

## HVAC Simple Systems

Space Conditioning Equipment <sup>A</sup>	Mandatory Requirements								Prescriptive Requirements			
	Zone Thermostat <sup>F</sup> §120.2(a), (b) Setback Capable <sup>G</sup>	DCV <sup>H</sup> §120.1(c)	Heat Pump Controls <sup>I</sup> §120.2(d)	Shutoff and Reset <sup>J</sup> §120.2(e)	Ventilation Dampers §120.2(f) Automatic close upon fan shutdown <sup>L</sup>	Isolation Devices <sup>N</sup> §120.2(g)	Demand Shedding <sup>O</sup> §120.2(h)	Economizer FDD <sup>P</sup> §120.2(i)	Zone Control <sup>Q</sup> §140.4(d)	Supply Temperature Reset <sup>R</sup> §140.4(f)	Economizer <sup>P,S</sup> §140.4(e)1-5	Variable Flow Control <sup>T</sup> §140.4(k)6 §140.4(m)
Package Terminal Air Conditioner <sup>B,C</sup>	YES <sup>D</sup>	YES	no	YES <sup>K</sup>	YES	no	YES	YES	YES	YES	no	YES <sup>U</sup>
Unitary Air Conditioners and Condensing Units <sup>D</sup>	YES	YES	no	YES <sup>K</sup>	YES	no	no	YES	no	no	YES	YES <sup>U</sup>
Unitary Heat Pumps <sup>E</sup>	YES	YES	YES	YES <sup>K</sup>	YES	no	no	YES	no	no	YES	YES <sup>U</sup>
Applied Heat Pumps <sup>E</sup>	YES	YES	YES	YES <sup>K</sup>	YES	YES	YES	YES	YES	no	YES	YES <sup>U</sup>
Forced Air Furnace	YES	YES	no	YES <sup>K</sup>	YES <sup>M</sup>	no	YES	no	no	no	no	no
Unit Heater	YES	no	no	YES <sup>K</sup>	no	no	no	no	no	no	no	no

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

B Configurations vary between availability of central plant in design or reliance on self-contained heating and cooling.

C 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)).

D Stand-alone single room window units are exempt (See §110.2(c)).

E Air or water source configuration.

F An EMCS may perform the setback functions.

G Set back the zone temperature setpoints to 55°F or lower for heating and 85°F or higher for cooling. Where used to control both heating and cooling, and where changeover between heating and cooling modes is automatic, the thermostatic controls shall be capable of providing a temperature dead band of at least 5°F, within which heating and cooling are both shut off or minimized.

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

I Heat pumps with supplementary electric resistance heat have control requirements.

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

K Must include automatic time switch OR occupancy sensor OR 4-hour timer. 7-day programmable local control exemption.

L Assumes system has ventilation capacity at the terminal device. Damper is to reduce ventilation to zero during unoccupied periods. Exemptions for: gravity dampers, combustion air paths, 24-hour operation, or local law jurisdiction.

M Reference to combustion air requirements.

N For systems serving multiple zones totaling more than 25,000 ft<sup>2</sup>. A zone need not be isolated if demonstrated that it must be heated or cooled continuously.

O Include settings capable of disabling, manually controlling, or automatically operating equipment. Applies to HVAC systems with DDC to the zone level.

P 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 new air-cooled unitary direct-expansion 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 in Reference Appendix NA7.5.11.

Q 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 per §140.4(n).

R A reset strategy defined and applied to the supply air stream of the unit or terminal device.

S 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).

T 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.

U Variable Frequency Drive necessary to operate supply fan speed control at the unit.

# Acceptance Tests: HVAC Simple Systems

The measures below trigger these acceptance tests	NRCA-MCH-02-A Outdoor Air	NRCA-MCH-03-A Constant Volume, Single-zone, Unitary A/C and HP	NRCA-MCH04-A Air Distribution Duct Leakage	NRCA-MCH-05-A Air Economizer Controls	NRCA-MCH-06-A Demand Control Ventilation	NRCA-MCH-07-A Supply Fan VFD	NRCA-MCH-08-A Valve Leakage	NRCA-MCH-11-A Automatic Demand Shed	NRCA-MCH-12-A Fault Detection and Diagnostic for DX Systems	NRCA-MCH-13-A Fault Detection and Diagnostic for AHUs	NRCA-MCH-16-A Supply Air Temp Reset	NRCA-MCH-18-A <sup>A</sup> Energy Management Control System
Zone T-Stats	no	YES	no	no	no	no	no	no	no	no	no	YES
DCV	YES	YES	no	YES	YES	YES	no	no	no	no	no	YES
Heat Pump Controls	no	YES	no	no	no	no	no	no	no	no	no	no
Shutoff and Reset	no	YES	no	no	no	no	no	YES	no	no	no	YES
Ventilation Dampers	YES	YES	YES	YES	no	YES	no	no	no	no	no	YES
Isolation Devices	no	YES	YES	no	no	no	YES	no	no	no	no	YES
Demand Shedding	no	no	no	no	no	no	no	YES	no	no	no	YES
Economizer and/or FDD	YES	YES	no	YES	no	YES	no	no	YES	YES	no	YES
Zone Control	no	YES	no	no	no	no	YES	YES	no	no	no	YES
Supply Temp. Reset	no	no	no	no	no	no	no	no	no	no	YES	YES
Variable Flow Control	no	no	no	no	no	YES	YES	no	no	no	no	YES
Duct Systems	YES	no	YES	no	no	no	no	no	no	no	no	no

