Title 24 Standards Essentials

What triggers the Energy Code (Title 24, part 6)?

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McHugh Energy Consultants Inc.

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California Building & Appliance Standards

- Building Standards (Title 24)
  - Part of “building code”
  - Enforced by building department
    - Local jurisdiction decides when permit required for retrofits

- Appliance Standards
  - Efficiency requirements at time of sale
  - Covered products must be in CEC appliance databases
  - Spot checks by CEC
  - Appliance efficiency required by building code
Title 24 Officially is all Building Codes, But often refers to only Part 6 - the Building Efficiency Standards

- Part 1 - California Building Standards Admin Code
- Part 2 - California Building Code
- Part 3 - California Electrical Code
- Part 4 - California Mechanical Code
- Part 5 - California Plumbing Code
- Part 6 - California Energy Code
- Part 7 - California Elevator Safety Construction Code
- Part 8 - California Historical Building Code
- Part 9 - California Fire Code
- Part 10 - California Code for Building Conservation
- Part 11 – California Green Building Standard
Where Can The Information Be Found?

2013 Building Energy Efficiency Standards

California’s Building Energy Efficiency Standards are updated on an approximately three-year cycle. The 2013 Standards will continue to improve upon the current 2008 Standards for new construction of, and additions and alterations to, residential and nonresidential buildings. The 2013 Standards will go into effect on July 1, 2014.

To know what has changed from the 2008 Standards, see the Summary of Major Changes from 2008

Standards, Compliance Manuals and Forms

- **NEW** NOTICE: Revised Effective Date for the 2013 California Building Energy Efficiency Standards
- 2013 Building Energy Efficiency Standards for Residential and Nonresidential Buildings - Revised
  Posted November 25, 2013. (PDF file, 263 pages, 1.9 mb)
  - Nonsubstantial Errata - November 2013
  - Nonsubstantial Errata - October 2013
  - Nonsubstantial Errata - September 2013
  - Supplement to Nonsubstantial Errata - December 2012
  - Nonsubstantive Errata - May 2012

- 2013 Reference Appendices. Revised
  Posted November 25, 2013. (PDF file, 561 pages, 6.5 mb)
- 2013 Residential Compliance Manual & Forms Page
- 2013 Nonresidential Compliance Manual & Forms Page
Application of Standards (Table 100.0-A)

<table>
<thead>
<tr>
<th>Occupancies</th>
<th>Application</th>
<th>Mandatory</th>
<th>Prescriptive</th>
<th>Performance</th>
<th>Additions/Alterations</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
<td>140.0</td>
<td>140.2</td>
<td></td>
<td>140.1</td>
</tr>
<tr>
<td>Envelope (conditioned)</td>
<td></td>
<td>110.6, 110.7, 110.8, 110.110.7</td>
<td>140.3</td>
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<tr>
<td>Envelope (unconditioned process spaces)</td>
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<td>N.A.</td>
<td>140.5(c)</td>
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<td>140.4</td>
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<td>Water Heating</td>
<td></td>
<td>110.3, 120.3, 120.8</td>
<td>140.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indoor Lighting (conditioned, process spaces)</td>
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<td>110.6, 120.8, 139.0, 150.1, 150.4</td>
<td>140.3(c), 140.6</td>
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<td>Indoor Lighting (unconditioned, and parking garages)</td>
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<td>110.9, 120.8, 139.0, 150.1, 150.4</td>
<td>140.3(c), 140.6</td>
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<tr>
<td>Outdoor Lighting</td>
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<td>140.7</td>
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<td></td>
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<td>141.0</td>
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<td>Covered Processes</td>
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<td>110.2, 120.6, 120.8</td>
<td>140.9</td>
<td>120.6, 140.9</td>
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<td>Signs</td>
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<td>130.0, 130.3</td>
<td>140.8</td>
<td>N.A.</td>
<td>141.9</td>
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<td>150.1(a, b)</td>
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<td>Solar Ready Buildings</td>
<td></td>
<td>110.10</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

Number system has changed by adding decimal: 100.1 was 101

**New sections**

110.1: “Solar Ready” buildings

120.6: NR: “Covered Processes” instead of “Refrigerated Warehouses”

120.7: NR “Mandatory Insulation Requirements”

120.8: NR “Building Commissioning”

120.9: NR “Mandatory Requirements for Commercial Boilers”

130.5: NR “Electrical Power Distribution Systems”

