes, however, and may be acquired from the manufacturer's specification sheet.

Q: Do solar day lighting tubes need to meet the same requirements as skylights?

A: No. The National Fenestration Rating Council (NFRC) now has an available methodology to standardize testing of solar day lighting tubing. For more information on the NFRC test method, phone (301) 589-1776. For non-NFRC labeled solar day lighting tubes, use the Energy Commission's Default Table for the default values. If the diffuser is double pane, use the double pane default values, (The diffuser is the piece that is attached to the conditioned side of the ceiling that helps distribute day light into the space. The diffuser must be sealed and caulked to prevent infiltration into the conditioned space [Section 117 of the Standards.])

Blueprint #70

Q: May HVAC subcontractors test at rough-in for system leakage when "duct sealing" is required by the energy calculations?

A: Yes. Subcontractors are allowed, for purposes of the CF-6R testing and certification, to test at rough-in. Note that the installer must insure that the spaces between the register boots and the wallboard are sealed after the drywall is installed. Also, the installer is obligated to revisit every applicable house after the drywall is installed to check to see that no leaks have developed since the testing at rough-in. It is prudent fort the subcontractor to lower their leakage targets (below 6%) at rough-in so that they will not conflict with the HERS rater's testing that must be done after the drywall is installed.

Q: May a certified HERS rater, who does the field verification and completes and signs the CF-4R, do the testing required for the builder or installer to certify compliance with Title 24 installation requirements on the CF-6R?

A: Yes. This approach only works where the certified HERS rater is doing field verification for every house. It is not allowable in the case where the HERS rater is doing field verification only on a sample of homes. The builder of the installer must sign the CF-6R certifying compliance. The HERS rater may not sign the CF-6R. However, the builder or installer can rely on the HERS rater's diagnostic test results when the builder of installer signs the certification statement on the CF-6R. Of course, if the HERS rater determines that the compliance retirements are not met, the builder or installer may not sign the CF-6R until action is taken to make whatever corrections are necessary. Once corrections have been made, and the HERS rater determines that all

compliance requirements are met, the builder or installer may certify the work by completing and signing the applicable section of the CF-6R. The rater then must complete and sign the CF-4R for this building. *Note that HERS rater must complete diagnostic testing and field verification (as documented and certified on the CF-4R) after the measure is completely installed. For duct sealing, drywall must be completely installed before testing. A builder may contract with a certified HERS rater to complete testing at rough-in for qualify control purposes, but such testing is not sufficient for meeting compliance requirements and certifications on the CF-4R.

Blueprint #71

Q: Do return ducts have to be insulated if they are located in shafts that are inside the buildings thermal envelope?

A: No, ducts do not need to be insulated if they are inside the buildings thermal envelope. Standards Section 124 (a) and 150(m) talks about requirements for air distribution ducts and plenums.

Blueprint # 72

Q: What are the penalties for altering a National Fenestration Rating Council (NFRC) label?

A: Altering an NFRC label is strictly prohibited and can result in revocation of a fenestration manufacturer's licensing and labeling agreement with the NFRC if the label was altered by the manufacturer or its agent. In addition, a fine of up to $2,000 may be levied against the manufacturer for each label found to be altered. Tampering is an issue in the field, because in some cases NFRC labels have been altered on site. In one case a white sticky typewritten label was patched into the NFRC label and in another case, the added sticky label was lettered by hand with a marker. Field tampering or alteration by a vendor or contractor can result in action possible serious sanctions under the California Business and Professions Code Sections 17200, et seq. (Unfair Competition) , and 17500, et seq. (Fraud and Misleading Facts) . Fenestration labeling is addressed in the Standards in Sections 10-111 and 116 (a) 2.A.

Q: When I make an alteration to my building, do I have to comply with the energy code?

A: Yes, if a permit is required by the building department and the type of alteration made is covered by the energy code. See Section 152 (b) of the *Energy Efficiency Standards for Residential and Nonresidential Buildings.*

Blueprint #73

Q: Do I need to insulate when opening the wall cavity of an outside wall?

A: Yes, the insulation level must be a minimum of R-13. An outside wall is one where there is conditioned space on one side and unconditioned on the other. If the outside wall is opened, then the insulation must be installed in all accessible areas. Cut the batt insulation when installing to fit the opening as tightly as possible. The insulation should touch all four sides of the framing bay without being compressed. Compressing insulation reduces its ability to provide its rated insulation value. Fit around pipes and wiring by slicing the insulation. See Section 150(c).

Q: I am planning to build a new house. Can I achieve compliance with the Energy Efficiency Standards if I want to install an electric water heater in my new residence?

A: Yes. Compliance with the energy budget can be achieved using electric water heating, but it is difficult. You will need to use the performance compliance approach, or meet all the prescriptive requirements, including those listed in table 3-14 of the Residential Compliance Manual. Check with your energy consultant or call the Commission's hotline for answers to specific scenarios.
Even when using high efficiency (Energy Factor of 0.93 or better) electric storage tank water heaters of electric instantaneous water heaters, plan on using the performance approach and installing high efficacy heating and air conditioning equipment and other energy efficiency measures to achieve compliance. Consider installing instantaneous electric water heaters at each point of use if the water piping design allows you to take the Point of Use credit.
In locations where freezing is not considered a problem, you can use solar hot water systems. Note that this is the only single option for electric water heating where you can achieve equivalency to natural gas with no other tradeoffs required.

Q: I am developing a small subdivision and have been told that it would be less expensive to build "all-electric" homes. Will I be able to achieve compliance with the energy code if I install electric space heating and water heating?

A: Yes, compliance may be achieved but it might cost you more money because of necessary "trade-offs" employing the use of other higher energy efficient systems and devices.
To achieve compliance for an all electric house using the performance approach, first see the answer on electric water heating above. You may need to use either a heat pump or meet the requirements for wood heating as the primary heat source. Check local ordinances related to any prohibition of wood heating if you are considering the wood heating option.
Consider using electric radiant instead of convective heating systems. There is a credit for using electric radiant heating; so if electric space heating is the only option, consider electric radiant panels on the ceiling or walls.
If you are using electricity, choose windows with the lowest U-Factor and Solar Heat Gain Coefficient available.

Blueprint Index Nonresidential Standards

P400-00-006

Lighting continued…

Scope/Signature

Nonresidential Blueprints

Blueprint # 12

Q: **An open mezzanine, that creates additional floor area, is being added inside an existing office building. Is this creating conditioned space?**

A: If the mezzanine is being added within the previously conditioned space of the building and is not adding volume to the conditioned space (i.e. raising the ceiling), it is only adding square footage of floor area. It is not creating new conditioned space.

Blueprint # 25

Q: **I'm designing a space that will have hard-wired neon lighting. Does this neon lighting have to be included in compliance calculations?**

A: Yes. Hard-wired neon lighting must be included in your lighting calculations.

Blueprint # 28

Q: **Do commercial coaches have to meet the California Energy Commission's energy efficiency standards**?

A: No. Commercial coaches, and special purpose commercial coaches, as defined in the California Health and Safety Code, are not subject to the Building Energy Efficiency Standards because they are built to a unique standard for portable structures. A commercial coach is one designed for professional, commercial, or industrial use. It will have a Department of Housing and Community Development (HCD) insignia of approval on it indicating it has met the applicable standards. Special purpose commercial coaches are less than 8-½ feet wide and less than 40 feet long, do not require an "oversize load" permit to transport on California highways, are on a chassis, and have a HCD insignia of approval. Questions regarding commercial coaches can be directed to HCD at (800) 952-5275. [Note: Pre-engineered buildings (e.g. ARMCO, Butler) must meet energy standards.]

Blueprint # 36

Q: **When is an equipment alteration considered a repair, which is not subject to the Building Energy Efficiency Standards?**

A: When a part or parts of a system are replaced with like equipment (capacity and type are the same) because of age or defects in the system, it is considered a repair. Repairs do not have to meet current building energy standards. Appliance efficiency standards still apply.

Blueprint # 41

Q: **Are occupancy sensors required by the new standards? Will ultrasonic occupancy sensors be allowed for complying with the new standards?**

A: Occupancy sensors are not required by the new standards. In many cases, lighting controls are required, but occupancy sensors are not the only type of control that can meet this requirement (Energy Standards Section 131). Occupancy sensors used to meet the control requirements must conform to the criteria of Section 119. As long as the ultrasonic sensor meets the requirements of Section 119, it can be used for compliance.

Blueprint # 43

Q: **There aren't any ventilation rates for H occupancies in either the Energy Efficiency Standards (Table 1-F) or the Nonresidential Manual (Table 4-2). What if I have soldering, welding or some other activity not listed that requires more than the "all other" category allowance of 0.15 cfm/square foot of conditioned floor area?**

A: For any occupancy type, if the Uniform Building Code or Uniform Mechanical Code have a higher ventilation rate, use the higher rate.

Q: **What are the economizer requirements for nonresidential buildings meeting prescriptive HVAC standards?**

A: Economizers are only required when equipment capacity exceeds 75,000 Btu/hr of mechanical cooling capacity and 2,500 cfm design supply capacity (see energy Efficiency Standards, Section 144(e)). These upper limits apply to each piece of equipment individually. If a building or space has multiple pieces of equipment, the cooling and supply capacities are not combined to determine if an economizer is required.

Blueprint # 45

Q: **The MECH-1 form has a section entitled "proof of envelope compliance" with two boxes - "previous envelope permit" or "envelope compliance attached." How do I determine which box to check, particularly for a mechanical permit on a building built before energy standards existed? Don't the standards only apply to the permitted work?**

A: For a building built before Energy Standards, and for any conditioned space with tenants, check the "previous envelope compliance" box.
If there were not previous tenants, or the space was occupied but unconditioned, check "envelope compliance attached" and attach either a copy of previously submitted documentation or current compliance documentation.
Although the standards only apply to the construction which is the subject of the permit, some building owners chose to designate their buildings (particularly

multi-tenant shells) unconditioned for purposes of energy compliance, delaying energy compliance until a space became conditioned. In such a case, when the permit for mechanical equipment is sought, it is to condition a previously unconditioned space (an "addition") and requires envelope compliance.