A Test is only applicable if an EMCS is present

# HVAC Complex Systems

Space Conditioning Equipment <sup>A</sup>	Mandatory Requirements								Prescriptive Requirements				
	Zone Thermostat <sup>C</sup> §120.2(a), (b) Setback Capable <sup>D</sup>	DCV <sup>E</sup> §120.1(c)	Shutoff and Reset <sup>F</sup> §120.2(e)	Ventilation Dampers §120.2(f) Automatic close upon fan shutdown <sup>H</sup>	Isolation Devices <sup>I</sup> §120.2(g)	Demand Shedding <sup>J</sup> §120.2(h)	DDC §120.2(j)	Optimum Start Stop §120.2(k) (new in 2016)	Zone Control <sup>K</sup> §140.4(d)	Supply Temperature Reset §140.4(f) §140.4(k)4	Economizer <sup>N</sup> §140.4(e)1- 5	Variable Flow Control <sup>O</sup> §140.4(k)6 §140.4(m)	Isolation §140.4(k)2 §140.4(k)3
Boiler	no	no	YES <sup>G</sup>	no	no	YES	YES	YES	YES	YES <sup>L</sup>	no	no	YES
Air-cooled Chiller	no	no	YES <sup>G</sup>	no	no	YES	YES	YES	YES	YES <sup>M</sup>	no	YES	YES
Water-cooled Chiller	no	no	YES <sup>G</sup>	no	no	YES	YES	YES	YES	YES <sup>M</sup>	no	YES	YES
Variable Refrigerant Flow (VRF)	YES	YES	YES <sup>G</sup>	no	YES	YES	no	no	YES	YES	YES	YES	no
Air Handling Systems & Zones <sup>B</sup>	YES	YES	YES <sup>G</sup>	YES	YES	YES	YES	YES	YES	YES	YES	YES	no
Zone Terminal Units or Fan Coils	YES	no	YES <sup>G</sup>	no	no	YES	YES	YES	YES	YES	no	YES	no

- A Central Energy Management Control System (EMCS) should be installed at building site for optimal equipment operation and coordination.
- B Applies to fan systems serving multiple thermostatically controlled zones, and to built-up air handler systems (non-unitary or nonpackaged HVAC equipment).
- C An EMCS may perform the setback functions.
- D Heating and cooling set point dead band of ±5°F should be implemented on all temperature set points. Applies only to equipment with heating AND cooling capability. Set back the zone temperature set points to 55°F or lower for heating and 85°F or higher for cooling.
- E Demand Control Ventilation. See §120.1(c) 3, 4 and 5 for additional CO<sub>2</sub> concentration set point information and sensor location requirements.
- F Must include automatic restart to maintain setback temperatures as necessary.

- G Must include automatic time switch OR occupancy sensor OR 4-hour timer. 7-day programmable local control exemption.
- H Reference to mechanical room ventilation fan where chillers are located.
- I For systems serving multiple zones totaling more than 25,000 ft<sup>2</sup>. A zone need not be isolated if demonstrated that it must be heated or cooled continuously.
- J Include settings capable of disabling, manually controlling, or automatically operating equipment. Applies to HVAC systems with DDC to the zone level.
- K 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.
- L Referred to as "Hot Water Supply Temperature Reset".

- M Referred to as "Chilled Water Supply Temperature Reset".
- N 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).
- O Includes reference to both water and 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.

