

Nonresidential Unitary (Packaged and Split) HVAC Systems: Guide to 2019 Energy Code Compliance Documents

What is the energy code and why does it matter?

California's energy code, the Building Energy Efficiency Standards (Title 24, Part 6; the Standards), outlines the energy efficiency requirements for newly constructed buildings and additions and alterations to existing buildings. Energy efficiency reduces energy costs and wasteful consumption, improves building comfort, and reduces environmental impacts of energy use. The Standards ensure that builders use technologies and practices that are energy efficient and cost effective for building owners.

Nonresidential Mechanical Certificate(s) of Compliance and Acceptance

The Energy Standards specify detailed reporting requirements intended to provide design, construction and enforcement parties information needed to complete the building process and ensure that the energy features are installed.

Projects that involve the **installation, modification or replacement of HVAC equipment and/or ductwork** are required to complete compliance form **NRCC-MCH-E** when meeting compliance using the **prescriptive approach**, meaning that each component of a proposed project must meet a prescribed minimum energy requirement; or, **NRCC-PRF-01** when meeting compliance using the **performance approach**, meaning a computer model is used to demonstrate the energy use of the building. Acceptance testing or acceptance criteria verification is also required for HVAC equipment and ductwork. Certificates of acceptance are listed in the prescriptive approach compliance form **NRCC-MCH-E, "Item O. DECLARATION OF REQUIRED CERTIFICATES OF ACCEPTANCE"**.

Mandatory Measures

All applicable measures should be noted on the plan sheet or construction documentation. For mandatory measures that do not apply, the label "N/A" should appear in the plan sheet or construction document. Mandatory measures can also be found on page 1 of **NRCC-MCH-02**.

Measure	Section	Requirements
Thermostat Requirements	Section 110.2 (c)	All heating or cooling systems are required to have a thermostat with setback capability and is capable of at least four set points in a 24-hour period. In the case of a heat pump, the control requirements of Section 110.2(b) must also be met.
	Section 120.2 (b) 4 Section 120.2(a)	Thermostat controls (or energy management control system) are required for each HVAC zone
	Section 110.2(b)	Thermostats for heat pump with supplementary electric heat must prevent electric resistance heating when load can be met by heat pump
	Section 120.2(c)	Provide shut-off, reset and setback controls
	Section 120.2(h)	Systems with Direct Digital Controls to the zone level shall include centralized demand shed control for non-critical spaces
	Section 120.1(c)5	<p>Automatically setup cooling temperature 2°F and heating temperature 2°F and automatically reset minimum ventilation with an Occupant Sensor Control for the following occupancies:</p> <ul style="list-style-type: none"> ▪ Multi-purpose rooms less than 1,000 sf. ▪ Classrooms, conference, convention, auditorium and meeting center rooms greater than 750 ft² ▪ Exceptions: <ul style="list-style-type: none"> ○ If spaces controlled by demand control ventilation with economizers. ○ If HVAC system has full load demand of 2 Kw or less. <p>Hotel-motel guest rooms shall have captive key, occupancy sensing controls or automatic controls that automatically setup the cooling temperature 5°F and set-down the heating temperature 3°F 30 minutes after the room is vacated.</p>

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Minimum HVAC Equipment Efficiencies	Section 110.2(a) (for minimum efficiency of equipment types not listed here, please refer to section 110.2 Tables 110.2-A through 110.2-K)	Equipment Type	Input	Minimum Efficiency
		Warm-Air Furnace, Gas-Fired	< 225,000 Btu/h ≥ 225,000 Btu/h	80% thermal efficiency 80% thermal efficiency
Warm-Air Furnace, oil-Fired	< 225,000 Btu/h ≥ 225,000 Btu/h	80% thermal efficiency 81% thermal efficiency		
Air conditioners, air cooled both split system and single package	≥ 65,000 Btu/h & < 135,000 Btu/h	11.2 EER 12.9 IEER		
	≥ 135,000 Btu/h and < 240,000 Btu/h	11.0 EER 12.4 IEER		
	≥ 240,000 Btu/h and < 760,000 Btu/h	10.0 EER 11.6 IEER		
	≥ 760,000 Btu/h	9.7 EER 11.2 IEER		
Measure	Section	Requirements		
Ventilation	Section 120.1 Section 120.2(f)	<p>Conditioned spaces shall provide mechanical ventilation equal to the ventilation rate in Table 120.1-A of the Standards or Tables 4-13 and 4-14 of the 2013 Non-Residential Compliance Manual or 15 cfm times the expected number of occupants, whichever is greater.</p> <ul style="list-style-type: none"> ▪ Exceptions: <ul style="list-style-type: none"> ○ Natural ventilation permanently open to and within 20 sf of operable wall and roof openings to the outside with a free unobstructed area equal to at least 5% of the area served. Distance to operable opening increased to 25 sf for high-rise residential, hotel and motel guest rooms. <p>Supply air and exhaust equipment shall have dampers on fresh air intake and exhaust locations that automatically close upon fan shutdown</p>		
Demand Control Ventilation	Section 120.1(d)3	HVAC equipment with an economizer serving spaces with an occupant density of 25 occupants/1,000 sf or more (40sf/occupant) shall have a separate Demand Control Sensor for each enclosed area that meets or exceeds this occupancy density.		
Economizer Fault Detection and Diagnostic Controls	Section 120.2(i)	Packaged unitary direct expansion HVAC units rated at 54,000 BTUH or higher that have an economizer shall include a Fault Detection and Diagnostic (FDD) system (variable refrigerant flow - VRF - systems are exempt)		
Isolation Zones	Section 120.2(g)	HVAC equipment serving spaces larger than 25,000 sf shall be divided into separate isolation zones.		
Duct insulation	Section 120.4(a)	<ul style="list-style-type: none"> ▪ R-8 when ducts are located in unconditioned spaces. ▪ R-4.2 when ducts in indirectly conditioned spaces. ▪ No requirement when ducts located in directly conditioned spaces 		
Relocation of existing equipment	NR Manual Section 4.9.1.B	<ul style="list-style-type: none"> ▪ When existing heating or cooling systems or components are moved within a building the existing systems and components need not comply with Mandatory Measures nor with Prescriptive or Performance compliance requirements. 		