Q: **If I have a building with more than one occupancy type, can I meet one set of standards for the dominant occupancy? Do I meet the mandatory measures applicable to the dominant occupancy?**

A: The exception to Section 100(e) of the Energy Efficiency Standards allows you to show compliance with the standards applicable to the dominant occupancy for the entire building if the dominant occupancy makes up at least 90 percent of the conditioned floor area. You must, however, meet the mandatory measures applicable to the actual occupancies, not the dominant occupancy.

Q: **If I have an unconditioned warehouse with a small office (consisting of less than 10 percent of the building), is the office exempt under the mixed occupancy exception?**

A: No. The exception to Section 100(e) applies to conditioned floor area in buildings within the scope of the Energy Efficiency Standards (Section 100(a)).

Q: **When using the prescriptive compliance approach for a building envelope, are doors included in the gross exterior wall area? Do the doors need to meet any U-value requirements?**

A: The gross wall area is the entire area of exterior surfaces, including windows and doors. Demising walls (walls between conditioned space and enclosed unconditioned space) and party walls are not counted as gross exterior wall. There are no maximum U-value requirements applicable to doors in either the component or overall envelope compliance methods (prescriptive). Aside from the area of doors being included in the gross exterior wall area, and any glazing in doors included as window area, opaque doors are not included in prescriptive compliance calculations.

Q: **When calculating equipment loads and indicating equipment selection on the MECH-2 form are these sensible or total loads?**

A: Comparison of either sensible loads and sensible capacities or total loads and total capacities can be made on the MECH-2 form (Nonresidential Manual, Chapter 4). Be sure to note on the MECH-2 which value you used to size and select equipment.

Q: **When using the prescriptive compliance method for a package HVAC system, can the capacity for both the heating and cooling exceed the maximum allowable loads as calculated on the MECH-4?**

A: Yes, if it is necessary in order to get the appropriate size equipment. Energy Efficiency Standards, Section 144(a), allows you to select the smallest size, within the available options of the desired equipment line, necessary to meet both heating and cooling loads. For example, assume you have calculated a heating load of 190 kBtu/hour and a cooling load of 110 kBtu/hour. The product line you have selected comes with either a capacity of 170 kBtu/hour heating and 90 kBtu/hour cooling, or 200 kBtu/hour heating and 120 kBtu/hour cooling. The latter piece of equipment is probably the most appropriate selection even though it exceeds both heating and cooling maximum allowable load.

Q: **If I am using an automatic time switch to control the lights in a single-story, 8,000 square-foot (single meter) building, how many control devices and how many override switches do I need to install?**

A: One automatic time switch with at least two manual overrides. Any building or separately metered space exceeding 5,000 square feet must have some type of shut-off control for every floor (Section 131(d)1). When an automatic time switch is used, an override switch is also required. Each override switch must control an area that is 5,000 square feet or less (Section 131(d)2). the override activates the power within the controlled space allowing lights to be turned on for up to two hours during normally unoccupied times.

Q: **Do hotel/motel guest rooms and high-rise residential occupancies have to meet the kitchen and bathroom lighting requirements applicable to low-rise residential buildings?**

A: The lighting requirements for hotel/motel guest room kitchens and bathrooms are contained in Section 130(b) of the Energy Efficiency Standards, and are the same as those applicable to low-rise residential buildings (Section 150(k)). Up to 10 percent of the number of guest rooms may be exempted from the lighting requirements.

Blueprint # 46

Q: **Does the square footage calculation for gross sales area in a retail space exclude areas of floor displays?**

A: No. The gross sales floor area, as defined in Energy Efficiency Standards Section 101(b), includes floor space used for the display and sale of merchandise.

Q: **When is the wattage for exhaust fans NOT counted, in determining whether total fan energy exceeds 25 horsepower?**

A: Fans that exhaust only unconditioned air are not counted when calculating fan energy (Nonresidential Manual, Chapter 4). Some examples are fans in unconditioned mechanical rooms or unconditioned garage exhaust fans.

Q: **I have several questions related to lighting alterations and application of the Energy Efficiency Standards (Section 149):**
When is it necessary to calculate the existing watts per square foot for alteration requirements?

A: Section 149(b)1.C. specifies that you must meet current standards for lighting power density (Section 146) if the alteration results in an increase in the connected lighting load or involves replacing more than 50 percent of the lighting. It may be necessary to calculate the existing wattage to demonstrate that the alteration does not result in an increased lighting level.
To determine existing lighting levels, use the same methodology used for new lighting installations (Nonresidential Manual, Chapter 5). For example, track lighting is counted at 45 watts per linear foot of track. Use a form LTG-2 noting that it is the "existing" lighting power.

Q: **What is the correct way to determine if 50 percent or more of the fixtures are being replaced? For example, all of the fixtures in the 2,000 square-foot cafeteria of a 20,000 square-foot multi-story office building with one tenant are changing.**

A: The 50 percent or more fixture replacement is based on the permitted space (not the building space) that is being altered, therefore you must comply with Section 146 because 100 percent of the fixtures in the cafeteria are being replaced.

Q: **How do I determine which mandatory requirement apply?**

A: Mandatory measures apply to the lighting component being altered (Section 149(b)1.)

Section 111 requires certification of any new lamps and ballasts that aer installed if they are type regulated by the appliance Efficiency Standards.

Section 119 contains the minimum requirements for any newly installed lighting controls.

Altered lighting systems in high-rise residential living quarters and hotel/motel guest rooms must comply with the requirements of Section 130.

Compliance with Sections 131 and 132 will apply on a case-by-case basis. Independent switching within a space or room (Section 131(a)) is required if ceiling height partitions are installed or moved, creating a new enclosed space. Bi-level illumination (Section 131(b)) is required if the alteration consists of rewiring and the permitted space exceeds

100 square feet and has more than 1.2 watts per square foot. Separate switching for day lit areas (Section 131(c)) is required if the alteration involves rewiring and the permitted space exceeds 250 square feet.

Shut-off control requirements (Section 131(d)) apply if the permitted space exceeds 5,000 square feet. Tandem wiring (Section 132) is required if the alteration involves rewiring. (NOTE: There are exceptions and alternative methods of complying with each of these sections which are not covered in this discussion.)

Q: **Are shut-off controls (Section 131(d)) required if the permitted space totals more than 5,000 square feet but the spaces are not contiguous? (Example #1: a department store altering three different departments on two floors; Example #2: multiple spaces in an office complex.)**

A: Yes, some type of shut-off control is required if the permitted space totals 5,000 square feet or more. In Example #1, the building management may choose to equip the entire building with shut-off controls (one per floor). In Example #2, if all of the spaces were permitted together, at least one shut-off per floor affected by the alteration is required. A possible solution is to install an automatic time switch control for each floor and provide a manual override for each individual space. Each override must control a maximum area of 5,000 square feet.

Blueprint # 47

Q: **I have an existing building with a heating system only. If I am adding cooling and using existing duct work, do I have a new system? Do I need to meet ventilation requirements? If I do not currently have a ventilation system and I do not propose a new ventilation system, do I have to meet ventilation requirements?**

A: Adding an air conditioning (cooling) unit is adding a system. A system is defined as a combination of equipment, controls, accessories, interconnecting means, or terminal elements, by which energy is transformed to perform the function of space conditioning (Energy Efficiency Standards, Sections 112, 121 and 122 [Section 124 applies to any new duct work]) and either prescriptive or performance requirements (Section 144). Using existing duct work does not eliminate the need for complying with current ventilation requirements unless (1) it is physically impossible to bring in outside air or (2) it would, in the building official's judgment, cause a hardship. NOTE: The ventilation requirements apply to this new cooling system only, not to the existing heating system.

Q: **When are vapor barriers required for nonresidential buildings?**

A: Nonresidential buildings are not required to have vapor barriers installed in walls and attics unless the building will be insulated with urea formaldehyde foam insulation. Any building type (residential or nonresidential) installing urea formaldehyde foam insulation is required to have a polyethylene vapor barrier or

equivalent plastic sheeting vapor barrier installed between the insulation and the interior space. (Energy Efficiency Standards, Section 118(b)).
Also, in accordance with Uniform Mechanical Code Section 1005 (Table 6-D), vapor barriers must be installed on ducts when condensation may impair the effectiveness of the insulation. Specifically, on supply ducts in spaces vented to the outside in geographic areas where the average July, August and September mean dew point temperature exceeds 60 F. (Nonresidential Manual, Chapter 4)
When pipes carry cold fluids, the Nonresidential Manual (Chapter 4) recommends a vapor barrier or some other material to prevent condensation from interfering with the effectiveness of piping insulation.

Q: **What is visible light transmittance and where can I find this information?**

A: Visible light transmittance (VLT) is the ratio of visible light transmitted through glazing material to light that strikes glazing material.
VLT is specific to each glass type and must be obtained from the manufacturer's literature. VLT can also be found in the data libraries within the computer program Window 4.0 adopted by the National Fenestration Rating Council.

Q: **Can I get credit for automatic daylighting controls, or are they just an alternative way to meet the mandatory requirement for separate switching of the daylit area?**

A: You can get credit for automatic daylighting control devices even if you are using them to meet a mandatory requirement. The amount of the credit, the power savings adjustment factor, will vary based on the window-to-wall ratio (or percent of exterior roof area for skylights), and whether the control is stepped or continuous dimming. Credits vary from 0 to 0.40 for automatic daylighting controls. (Energy Efficiency Standards, Section 146 (a), Table 1-L)

Blueprint # 48

Q: **Who can sign the Certificate of Compliance forms? Where can I call if I have more questions?**

A: The person who can sign the Certificate of Compliance is the person who can legally accept responsibility for a project, as regulated by the Business and Professions Code.
For example, a mechanical engineer can sign and take responsibility for mechanical design work; a mechanical contractor can only sign and take responsibility for design work that he/she will install. (Most types of residential

construction do not require a licensed person for either design or construction work.)