140.9: NR “Prescriptive Requirements For Covered Processes”

141.1: NR “Requirements For Covered Processes In Additions, Alterations To Existing Buildings That Will Be Nonresidential, High-Rise Residential, And Hotel/Motel Occupancies”

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

- Refrigeration system efficiency
  - Refrigerated warehouses > 3,000 sf
  - Supermarkets > 8,000 sf
- Parking Garages
  - Motion controlled bi-level lighting
  - CO controlled VSD exhaust fans
- Industrial boiler efficiency
  - Vent or flue damper
  - Parallel positioning and trim controls
- Compressed air controls and swing compressor unloading
- Computer room and data center HVAC
  - Air or water economizer
  - No reheat or steam humidification
  - Air containment, fan control and fan power
- Commercial kitchens ventilation control
- Laboratory exhaust systems where less than 10 ACH is required
  - Variable zone exhaust and make-up air
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- Permits Can Save Money: Permits can save you money when you build.
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Ace Resources™

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* Trigger Sheets – Summaries of sections of Title 24, Part 6 that are triggered based on project scope.

* Checklists – Coming Soon!

* FAQs – Coming Soon!

All tools, training and resources are offered free of charge

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Fact Sheets & Trigger Sheets

2013 Sheets Now Available!

2013 Trigger Sheets

- 2013 Trigger Sheet: Nonresidential Interior Lighting Alterations
- 2013 Trigger Sheet: Nonresidential Exterior Lighting
- 2013 Trigger Sheet: Nonresidential Fenestration
- 2013 Trigger Sheet: Small Commercial HVAC Changeouts
- 2013 Trigger Sheet: Nonresidential Lighting Controls – Additions & Alterations
- 2013 Trigger Sheet: Nonresidential HVAC Controls
- 2013 Trigger Sheet: Nonresidential HVAC Built-up Alterations
- 2013 Trigger Sheet: Nonresidential Lighting Controls – New Construction
- 2013 Trigger Sheet: Refrigeration
- 2013 Trigger Sheets: Small Commercial HVAC Alterations
- 2013 Trigger Sheet: Residential HVAC Alterations

2013 Fact Sheets

- 2013 Fact Sheet: Nonresidential Daylighting and Daylighting Controls
- 2013 Fact Sheet: Nonresidential Lighting Controls for Credit
- 2013 Fact Sheet: Nonresidential Lighting Mandatory Controls
- 2013 Fact Sheet: Residential Lighting
- 2013 Fact Sheet: Residential Fenestration
- 2013 Fact Sheet: Nonresidential Cool Roofs
How to Use Trigger Sheets

- Trigger Sheets identify which code sections to apply with various new construction and retrofit scenarios
  - Use in conjunction with T-24 code and/or compliance manual
- Most of code written with new construction in mind
  - But over 2/3s of permits are for retrofits
  - New construction is approximately 1.5% of existing building stock
- Nonresidential retrofits (Section 141.0)
- Industrial retrofits (included in Section 120.6)
  - Refrigeration alterations: only part altered has requirement
  - Exceptions for retrofits
## Nonresidential Fenestration (Windows and Skylights)

<table>
<thead>
<tr>
<th>Alterations to Skylights</th>
<th>Mandatory Measures</th>
<th>Prescriptive Requirements</th>
<th>Conditional Compliance Option</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NRCF Ratings §110.6(a)</td>
<td>Window Wall Ratio ≤ 0.40 §140.3 (a)5A</td>
<td>Skylight to Roof Ratio ≤ 0.05 §141.0 (b)2A</td>
</tr>
<tr>
<td>Add skylight &gt; 30 sq. ft</td>
<td>YES no</td>
<td>YESA</td>
<td>no</td>
</tr>
<tr>
<td>Add skylight ≤ 30 sq. ft</td>
<td>YES no</td>
<td>YESA</td>
<td>no</td>
</tr>
<tr>
<td>Replace skylight &gt; 150 sq. ft</td>
<td>YES no</td>
<td>YES</td>
<td>no</td>
</tr>
<tr>
<td>Replace skylight ≤ 150 sq. ft</td>
<td>YES no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Alter Existing Skylight</td>
<td>YES no</td>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>

**Footnotes:**

A. Atria over 55 ft high is limited to a maximum 0.10 skylight to roof ratio

B. The minimum skylight daylit area requirement applies to roofs directly over spaces > 5,000 sq. ft. with a ceiling height of at least 15 ft and interior LPD of at least 0.5 W/sq. ft.