# Acceptance Tests: HVAC Complex Systems

The measures below trigger these acceptance tests	NRCA-MCH-02-A Outdoor Air	NRCA-MCH-05-A Air Economizer Controls	NRCA-MCH-06-A Demand Control Ventilation	NRCA-MCH-07-A Supply Fan VFD	NRCA-MCH-08-A Valve Leakage	NRCA-MCH-09-A Supply Water Temperature Reset	NRCA-MCH-10-A Hydronic System Variable Flow	NRCA-MCH-11-A Automatic Demand Shed	NRCA-MCH-13-A AHUs and Zone Terminal Units	NRCA-MCH-14-A Distributed Energy Storage DX AC Systems	NRCA-MCH-15-A Thermal Energy Storage	NRCA-MCH-16-A SAT Reset Controls	NRCA-MCH-17-A Condenser Water Temperature Reset	NRCA-MCH-18-A <sup>A</sup> Energy Management Control System
Zone T-Stats	no	no	no	no	no	no	no	no	no	no	no	no	no	YES
DCV	YES	no	YES	YES	no	no	no	no	no	no	no	no	no	YES
Shutoff and Reset	no	no	no	no	no	no	YES	YES	no	no	no	no	no	YES
Ventilation Dampers	YES	YES	no	YES	no	no	no	no	YES	no	no	no	no	YES
Isolation Devices	no	no	no	no	YES	no	YES	no	no	no	no	no	no	YES
Demand Shedding	no	no	no	no	no	no	no	YES	no	no	no	no	no	YES
Economizer and/or FDD	YES	YES	no	YES	no	no	no	no	no	no	no	no	no	YES
Zone Control	no	no	no	no	YES	no	YES	YES	YES	no	no	YES	no	YES
Supply Temp. Reset	no	no	no	no	no	YES	no	no	no	no	no	YES	YES	YES
Variable Flow Control	no	no	no	YES	YES	no	YES	no	YES	no	no	no	no	YES
Distributed Energy Storage DX AC Systems	no	no	no	no	no	no	no	no	no	YES	no	no	no	no
Thermal Energy Storage Systems	no	no	no	no	no	no	no	no	no	no	YES	no	no	no

A Test is only applicable if an EMCS is present

# For More Information

## Primary Sources

- Energy Standards Section 110.2 – Mandatory Requirements for Space-Conditioning Equipment:  
[energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1102mandatoryrequirementsforspaceconditioningequipment.htm](http://energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1102mandatoryrequirementsforspaceconditioningequipment.htm)
- Energy Standards Section 120.1 – Requirements for Ventilation:  
[energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1201requirementsforventilation.htm](http://energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1201requirementsforventilation.htm)
- Energy Standards Section 120.2 – Required Controls for Space-Conditioning Systems:  
[energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1202requiredcontrolsforspaceconditioningsystems.htm](http://energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1202requiredcontrolsforspaceconditioningsystems.htm)
- Energy Standards Section 140.4 – Prescriptive Requirements for Space-Conditioning Systems:  
[energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1404prescriptiverequirementsforspaceconditioningsystems.htm](http://energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1404prescriptiverequirementsforspaceconditioningsystems.htm)
- Energy Standards Section 140.9 – Prescriptive Requirements for Covered Processes:  
[energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1409prescriptiverequirementsforcoveredprocesses.htm](http://energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1409prescriptiverequirementsforcoveredprocesses.htm)
- Energy Standards Reference Appendix NA7– Installation and Acceptance Requirements for Nonresidential Buildings and Covered Processes:  
[energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/appendixna7installationandacceptancerequirementsfornonresidentia.htm](http://energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/appendixna7installationandacceptancerequirementsfornonresidentia.htm)

## California Energy Commission Information & Services

- Energy Standards Hotline: 1-800-772-3300 (Free) or [Title24@energy.ca.gov](mailto:Title24@energy.ca.gov)
- Online Resource Center:  
[energy.ca.gov/title24/orc/](http://energy.ca.gov/title24/orc/)
  - The Energy Commission’s main web portal for Energy Standards, including information, documents, and historical information

## Additional Resources

- Energy Code Ace:  
[EnergyCodeAce.com](http://EnergyCodeAce.com)
  - An online “one-stop-shop” providing free resources and training to help appliance and building industry professionals decode and comply with Title 24, Part 6 and Title 20. The site is administered by California’s investor-owned utilities. Please register with the site and select an industry role for your profile in order to receive messages about all our free offerings!



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. © 2016 Pacific Gas and Electric Company, San Diego Gas and Electric, Southern California Gas Company and Southern California Edison. All rights reserved, except that this document may be used, copied, and distributed without modification. Neither PG&E, Sempra, nor SCE — nor any of their employees makes any warranty, express or implied; or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any data, information, method, product, policy or process disclosed in this document; or represents that its use will not infringe any privately-owned rights including, but not limited to patents, trademarks or copyrights.