The scope of work is the determining factor in whether a particular license is required in order to accept responsibility for a project and subsequently sign the Certificate of Compliance. Licensed professionals with questions about their ability to accept responsibility for a given project can contact the appropriate office within the Department of Consumer Affairs:

Engineers - (916) 263-2222
Contractors - (916) 255-3985
Architects - (916) 324-9914

If you are signing a Certificate of Compliance, it is up to you to know whether you are authorized to take such legal responsibility for work being done. If you are not licensed, you may need to consult with an attorney to determine if you can legally take responsibility.

Q: **Are door areas considered in envelope calculations? If so, where? And do they have to meet a U-value requirement?**

A: The area of doors is included only in the gross wall area (not in the exterior wall area) for prescriptive compliance. For performance compliance, doors are modeled as an opaque surface. (Any glass in doors must be included in window calculations.) There are no U- or R- value requirements applicable to opaque doors (Energy Efficiency Standards, Section 143(a)7) and approved computer programs model doors with the same characteristics in both standard and proposed design.

Q: **In an unconditioned multi-tenant shell, if a space adjacent to my tenant space is currently unoccupied, do I assume interior walls are demising walls even though the space may not remain unconditioned?**

A: Yes. Prescriptive compliance requires that any demising walls/partitions be insulated to R-11; performance compliance requires that insulation levels modeled (including demising walls) be installed.

Q: **How do I show compliance for central plant systems that are oversized for future capacity needs? For example, I am ducting off the central plant system to space condition five offices and one control room-the rest of the system is for manufacturing process loads (¡Ý 900,000 Btu boilers/chillers) with 100 percent air flush in the manufacturing area.**

A: Prepare energy calculations/load calculations for the five offices and control room; plans and specifications documenting future loads must accompany the energy compliance documentation. On the MECH-2 Part 1 form, where installed capacity is larger than needed, the explanation should indicate “excess capacity for future manufacturing area.”

Q: **Can I use the tailored lighting and area category methods in the same structure?**

A: You are limited to one method per permit (Energy Efficiency Standards, Section 146(b)). Each permit applicant can select a lighting compliance method independent of the remainder of the building.

Q: **How are categories selected in the Area Category Method for lighting compliance (Energy Efficiency Standards, Section 146(b)2)?**

A: The category selections are based on the primary function occurring in an area surrounded by floor to ceiling partitions. Each primary function must be listed separately. Select the primary function based on the defined "occupancy types" found in Section 101(b). Any function not defined may be categorized as "support space."

Please provide additional guidance for display calculations in the tailored lighting method (Section 146(b)3) (LTG-4 form).

Q: **When can I take credit for displays?**

A: You can take credit for displays only when such areas are called out on the plans. These credits are sometimes called "use it or lose it allowances" because your allowed watts will either be the calculated allotment (e.g., 2.2 watts per square foot of wall area) or your proposed design watts, whichever is less.

Q: **What if the display lighting exceeds its allotment and I don't want to change the design?**

A: Lighting allotments from the gross sales area, or any area other than display, can be used to provide additional lighting for the display. On the LTG-4, part 1 (tailored LPD summary), the total allowed watts are a combination of display lighting, gross sales area, and support spaces. At the time of installation, allowed lighting form the gross sales area can be used to supplement the allowed watts for displays. (This is reflected in the "actual lighting power" section of the LTG-2 where "adjusted actual watts" cannot exceed "total allowed watts" from LTG-4. Information from the LTG-2 is carried forward to the LTG-1.)

Q: **Is the floor area for feature floor displays subtracted from the gross sales floor area?**

A: No. Neither is the area of feature wall displays subtracted from the gross sales wall \ area.

Q: **When is a display a "feature display?"**

A: A feature display requires special highlighting to attract attention and visually distinguish the display from the surrounding area (Section 101(b)). Feature displays get 13 to 26 watts per square foot and cannot exceed 10 percent of gross wall or floor area (stores with less than 800 square receive an allotment of up to 1,000 watts for feature floor displays).

Blueprint # 50

Q: **What are the different types of display lighting available for a retail store using the tailored lighting method for compliance? How can I determine which type of display lighting I have?**

A: There are four types of displays - Floor, Wall, Sales Feature Floor, and Sales Feature Wall displays.

Floor displays are already included in the gross sales floor area along with dressing rooms, sales transactions and circulation areas; the gross sales floor area receives 2.2 Watts/square foot.

Wall displays are called gross sales wall area and receive an allotment of 2.2 Watts/square foot, limited to the actual areas of wall display.

Feature display allotments are based on a need for special highlighting to attract attention to the item being sold and to visually set it apart from surrounding areas. Feature displays receive either 13 or 26 Watts/square foot (illuminance category G), depending on the area of the display and the throw distance (see Energy Efficiency Standards, Section 146(b), Table No. 1-R).

Sales feature floor displays highlight items not accessible to the customer (although accessible items may be nearby). The allotments are in addition to gross sales areas (that is, the display floor area is not subtracted from gross sales area). Such displays are limited to 10 percent of the gross sales floor area, except in very small stores. If a store is less than 800 square feet, the allotment for feature floor displays is 1,000 Watts (Section 146(b)3.D.ii.). The allotments must be used for the displays-any excess lighting cannot be used to supplement gross sales area lighting.

Sales feature wall displays require open shelving or an internally lit, see-through display case. The light source for feature wall displays must be within reasonable proximity of the wall and must be focused on the display, not on the display and the surrounding area. Feature wall displays are limited to 10 percent of the wall area and any excess lighting cannot be used to supplement gross sales area lighting.

Q: **If I use the area category method, do I have to separate out such areas as bathrooms and corridors from the allowed lighting level (e.g., 1.6 Watts/square foot for office)?**

A: Yes. Any area separated by interior partitions must be given a separate area designation.

Q: **For a building with an HVAC system in excess of 75,000 Btu, which was modeled using a performance compliance approach, do I need to install an economizer?**

A: An economizer must be installed only when an economizer is modeled as part of the proposed design to achieve compliance. Economizers are not a "mandatory" requirement [in the prescriptive approach (Energy Efficiency Standards, Section 144(e)), they are required under certain conditions (based on capacity and air flow)]. However, it should be noted that for large HVAC equipment, the standard design (energy budget) will assume an economizer. This will reduce the budget for the proposed design by 30-35 kBtu/ft2, making it difficult to get compliance without an economizer.

Q: **I've calculated the mechanical ventilation for a barber shop, per Energy Efficiency Standards Section 121(b)2.A and B., as follows:**
A. 2,000 x 0.40 = 800 cfm
B. 15 x (40) = 600 cfm
Do I need a system capable of supplying 600 or 800 cfm?

A: The mechanical system must provide 800 cfm or more. The system must be capable of providing no less than the larger of A or B.

Q: **When calculating the minimum ventilation requirements for a space with fixed seating, can I assume one-half the number of seats as the expected number of occupants?**

A: No. Spaces with fixed seating must use the number of seats as the expected number of occupants when calculating their mechanical ventilation requirements. An arena, for example, is often filled to capacity for anywhere from two hours (for a concert) to eight hours or more (for conferences). Regardless of the duration of an event, the system must be capable of providing adequate ventilation.

Q: **Can you suggest some ways of meeting the ventilation requirements for spaces such as theaters or churches where occupancy levels can vary greatly?**

A: As recommended in the Nonresidential Manual (Chapter 4), such spaces can reduce ventilation when they are not fully occupied by using a demand control ventilation device (see also Energy Efficiency Standards, Section 121 (c)1). These devices, which must be certified to the Commission, can reduce the ventilation rate down to 0.15 cfm per square foot when the space isn't fully occupied. While such devices do not eliminate the need for the system to be capable of supplying full outside air levels when required, they can reduce operating costs without sacrificing comfort.

Q: **Are there any options for providing ventilation besides mechanical ventilation?**

A: Outdoor air requirements can sometimes be met with natural ventilation. Two conditions are required: (1) the openable area of accessible windows/doors/skylights must be at least 5% of the conditioned floor area; and (2) all spaces must be within 20 feet of these openings (without obstruction). If these two conditions are met, ventilation requirements can be met with natural ventilation.

Q: **Can the ventilation requirements of a space be met with a mixture of natural and mechanical ventilation?**

A: No. Each space must use either mechanical or natural ventilation (Energy Efficiency Standards, Section 121(b)). Using natural ventilation may negatively impact the efficiency and operation of a central system if the outside temperature is warmer or cooler than the inside temperature setting.

Q: **If a space contains some process loads, but isn't exempt from the standards (i.e., it is maintained within the comfort range of 55-90ºF), how do I indicate these loads in my compliance documentation/calculations?**

A: Process loads are included as "other" loads in the sizing calculations (MECH-4 form/computer inputs). These loads should be described or explained in the compliance documentation.

Q: **If including process loads in sizing calculations results in equipment being large enough to require an economizer with prescriptive compliance, do I have to have one, or is there an exception for process loads?**

A: There are some exceptions for the economizer requirements, but not specifically for process loads. The three exceptions are: (1) high-rise residential living quarters and hotel/motel guest rooms; (2) where special air treatment equipment is required due to outdoor contaminants; and (3) where outside air for cooling will adversely affect other systems (humidification, refrigeration, etc.) resulting in increased energy use (Energy Efficiency Standards, Section 144(e)).

Blueprint # 51

Q: **Can I use gas absorption chillers (or any other type of equipment not regulated by the Appliance Efficiency Regulations) and still be in compliance with the building Energy Efficiency Standards?**

A: Yes. The Energy Efficiency Standards, (Section 110-111) require certification to any "applicable" appliance standards. For some types of equipment the Energy Efficiency Standards (Section 112) contain minimum efficiency requirements. And for other types of equipment there are no efficiency requirements.

