2016 Energy Standards Overview

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California Energy Commission

SEEC Forum
Riverside, CA
June 15, 2016
2016 Building Energy Efficiency Standards

• Effective on Jan. 1, 2017
  ➢ Building permit applications submitted on or after this date

• Master plans for tract homes affected:
  ➢ Need to resubmit if permits pulled on/after effective date
2016 Documents

- Building Energy Efficiency Standards
- Res. and Nonres. Compliance Manuals
- Reference Appendices
- All docs. available online at:
  www.energy.ca.gov/title24
2016 Residential Energy Savings

- Overall, 28% more efficient than 2013 Standards
  - Electric savings = 345 GWHs
  - Demand Reduction = 115 MW
  - Gas Savings = 31 Mtherms

- Monthly life cycle cost of $11 with savings of $31 for “typical” home (statewide)
2016 Nonresidential Energy Savings

- Overall, 5% more efficient than 2013 Standards
  - Electric Savings = 192 GWHs
  - Demand Reduction = 80 MW
  - Gas Savings = 0.9 Mtherms
Let’s begin with the Admin. Regulation changes for Residential Buildings
Administrative Regulations: Signatures and NSHP (§10-103)

• Delegation of Signature Authority
  ➢ Applies to Certificate of Installation (CF2R) Forms only
  ➢ Installing contractor/builder can designate someone as an authorized representative to sign form (likely a HERS Rater)
  ➢ Agreement, signatures, etc. will be facilitated by HERS Providers

• Exception to waive plan review and inspection for New Solar Homes Projects (NSHP) removed
Now for the changes to the Residential Energy Measures
Summary of Major Changes

• Solar ready zone exceptions revised

• Instantaneous water heaters
  ➢ Baseline for prescriptive and performance compliance

• High efficacy lighting
  ➢ New JA8 requirements

• High Performance Attics (HPA)
  ➢ Insulation required at ceiling and at the roof

• High Performance Walls (HPW)
  ➢ Maximum allowed U-factor lowered

* See summary of changes handout
Solar Ready – Mandatory
(§110.10)

• For single-family residences and low-rise multi family buildings:
  ➢ Smart thermostats and high efficacy lighting exception for solar zone and interconnection/documentation reqs. replaced with:
    ▪ Smart thermostat still required,
      and:
        ▪ Energy Star dishwasher and fridge, or whole house fan with an ECM; or
        ▪ Home automation controlling appliances and lighting that responds to demand response signals; or
        ▪ Alternate plumbing that dischargers clothes washer and shower/tub water for an irrigation system that complies with CA Plumbing Code; or
        ▪ Rainwater catchment system that complies with CA Plumbing Code and uses rainwater flowing from at least 65% of available roof area
Water Heating – Mandatory
(§110.3(c)7)

• Isolation valves required for instantaneous water heaters > 6.8 kBTU/hr (2 kW)

• Valves must be installed on cold line in, and hot water line leaving

• Valves simplify flushing the heat exchanger for maintenance
## Water Heating – Prescriptive

*(§150.1(c)8)*

<table>
<thead>
<tr>
<th>2013</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Instantaneous gas/propane, or</td>
<td>• Instantaneous gas/propane, or</td>
</tr>
<tr>
<td>• A single gas/propane storage water heater</td>
<td>• If single gas/propane storage is designed:</td>
</tr>
<tr>
<td>➢ Max input of 75,000 Btu/hr</td>
<td>➢ Max input of 105,000 Btu/hr</td>
</tr>
<tr>
<td>➢ No QII or HERS verification requirements</td>
<td>➢ Depending on tank size, QII or other HERS Verification measures required</td>
</tr>
<tr>
<td>• Electric-resistance allowed if natural gas is unavailable</td>
<td>• Electric-resistance <strong>removed</strong> as prescriptive option for newly constructed buildings</td>
</tr>
</tbody>
</table>
Lighting – Luminaire Efficacy
(§150.0(k)1A)

- Classification of efficacy has changed
  - Screw base can now be considered high efficacy

- Luminaires are either:
  - High efficacy by source types listed, or
  - Must be certified & labeled per JA8 to be classified as high efficacy
  - No low efficacy allowed!

