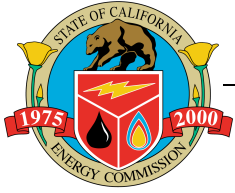


Cool Roofs in California's Title 24 Building Energy Efficiency Code 2005 Update and 2008 Preview

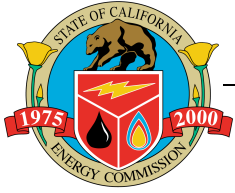
**CRRC Membership Meeting
February 13, 2006**

Elaine Hebert, Energy Specialist (Efficiency)
California Energy Commission, Sacramento



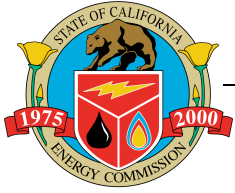
What We Will Cover Today

- Summary of Last Year's Presentation
 - How CA Title 24 (Part 6 is Energy Code) Works
 - Quick Review of T24 Cool Roof regulations
- Updates
- 2008 Preview
- Contact Information/Resources



Title 24, Part 6, California's Energy Code: How It Works

- Sets an energy budget for residential and nonresidential buildings
 - New buildings and additions/alterations (**alterations can include re-roofing**)
 - Budget is in kBtu/square foot/year
 - Budget varies by climate zone
 - **16** climate zones in California



Title 24, Part 6: How It Works (2)

Regulates the Following:

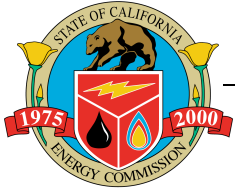
Insulation levels in walls,
floors, and
ceilings/attics/roofs

Tightness of air ducts

Allowed square footage
of windows, doors, and
skylights

Efficiency of

- Lighting
- Windows, doors,
skylights
- Water heating systems
- Space heating and
cooling systems
- Roofs (as of Oct 2005)



Meeting the Energy Budget

**Mandatory
Measures**

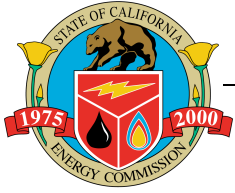
(for energy
efficiency)

AND

**Prescriptive
Measures**

OR

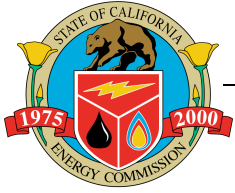
**Performance
Method**



“Prescriptive” means - -

- T24 provides a list of minimum energy efficiency measures – the list is like a prescription - for how to construct a building to meet the energy budget

The alternative to prescriptive is *performance* (computer-model how the building will perform energy-wise) – can trade off among energy efficiency measures



Cool Roofs Are on the “Prescriptive” List for Nonresidential Buildings (Cool roofs are NOT mandatory)

This means either

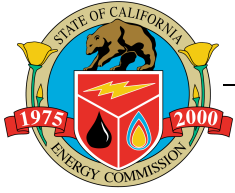
- Follow the prescription for a cool roof (next slide),
OR
- Do some other measure to have equivalent energy savings
 - Use either the overall envelope prescriptive method (allows tradeoffs among components of bldg envelope)
OR
 - Model the building via (approved) software – may make more sense for designing new bldg than for reroof



What is a Cool Roof under California's Title 24 Energy Standards?

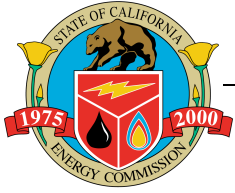
Must

- Be rated through CRRC (Title 24, Part 1, §10-113)
- Be properly labeled (Title 24, Part 1, §10-113)
- Meet reflectance and emittance requirements (≥ 0.70 and ≥ 0.75 respectively, or go by a formula if emittance is lower) [Part 6, §118(i)1 and 2]
- For coatings liquid-applied in the field, meet performance requirements [Part 6, §118(i)3 & Table 118-C]



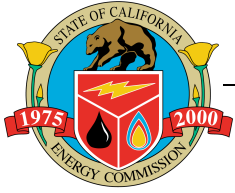
Title 24 Cool Roofs Apply to - -

- Conditioned space
- Low slopes ($\leq 2:12$)
- Nonresidential buildings except Occupancy Use “I” (institutions, hospitals, jails, etc) and hotels/motels
- *There are some allowances for cool roofs to help meet energy budgets for some high slopes and residences, using performance modeling*



Cool Roofs Are Optional (NOT prescriptive) for - -

- Hotels and motels
- High-rise residential buildings
- Unconditioned warehouses
- Refrigerated warehouses, other spaces held under 55°F, and spaces held over 90°F
- Buildings cooled by evaporative coolers
- Roofs with slopes over 2:12