Q: **If a gas absorption chiller (or other equipment not regulated by the Appliance Efficiency Regulations) is proposed for a building, can I get efficiency information from the Commission? Are there any limitations with either the prescriptive or performance approach?**

A: Efficiency information should be obtained from the manufacturer. The Commission may have information where a manufacturer has voluntarily listed their equipment.

The prescriptive compliance approach (Energy Efficiency Standards, Section 144) does not require a minimum efficiency, so no efficiency information is required beyond verifying certification, if applicable.

In the performance compliance approach (Energy Efficiency Standards, Section 141) the program determines the energy budget (standard design) by modeling one of five specific types of HVAC systems, based on the building type (residential, nonresidential, etc.), heating fuel source, and number of zones served by the system. The program's calculation engine will limit the types of equipment that can be modeled for the proposed design. If the equipment type can be modeled, one of five standard HVAC system types will assumed in determining the energy budget/standard design.

You should consult the program users' manual for modeling instructions for the proposed equipment type. If there are no instructions in the user's manual, a program vendor must propose an optional capability to model new or different HVAC equipment or systems. This optional capability must receive approval from the Commission. Until such a method is approved, the equipment cannot be modeled using a performance compliance approach.

Q: **Can I install one automatic time switch (ATS) control device override control in a 5,000 square foot space and be in compliance with the shut-off requirements of Section 131(d), or do I need an override control in each area enclosed by ceiling-height partitions?**

A: If the ATS device and override controls are installed to meet only shut-off requirements, each area with ceiling-height partitions does not have to have an individual override control. However, if the override control is also being installed to meet the "bi-level illumination" requirements of Energy Efficiency Standards, Section 131(b), each area with ceiling-height partition must have an override control (Exception No. 3).

If the override is installed to comply with shut-off control requirements only, although there is no requirements for a separate override control in each room, there are some requirements to consider other than the 5,000 ft^2 maximum area. [The 5,000 ft^2 maximum is increasing for some occupancies effective July 1, 1995.] The Standards (Section 131(d)2.A.-E.) require that the override control be installed so that it can be reached quickly ("readily accessible"), and the person activating the override switch can either see the lights being controlled or the device visually signals that the lights are on or off in a given space ("annunciation").

Q: **Can I use occupancy sensor to meet all of the interior lighting control requirements of the Standards (Section 131)? If so, would one occupancy sensing device on each floor of the building be adequate?**

A: Occupancy sensing devices will satisfy the requirements of Sections 131(a), (b), and (d) , but not (c) unless there is also a manual switch in series with the occupancy sensor.

Area controls (Section 131(a)) require that each area enclosed by ceiling-height partitions have an independent control; spaces with occupancy sensing devices do not have to meet Section 131(b); and shut-off controls requirements (Section 131(d)) for buildings with 5,000 square feet or more can be met if the devices also meets Section 119. The installation must be "in accordance with manufacturer's instructions" (Section 119(h)). When properly installed, the device must be able to sense occupancy in all spaces or rooms that are being controlled, which will require multiple sensors to prevent lights from going out while the building is still occupied. Occupancy sensing devices do not satisfy the requirement for separate switching within daylit area (Section 131(c))-occupants must be able to reduce the lighting level when there is adequate daylight available.

Q: **Can I get control credit for an occupancy sensor (Section 146(a)2) if it also being used to satisfy mandatory requirements for room switching and bi-level illumination?**

A: Yes.

Blueprint # 52

Q: **What are the new occupancy groups from the 1994 Uniform Building Code? And how are compliance calculations affected?**

A: The scope of the 1995 Energy Efficiency Standards (Section 100) is occupancy groups A, B, E, F, H, M, R and S. A summary of these occupancy groups [changes did not affect residential occupancies] is:

A. An assembly room with an occupant load of 300 or more, including buildings used for educational purposes which are not Group E or B.

B. Office, professional or service-type transactions; storage of records and accounts; and eating and drinking establishments with an occupant load of less than 50.

E. Buildings used for education purposes through the 12th grade; any building or portion of a building used for day-care purposes for more than six persons.

F. Factory and industrial facilities involving low and moderate-hazard materials.

H. Buildings with specified quantities of materials which present a fire or explosion hazard; repair garages and aircraft repair hangars not classified as Group S, and heliports.

M. Merchandise display and sales.

S. Storage of low and moderate-hazard materials; repair garages without open flame or welding; parking garages.

Buildings of these occupancy groups which meet the other criteria for being within the scope of the Standards (permitted, conditioned space) must comply with the nonresidential standards.

Q: **How are process loads handled in the computer compliance approach? Do they result in a credit? For example, a small office building with substantial glazing, 6 Watts/ft2 of lighting and a 120,000 Btuh cooling load, is claiming a process load of 15 Watts/ft2. Their total cooling capacity is 199,000.**

A: There is no credit for process loads. The reference building (standard design) will have the same process loads as the proposed building. The applicant must, however, justify the amount of the process loads. If the cooling load, including the process loads, is 199,000 Btuh, this capacity is compared with the capacity of the HVAC unit for the reference building which includes the process load +21% (Energy Efficiency Standards, Section 144 (b); Nonresidential Manual, Chapter 4; Alternative Calculation Methods Manual (April 1992), pp. 32 and 62.)

Q: **When preparing lighting compliance calculations, Section 146 (a) 3.D of the Energy Efficiency Standards indicates that I do not have to include wattage from "specialized local lighting installed in non-lighting equipment by its manufacturer." What are some examples of equipment types which can be excluded?**

A: Examples of lighting wattage which can be excluded from total wattage calculations include:

Lighted signs (if they are not hardwired)

Walk-in freezer

Cabinetry that is not movable and not used for display purposes with built-in

lights
Food dispensing machines
Drink dispensing machines
Industrial equipment such as that used by manufacturing facilities (drill press, sewing machines, etc.)
Refrigerators of coolers including walk-in refrigerators or coolers

Q: **Is a light fixture in a site built walk-in refrigerator or cooler excluded from the lighting wattage calculations?**

A: If the space is maintained at a temperature of less that 55°F, it is outside the scope of the standards and energy compliance is not required for the space occupied by the site built walk-in unit. (See "directly conditioned space," Section 101(b).)

Q: **If the lighting is excluded for refrigerated display cases or walk-in refrigerators, should the floor area occupied by these units be excluded form the lighting calculations?**

A: Since it is part of the conditioned space, the floor area occupied by refrigerated display cases is included as floor area for the lighting calculations. (This is similar to "gross sales area" which includes areas associated with the display and sale of merchandise.) Walk-in refrigerators or freezers, however, are enclosed, unconditioned space and the floor area associated with them is not included as floor area in the energy compliance calculations.

Q: **Is a light fixture under a restaurant exhaust hood built over a stove or grill exempt from lighting wattage calculations?**

A: If the light is installed in the exhaust hood by the manufacturer, it can be excluded (Energy Efficiency Standards, Section 146(a)3.D.). Otherwise, the lighting is not "integral to food preparation equipment" and must be included in the lighting calculations.

Blueprint # 53

Q: **In calculating lighting compliance, how is the wattage for incandescent fixtures supposed to be determined?**

A: It is greater of either the proposed fixture lamp wattage or 75 watts per fixture.

Q: **One exception for lighting shut-off controls is for "an area that must be continuously lit, or lit in a manner requiring manual operation of the lighting" (Section 131(d)1, Exception No. 2). What are some examples of the correct application of this exception?**

A: An area which must be continuously lit would operate 24 hours, such as hotel lobbies and 24-hour grocery stores. Thus, at no time would the lights be shut off. The latter part of the exception is provided for:
Spaces which always have varying and unpredictable operating schedules, such as live performance theaters, arenas, and concert venues.
Space with lighting systems equipped with high intensity discharge (HID) lamps AND where the use of the space results in unpredictable on/off operation. The space requires manual operation because of the longer start/restart time of HID lamps coupled with the unpredictable schedule.
Please note that most facilities equipped with HID lighting will not fall under this exception because an operating schedule will be reasonable to predict. A facility with a predicable operating schedule and metal halide lighting could still use automatic shut-off without posing a risk to people working or conducting business in the building.

Q: **What R-value can I use for a crawlspace in a nonresidential building?**

A: You may use an R-6 in assembly calculations for the crawlspace (see Table B-7 for sample floor assembly calculations). This R-6 value cannot be used when the floor is over a basement of underground parking facility.

Q: **With the special construction requirements for suspended (T-bar) ceiling eliminated, are there any construction requirements or special modeling details to consider?**

A: Standards construction is adequate for meeting the infiltration/exfiltration requirements of the standards. If insulation is placed on the suspended ceiling, however, recessed lights must either be IC-rated (approved for insulation cover) or areas without insulation must be accounted for in the overall assembly U-values.
When recessed lights are not IC-rated, the ceiling is modeled as two parallel assemblies. The first assembly consists of ceiling insulation, acoustic tile and a T-bar grid. The second assembly consists of the luminaries alone. The effective R-value of the first assembly is the sum of the T-bar/acoustic tile combined R-value, ceiling insulation and two inside air film resistances (0.61 R-value per air film). Because of the metal grids, you may only use up to 50 percent of the tile's R-value for the T-bar/acoustic tile combined R-value.

For the second assembly, the R-value of the light fixture should be calculated as two inside air film resistances (0.61 R-value per air film). If the fixtures include plastic diffusers, the R-value of the light fixture should be calculated as two air film resistances and a 1.5 inch air space (0.77 R-value).

The overall assembly R-value will be calculated as the inverse of the area weighted average U-values of the two parallel assemblies.