<table>
<thead>
<tr>
<th>High Efficacy Light Sources</th>
<th>Light sources in this column shall be certified to the Commission as High Efficacy Light Sources in accordance with Reference Joint Appendix JA8 and be marked as meeting JA8.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light sources in this column other than those installed in ceiling recessed downlight luminaires are classified as high efficacy and are not required to comply with Reference Joint Appendix JA8</td>
<td>Light sources in this column other than those installed in ceiling recessed downlight luminaires are classified as high efficacy and are not required to comply with Reference Joint Appendix JA8.</td>
</tr>
<tr>
<td>1. Pin-based linear or compact fluorescent light sources using electronic ballasts.</td>
<td>8. All light sources in ceiling recessed downlight luminaires. Note that ceiling recessed downlight luminaires shall not have screw bases regardless of lamp type as described in Section 150.0(k)1C.</td>
</tr>
<tr>
<td>3. High pressure sodium.</td>
<td>10. Any light source not otherwise listed in this table and certified to the Commission as complying with Joint Appendix 8.</td>
</tr>
<tr>
<td>4. GU-24 sockets containing light sources other than LEDs.</td>
<td></td>
</tr>
<tr>
<td>5. Luminaires with hardwired high frequency generator and induction lamp.</td>
<td></td>
</tr>
<tr>
<td>6. Inseparable SSL luminaires that are installed outdoors.</td>
<td></td>
</tr>
<tr>
<td>7. Inseparable SSL luminaires containing colored light sources that are installed to provide decorative lighting.</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- a. GU-24 sockets containing light sources such as compact fluorescent lamps and induction lamps.
- b. California Title 20 Section 1605(k)3 does not allow incandescent sources to have a GU-24 base.
# Lighting – Luminaire Efficacy

(§150.0(k)1A, cont’d)

<table>
<thead>
<tr>
<th>Auto High Efficacy List</th>
<th>(No JA8 Certification Required)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2013 Standards</strong></td>
<td><strong>2016 Standards</strong></td>
</tr>
<tr>
<td>Pin-based linear or Compact Fluorescent</td>
<td>No Change</td>
</tr>
<tr>
<td>GU-24 Sockets rated for CFLs/LEDs</td>
<td>Only GU24 sockets rated for use with other than LED light sources (CFL/Induction)</td>
</tr>
<tr>
<td>Pulse Start Metal Halide &amp; High Pressure Sodium</td>
<td>No Change</td>
</tr>
<tr>
<td><strong>Induction</strong></td>
<td>Luminaires with high frequency generator and <strong>induction</strong> lamp</td>
</tr>
<tr>
<td>LEDs Certified to the CEC as High Efficacy</td>
<td>Inseparable Solid State Lighting (SSL, aka LED) installed outdoors, or decorative</td>
</tr>
</tbody>
</table>
## JA8 Certification & Labeling Required for High Efficacy Classification

<table>
<thead>
<tr>
<th>Light Source Type</th>
<th>More Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recessed Downlights in Ceilings – All Lighting Sources</td>
<td>1. Tested for elevated temperature</td>
</tr>
<tr>
<td></td>
<td>2. Cannot have screw base socket, regardless of lamp</td>
</tr>
<tr>
<td>LEDs – Indoor, Non-decorative</td>
<td>Including GU-24 base luminaires containing LEDs</td>
</tr>
<tr>
<td>Any lamp designed for use in screw base socket</td>
<td></td>
</tr>
<tr>
<td>All others not listed on this or previous table</td>
<td></td>
</tr>
</tbody>
</table>
## Ceiling/Wall Insulation: Mandatory (§150.0(a), (c))

