

# Nonresidential Unitary (Packaged and Split) HVAC Systems: Guide to 2022 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 Energy 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. Required 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**. Tables 110.2-A through 110.2-N in section 110.2(a) of the 2022 Building Energy Efficiency Standards cover minimum efficiency requirements for a wide range of space conditioning equipment. including Air Conditioners (Table 110.2-A), Warm-Air Furnaces (Table 110.2-I), and Heat Pumps (Table 110.2-B).

Measure	Section	Requirements
Thermostat Requirements	Section 110.2 (c)	All heating or cooling systems not controlled by a central energy management control system are required to have a thermostat with setback capability. The thermostat must be able to program 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(a) Section 120.2 (b)4	Thermostat controls (or energy management control system) are required for each HVAC zone.
Controls for Space-Conditioning Systems	Section 110.2(b)	Controls for heat pumps with supplementary electric heat must prevent electric resistance heating when load can be met by heat pump. Additionally, the cut-on and cut-off temperatures for compression heating must be higher than the corresponding cut-on/off temperatures for the supplemental heating.
	Section 120.2(e)	Provide shut-off and reset controls
	Section 120.2(h)	Systems with Direct Digital Controls to the zone level shall include centralized demand shed control for non-critical spaces.
Occupant Sensing Controls	Section 120.2(e)3 Section 120.2(e)4	<p>Where the system providing space conditioning also provides the ventilation required by Section 120.1 and includes occupant sensor ventilation control as specified in Section 120.1(d) 5, the occupant sensing zone controls shall additionally comply with the following:</p> <p>During occupied standby mode, the Occupant Sensor Control must automatically set up cooling temperature 2°F and set back heating temperature 2°F (0.5°F heating and cooling with Direct Digital Controls). Additionally, during occupied-standby mode mechanical ventilation to the zone shall remain off whenever the space temperature is between the active heating and cooling setpoints.</p> <ul style="list-style-type: none"> <li>▪ Exceptions: <ul style="list-style-type: none"> <li>○ Where it can be demonstrated that the system serves an area that must operate continuously</li> <li>○ If HVAC system has full load demand of 2 kW or less.</li> </ul> </li> </ul> <p>Hotel and motel guest rooms shall have captive card key controls, occupancy sensing controls, or automatic controls such that, no longer than 30 minutes after the guest room has been vacated, setpoints are set up at least +5°F (+3°C) in cooling mode and set down at least -5°F (-3°C) in heating mode.</p>

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Ventilation	Section 120.1(f)	1. All mechanical ventilation/space-conditioning systems shall have installed ductwork, dampers and controls that allow design minimum outside air rates to be operated at no less than the larger of (1) the minimum levels specified in Section 120.1(c)3; or (2) the rate required for make-up of exhaust systems that are required for an exempt or covered process, for control of odors, or for the removal of contaminants within the space. 2. All variable air volume mechanical ventilation and space-conditioning systems shall include dynamic controls that are capable of maintaining measured outside air ventilation rates within 10 percent of the design minimum outside air ventilation rate at both full and reduced supply airflow conditions. Fixed minimum damper position is not considered to be dynamic and is not an allowed control strategy. 3. Systems shall be tested for ability to operate within 10 percent of the design minimum outside air rate.
Demand Control Ventilation	Section 120.1(d)3	HVAC equipment with an economizer, modulating outside air control, or design outdoor airflow rate > 3,000 cfm serving spaces with an occupant density of 25 occupants/1,000 sf or more (40 sf or less/occupant) shall have a separate Demand Control Sensor for each enclosed area that meets or exceed occupancy density.
Economizer Fault Detection and Diagnostic Controls	Section 120.2(i)	Packaged unitary direct expansion HVAC units rated at 33,000 BTUH or higher that have an economizer shall include a Fault Detection and Diagnostic (FDD) system.
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)	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 4.10.1.1	When existing heating, cooling, or service water heating systems or components are moved within a building, the existing systems or components do not need to comply with mandatory measures nor with the 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	Mechanical cooling systems with a cooling capacity exceeding 33,000 Btu/hr shall have either: <ul style="list-style-type: none"> <li>▪ An air economizer capable of modulating outside air and return air dampers to supply 100 percent of the design airflow as outside air; or</li> <li>▪ 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.</li> <li>▪ Economizer Trade-off Table 140.4. Increase cooling efficiency listed below:</li> </ul> <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 &amp; 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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2, 3 & 4	65%	SEER 14 → SEER 21.1									
12	30%	SEER 14 → SEER 18.2									
Single Zone Space-Conditioning System Type	Section 140.4(a)2	Single zone space-conditioning systems with direct expansion cooling with rated cooling capacity 240,000 Btu/hr or less serving the following spaces shall meet the applicable requirements in Items A–H, or shall meet the performance compliance requirements of Section 140.1. All other system types, including systems with rated cooling capacity greater than 240,000 Btu/hr, multi-zone systems and systems using central boilers or chillers, shall comply with the applicable requirements of Section 140. Exception to Section 140.4(a)2: Systems utilizing recovered heat for space heating.									
Fan Systems	Section 140.4(c)	Each fan system moving air into, out of or between conditioned spaces or circulating air for the purpose of conditioning air within a space shall meet the requirements of Items 1, 2 and 3 of section 140.4(c) of the 2022 Building Energy Efficiency Standards.									

