BUSINESS AND PROFESSIONS CODE, SECTION 7110

Willful or deliberate disregard and violation of the building laws, including the California Building Code and local permit requirements constitutes a cause for disciplinary action from the Contractors State License Board working in conjunction with the local building department. This action may consist of fines up to $5,000 per violation or suspension/revocation of a contractor’s license.

WHEN IS A PERMIT REQUIRED?

A written construction permit shall be obtained from the enforcement agency prior to the erection, construction, reconstruction, installation, relocation, or alteration of any mechanical system, except as permitted in Chapter 1, Section 111.2 of the 2016 California Mechanical Code. Projects requiring permits include, but are not limited to:

- New HVAC installation
- HVAC Changeout
- Replacement of furnace, coil, FAU, condenser, or ductwork
- Relocation of an existing HVAC unit

2016 BUILDING ENERGY EFFICIENCY STANDARDS (Title 24, Part 6) REQUIREMENTS INCLUDE:

1. Heating equipment must have a minimum 80% AFUE (Exception: Wall & floor furnaces; room heaters).
2. Central air conditioners & heat pumps less than 65,000 Btu/hr must have a minimum 14 SEER.
3. Newly installed or replaced ducts must have a minimum insulation value of R-6.
4. A setback type thermostat (24 hr clock with four set points) is required for all alterations.
5. New or replacement ducts must meet the mandatory requirements of Section 150(m):
   - All joints and openings in the HVAC system must be sealed.
   - Only UL 181, UL 181A, or UL 181B approved tapes or mastic shall be used to seal duct openings.
   - Connections of metals ducts and the inner core of flex ducts shall be mechanically fastened. Flex ducts must be connected using a metal sleeve/coupling.
   - Flex ducts that are suspended must be supported every 4ft. max for horizontal runs with no more than 2” of sag between supports and 6 ft. max for vertical runs.

WHAT FORMS ARE REQUIRED?

The CF1R-ALT-02-E or CF1R-ALT-04-E and CF2R-MCH-01-H are required for all HVAC alterations. HERS verification is required for all HVAC alterations. CF3R’s are the forms that are provided through the HERS verification process. A HERS rater is a special inspector for the building department. The building inspector may also request to be on site to witness testing by the contractor and/or HERS rater.

For Final inspection ALL compliance forms (CF1Rs, CF2Rs, and CF3Rs) shall be registered with an approved HERS Provider.

The attached Ace Resources Residential Trigger Sheet for HVAC alterations provides detailed information for requirements that apply to HVAC alterations.
<table>
<thead>
<tr>
<th>Split Systems and Packaged Systems</th>
<th>Mandatory Measures</th>
<th>Prescriptive Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change this (and nothing else)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole split or packaged system</td>
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<tr>
<td>(no ducts added or replaced)</td>
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<td>Furnace (air handler)</td>
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<tr>
<td>Compressor, refrigerant metering device</td>
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<tr>
<td>Some ducts</td>
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</tr>
<tr>
<td>&quot;All new&quot; ducts</td>
<td></td>
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</tr>
<tr>
<td>Whole split or packaged system and all new ducts</td>
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<td></td>
</tr>
</tbody>
</table>

**Mandatory Measures**

- Change this (and nothing else)
- Whole split or packaged system (no ducts added or replaced)
- Evaporator coil (cooling coil), condenser coil, or outdoor condensing unit
- Furnace (air handler)
- Compressor, refrigerant metering device
- Some ducts
- "All new" ducts
- Whole split or packaged system and all new ducts

**Prescriptive Requirements**

- Change this (and nothing else)
- Whole split or packaged system (no ducts added or replaced)
- Evaporator coil (cooling coil), condenser coil, or outdoor condensing unit
- Furnace (air handler)
- Compressor, refrigerant metering device
- Some ducts
- "All new" ducts
- Whole split or packaged system and all new ducts

**NOTE:**
- Replacing the blower wheel fan is considered a repair and does NOT trigger the Standards.
- All new HVAC equipment must meet minimum federal efficiency requirements.
- Cooling line insulation is triggered if the line set (cooling system, suction line) is replaced or repaired. Line sets ≤1.5" in diameter must have 0.5" thick insulation.

**A** Heating equipment must meet CBC minimum capacity requirements.

**B** Unless exceptions apply, duct systems must be sealed and verified if >40 feet of ducts in unconditioned space. Duct system leakage must be ≤15% in total, or ≤10% to the outside. Or, if unable to meet the sealing requirements, all accessible leaks must be sealed and verified by a HERS rater.

**C** HERS verification of refrigerant charge is required in climate zones 2 and 8–15 only when a refrigerant containing component of an air conditioner or heat pump is replaced or installed in an existing building.

**D** Although there are no commercially available HVAC systems with approved Charge Indicator Display (CID) devices at the time of publication (July 2014) the Standards do allow use of a CEC-approved CID should such equipment become available during the 2013 code cycle.

**E** Cooling and heating load calculations are required when ducts are added to serve new conditioned space, such as an addition.