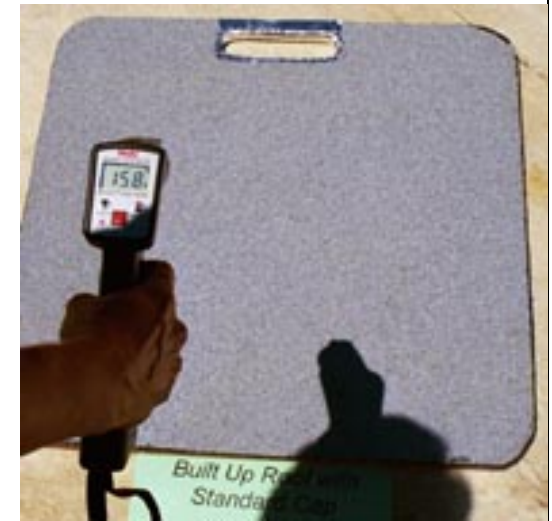
How Cool is a Cool Roof? (1)

Sacramento, CA July 12, 2000
89°F, about noon, with local delta breeze

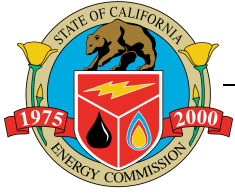
**EPDM
single-ply
173 °F**

**BUR topped
with aggregate
159 °F**

**BUR topped
with capsheet
158 °F**



Courtesy Dan Varvais, Applied Polymer Systems



How Cool is a Cool Roof? (2)