C. See table 141.0-A for efficiency values

D. VT ≥ 0.11/WWR also applicable

E. See table 140.3 –B, C or D for minimum VT value

F. Window Films are applicable for use in existing glass in existing buildings and must be modeled under the performance approach to receive performance SHGC credit and must meet the criteria of NA7.4.2.

G. Dynamic Glazing must use automatic controls and must meet the criteria in NA7.4.3
# Lighting Alteration Triggers

<table>
<thead>
<tr>
<th>Change this (and nothing else)</th>
<th>Mandatory Measures</th>
<th>Prescriptive Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lighting Control Devices &amp; Systems §110.9</td>
<td>Indoor Lighting Controls §130.1</td>
</tr>
<tr>
<td>Luminaire Addition</td>
<td>YES</td>
<td>YES ABCDE no</td>
</tr>
<tr>
<td>Luminaire Alteration, &lt;=85% of allowed Area Category lighting power</td>
<td>YES</td>
<td>YES ABCDE no</td>
</tr>
<tr>
<td>Luminaire Alteration, &gt;85% of allowed Area Category lighting power</td>
<td>YES</td>
<td>YES ABCDE no</td>
</tr>
<tr>
<td>Skylights or Daylighting Controls</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Luminaire Modification In-Place (Quantity &gt;=40)</td>
<td>YES</td>
<td>YES ABCD</td>
</tr>
<tr>
<td>Lighting Wiring Alterations</td>
<td>YES</td>
<td>no</td>
</tr>
<tr>
<td>Illuminated Signs</td>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>

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**130.1(a)** - Area Controls: All luminaires shall be functionally controlled with manually switched ON and OFF lighting controls. Each area enclosed by ceiling-height partitions shall be independently controlled.

**130.1(b)** - Multi-Level Lighting Controls: The general lighting of any enclosed area 100 square feet or larger, with a connected lighting load that exceeds 0.5W per square foot shall meet the requirements of §130.1(b).

**130.1(c)** - Shut-Off Controls: In addition to lighting controls installed to comply with Sections 130.1 (a) and (b), all installed indoor lighting shall be equipped with controls that meet the requirements of §130.1(c).

**130.1(d)** - Automatic Daylighting Controls: Any altered luminaires providing general lighting that are in or are partially in daylit zones shall meet the requirements of §130.1 (d).

**130.1(e)** - Demand Responsive Controls: If space is added, or lighting power is increased, lighting power in buildings larger than 10,000 sq. ft. shall be capable of being automatically reduced in response to a demand response signal as per §130.1(e).
Luminaire Modifications [Section 141.0(b)2lii]

“...alterations where an existing lighting system is modified, luminaires are replaced, or luminaires are disconnected from the circuit, removed and reinstalled, whether in the same location or installed elsewhere.”

Also adding new luminaires

Luminaire Modifications-in-Place [Section 141.0(b)2liii]

Replacing lamps and ballasts with like type or quantity in a manner that preserves the original luminaire listing.

Changing the number or type of light source:
- socket renewal, relocation of lampholders, and internal wiring

Changing the optical system of a luminaire in part or in whole.

Replacement of whole luminaires one for one
- only disconnecting the existing luminaire and reconnecting the replacement luminaire.

Not a luminaire modification in place:
- part of general remodeling or renovation of the enclosed space
- involve any changes to the panelboard or branch circuit wiring
TABLE 141.0-E Requirements for Luminaire Alterations

<table>
<thead>
<tr>
<th>Quantity of existing affected luminaires per Enclosed Space</th>
<th>Resulting Lighting Power for Each Enclosed Space</th>
<th>Applicable Mandatory Control Provisions for Each Enclosed Space</th>
<th>Multi-level Lighting Control Requirements for Each Altered Luminaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alterations that do not change the area of the enclosed space or the space type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum total &lt; 10% of existing luminaires</td>
<td>Existing lighting power is permitted</td>
<td>Existing provisions are permitted</td>
<td>Existing controls are permitted</td>
</tr>
<tr>
<td>Sum total ≥ 10% of existing luminaires</td>
<td>≤ 85% of allowed lighting power per Section 140.6 Area Category Method</td>
<td>§130.1(a), (c)</td>
<td>Two level lighting control ² or §130.1(b)</td>
</tr>
<tr>
<td></td>
<td>&gt; 85% of allowed lighting power per Section 140.6 Area Category Method</td>
<td>§130.1(a), (c), (d) ³</td>
<td>§130.1(b)</td>
</tr>
<tr>
<td>Alterations that change the area of the enclosed space or the space type or increase the lighting power in the enclosed space</td>
<td>Any number</td>
<td>Comply with Section 140.6</td>
<td>§130.0(d) ³</td>
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<td></td>
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<td>§130.1(a), (c), (d) ³, (e)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>§130.1(b)</td>
</tr>
</tbody>
</table>