**F** When adding or replacing >40 feet of ducts in unconditioned space: CZ 1-10 and 12-13: R-6; CZ 11 and 14-16: R-8. HERS verification is required for insulated ducts in conditioned space. Mandatory duct insulation requirements (R-6) apply to all new or replacement ducts (not existing or unaltered ducts).

**G** The system is considered to have "all new" ducts when 75% or more of the ducts are new material and up to 25% reused parts from the existing duct system (e.g., registers, grilles, boots, air handler, coil, plenums, duct material) if the reused parts are accessible and can be sealed to prevent leakage.

**H** In all climate zones, when new duct systems are installed in unconditioned space, leakage must be ≤6% of the air handler airflow.

**I** When new duct systems are installed, cooling coil airflow must be >350 CFM per ton, and fan watt draw must be ≤0.58W/CFM. Alternatively, the system can meet the requirements in Table 150.0-C or Table 150.0-D (Return Duct Sizing and Filter Sizing).
Required Documentation

### For All HVAC Alterations
All HVAC alterations require:
- Permit — for all HVAC changeouts
- CF1R: Certificate of Compliance: Alteration to an HVAC System (CF1R-ALT-02*-E, or CF1R-ALT-03-E or CF1R-ALT-04-E)
  - Submitted to the building department by the contractor or the homeowner
- CF2R-MCH-01-H: Certificate of Installation for Space Conditioning Systems, Ducts and Fans
  - Completed and signed by the installing contractor and made available for final inspection by building department

### For HERS Measures
Projects with HERS measures require:
- Registration of the CF1R, via HERS Provider
- CF2R-MCH…H: Certificates of Installation for mechanical system with HERS measures
  - Completed and signed by the installing contractor; must be submitted to a HERS Provider Registry after the contractor has signed it, and made available for inspection by the building department
- CF3R-MCH…H: Certificates of Field Verification for mechanical system with HERS measures
  - Completed and registered by a HERS Rater for each CF2R-H; the HERS Rater or contractor ensures the relevant CF3Rs are available for final inspection by the building department
- HERS: Duct Leakage Diagnostic Test
  - CF2R-MCH-20*-H and CF3R-MCH-20*-H
- HERS: Fan Efficacy (Fan Watt Draw)
  - CF2R-MCH-22-H and CF3R-MCH-22-H
- HERS: Space Conditioning System Airflow Rate
  - CF2R-MCH-23*-H and CF3R-MCH-23*-H
- HERS: Refrigerant Charge Verification
  - CF2R-MCH-25*-H and CF3R-MCH-25*-H
  - CF2R-MCH-25f-E (for packaged systems with refrigerant charge certified by manufacturer)
- Correct version (e.g., “a” or “b” or “c”) varies depending upon the project scope and approach used to demonstrate compliance

### For Projects with New or Replacement Duct Systems using Duct and Filter Sizing
Projects that use Duct and Filter Sizing instead of the Cooling Coil Airflow and Fan Watt Draw HERS Measure require:
- CF2R-MCH-28-H and CF3R-MCH-28-H

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**2013 Entirely New or Complete Replacement Space-Conditioning System**

A space-conditioning system is considered entirely new or a complete replacement when all of the following are installed or replaced:
- All the system heating/cooling equipment
- CF1R: Certificate of Compliance: Alteration to an HVAC System (CF1R-ALT-02*-E, or CF1R-ALT-03-E or CF1R-ALT-04-E)
  - Submitted to the building department by the contractor or the homeowner
- CF2R-MCH-01-H: Certificate of Installation for Space Conditioning Systems, Ducts and Fans
  - Completed and signed by the installing contractor and made available for final inspection by building department

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**2013 Altered Space-Conditioning System**

A space-conditioning system is considered altered when it is not a new or replacement system and any of the following components is installed or replaced:
- Any refrigerant-containing component: Cooling coil, Condenser coil, Compressor, Refrigerant piping, Refrigerant metering device
  - Cooling coil
  - Condenser coil
  - Compressor
  - Refrigerant piping
  - Refrigerant metering device
  - Air handler
  - Heat exchanger
- Replacing other components is considered a repair — not an alteration. For example, replacing the blower wheel fan, but not the heat exchanger or air handler in the furnace, is a repair.

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**2013 Altered or Replaced Duct Systems (Duct Sealing)**

Entirely new or complete replacement duct systems are those that contain at least 75% new duct material. Existing duct system components (up to 25%) may be reused if they are accessible and can be sealed.