Sacramento, CA

July 12, 2000

89°F noon delta breeze

Cool single-ply

121 °F

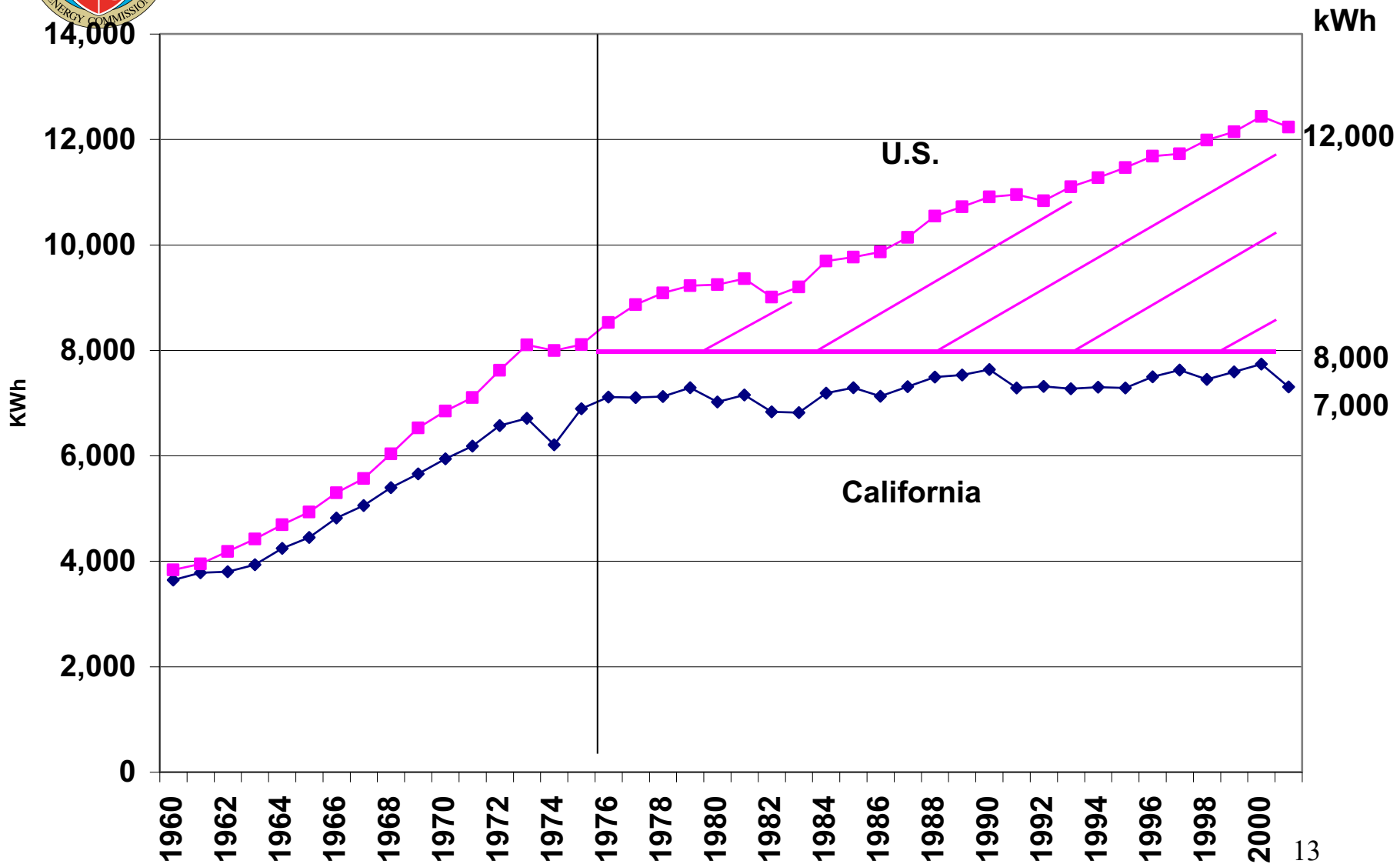
Cool coating over BUR

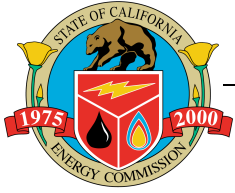
108 °F





Total Electricity Use, per capita, 1960 - 2001

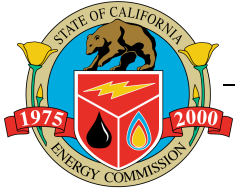




Nonresidential Re-roofing

Cool roofs apply if - -

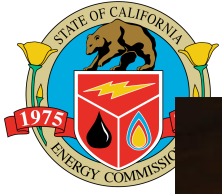
- more than 50% or 2,000 sf of low-sloped roof (whichever is less) is being replaced, recovered, or recoated [§149(b)1B]
 - This means put on a cool roof
- or
- Do some other equivalent energy efficiency measure with the building envelope (such as roof insulation)



Update: Conditioned Office Inside Unconditioned Warehouse – Time to Reroof. Cool Roof time??

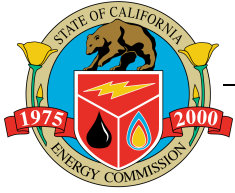
- IT DEPENDS....

