

# Nonresidential Unitary HVAC Systems

## 2016 Energy Code Permit Guide

### Certificates of Compliance

The following forms must be submitted, as applicable, when replacing or installing new HVAC equipment or when modifying or replacing ductwork located anywhere other than conditioned space.

#### Approaches

Prescriptive		Performance	Prescriptive & Performance	
All HVAC Systems	<u>Simple Unitary Systems</u>	<u>Water Cooling Towers</u>	<u>Forms for All HVAC Systems:</u>	<i>New Buildings also require design commissioning Certificate of Compliance forms</i>
NRCC-MCH-01-E NRCC-MCH-02-E NRCC-MCH-03-E	NRCC-MCH-04-E NRCC-MCH-05-E	NRCC-MCH-06-E	NRCC-PRF-01-E	NRCC-CXR-01-E NRCC-CXR-02-E NRCC-CXR-03-E NRCC-CXR-04-E NRCC-CXR-05-E Design Review Kick-off Meeting General Construction Documents Simple HVAC Systems Complex HVAC Systems (if not all HVAC systems are Simple) Design Review Signature Page
<b>Acceptance Testing</b>	<ul style="list-style-type: none"> <li>The list of Acceptance Tests required for each permit is on form NRCC-MCH-01-E or NRCC-MCH-04-E. Completed Acceptance test forms will need to be seen by field inspector and provided to building owner.</li> <li>All <b>NEW</b> HVAC systems must complete the "Outside Air" Acceptance Test and document the results on NRCA-MCH-02A.</li> </ul>			

### Mandatory Measures

Can also be found on NRCC-MCH-02, Page 1 of 3 – All applicable measures should be noted on plans.

Measure	Section	Requirements																				
Thermostat Requirements	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	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: <ul style="list-style-type: none"> <li>▪ Multi-purpose rooms less than 1,000 sf.</li> <li>▪ Classrooms, conference, convention, auditorium and meeting center rooms greater than 750 sf.</li> <li>▪ Exceptions:                             <ul style="list-style-type: none"> <li>○ If spaces controlled by demand control ventilation with economizers.</li> <li>○ If HVAC system has full load demand of 2 Kw or less.</li> </ul> </li> </ul> 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.																				
Minimum HVAC Gas/Oil Equipment Efficiencies	<i>Source: 2015 Appliance Efficiency Regulations, July 2015, CEC-400-2015-021</i>	<table border="1"> <thead> <tr> <th>HVAC System</th> <th>Fuel</th> <th>BTUH (Input)</th> <th>Enclosure</th> <th>AFUE %</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Gas and Oil-fired Furnaces</td> <td rowspan="2">Gas</td> <td>&lt; 225,000</td> <td>Weatherized</td> <td>81</td> </tr> <tr> <td>&gt;= 225,000</td> <td>Non-Weatherized</td> <td>80</td> </tr> <tr> <td rowspan="2">Oil</td> <td>&lt; 225,000</td> <td>Weatherized</td> <td>78</td> </tr> <tr> <td>&gt;= 225,000</td> <td>Non-Weatherized</td> <td>83</td> </tr> </tbody> </table>	HVAC System	Fuel	BTUH (Input)	Enclosure	AFUE %	Gas and Oil-fired Furnaces	Gas	< 225,000	Weatherized	81	>= 225,000	Non-Weatherized	80	Oil	< 225,000	Weatherized	78	>= 225,000	Non-Weatherized	83
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Measure	Section	Requirements
Ventilation	Section 120.1(b)  Section 120.2(f)	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. <ul style="list-style-type: none"> <li>▪ Exceptions:                             <ul style="list-style-type: none"> <li>○ 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.</li> </ul> </li> </ul> Supply air and exhaust equipment shall have dampers on fresh air intake and exhaust locations that automatically close upon fan shutdown
Demand Control Ventilation	Section 120.1(c)	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"> <li>▪ R-8 when ducts are located in unconditioned spaces.</li> <li>▪ R-4.2 when ducts in indirectly conditioned spaces.</li> <li>▪ No requirement when ducts located in conditioned spaces</li> </ul>
Relocation of existing equipment	NR Manual Section 4.9.1.B	<ul style="list-style-type: none"> <li>▪ 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.</li> </ul>

### PRESCRIPTIVE REQUIREMENTS

Measure	Section	Requirements									
Zone Controls	Section 140.4(d)	Each space conditioning zone shall have controls to prevent reheating, recooling and simultaneous heating and cooling									
Economizers	Section 140.4(e)1,2,3,4 & 5	Mechanical cooling systems with a cooling capacity exceeding 54,000 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: 40px;"> <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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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	<p><b>New Construction*</b> (Section 140.4(l) 1,2 &amp; 3)</p> <p><i>Individual zones not to exceed 5,000 sqft.</i></p>	<ul style="list-style-type: none"> <li>More than 25% of the ductwork surface area is located in unconditioned space or outside; <b>and</b></li> <li>The HVAC unit has a constant volume fan; <b>and</b></li> <li>The HVAC system serves a single zone; <b>and</b></li> <li>The zone served by the HVAC unit is less than 5,000 sf</li> </ul>	<ul style="list-style-type: none"> <li>Institutional Occupancies.</li> <li>Historic structures when waived by the building official</li> <li>Temporary buildings</li> </ul>
	<p><b>Altered Duct Systems</b> Section 141.0(b)2D</p>	<ul style="list-style-type: none"> <li>If the existing HVAC System meets all the requirements for “New Construction” (above)</li> <li>The ductwork is modified (No exception for minor ductwork changes)</li> </ul>	<ul style="list-style-type: none"> <li>Same exceptions as “New Construction” above. Plus, the following:</li> <li>When existing ductwork remains and is constructed, insulated or sealed with asbestos.</li> </ul>
	<p><b>Altered HVAC System</b> Section 141.0(b) 2Eii</p>	<ul style="list-style-type: none"> <li>If the existing HVAC System meets all the requirements for “New Construction” (above)</li> <li>HVAC equipment is added or replaced; or</li> <li>The outside condenser on a split system is replaced.</li> <li>The cooling coil is replaced.</li> <li>The heating coil is replaced. (Gas heat exchanges are exempt)</li> <li>The air handler is replaced</li> </ul>	<ul style="list-style-type: none"> <li>Same exceptions as “New Construction” and “Altered Duct System” above.</li> <li>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.</li> </ul>
PERFORMANCE APPROACH	<p>NRCC-PRF-01, Section E – HERS Verification</p> <p>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 &amp; 3.</p>		
* 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"> <li>Optional credit available if requirement listed in form NRCC-PRF-01-E - Section E – HERS Verification.</li> <li>Low leakage air handler must be listed in the CEC directory of approved air handlers. <a href="http://www.energy.ca.gov/title24/equipment_cert/llahu/low_leakage_air_handling_units.pdf">http://www.energy.ca.gov/title24/equipment_cert/llahu/low_leakage_air_handling_units.pdf</a></li> </ul>		

### For more information on 2013 Title 24 Part 6 requirements:

- Visit [www.energy.ca.gov/title24/2013standards/](http://www.energy.ca.gov/title24/2013standards/)
- Contact the energy code hotline at (800) 772-3300 or email: [title24@energy.state.ca.us](mailto:title24@energy.state.ca.us)
- Contact the BayREN Codes & Standards Program by email: [codes@bayren.org](mailto:codes@bayren.org)