<table>
<thead>
<tr>
<th>2013</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Insulation placement language in §110.8</td>
<td>• Moved to §150.0(a)</td>
</tr>
<tr>
<td>• Roof/ceiling insulation required:</td>
<td>• Roof/ceiling insulation reduced:</td>
</tr>
<tr>
<td>➢ 0.031 max U-factor/R-30</td>
<td>➢ 0.043 max U-factor/R-22</td>
</tr>
<tr>
<td>• Addresses only framed walls</td>
<td>• Non-framed walls must meet max 0.102 U-factor</td>
</tr>
</tbody>
</table>
# Ceiling/Roof Insulation: Prescriptive (§150.1(c)1A)

<table>
<thead>
<tr>
<th>2013</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Meet R-Value or U-Factor</td>
<td>• Introduction of “high performance attics” requirements</td>
</tr>
<tr>
<td>• Installed at ceiling or roof</td>
<td>• Insulation required at ceiling &amp; roof depending on Option &amp; CZ</td>
</tr>
<tr>
<td></td>
<td>• Radiant barrier &amp; duct location/insulation requirements also depend on Option &amp; CZ</td>
</tr>
<tr>
<td></td>
<td>• 3 Options available</td>
</tr>
<tr>
<td></td>
<td>• Photovoltaic system trade-off option proportional to HPA &amp; HPW</td>
</tr>
</tbody>
</table>
Ceiling/Roof Insulation: Prescriptive (§150.1(c)1A, cont’d)

- **Option A**

  - Per **TABLE 150.1-A**
    - Continuous insulation required **above roof rafters** in some Climate Zones
    - Ceiling insulation required
    - Radiant barrier required in Climate Zones 2 through 15
    - Must meet §150.1(c)9A
Ceiling/Roof Insulation: Prescriptive (§150.1(c)1A, cont’d)

- **Option B**
  - Per **TABLE 150.1-A**
    - Insulation required **below roof deck** in some Climate Zones
    - Ceiling insulation required
    - Radiant barrier required in Climate Zones 2, 3 and 5 through 7
    - Must meet §150.1(c)9A
Ceiling/Roof Insulation: Prescriptive (§150.1(c)1A, cont’d)

- **Option C**
  - Per **TABLE 150.1-A**
    - Ceiling insulation required
    - Radiant barrier required in Climate Zones 2 through 15
    - Must meet §150.1(c)9B
    - Duct are located in conditioned space (HERS verified)
## Wall Insulation – Prescriptive
(§150.1(c)1B)

<table>
<thead>
<tr>
<th>2013</th>
<th>2016</th>
</tr>
</thead>
</table>
| • Cavity insulation R-value; and  
• Continuous insulation R-value  
OR  
• Meet U-Factor | • “High performance walls” requirements introduced  
• Per [TABLE 150.1-A](#):  
  ➢ Maximum U-Factor specified  
  ➢ Req. U-Factor lowered (more stringent)  
  ➢ Provides for greater design flexibility |
QUESTIONS…

About the residential requirement changes?
Let’s change course
and talk about
Nonresidential Buildings
Administrative Regulations: Signatures and ATTCP (§10-103)

- Design Review Kickoff and Checklist NRCC
  - Language revised to be more inclusive of eligible reviewers and signers
  - Can be a licensed professional engineer, architect, or contractor under the direct supervision of a P.E. or architect

- Acceptance Test Technician Certification Providers
  - Section numbers changed to 10-103.1 and 10-103.2
  - Updates to annual reporting and application amendment reqs.
  - These changes will be facilitated by the ATTCPs
Now let’s talk about the changes to the Nonresidential Energy Measures
Summary of Major Changes

- **Equipment efficiencies**
  - Minimum reqs. increased

- **Direct digital controls**

- **Door & window interlocks**
  - New sensor reqs. to turn HVAC off

- **Covered Processes**
  - New reqs. for elevators and escalators

- **Envelope U-factors**
  - Maximum values lowered

- **Indoor and outdoor lighting**
  - Power allowances reduced
  - Indoor lighting alterations