We are still writing our interpretation

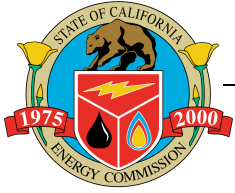


CALIFORNIA ENERGY COMMISSION

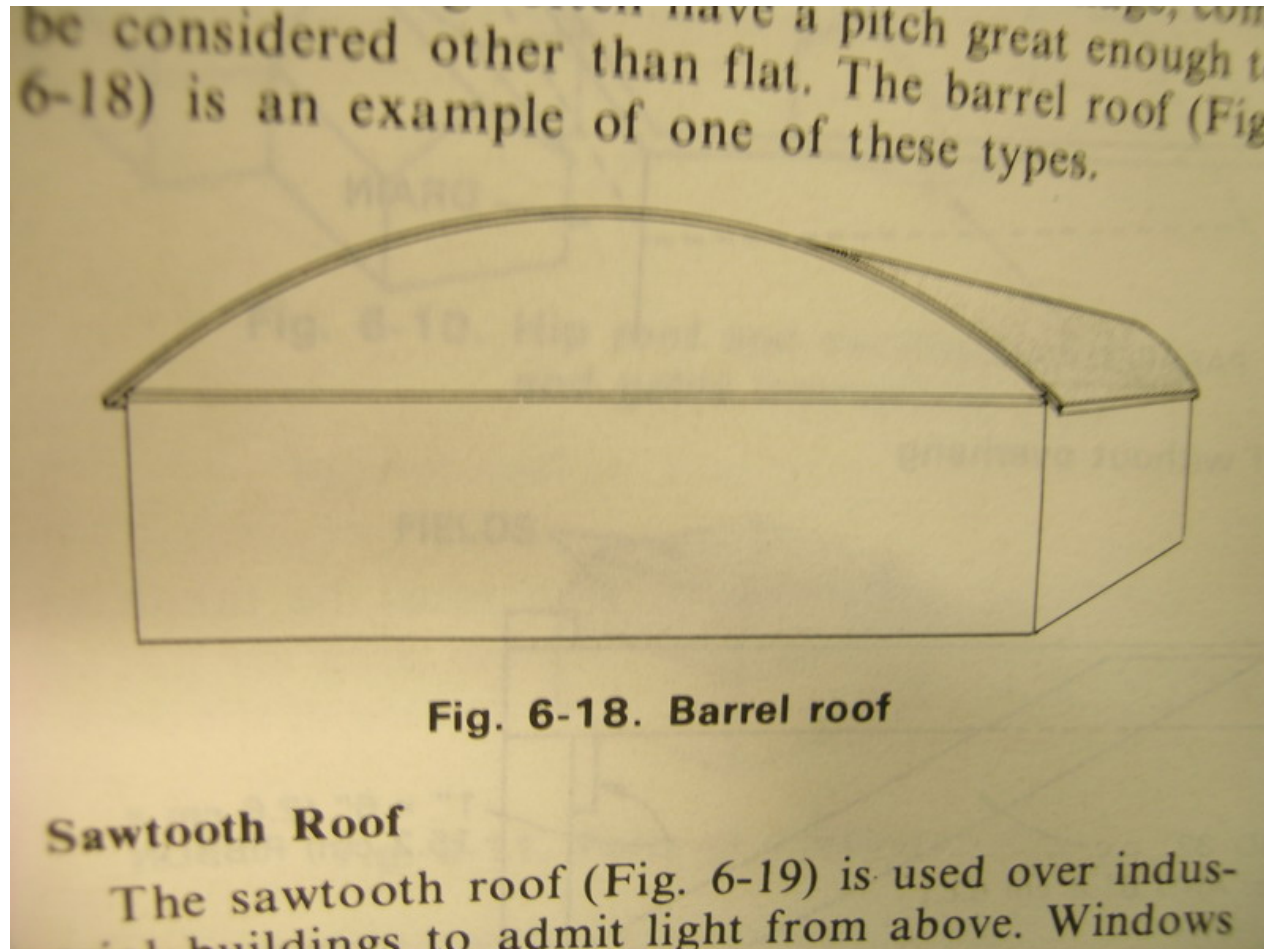




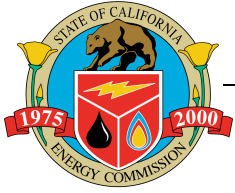
- If walls of conditioned space go all the way up to the roof of the warehouse, likely will need a cool roof **over the conditioned space**



Update: Barrel roofs



Courtesy John Goveia, DNG Group



Update: Field-applied liquid coatings

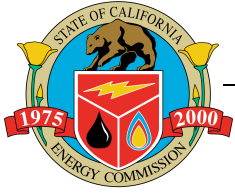
Under consideration now for taking effect before 2008

- Adding an ASTM test for low temperature elongation, initial and accelerated aging
- Changing the minimum dry mil thickness



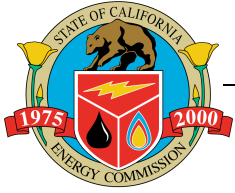
Under Consideration: 2008 Standards

- Removing cool roof requirements for some building types that are heated only, no air conditioning (a few climate zones only)
- Adding prescriptive reflective requirements for steep roofs
 - May differ for tiles vs. coated metal vs. asphalt shingles, etc.
 - For residential and nonresidential buildings
- Adding prescriptive reflective requirements for low-sloped residential
- Adding aged reflectance/emittance as alternative to initial



Under Consideration: 2008 Standards (2)

- Roofs with certain rock/gravel ballast – thermal mass properties may get energy credit
- Different equation for determining reflectance if emittance is less than prescriptive 0.75
- Adjustment to roof insulation levels needed with noncool roof
- Misc. clarification/cleanup of 2005 Standards



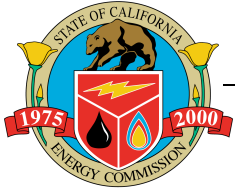
2008 Standards – We need your input - -

NOW!

TENTATIVE public meeting dates May 2-4, 2006 –
in Sacramento - - cool roofs to be discussed on at
least one of those days

More info via

- Two email list servers
- Website
- Myself



Resources

- www.energy.ca.gov/title24
- Title 24 Energy Hotline - 1-800-772-3300 (within CA), 916-654-5106 (outside CA), title24@energy.state.ca.us
- Title 24 Office – 916/654-4064
 - **Elaine Hebert** – 916/654-4800, ehebert@energy.state.ca.us
- Title 24 Energy Informational (Streaming) Videos (free) – www.energyvideos.com
- **COMING: our cool roofs website**