For example, if 10 percent of the ceiling is light fixtures without plastic diffusers and 90 percent is R-19 insulation with ½" tiles (tile R-value 1.2), the calculation would be:

Assembly #1 R = 19 + [1.20/2] + 0.61 + 0.61 = 20.82
Assembly #2 R = 0.61 + 0.61 = 1.22
Overall U-value =
[(1/20.82) * 0.90] + [(1/1.22) * 0.10) = 0.1252
Overall R-value = 1/Overall U-value = 8.0
NOTE: You cannot use EZFRAME program or ENV-3 form for T-bar ceilings.

Blueprint # 54

Q: **Does changing the occupancy of a building require compliance with the current energy requirements for the new occupancy?**

A: Only features or components which are the altered must comply with the requirements of the new occupancy (Nonresidential Manual, Section 2.2.7.)

Q: **When is demising wall insulation required? And how much insulation is required?**

A: Demising wall insulation (R-11) is a mandatory requirement for framed walls (Energy Efficiency Standards, Section 118 (e)). Therefore, any time envelope compliance is required, these walls separating conditioned and unconditioned space must be insulated to R-11.

Q: **When does an alteration to a mechanical system require that I install an economizer?**

A: Since an economizer is not a mandatory requirement, alterations to components of an existing mechanical system do not require the installation of an economizer. Alterations which consist of adding a new system must install an economizer when two conditions are met: (1) the new system has a design supply capacity that is greater than 2500 cfm and over 75,000 Btu/hour of mechanical cooling capacity, and (2) compliance is demonstrated using the prescriptive approach (Energy Efficiency Standards, Section 144). [Note: If performance compliance is used for the new system, an economizer is required only if one is modeled as part of compliance.]

Blueprint # 55

Q: **After reading the information in Blueprint No. 53 about assumptions for a drop (T-bar ceiling), I have additional questions:**
Can I get credit for fire-rated acoustic tiles?

A: No, Although this type of construction helps to limit infiltration and exfiltration, the Standards do not have a provision to account for it.

Q: **How do I calculate the assembly R-value if the fixtures are IC-rated and covered by insulation?**

A: You have three options. First, you can use the insulation value alone to show that the R-value meets the requirement for the prescriptive approach. Second, you can follow the procedures described in Blueprint No. 53 for non-IC-rated light fixtures and include the R-value of the insulation over the light fixture in assembly #2. For example, R-19 insulation becomes:

Assembly #1 (ceiling tile—90% of ceiling)
R = 19 + [1.20/2] + 0.61 + 0.61 = R-20.82
Assembly #2 (light fixtures—10% of ceiling)
R = 19 + 0.61 + 0.61 = R-20.22
U-overall = [(1/20.82) x 0.9] + [(1/20.22) x 0.1] = U-0.048 (R-20.8)

Third, you can conservatively assume that the entire ceiling assembly is made up of light fixtures. In the above example the ceiling would be R-20.22/U-0.049 for a ceiling with IC-rated fixtures covered with insulation.

Q: **What if there is no lighting plan and therefore I don't know what percent of the ceiling is made up of light fixtures?**

A: In the absence of a lighting plan you may assume the following percentages:

General Commercial/Industrial Work Buildings	10%
Grocery	15%
Industrial/Commercial Storage	7%
Medical Buildings	12%
Office Building	12%
Religious Worship, Auditorium, and Convention Center	16%
Restaurants	12%
Retail and Wholesale	16%
Schools	15%
Theaters	12%
All Others	7%

Q: **How do I model the T-bar/light fixture assembly when using computer (prescriptive or performance) compliance?**

A: Either the framing function of the ENV-3 calculation is turned off, by selecting "none" for frame type or specify "no penetration" for entries. Follow the procedures outlined above for IC-rated fixtures covered with insulation or the procedures outlined below for non-IC rated fixtures when modeling on a computer (excerpted from Blueprint No. 53).

The light fixtures, whether they are IC-rated or not, are modeled as two assemblies. The first consists of ceiling insulation, acoustic tiles and a T-bar grid. The second assembly consists of the luminaire and insulation, if any.

For example, the first assembly consists of the sum of the effective R-value of the T-bar/acoustic tile combined (50 percent of the tile's R-value to account for the effects of the metal grids), ceiling insulation and two inside air film resistance (0.61 R-vale per air film).

Outside air film	0.17
Air film (net 0.61 - 0.17)	0.44
Insulation	19
Acoustic tile (1/2 R-value)	0.60
Inside air film	0.61
R-value	20.82
Outside air film	0.17
Air film (net 0.61 - 0.17)	0.44
Insulation	0
Inside air film	0.61
R-value	1.22

The second assembly which consists of non-IC-rated light fixtures is calculated as two inside air film resistances (0.61 R-value per air film). If the fixtures include plastic diffusers, the R-value of the light fixture should be calculated as two air film resistances and a 1.5 inch air space (0.77 R-value). Also, if the fixtures are IC-rated and covered by insulation, include the insulation R-vale.

Blueprint # 56

Q: **Near the designer's signature on all of the Certificate of Compliance forms (ENV-1, MECH-1, LTG-1) is a place for the license number and date. Is this the date the license expires, or when the document is signed?**

A: It is the date the document is signed.

Q: If a space will not be conditioned for human comfort, is it exempt from the Energy Efficiency Standards?

A: Not necessarily. Although the definitions of mechanical heating and mechanical cooling (Section 101(b)) both use the phrase "human comfort", ASHRAE defines comfort conditioning as conditioning in the range of 55-90°F. Since the scope of the Standards (Section 100) includes a space that is "directly conditioned" within the range of 55 and 90°F a space conditioned in this range must comply. To illustrate:

In SITUATION #1: Space conditioning is provided for computers which must be maintained at 75°F or less (not for human comfort). The space will be unoccupied, except for maintenance and repair.

RESOLUTION: The space must comply since it is maintained within the range of human comfort.

SITUATION #2: A water treatment plant will have heating to prevent pipes from freezing. The thermostat cannot be set higher than 50°F. There will be no human occupancy.

RESOLUTION: If the building official makes the following two determinations, the building does not need to comply with the standards: There must be evidence that the space is not being conditioned to within comfort conditions. This can be determined if a building has only heating and is controlled by a thermostat that cannot be set above 55°F. For example, a thermostat shipped from the manufacturer with a fixed setpoint that is not adjustable by others. Reasonable evidence indicates that the building is not for occupancy by humans. This requires judgment on the part of the building official. Some pertinent questions in making this determination are: Is there no space for people to erect an office inside the building? Is the building a very noisy space? Is the building full of operating equipment that does not require nearly continuous human intervention to operate?

Q: When the building department asks for "Title 24 compliance" on a lighting alteration, what compliance is required?

A: Compliance with applicable mandatory requirements is necessary for every lighting alteration regardless of how big or small the alteration (Section 149(b)1). Some alterations will require compliance with lighting power density requirements (Section 149(b)1 D).

When a project involves relocating light fixtures:

Local switching must be maintained so that, after the alteration, any lights within a room are controlled by a switch within that room (Section 131(a)).

When the project involves rewiring:

• Bi-level switching is required if the altered area exceeds 100 square feet with a light level of 1.2 Watts/ft$_2$ or greater (Section 131(b)).

• Separate switching for the daylit area is required if the altered area is within a daylit space that exceeds 250 square feet (Section 131(c)).

• Tandem wiring of one- and three- lamp luminaires is required (Section 132).

Additional requirements: (cont…)

• Shut-off controls are required when the area served by the altered lighting is 5,000 square feet or more (Section 131(d)).
• New lamps and ballasts that are of a type regulated by the Appliance Efficiency Regulations must be certified (Section 111).
• New lighting controls must meet applicable criteria contained in Section 119.

When fixtures (consisting of lamp, ballast, and housing) are replaced:
• If more than 50 percent of fixtures within the permitted space are replaced, you must comply with lighting power density requirements of Section 146.

When adding lights:
• If the connected load is increased, the lighting alteration must comply with lighting power density requirements of Section 146.

NOTE: There are exceptions and alternative methods of complying with each of these sections which are not covered in this discussion. Consult the Energy Efficiency Standards and the Nonresidential Manual, Chapter 5 for more detailed information.

Q: **If an alteration involves moving or installing new cubicle walls, does this trigger any requirements of the Energy Efficiency Standards?**

A: Yes. If the partitions are ceiling-height, this alteration requires that accessible local switching for the lights within the room or space be provided and that the switch controls only the lights in that room or space (Section 131(a)).

Q: **What are the duct insulation requirements for nonresidential mechanical systems?**

A: Section 124 of the Energy Efficiency Standards refers to Section 601, 603, 604 of the Uniform Mechanical Code for installation and insulation requirements. The insulation requirements from Section 604 of UMC are restated below:

Duct Location	Insulation R-value Mechanical Cooling	Heating Degree Days	Insulation R-value Heating Only
On roof On exterior	6.3	<4500	2.1
4501-8000		4.2	
>8000		6.3	
Attics, garages Crawl spaces	2.1	<4500	2.1
4501-8000		4.2	
>8000			
In walls within floor to ceiling spaces except as noted*	2.1	<4500	2.1
4501-8000		2.1	
>8000		4.2	

(continued on next page…)

*No duct insulation is required on portions of ducts located in walls, and/or within floor to ceiling spaces, when:
Insulation is required when:
• Both sides of space are exposed to conditioned air
• The space is not ventilated
• The space is not used as a return plenum
• The space is not exposed to unconditioned air
When the ceiling forms a plenum, it need not be insulated.
• Not duct insulation is required for:
• Ducts within conditioned space
• Ducts in basements
• Return ducts in plenums
• Ducts in a cement slab or in the ground
Two additional requirements should be noted:
• Ducts located on the roof on exterior of the building must include an approved weatherproof barrier.
• All joints in cooling system ducts must be sealed. A vapor retarder (not exceeding 0.5 perm) is required on cooling system supply ducts is spaces vented to outside in geographic areas where the summer dew point temperature based on the 2-1/2 percent column of dry bulb and mean coincident wet-bulb temperature exceeds 60°F.