* See summary of changes handout
HVAC Efficiency – Mandatory

(§110.2)

• Minimum efficiencies updated for mid-size/larger:
  - A/Cs and condensing units
  - Unitary and applied heat pumps
  - Water chilling packages
  - Packaged terminal A/Cs and heat pumps
  - Warm air unit heaters (oil fired)
  - Gas and oil-fired boilers

• Listed in TABLES 110.2-A through 110.2-K
Direct Digital Controls – Mandatory (§120.2(j))

- DDC to the zone req. per TABLE 120.2
- Be capable of:
  - Monitoring fan and pump pressure, heat/cool
  - Transferring zone and demand info.
  - Removing zones form reset algorithm
  - Displaying input/output points
  - Resetting heat/cool setpoints

<table>
<thead>
<tr>
<th>BUILDING STATUS</th>
<th>APPLICATIONS</th>
<th>QUALIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newly Constructed Buildings</td>
<td>Air handling system and all zones served by the system</td>
<td>Individual systems supplying more than three zones and with design heating or cooling capacity of 300 kBTu/h and larger</td>
</tr>
<tr>
<td>Newly Constructed Buildings</td>
<td>Chilled water plant and all coils and terminal units served by the system</td>
<td>Individual plants supplying more than three zones and with design cooling capacity of 300 kBTu/h (87.9 kW) and larger</td>
</tr>
<tr>
<td>Newly Constructed Buildings</td>
<td>Hot water plant and all coils and terminal units served by the system</td>
<td>Individual plants supplying more than three zones and with design heating capacity of 300 kBTu/h (87.9 kW) and larger</td>
</tr>
<tr>
<td>Additions or Alterations</td>
<td>Zone terminal unit such as VAV box</td>
<td>Where existing zones served by the same air handling, chilled water, or hot water systems have DDC</td>
</tr>
<tr>
<td>Additions or Alterations</td>
<td>Air handling system or fan coil</td>
<td>Where existing air handling system(s) and fan coil(s) served by the same chilled or hot water plant have DDC</td>
</tr>
<tr>
<td>Additions or Alterations</td>
<td>New air handling system and all new zones served by the system</td>
<td>Individual systems with design heating or cooling capacity of 300 kBTu/h and larger and supplying more than three zones and more than 75 percent of zones are new</td>
</tr>
<tr>
<td>Additions or Alterations</td>
<td>New or upgraded chilled water plant</td>
<td>Where all chillers are new and plant design cooling capacity is 300 kBTu/h (87.9 kW) and larger</td>
</tr>
<tr>
<td>Additions or Alterations</td>
<td>New or upgraded hot water plant</td>
<td>Where all boilers are new and plant design heating capacity is 300 kBTu/h (87.9 kW) and larger</td>
</tr>
</tbody>
</table>
HVAC Shut-Off – Prescriptive
(§140.4(n))

• Directly conditioned spaces with operable wall or roof openings shall have interlock controls that:
  ➢ Disable or reset the temperature setpoint to 55°F for heating; and
  ➢ Disable or reset the temperature setpoint to 90°F for cooling

• Controls must initiate when window/skylight is open for more than 5 minutes

• Exceptions:
  ➢ Doors with automatic closing devices
  ➢ Spaces without a thermostatic control (thermostat or temperature sensor) for heating or cooling
Covered Processes: Elevators
(§120.6 (f))

- **New mandatory requirements for elevators**
  - LPD shall be \( \leq 0.6 \text{ watts/ft}^2 \)
  - Ventilation for cabs without A/C shall be \( \leq 0.33 \text{ watts/cfm} \)
  - Lights and ventilation shut-off when unused for over 15 minutes
    - Lighting & ventilation shall remain operational in event cab is stuck and occupied
  - Acceptance testing required
Covered Processes: Escalators & Moving Walkways (§120.6 (g))