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Measure	Section	Requirement
Dedicated Outdoor Air Systems (DOAS)	140.4(p)	HVAC systems that utilize a dedicated outdoor air system (DOAS) such as a DX-DOAS, HRV or ERV unit to condition, temper or filter 100 percent outdoor air separate from local or central space-conditioning systems serving the same space shall meet the criteria 140.4(p) of the 2022 Building Energy Efficiency Standards. Please note that these sections include important updates for the 2022 Building Energy Efficiency Standards.
Exhaust Air Heat Recovery	140.4(q)	<p>Fan systems designed to operate to the criteria listed in either Table 140.4-J or Table 140.4-K shall include an exhaust air heat recovery system that meets the following:</p> <ol style="list-style-type: none"> <li>1. A sensible energy recovery ratio of at least 60 percent or an enthalpy recovery ratio of at least 50 percent for both heating and cooling design conditions and a rating in accordance with AHRI 1060.</li> <li>2. Energy recovery bypass or control to disable energy recovery and to directly economize with ventilation air based on outdoor air temperature limits specified in Table 140.4-G. For energy recovery systems where the transfer of energy cannot be stopped, bypass shall prevent the total airflow rate of either outdoor air or exhaust air through the energy recovery exchanger from exceeding 10 percent of the full design airflow rate.</li> </ol> <p>Please see section 140.4(q) for list of exceptions to 1 and 2.</p>

## 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:
<b>PRESCRIPTIVE APPROACH</b>	<b>New Construction</b> (Section 120.4(g) 1&2)  <i>Individual zones not to exceed 5,000 sq ft.</i>	More than 25% of the ductwork surface area is located in an unconditioned space or outside; <b>and</b> the HVAC unit has a constant volume fan and serves a single zone; <b>and</b> the duct system does not serve a healthcare facility; <b>and</b> the zone served by the HVAC unit is less than 5,000 sq. ft.	All other duct systems that fall outside the 4 conditions in the "Required When" section for "New Construction" (left) shall instead meet the duct leakage testing requirements of CMC Section 603.9.2. No exceptions for ductwork less than 40 linear ft.
	<b>Altered Duct Systems</b> Section 141.0(b)2D	If the existing HVAC System meets all the requirements for "New Construction" (above) <b>and</b> ducting was added or replaced (75% new duct material) duct testing is required.	When existing ductwork remains and is constructed, insulated or sealed with asbestos, or when conditions to the left are not met, test requirements above apply instead.
	<b>Altered HVAC System</b> Section 141.0(b) 2Eii	If the existing HVAC System connects to a duct system that meets all the requirements for "New Construction" (above); <b>and</b> HVAC equipment is added or replaced (including replacement of the air handler, outdoor condensing unit of a split system air conditioner or heat pump, cooling coil, or heating coil).	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.
<b>PERFORMANCE APPROACH</b>	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. For low-leakage air handlers, there are optional credit available if the requirement is listed in form NRCC-PRF-01-E - Section E – HERS Verification.		

## For more information on 2022 Title 24 Part 6 requirements:

- Visit [www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2022-building-energy-efficiency](http://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2022-building-energy-efficiency)
- Contact the energy code hotline at (800) 772-3300 or email: [title24@energy.ca.gov](mailto:title24@energy.ca.gov)
- Contact the BayREN Codes & Standards Program by email: [codes@bayren.org](mailto:codes@bayren.org)