Q: **Does a thermostat, required by Section 122(b), need to have numeric setpoints in degrees F? If so, why doesn't it state that explicitly like Section 122(c)2 does?**

A: Yes. The thermostat must have numeric setpoints in order to provide the capability of setting heating down to at least 55°F and cooling to 85°F or higher. The language in Section 122(c)2 was added because this was an issue for many hotel/motel guest rooms with controls that indicate warmer and cooler rather than temperature settings, which can result in wasted energy.

Blueprint # 58

Q: **As a lighting designer, I would like to be able to prepare compliance documentation without having to coordinate with the envelope and/or mechanical designers. Is it acceptable for me, for example, to use the tailored method while the envelope designer uses computer compliance? Is there any time when we must coordinate?**

A: Unless there are trade-offs between building features, they do not need to be modeled together. Therefore, the only time you must coordinate is if there will be trade-offs between various building components.
If the envelope designer uses computer compliance, s/he will indicate in the scope of compliance that lighting is not included. The PERF-1 (Certificate of Compliance for the performance approach) will indicate that lighting compliance

is not in the scope of the submittal for the envelope compliance. This provides the plan checker with verification that features of a building that are not part of the compliance documentation are automatically set to "default" values by the certified program.

As an example, in a building with all features permitted at the same time, the envelope could comply with prescriptive requirements, the mechanical could comply with the performance approach to avoid the economizer requirements, and the lighting could comply using any approach including computer compliance. (All the possible variations are explained in Chapter 6 of the Nonresidential Manual.)

Q: **I'd like to use the Complete Building Lighting approach for a building with several different occupancies, none of which is dominant. Since this lighting approach requires that I select only one occupancy type, how do I determine the primary occupancy?**

A: The complete building method is intended for, and the lighting allotments are based on, a single building type with a lighting plan for the entire building permitted at one time. With multiple occupancies, you have one of four prescriptive choices:

Choose the building type that makes up 75 percent or more of the entire building from the Complete Building Method

Choose "All Others" (0.8 Watts/ft2) from the Complete Building Method

Use the Area Category Method, or Use the Tailored Lighting Method.

Q: **Are there any tables I can use to obtain information for T-8 lamps and electronic ballasts?**

A: The Addendum to the Nonresidential Manual has an extensive list of products in Appendix B, including electronic, magnetic and magnetic energy efficient ballasts. If you haven't received your copy, contact the Energy Standards Hotline (see back page).

Blueprint # 59

Q: **Is there such a thing as "official" Energy Commission compliance forms? What are the documentation requirements?**

A: There are no "official" forms. The forms contained in the Nonresidential Manual are recommended and provided as guidance for consistency. The Administrative Regulations, Section 10-103(a), specify the forms be "readily legible and of substantially similar format and informational order and content" as the forms found in the compliance manuals. This allows the necessary flexibility for program vendors, consultants and building departments to produce their own forms.

Q: **Can you explain the oversizing allowances for sizing HVAC equipment when showing compliance with the prescriptive approach?**

A: First, calculate the building's heating and cooling loads in accordance with Energy Efficiency Standards, Section 144(b)1.-11. Second, Section 144(b)12. Allows the designer to increase the loads by 10 percent as a safety factor. Third, loads may be increased additionally for pick-up loads (Section 144(b)13.). The designer can either calculate the pick-up loads or optionally choose to increase heating loads by 30 percent and cooling loads by 10 percent.
Other loads and system losses not considered in the first step (Section 144(b)1.-11.) are heat gain across fans, heat loss in ducts, environmental conditions of the condenser location, and such. These loads may also be included in the load calculations.
In summary, the building loads for HVAC equipment sizing can be calculated using one of the following options:
[(Loads from 144(b)1.-11.) + (other loads and system losses)] x (1.10 for cooling and 1.30 for heating) x (1.2 safety factor) or
[(Loads from 144(b)1.-11.) + (other loads and system losses)+ (pick-up loads)] x (1.10 safety factor)

Blueprint # 60

Q: **I will be using the area category method for a space that functions as both a warehouse and industrial work area. These two areas are not separated by walls or partitions. Can I assign more than one primary function to these areas?**

A: Yes. The designation "primary function" is meant to define the primary activity of the square footage associated with the activity. There is no limit to the number of primary function areas when using the area category method

Q: **Can I transfer lighting wattage between areas when I've used the area category method for compliance?**

A: Only for areas where there are lighting plans submitted and lighting is installed as part of the approved permit.

Blueprint # 61

Q: **I can't find information about Solar Heat Gain Coefficients (SHGC) for the windows in my nonresidential building. Where do I find the find SHGC information?**

A: Call the California Energy Commission's Energy Hotline at 1-800-772-3300. All the information you need should be found in the Notice on the Alternative Calculation Method for Nonresidential Buildings-Solar Heat Gain Coefficient Compliance.

Q: **On the ENV-1, part 2 of 2 in the azimuth columns, do I need to enter N, S, E, W, or exact degrees from North? The instructions are unclear.**

A: You can use either method. For compliance with the prescriptive standards, N, S, E, and W (for North facing, East facing, South facing, and West facing) are acceptable as those terms are defined in the *Energy Efficiency Standards for Residential and Nonresidential Buildings* (Standards), Section 101(b) Definitions. Entering the exact degrees from North is also acceptable.

Q: **I am trying to comply using the Prescriptive approach. I will be using a computer room air conditioner with electric resistance reheat for dehumidification. Section 144(g) states that electric resistance heating can not be used for space heating. Am I exempt because I am not using the electric heating for "Space Heating"?**

A: It depends. Electric resistance heating for reheat purposes must comply with exceptions in Sections 144(d) and 144(g). A gas-fired boiler may be used for all of the reheat. A water coil from a gas-fired boiler can be used as the primary heating with supplementary electric resistance if the design complies with the exceptions in Sections 144(d) and 144(g).

Q: **In Table 5-3 of the Nonresidential Manual (Complete Building Method Lighting Power Density Values), what do the designations "high" and "low" mean when referring to the Lighting Power Density (LPD) for "General Commercial and Industrial Work Buildings"?**

A: The term "high" refers to "high bay"(where the luminaire is 25 feet or higher from the floor) and the term "low" refers to "low bay" (where the luminaire is less than 25 feet from the floor).

Q: **I have a project where a space previously defined as unconditioned would now become semiconditioned. What are the lighting requirements?**

A: If changes in an existing unconditioned building results in a space becoming semiconditioned, the Efficiency Standards have no requirements for lighting (Nonresidential Manual, Sec. 2 2 2). However, if an alteration results in a change to the lighting, as described in Section 149, you must comply with the Standards.

Q: **If I am going to convert a building from semiconditioned space to directly conditioned space, what are the requirements?**

A: The building would be treated as if it was a whole new building. The entire building would have to comply.

Blueprint # 62

Q: **In the Nonresidential Manual, page 5-42, it states the wattage for track lighting is calculated using "…45 watts per foot, which is 50 percent of the lighting power rating by the National Electric Code (90 watts per foot)." If the California Energy Commission adopted the 1996 NEC values for track lighting which is now 150 watts per two feet instead of 180, this would change the Energy Commission default value of 45 to 37.5 watts/linear foot of track. Which values should be used?**

A: 45 Watts /linear foot of track is the formal interpretation of the Energy Commission as published in its Nonresidential Manual; therefore 45 watts per linear foot should be used.

Note that the Nonresidential Manual (page 5-42) also states:

Tracks serviced through permanent, installed transformers for low voltage lighting may use the volt ampere (VA) rating of the transformer as the Actual Lighting Power of the track. Standard voltage tracks equipped with current limiters may use the actual volt-ampere (VA) rating of the current limiter as the Actual Lighting Power of the track if (a) The current limiter is an integral part of the track and can only be replaced by manufacturer authorized technicians; and (b) The VA rating of the current limiter is clearly marked on the track and is readily available for the building officials' field inspection without opening the fixture or panels.

Q: **What energy code comes into effect for tents, if any? Does this conditioned space still invoke Title 24? Does the fire marshal handle this?**

A: If the building official considers the tent to be an occupancy within the scope of Section 100 (a) of the standards and the tent is conditioned, then it must comply with the requirements of the energy code. Note that exception 2 to Section 100(a) states: Building departments, at their discretion, may exempt temporary buildings or structures erected in response to a natural disaster. Temporary buildings or structures shall be completely removed upon the expiration of the time limit stated in the permit.

Q: **Can a building department plan checker or inspector ask for further documentation and additional information (other than standard forms) in order to verify compliance with the Standards?**

A: Section 10-103(a)3.B states: "The enforcement agency may require the person with overall responsibility for the construction to provide any reasonable information to determine that the building as constructed is consistent with approved plans and specifications and complies with Part 6" (of the Standards). Section 10-103(a)2.B. states: "If any characteristic is materially changed before final construction and installation, such that the building may no longer comply with Part 6, the building must be brought back into compliance, and so indicated on amended plans, specifications, and Certificate(s) of Compliance and shall be submitted to the enforcement agency."

Q: **How do I model (for compliance with the Standards) Residential Care Facilities for the Elderly (R2) buildings having both residential and nonresidential components?**

A: Section 100(e) states: "When a building is designed and constructed for more than one type of occupancy, the space for each occupancy shall meet the provisions of Title 24, Part 6, applicable to that occupancy." Exception to Section 100(e) states: "If one occupancy constitutes at least 90 percent of the conditioned floor area of the building, the entire building may comply with the provisions of Title 24, Part 6, applicable to that occupancy, provided that the applicable mandatory measures in Sections 110 through 139, and 150, are met for each occupancy."

Blueprint # 63

Q: **As a building official, can I exempt a tenant improvement of 1000 square feet or less from complying with the *Energy Efficiency Standards for Residential and Nonresidential Buildings* (Standards)?**

A: No. There is no such exemption. Some people have misinterpreted the exception noted at the end of Section 10-103(a) of the Administrative Regulations.