The Duct Sealing and Testing HERS measure must demonstrate a leakage rate less than or equal to 6% of the system air handler airflow. In addition, verification of Cooling Coil Airflow and Fan Watt Draw (HERS measure) is required. The system must have airflow >350 CFM per ton of nominal cooling capacity through the return grilles, and an air-handling unit fan efficiency ≤0.58 W/CFM.
### Heating and Cooling Requirements

#### Federal Minimums for HVAC Efficiency

**Air Conditioners** (cooling capacity < 65 kBtu/h) and **Central Gas Furnaces** (heating capacity < 225 kBtu/h)

<table>
<thead>
<tr>
<th>Type</th>
<th>Capacity</th>
<th>AFUE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wall Furnace</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(fan type)</td>
<td>up to 42,000 Btu/hour</td>
<td>73%</td>
</tr>
<tr>
<td></td>
<td>over 42,000 Btu/hour</td>
<td>74%</td>
</tr>
<tr>
<td></td>
<td>up to 10,000 Btu/hour</td>
<td>59%</td>
</tr>
<tr>
<td></td>
<td>over 10,000 Btu/hour up to 12,000 Btu/hour</td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td>over 12,000 Btu/hour up to 15,000 Btu/hour</td>
<td>61%</td>
</tr>
<tr>
<td></td>
<td>over 15,000 Btu/hour up to 19,000 Btu/hour</td>
<td>62%</td>
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<tr>
<td></td>
<td>over 19,000 Btu/hour up to 27,000 Btu/hour</td>
<td>63%</td>
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<tr>
<td></td>
<td>over 27,000 Btu/hour up to 46,000 Btu/hour</td>
<td>64%</td>
</tr>
<tr>
<td></td>
<td>over 46,000 Btu/hour</td>
<td>65%</td>
</tr>
</tbody>
</table>

#### Wall Furnace (gravity type)

- Single Package ≥ 45 and ≤ 65 kBtu/h: SEER = 14, EER = 11.0
- Gas Central Furnace ≤ 225 kBtu/h: AFUE = 80%

**Common Acronyms:**

- **AFUE:** Annual Fuel Utilization Efficiency (Gas Heating)
- **SEER:** Service Energy Efficiency Rating (Cooling)
- **EER:** Energy Efficiency Ratio (Cooling)
- **COP:** Coefficient of Performance (Heat Pump)
- **HSPF:** Heating Seasonal Performance Factor (Heat Pump)

#### Notes:

- The size of cooling systems are sometimes referred to in “Tons” (e.g. 4 ton unit)
  - 12,000 BTUs = 1 ton of cooling
  - 45,000 BTUs = 3.75 Tons
  - 65,000 BTUs = 5.4 Tons
- Most residential systems will be less than 5 tons (less than 65k BTUs) so refer to these graphics for the required equipment efficiency ratings.
- Heat pump systems are electric and typically used when natural gas is unavailable. These types of systems are less common as it is usually more cost effective to heat using natural gas.
- Wall furnaces are typically seen in older homes and small additions where the central HVAC system isn’t being extended.
- A fan type wall furnace has a fan or blower that circulates the air in the room.
- Gravity type wall furnaces have no mechanism to distribute the air; they simply radiate heat into the space.
<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Equipment Efficiency</th>
<th>New Ducting, Plenums, Lineset: Required R-value</th>
<th>Conditioned Floor Area (sq ft)</th>
<th>Thermostat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package System</td>
<td></td>
<td>R-6 (CZ 2, 8-13) Ducting</td>
<td>Served by system</td>
<td></td>
</tr>
<tr>
<td>Split System</td>
<td></td>
<td>R-8 (CZ 11, 14, 15) Ducting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mini Split</td>
<td></td>
<td>R-6 (all CZ's) Plenums</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Furnace</td>
<td></td>
<td>R-5 or R7.5 Lineset</td>
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</tbody>
</table>

**HERS VERIFICATION SUMMARY** Installer determines work to be completed and matches to one of the options below. At permit application this form is allowed to be filled out by hand. For final inspection all forms are to be registered (no hand filled forms allowed) and a copy left on site.

1. HVAC Changeout/Repair

- **Required Compliance Documents to be left on site for Final:**
  - All Equipment, Condenser Unit, Evaporator Coil, Compressor, TXV, Lineset, Air Handler/Furnace² (Can include new ducting)

2. New HVAC System

- **Required Compliance Documents to be left on site for Final:**
  - All new equipment and All New Ducts³ including Mini Split

3. All New Ducts² and one or more of the following replaced: Condenser Unit, Evaporator Coil, Compressor, TXV, Lineset, Furnace⁴

4. New ducting but less than All New Ducts³

- **Installer Requirement:** Duct leakage <6%, Fan Efficacy (.58W/CFM), Air Flow ≥ 350 CFM/ton (or alternative), Refrigerant Charge

- **Installer Requirement:** Duct leakage <6%, Air Flow ≥ 350 CFM/ton (or alternative), Refrigerant Charge

- **Installer Required to:** Duct leakage <15% or <10% to outside or, or seal all accessible leaks

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1. All new ducting R-8 required when more than 40 ft installed and R-6 when less than 40 ft installed. This includes in walls, between floors etc.
2. Heating only systems and Air Handler/Furnace changes do not require Air Flow MECH-(23 or 24), or Refrigerant Charge verification MECH-25
3. All New Ducts is when at least 75 percent of the duct system is new duct material, and up to 25 percent may consist of reused parts from the dwelling unit’s existing duct system (e.g., registers, grilles, boots, air handler, coil, plenums, duct material)
4. R-5 (1" thick insulation) for linesets 1" and less. R-7.5 (1.5" thick insulation) for linesets over 1 inch. Most mfg will require Suction line Diameter with insulation as the following 1.5-21-25", 2.5-31-25", 3.5 to 41-25", 51-41"