PRESCRIPTIVE REQUIREMENTS

Measure	Section	Requirements									
Zone Controls	Section 140.4(d)	Each space conditioning zone shall have controls to prevent reheating, re-cooling and simultaneous heating and cooling									
Economizers	Section 140.4(e)1,2,3,4 & 5	<p>Mechanical cooling systems with a cooling capacity exceeding 54,000 Btu/hr shall have either:</p> <ul style="list-style-type: none"> ▪ An air economizer capable of modulating outside air and return air dampers to supply 100 percent of the design airflow as outside air; or ▪ A water economizer capable of providing 100 percent of the expected cooling at an outside air temperature of 50°F dry-bulb and 45°F wet-bulb. ▪ Economizer Trade-off Table 140.4. Increase cooling efficiency listed below: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Climate Zone</th> <th>Efficiency Improvement</th> <th>Example</th> </tr> </thead> <tbody> <tr> <td>2, 3 & 4</td> <td>65%</td> <td>SEER 14 → SEER 21.1</td> </tr> <tr> <td>12</td> <td>30%</td> <td>SEER 14 → SEER 18.2</td> </tr> </tbody> </table>	Climate Zone	Efficiency Improvement	Example	2, 3 & 4	65%	SEER 14 → SEER 21.1	12	30%	SEER 14 → SEER 18.2
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HERS REQUIREMENTS

Duct Leakage Inspection and Testing NRCC-MCH-02-E, Page 1 of 3 or NRCC-MCH-05-E, Page 1 of 2			
	Required When:	Exceptions:	
PRESCRIPTIVE APPROACH	New Construction* (Section 140.4(l) 1,2 & 3) <i>Individual zones not to exceed 5,000 sq ft.</i>	<ul style="list-style-type: none"> More than 25% of the ductwork surface area is located in an unconditioned space or outside; and The HVAC unit has a constant volume fan; and The HVAC system serves a single zone; and The zone served by the HVAC unit is less than 5,000 sf 	<ul style="list-style-type: none"> Institutional Occupancies. Historic structures when waived by the building official Temporary buildings
	Altered Duct Systems Section 141.0(b)2D	<ul style="list-style-type: none"> If the existing HVAC System meets all the requirements for "New Construction" (above) And ducting was added or replaced duct testing is required. 	<ul style="list-style-type: none"> Same exceptions as "New Construction" above. Plus, the following: When existing ductwork remains and is constructed, insulated or sealed with asbestos.
	Altered HVAC System Section 141.0(b) 2Eii	<ul style="list-style-type: none"> If the existing HVAC System meets all the requirements for "New Construction" (above) HVAC equipment is added or replaced; or The outside condenser on a split system is replaced. The cooling coil is replaced. The heating coil is replaced. (Gas heat exchanges are exempt) The air handler is replaced 	<ul style="list-style-type: none"> Same exceptions as "New Construction" and "Altered Duct System" above. When the HVAC unit is replaced or altered and, no ductwork is modified, and the existing ductwork was previously sealed, inspected, tested and formally certified for compliance with an approved HERS Provider, and a copy of the previous duct leakage certification is provided to the building official.
PERFORMANCE APPROACH	NRCC-PRF-01, Section E – HERS Verification HERS inspection and testing not required unless specifically listed in the NRCC-PRF-01-E form. Duct sealing can be traded off against other features. If duct testing is listed in the NRCC-PRF-01-E it is required even if the ductwork does not meet the requirements of Section 140.4(l) 1,2 & 3.		
* No exceptions for ductwork less than 40 linear ft. (Only for residential)			
LOW-LEAKAGE AIR HANDLER			
	Requirements		
PRESCRIPTIVE APPROACH	N/A		
PERFORMANCE APPROACH	<ul style="list-style-type: none"> Optional credit available if requirement listed in form NRCC-PRF-01-E - Section E – HERS Verification. Low leakage air handler must be listed in the CEC directory of approved air handlers. https://ww2.energy.ca.gov/title24/equipment_cert/ 		

For more information on 2019 Title 24 Part 6 requirements:

- Visit www.energy.ca.gov/title24/2019standards/
- Contact the energy code hotline at (800) 772-3300 or email: title24@energy.state.ca.us
- Contact the BayREN Codes & Standards Program by email: codes@bayren.org