1. Affected luminaires include any luminaire that is changed, replaced, removed, relocated; or, connected to, altered or revised wiring, except as permitted by EXCEPTIONS 1 and 2 to Section 141.0(b) ²lii:
2. Two level lighting control shall have at least one control step between 30 and 70% of design lighting power in a manner providing reasonably uniform illuminations
3. Daylight controls in accordance with Section 130.0(d) are required only for luminaires that are altered.

130.1(a) – Area controls; a light switch by the door
130.1(b) – Multi-level controls; for linear fluorescent a 4 step control, effectively a continuous dimming control

Note: only applies to altered luminaires
130.1[c] - Automatic shut-off; a time sweep control or occupancy sensor depending on the space
130.1(d) – Automatic daylighting controls for luminaires in the primary sidelit zone or in daylit zone under skylights
The primary sidelit zone is within one window head height of windows. Skylit zone within 0.7 x ceiling height of skylights
130.1(e) – Automatic demand responsive controls responding to signal from utility or ISO
For compliance with this Table, building space is defined as any of the following:
1. A complete single story building. 2. A complete floor of a multi floor building. 3. The entire space in a building of a single tenant under a single lease. 4. All of the common, not leasable space in single building.

<table>
<thead>
<tr>
<th>Quantity of affected luminaires per Building Space per annum</th>
<th>Resulting Lighting Power per Each Enclosed Space Where ≥ 10% of Existing Luminaires are Luminaire Modifications-in-Place</th>
<th>Applicable mandatory control provisions for each enclosed space</th>
<th>Applicable multi-level lighting control requirements for each modified luminaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum total &lt; 40 Luminaire Modifications-in-Place</td>
<td>Existing lighting power is permitted</td>
<td>Existing provisions are permitted</td>
<td>Existing controls are permitted</td>
</tr>
<tr>
<td>Sum total ≥ 40 Luminaire Modifications-in-Place</td>
<td>≤ 85% of allowed lighting power per Section 140.6 Area Category Method</td>
<td>§130.1(a), (c)</td>
<td>Two level lighting control ^3 Or §130.1(b)</td>
</tr>
<tr>
<td></td>
<td>&gt; 85% of allowed lighting power per Section 140.6 Area Category Method</td>
<td>§130.0(d) ^4</td>
<td>§130.1(b)</td>
</tr>
</tbody>
</table>

1. Control requirements only apply to enclosed spaces for which there are Luminaire Modifications-in-Place.
2. Multi-level controls are required only for luminaires for which there are Luminaire Modifications-in-Place.
3. Two level lighting control shall have at least one control step between 30% and 70% of design lighting power in a manner providing reasonably uniform illuminations
4. Daylight controls in accordance with Section 130.0(d) are required only for luminaires that are modified-in-place.

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### HVAC Controls Triggers

#### Mandatory Measures

<table>
<thead>
<tr>
<th>Space Conditioning Equipment</th>
<th>Zone Thermostat B §120.2(a), (b) Setback Capable</th>
<th>DCV C §120.1(c)</th>
<th>Shutoff and Reset b §120.2(e)</th>
<th>Ventilation Dampers E §120.2(f) Automatic close upon fan shutdown M</th>
<th>Isolation Devices F §120.2(g)</th>
<th>Demand Shedding G §120.2(h)</th>
<th>Economizer FDD H §120.2(i) §140.4(e)</th>
<th>Zone Control I §140.4(d)</th>
<th>Supply Temperature Reset V §140.4(f)</th>
<th>Economizer E,J §140.4(e)1, 2, 3, 4, 5</th>
<th>Variable Flow Control k §140.4(k)6 §140.4(m)</th>
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</thead>
<tbody>
<tr>
<td>Package Terminal Air Conditioner S,T</td>
<td>YES N</td>
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<td>YES U</td>
<td>YES</td>
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<td>YES</td>
<td>YES</td>
<td>YES</td>
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<td>Unitary Air Conditioners and Condensing Units N</td>
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<td>YES</td>
<td>YES U</td>
<td>Yes</td>
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<td>Unitary Heat Pumps O</td>
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<td>Variable Refrigerant Flow (VRF) P</td>
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<td>YES U</td>
<td>YES o</td>
<td>YES</td>
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<td>YES</td>
<td>YES</td>
<td>no</td>
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<td>Forced Air Furnace</td>
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<td>YES r</td>
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<td>YES</td>
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<td>no</td>
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</table>