Section 10-103(a) – Permit, Certificate, Informational, and Enforcement Requirements for Designers, Installers, Builders, Manufacturers, and Suppliers – requires a Certificate of Compliance, Installation Certificate, and Insulation Certificate to be provided whenever an "application for a building permit subject to Part 6" is submitted. The exception listed at the end of Section 10-103(a) states the following:

Enforcing agencies may exempt nonresidential buildings that have no more than 1,000 square feet of conditioned floor area in the entire building and an occupant load of 49 persons or less from the documentation requirements of Section 10-103(a), provided a statement of compliance with Part 6 is submitted and signed by a licensed engineer or the licensed architect with chief responsibility for the design.

First, this is not an exemption from complying with the Standards. It is only an exemption from providing certain forms on the plans. Even if exempted by this exception, the builder is required to be in compliance with the Standards.

As a building official, you may choose to exempt the applicant from providing the Certificate of Compliance, Installation Certificate, and Insulation Certificate. In this case, however, the applicant MUST supply you with a signed statement saying that the conditioned area of the building is in compliance with Part 6. The signed statement is not based on any form supplied by the Energy Commission.

The key to this exemption lies in the words, "…documentation…" and "…"in the entire building." It is only the "documentation" that can be exempted; and if there is less than 1,000 square feet of conditioned space in the entire building, then individual tenant improvements that are less than 1,000 square feet cannot be exempted from complying with Section 10-103(a).

If the building official anticipates that the building may eventually house more than 1,000 square feet of conditioned space, he/she should not exempt any tenant improvement from providing the documentation listed in Section 10-103(a). The exemption is not automatic.

Q: **Section 100(d) 2.C. in the *Energy Efficiency Standards for Residential and Nonresidential Buildings* (Standards) states:**
"C. Semiconditioned nonresidential buildings. Sections 119, 130 through 132, and 146 apply to all new unconditioned buildings within the scope of Section 100 (a)."
Is the word "unconditioned" a mistake? Should it not be "semiconditioned"? If it is "unconditioned", then the *Nonresidential Manual* is inconsistent with the Standard.

A: Yes, the word "unconditioned" is a mistake. This should say "semiconditioned" to make sense. Section 100(d)2C, to which you refer, cross-references the scope which does not include unconditioned buildings. The title for Section 100(d)2C is for "Semiconditioned…" which is not included in the definition of unconditioned. The *Nonresidential Manual* is correct.

Q: **How can I best make use of daylighting in a nonresidential building?**

A: Hire an electrical engineer who specializes in nonresidential lighting design. Be sure that you follow the resulting design by installing daylighting controls on your light fixtures so that when there is sufficient daylight, the lights are automatically switched off.

Q: **The definition in the Standards [Section 101(b)] of an enclosed space is "space that is substantially surrounded by solid surfaces." What exactly does "substantially surrounded" mean? How big of a "hole" would constitute not being enclosed?**

A: A building with a "hole" having less than 20 percent of the wall area should be considered enclosed.

Blueprint # 64

Q: **I am interested in relocating a register within a room of a nonresidential building. At the same time, I will be increasing the occupant density. Do I need to meet the ventilation (outdoor air) requirements?**

A: No, the standards include an exception for relocating components. For any nonresidential mechanical alterations see section 149 (b) of the Energy Efficiency Standards for Residential and Nonresidential Buildings. "Exception 2 to Section 149 (b): When existing heating, cooling, or service water heating systems or components are moved within a building, the existing systems or components need not comply."

Q: **I have an existing retail space that I am converting into an office. I want to remove the existing track-lighting fixtures and install new fluorescent lighting fixtures by extending the tracks and moving the heads. Do I have to comply with the lighting requirements?**

A: Yes, by extending the track you are increasing the lighting load and must comply with the standards. The track itself, and not the track heads, is considered the lighting fixture, and extending the track is considered to be adding more lighting fixtures. Since you are increasing the lighting load, it is considered an alteration and according to Section 149, you must follow the requirements set forth in the Energy Efficiency Standards. "Alterations to existing lighting systems that increase the connected lighting load or replace more than 50 percent of the lighting fixtures shall meet the requirements of Section 146."

Q: **I have an existing building in which I want to change the heads of the track lighting from incandescent to fluorescent. I am only making this change in one room, but I have permitted the entire building for alterations not involving the lighting. Do I have to comply with the Standards?**

A: No, since your alteration is less than 50 percent of the permitted area, you do not have to comply with the Standards for lighting if you are only changing the heads on the track. The amount of energy that is attributed to a track lighting system is based upon how many linear feet of track there are, and not how many, or what kind of track heads are connected to the track. You may increase the connected lighting load on the existing track up to its rated capacity; however, you cannot increase the length of the track unless a current limiter is used to regulate the total volt-amperes available to the track system so that the total wattage for the new system is equal to or less than the original track lighting system. (See previous question/answer).

Q: **When determining compliance with the lighting part of the nonresidential standards, should I include planned plug-in lighting as part of the Actual Lighting Power Density?**

A: Yes, Section 146 (a) of the Standards states, " The actual lighting power density of the proposed building is the total watts of all planned permanent lighting systems (including, but not limited to track and flexible lighting systems, lighting that is integral with modular furniture, movable displays and cabinets, and internally illuminated case work for task or display purposes) minus any adjustments allowed under Subsections 1 through 4." The parenthetical portion of this excerpt helps define "planned permanent" lighting. Check to see if the lighting in question is listed in Section 146 (a) 3 as being excluded from the actual lighting power density. If plug-in lighting will be installed to meet the lighting needs of the occupants, it should be shown on the plans. If the plug-in lighting is shown on the plans, and is not listed as an exemption in Section 146, it must be counted as part of the actual lighting power. If an increase or change in the type of lighting happens prior to final inspection, the building inspector should determine compliance based upon confirmation that the lighting power density of the actual constructed building does not exceed the lighting power density shown on the plans.

Blueprint # 65

Q: **What are the most significant changes to the Nonresidential Standards?**

A: The most significant changes effect glazing and lighting requirements. Additional changes will impact space conditioning, cool roofs and other aspects of the nonresidential energy code. The next blueprint issue will include more of the nonresidential topics. Glazing: In many climate zones, nonresidential buildings that complied using single glazing under the 1998 Standards may need to have dual glazed, high performance windows to comply with the new 2001 Standards.

Section 143 – Prescriptive Requirements for Building Envelopes Tables 1-H and 1-I include new requirements for windows and skylights. U-factor and SHGC values are set lower: for vertical glazing, the values depend on the window-to-wall ratio, and for skylights the values depend on the type of skylight construction. Climate zones have been regrouped to form groups with the same glazing and other prescriptive envelope requirements. In Section 143(b), the overall heat gain tradeoff equation has been changed to add a cool roof alternative.

Lighting Systems and Controls

Section 130 (c) states that all permanently installed exterior luminaries attached to or powered by the electrical service in the building must either have a minimum efficacy value of 60 lumens/watt or be controlled by a motion sensor. Section 131 says there are no longer exceptions for occupancy sensors or automatic time switches with manual override from the bi-level control requirement. Bi-level controls are required in all spaces larger than 100 ft 2 and having a lighting load greater than 0.8 Watts/ft 2 . Buildings or separately metered spaces with less than 5000 ft 2 of conditioned space are no longer exempt from the automatic shutoff control requirement. Section 146 requires portable lighting to be included when determining the actual lighting power. If no specific plans for spaces larger than 250 square feet are provided for portable lighting, the standards specify a value of 0.2 Watts/ft 2 to be used for determining the actual lighting power density. The actual lighting power for portable lighting may be used if sufficient supporting evidence is provided on the plans.

Blueprint # 66

Q: **The Standards state that lighting for theme parks are excluded from the lighting power density of the building (Section146 (a) 5). Does this mean that all lighting within the theme park, including offices and retail shops, is excluded?**

A: No. A theme park is a large amusement park which includes carnival rides, shows, and exhibits. Only specialty lighting within theme parks is exempt from the lighting power density calculations. All other lighting must comply with the Nonresidential Energy Efficiency Standards.

This includes, retail spaces, restrooms, restaurants, lobbies, ballrooms, theaters and other primary function areas. The treatment of these primary function areas is no different for theme parks than for other building projects. Lighting that is designed strictly for entertainment however, such as the entertainment production lighting used to present the theme of the theme park, may be exempted from Title 24 lighting power density compliance.

Q: **I am building a Speculative Occupancy building. How would you recommend that I meet mechanical and lighting compliance?**

A: You have a couple of options. The first is to only complete the envelope portion of compliance and leave the lighting and mechanical compliance to the future tenants. If you can anticipate what type of occupancy you will have (for example, when building a strip mall you can anticipate that the tenants will be retail), you can install the lighting and/or mechanical that you expect they will need. Finally, if you are using the performance approach for compliance, use the default values for any feature that is not included in the permit. Using the complete building approach, the default value for retail lighting using complete building method would be 1.7 watts/ square foot.

Q: To determine if an appliance is certified, can I use an industry directory like GAMA or ARI?

A: Yes, but only if the appliance is listed in one of the following chapters of the following chapters of the following directories:
GAMA Directory of Certified Efficiency Ratings for Residential Heating and Water Heating Equipment:

Chapter 1:
Section 1: Residential Gas Central Furnaces
Section 2: Residential Oil Central Furnaces
Section 3: Residential Gas Boilers
Section 4: Residential Oil Boilers
Chapter III:
Section 1: Gas Water Heaters
Section 2: Oil Water Heaters (cont…)
Section 3: Electric Water Heaters
ARI (Applied Air-Conditioning Products Directory)
Sections: GSHP, GWHP, PTAC, PTHP, ULE, WSHP only
ARI (Unitary Directory)
Also, not all manufacturers participate in the GAMA or ARI directories, so if an appliance is not listed in a GAMA or ARI directory, please check with the Commission to see if the manufacturer has certified the appliance directly to us.
Finally, if it turns out that the appliance is not properly listed in the Commission's own directory, it is considered uncertified and may not be installed.