- New mandatory requirements for escalators and moving walkways:
  - Located in airports, hotels, and transportation areas
  - Shall reduce to minimum permitted speed (ASME A17.1/CSA B44) when not conveying passengers
  - Acceptance testing required

Source: www.telcosensors.com/solutions/industries/elevators
Envelope – Prescriptive

(§140.3(a), (c))

- **Roof/ceiling insulation tradeoff for aged solar reflectance revised**
  - Max. U-Factors reqs. lower in TABLE 140.3

- **Max. U-Factors for ceiling/roofs and walls lowered**
  - TABLES 140.3-B through D

- **Min. daylighting requirements updated**
Indoor Lighting – Prescriptive
(§140.6(a))

New for 2016:

- LPDs have been reduced for Complete Building, Area Category, and Tailored Method
- Two new PAFs added
  - Daylight dimming plus Off
  - Institutionalized tuning
- Three PAFs removed since the control strategies are now mandatory
  - Partial-ON occupancy sensors
  - Manual Dimming/Multiscene programmable controls
  - Combined manual dimming plus partial-ON occupancy sensor
Power Adjustment Factors - Prescriptive (§140.6(a)2)

- Power Adjustment Factor (PAF): Allows a reduction of calculated actual indoor lighting power by the factors below.

<table>
<thead>
<tr>
<th>TYPE OF CONTROL</th>
<th>TYPE OF AREA</th>
<th>FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Daylight Dimming plus OFF Control</td>
<td>Luminaires in skylit daylit zone or primary side lit daylit zone</td>
<td>0.10</td>
</tr>
<tr>
<td>2. Occupant Sensing Controls in Large Open Plan Offices</td>
<td>In open plan offices &gt; 250 square feet: One sensor controlling an area that is:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No larger than 125 square feet</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>From 126 to 250 square feet</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>From 251 to 500 square feet</td>
<td>0.20</td>
</tr>
<tr>
<td>3. Institutional Tuning</td>
<td>Luminaires in non-daylit areas:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Luminaires that qualify for other PAFs in this table may also qualify for this tuning PAF.</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>Luminaires in daylit areas:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Luminaires that qualify for other PAFs in this table may also qualify for this tuning PAF.</td>
<td>0.05</td>
</tr>
<tr>
<td>4. Demand Responsive Control</td>
<td>All building types less than 10,000 square feet.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Luminaires that qualify for other PAFs in this table may also qualify for this demand responsive control PAF</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Indoor Lighting Alterations
(§141.0(b)2I, J)

- Simplification of lighting alterations in existing buildings
  - Simplified language, tailored requirements to project size
  - New option to reduce control requirements in exchange for more power reduction for replaced or modified luminaires
  - Acceptance testing no longer required for projects where controls are added to control 20 or fewer luminaires
    - Applies to indoor and outdoor lighting alterations
§140.1(b)2I, J: Indoor Lighting Alterations \textit{cont.}

<table>
<thead>
<tr>
<th>2013</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Lighting System Alterations</td>
<td>• Entire Luminaire Alterations</td>
</tr>
<tr>
<td>• Luminaire Modification in Place</td>
<td>- Removing and reinstalling same luminaires (≥ 10% of existing)</td>
</tr>
<tr>
<td></td>
<td>- Replacing/adding luminaires</td>
</tr>
<tr>
<td></td>
<td>- Adding, removing, replacing walls along with redesign of lighting system</td>
</tr>
<tr>
<td></td>
<td>• Luminaire Component Modification</td>
</tr>
<tr>
<td></td>
<td>- Replacing ballast/driver and lamps</td>
</tr>
<tr>
<td></td>
<td>- Changing the light source</td>
</tr>
<tr>
<td></td>
<td>- Changing the optical system</td>
</tr>
</tbody>
</table>
§140.1(b)2I, J: Indoor Lighting Alterations cont.