#### Prescriptive Requirements

A Central Energy Management Control System (EMCS) should be installed at building site for optimal equipment operation and coordination.

B Feedback received from zones through EMCS. Load required based on number of satisfied zones.

C Demand Control Ventilation. See §120.1(c) 3, 4, & 5 for additional CO2 concentration setpoint information and sensor location requirements.

D Must include automatic restart to maintain setback temperatures as necessary.

E Only applies to new air-cooled unitary direct-expansion systems with 54,000 Btu/h capacity or greater. See §120.2(i) for greater detail.

F For systems serving multiple zones totaling more than 25,000 sq. ft.,

G Include settings capable of disabling, manually controlling, or automatically operating equipment.

H Fault detection and diagnostics (FDD) systems are commonly available for packaged HVAC units, and can be integrated directly by the manufacturer. These are required for all systems with cooling capacity of 54 kBtu/h (4 ½ tons) or greater. Controls include economizer checks and refrigerant diagnostics. The systems can report failures or suboptimal conditions that impact efficiency. Required acceptance tests for these systems may be found Reference Appendix NA7, 7.5.11."

I Simultaneous heat and cool prevention except for variable-air-volume and other system types listed in this section. Ambient conditions also provide lockout for seasonal operation only.

2013 Title 24, Part 6 Standards – Triggers for Energy Code Requirements
More footnotes

- J Variable Frequency Drive necessary to operate supply fan speed control at the unit.
- K Air-side applications referred to in respective code language. Central EMCS necessary for remote system operation and ability to oversee all space-conditioning equipment and pumping needs.
- L Heating and Cooling Setpoint dead band of ± 5°F should be implemented on all temperature setpoints. Applies only to equipment with heating AND cooling capability. Setback zone temperature setpoint to 55°F or lower for heating and 85°F or higher for cooling.
- M Exemptions for; gravity dampers, combustion air paths, 24 hour operation, or local law jurisdiction.
- N Stand-alone single room window units are exempt (See §110.2(c)).
- O Damper to reduce ventilation to zero during unoccupied periods.
- P Assuming system has ventilation capacity at the terminal device.
- Q Air or water source configuration.
- R Reference to combustion air requirements.
- S Configurations vary between availability of central plant in design or reliance on self-contained heating and cooling.
- T Special application requirements for Hotels, High-rise Residential, and Perimeter Zoning. Setback capable terminal devices should be used except where zone is not on EMCS. In that case, capability of four programmable control periods per 24 hours is required (§110.2(c)).
- U A reset strategy defined and applied to the supply air stream of the unit or terminal device.
- V Must include automatic time switch OR occ. sensor OR 4-hour timer. 7-day programmable local control exemption.
- W Exemptions apply where: (1) outside air conditions are undesirable, (2) high-rise residential, (3) adverse effects of other systems, like dehumidification, (4) high cooling efficiency systems [Table 140.1-A] (5) computer rooms served per §140.9(a).
Nonresidential Compliance Manual Chapter 10

- Second to last subsection of each covered process covers Additions and Alterations
- Typically just system being altered has requirements
- Some cases exceptions are given for retrofits
- All requirements including retrofits contained in Section 120.6 or 140.9
New Cooling Systems in an existing computer room must have an air or water economizer if the cooling system is > 50 tons (600 kBtu/hr)

New Cooling Systems in an new computer room in an existing building must have an air or water economizer if the cooling system is > 50 tons (600 kBtu/hr)

For new computer rooms in a new building the trigger for an economizer is 5 tons

Expansions of existing computer rooms are not required to have air containment

New rooms are required to have containment when the cooling system design load > 175 kW/room
Thank you

We welcome your feedback.
Our contact information for follow-up questions.

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Questions??

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