Blueprint # 67

Q: **Do occupancy sensor devices have to be certified, and if so, how can I tell if they are certified?**

A: Yes. You may use occupancy sensors only if their manufacturers have certified to the Energy Commission that their products meet the requirements of Section 119 of the Standards. To determine if they are certified, contact the Energy Commission hotline at 1 (800) 772-3300.

Q: **Is equation 1A for adjusting the thickness of pipe insulation in Section 123 of the *Nonresidential Building Efficiency Standards* publication number P400-01-024 correct?**

A: No. There is a typographical error in this publication that also occurred in the publication of the 1998 Standards. The equation is correctly expressed in the 1998 and upcoming 2001 *Nonresidential Manual* and the *California Building Code* published by the ICBO. The correct equation is:

EQUATION 1-A—INSULATION THICKNESS EQUATION

$$T = PR\left[\left(1+\frac{t}{PR}\right)^{\frac{K}{k}}-1\right]$$

WHERE:

T = Minimum insulation thickness for material with conductivity *K*, inches.

PR = Pipe actual outside radius, inches.

t = Insulation thickness from Table 1-G, inches.

K = Conductivity of alternate material at the mean rating temperature indicated in Table 1-G for the applicable fluid temperature range, in Btu-inch per hour per square foot per °F.

k = The lower value of the conductivity range listed in Table 1-G for the applicable fluid temperature range, Btu-inch per hour per square foot per °F.

Blueprint # 68

Q: **Is There a recommended method to account for additional chandelier wattage and for filling out the related lighting forms LTG-1 and LTG-2?**

A: Yes. To account for chandelier wattage:

First, determine the allowed chandelier wattage:

The smallest of the following values may be added to the allowed lighting power listed in "Area Category Method," Table 1-N in Section 146(b)2 of the 2001 Efficiency Standards. For ornamental chandeliers and sconces that are switched or dimmed on circuits different from the circuits for general lighting, use the smallest of either a, b, or c listed below.

a. 20 watts per cubic foot times the volume of the chandelier or sconce; or

b. One watt per square foot times the area of the task space that the chandelier or sconce is in; or

c. The actual design wattage of the chandelier or sconce

Second, the LTG-2 and LTG-1 forms should be filled out as follows:

1. On the LTG-2 forms, under the "Area Category Method," on a separate line show the calculations for a or b above or use c (the actual design wattage) and enter the resulting wattage in the "Allowed Watts" column. Subtotal the "Area Category Method, Allowed Watts" column of the form. Be careful not to double count the "Allowed Lighting Power" with the "Actual Lightings Power."

2. On the LTG-1 form enter the additional wattage in the "Installed Lighting Schedule" section, "SUBTOTAL FROM THIS PAGE" box of the form.

Q: **Did the Commission change the energy code requirements that prohibited the use of cloth backed rubber adhesive duct tape unless it is installed with mastic and mechanical fasteners?**

A: No. This prohibition has been in effect for the tight duct credit since 1999. in the 2001 Standards, the Commission made the prohibition mandatory for all residential and nonresidential duct systems. Two cloth duct tape manufactures petitioned the Commission to reconsider the prohibition, resulting in a special rule making proceeding on the issue. The information submitted during this proceeding, including laboratory testing results, expert testimony and written and oral comments, reinforced the appropriateness of the existing prohibition. The Commission's decision to NOT change the Standards was supported by the California Building Officials, California Building Industry Association, Insulation Contractors Association, Pacific Gas and Electric Company, Lawrence Berkeley National Laboratory, Proctor Engineering Group and Intertape Polymer Group (a cloth duct tape manufacturer). You can review the Notice of Committee Conclusions that explains the reasons for continuing the prohibition at: www.energy.ca.gov/title24/ducttape/notices/2002-03-26_COM_CONCLUSIONS.PDF.

Q: **Is laminated glass that is sandwiched by two outer layers of glass with an inner layer material considered a double pane window?**

A: No. To be considered a double pane window an air space must exist between the two glass panes, regardless of lamination and coating. The space between the two panes needs to be hermetically dry and sealed airtight. The airspace is commonly 3/16-inches to 3/4 –inches wide.

Blueprint # 69

Q: **A nonresidential building is built without tenants to occupy it, the building has a common area and spaces for tenants. The builder installs the HVAC system chiller, boiler fans and controls. They also install the distribution system for the common area, but do not run the HVAC system until the first tenant spaces are occupied. The builder does not install insulation at the time of construction, preferring to wait until tenants move in. Must the inspector write this up as non-complying with the energy efficiency code?**

A: No. The energy efficiency code allows for speculative ("spec") buildings that are not occupied upon completion of the shell. Note that for common areas, where the HVAC system is fully installed, the envelope compliance must be completed. Not complying with the code at the time of initial construction carries consequences. For example, tenants located in areas of the building with large percentages of glass, or the last tenant to move in, may find that there is insufficient HVAC capacity to serve their area.

Buildings can comply on a component-by-component basis with mandatory and prescriptive measures. For example, if just the building's central mechanical plant

is completed, it must comply with the applicable mandatory and prescriptive measures by using either the prescriptive or performance approach. Envelope, lighting and water heating compliance can wait until tenants move in. The prescriptive or performance approaches (except for lighting only, which is limited to the prescriptive approach) could be use. Under either of these options, lighting an achieve compliance by using the prescriptive options (whole building, area method or tailored lighting). For more information, see Section 2.2.2F, of the Nonresidential Manual.

Q: **Do the building energy efficiency standards apply to boilers, heat exchangers and related equipment that serve a process load?**

A: No. The standards do not apply to equipment that serves a process load where that process load - or any recovered waste energy from that equipment- is not being used for space conditioning.

The standards apply only if the following conditions are met. First, the enclosed space is being heated or mechanically cooled by this process energy or by associated recovered waste energy.

Second, the occupancy type of the building (type A,B,E,F,H,R or S) is included in the energy standards. If either of these conditions is not met, then energy compliance does not have to be done.

Note that the equipment may need to comply with appliance standards requirements, depending on the type of equipment.

Q: **Do solar day lighting tubes need to meet the same requirements as skylights?**

A: No. The National Fenestration Rating Council (NFRC) now has an available methodology to standardize testing of solar day lighting tubing. For more information on the NFRC test method, phone (301) 589-1776.

For non-NFRC labeled solar day lighting tubes, use the Energy Commission's Default Table for the default values. If the diffuser is double pane, use the double pane default values, (The diffuser is the piece that is attached to the conditioned side of the ceiling that helps distribute day light into the space. The diffuser must be sealed and caulked to prevent infiltration into the conditioned space [Section 117 of the Standards.])

Blueprint # 70

Q: **Did one of the optics expire for NFRC certification of manufactured windows used for nonresidential buildings?**

A: Yes, after October 1, 2002 SHGC values for manufactured windows can no longer be calculated based on center of glass values. Now the SHGC must be based on NFRC 200 testing and labe4ling or obtained from the default table, Table 3-12 of the Nonresidential Manual. SHGC values for site-assembled windows in buildings less than 100,000 square feet or with less than 10,000 square feet of site-assembled windows can still be calculated based on center of glass values. See Table 3.11 of the Non residential Manual.

Blueprint # 71

Q: **Can you install a thermostat that cycles the ventilation fan off when the temperature set point has been satisfied (Sometimes called "a residential thermostat") in a non residential building?**

A: No, Standards Section 122(c)1 requires the minimum outside air ventilation, appropriate to the occupancy type of the building, to be provided continuously when the space is occupied in nonresidential buildings.

Q: **Do the Energy Commission's Building and Appliance Standards apply to federal military bases?**

A: **Building Standards** Construction on federal land (bases, federally-owned office buildings, etc.) does not have to comply with the building standards. Buildings that are leased by the federal government, however must comply with the building standards.

Appliance Standards The appliance standards apply if the applicant is sold or offered fro sale in California.

Q: **What are the new requirements for distribution transformers?**

A: Enforcement of the energy efficiency standards for distribution transformers is within the authority of both the California Energy Commission and local building officials. The Commission enforces the standards at the point of retail sale through appliance regulations found in Title 20. Local building officials enforce the standards thought their authority over "Title 24 construction." That is, local building officials are responsible for enforcing the state's energy efficiency standards for buildings, which are found in Title 24 of the California Code of Regulations.

In 2002 the Energy Commission adopted Appliance Efficiency Standards for such devices. The standards appear in Section 1605.3(t) of Title 20 of the California Code of regulation. The standards apply only if the transformer is a "low-voltage dry-type distribution transformer," which is defined as "a transformer that has an input voltage of 600 volts or less, that is air cooled, and that does not use oil as a coolant." The standards apply only to units manufactured on or after March 1, 2003.

More than a dozen types of transformers are excluded from the definition of "low voltage dry-type distribution transformer." These exclude types are defined in Section 1602(t) of the Commission's Appliance Efficiency Regulations (Title 20). To locate excluded transformers go to: www.energy.ca.gov/appliances_rulemaking/notices/index.html and click on the link for "April 16, 2003 Appliance Efficiency Regulations (Adobe Acrobat PDF file)."

Blueprint # 72

Q: What is the enforcement agency for State buildings? Do the energy Efficiency Standards requirements apply?

A: The enforcement agency for State buildings is the Real Estate Division, Professional Services Branch, Construction Services part of the Department of General Services (DGS) . States buildings must comply with all Parts of Title 24, including Part 6, the energy code.
Plans and specifications must be submitted to DGS. The local jurisdiction does not get involved. A State professional engineer must sign off or stamp the documents to indicate compliance with the energy code.