Two options for meeting power and control req.

1. Meet LPD requirements and controls per **TABLE 141.0-E**
   - Area control
   - Multilevel lighting control
   - Shutoff control
   - Automatic daylight control
   - Demand responsive control
   Similar to 2013

2. Reduce existing lighting power by 50% or 35% and controls
   - Area control
   - Shutoff control

New for 2016
# Indoor Lighting Alterations

(Table 5-4 of 2016 Nonresidential Compliance Manual)

<table>
<thead>
<tr>
<th>Applicable Section 130.1 Control requirements:</th>
<th>Lighting power is reduced by 35/50% compared to existing</th>
<th>Resulting lighting power, compared to the lighting power allowance specified in Section 140.6(c)(2), Area Category Method</th>
<th>Lighting power is ≤ 85% of allowance</th>
<th>Lighting power is &gt; 85% to 100% of allowance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 130.1(a), 2, and 3 Area Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>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</td>
<td>Not Required</td>
<td>Bi-level control for each enclosed space, minimum one step between 30-70 percent of lighting power regardless of luminaire type, or meet Section 130.1(b)</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Section 130.1(c) Shut-Off Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Section 130.1(d) Automatic Daylight Controls</td>
<td>Not Required</td>
<td>Not Required</td>
<td>Not Required</td>
<td>Yes</td>
</tr>
<tr>
<td>Section 130.1(e) Demand Responsive Controls – only for alterations &gt; 10,000 ft² 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</td>
<td>Not Required</td>
<td>Not Required</td>
<td>Not Required</td>
<td>Yes</td>
</tr>
</tbody>
</table>
QUESTIONS…

About the nonresidential requirement changes?
Let’s finish with some Resources
Approved 2016 Compliance Software

Used to demonstrate compliance with the Energy Standards when using the Performance Approach

• Residential
  ➢ CBECC-Res
  ➢ Energy Pro
  ➢ Wrightsoft Right-Energy

• Nonresidential
  ➢ CBECC-Com
  ➢ Energy Pro

More information at:
http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html
2013 Approved HERS Providers

• New construction and HVAC alterations
  ➢ CalCERTS

• New construction ONLY
  ➢ CHEERS

• HVAC alterations ONLY
  ➢ U.S. Energy Raters Association (USERA)

More information at: http://www.energy.ca.gov/HERS/providers.html
2013 Approved ATTCPS

• Mechanical ATTCPS
  - NEMIC (replaced TABB)
  - NEBB

• Lighting ATTCPS
  - CALCTP
  - NLCAA

More information at:
http://www.energy.ca.gov/title24/attcp/
Published every other month

Clarifications on frequently asked questions

Receive by e-mail

http://www.energy.ca.gov/efficiency/blueprint/
2013 Fact Sheets

- 5 published to date
- Detailed clarifications on specific topic/requirements
- Receive by e-mail (listserver)

http://www.energy.ca.gov/efficiency/factsheets/
2016 Training

• Provided by Utilities

• Free of charge

• Can request for training in your region/area

• CEC training

• http://www.energy.ca.gov/title24/training/
Energy Code Ace

- Forms tools
- Free training (in person and online)
- Checklists, Trigger Sheets for building dept.

http://www.energycodeace.com/content/home/
Hotline

• Toll-free in California

• Open Monday through Friday
  ➢ 8:00 a.m. to noon, and
  1:00 p.m. to 4:30 p.m.

• Call at:
  ➢ 1-800-772-3300 (In CA)
  ➢ (916) 654-5106 (Outside CA)

• Or, e-mail at: Title24@energy.ca.gov
Listservers

• Main conduit for communicating with stakeholders

• Sign up at:
  ➢ http://www.energy.ca.gov/listservers/

• Subscribe to the following Efficiency Lists:
  ➢ Building Standards
  ➢ Blueprint

• Respond to confirmation e-mail within 24 hours