

## What is a Residential HVAC Alteration?

A residential HVAC alteration is any change to a home's space-conditioning system that is regulated by the 2019 California's Building Energy Efficiency Standards (Energy Code), Title 24, Part 6 which include systems that provide heating or cooling within or associated with conditioned spaces in a home. Title 24, Part 6 includes requirements for alterations affecting residential space-conditioning systems, which are generally categorized in the following three groups:

- Altered or Replaced Duct Systems
- Altered Space-Conditioning System
- Entirely New or Complete Replacement Space-Conditioning System

### Why?

As much as half of the energy used in a typical home goes to heating and cooling. Ensuring that HVAC systems are as efficient as possible can result in significant energy savings.

#### Relevant Code Sections

2019 California Building Energy Efficiency Standards, Title 24, Part 6:

- [Section 110.2](#) – Mandatory Requirements for Space-Conditioning Equipment
- [Section 150.0](#) – Mandatory Features and Devices
  - 150.0(h) – Space-Conditioning Equipment
  - 150.0(i) – Thermostats
  - 150.0(m) – Air-Distribution and Ventilation System Ducts, Plenums, and Fans
  - 150.0(j) – Suction Line Insulation
- [Section 150.1](#) – Performance and Prescriptive Compliance Approaches for Newly Constructed Residential Buildings
- [Section 150.2](#) – Energy Efficiency Standards for Additions and Alterations to Existing Low-Rise Residential Buildings
  - 150.2(b)1C – New or Complete Replacement Space - Conditioning System
  - 150.2(b)1D – Altered Duct Systems - Duct Sealing
  - 150.2(b)1E – Altered Space-Conditioning System - Duct Sealing
  - 150.2(b)1F – Altered Space-Conditioning System - Mechanical Cooling
  - 150.2(b)1G – Water-Heating System
- [Residential Compliance Manual, Chapter 4](#) – HVAC Building Requirements

## What is an Altered Duct System?

- Extension of Existing Ducts
  - >40 ft of extended duct system
  - any altered ducts in garage spaces
- Entirely New or Replacement Ducts
  - ≥75% of new duct system
  - Up to 25% existing duct system components may be reused, if accessible and can be sealed

Note: ≤40 ft of altered or extended duct does not trigger compliance documentation or duct leakage testing, unless it is in the garage. If ≤40 ft and not in garage, it must meet mandatory R-6 insulation only.

**Table 150.2-A Duct Insulation R-Value**

Climate Zone	1 through 10, 12 & 13	11, 14 through 16
Duct R-Value	R-6	R-8

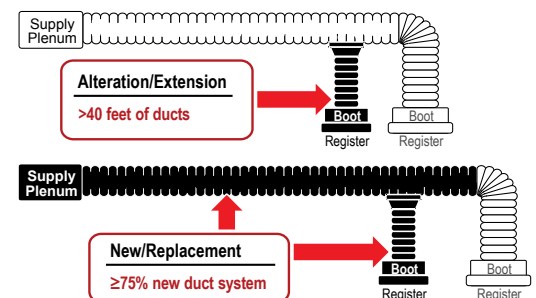


Figure 1: Altered or Replaced Duct Systems (Duct Sealing): §150.2(b)1D

## What is an Altered Space-Conditioning System?

If the alteration is not a complete replacement of the space conditioning system but one or more of the following components is installed or replaced, it is considered an Altered Space-Conditioning System.

- Any refrigerant-containing component, including:
  - Cooling coil
  - Condenser coil
  - Compressor Refrigerant piping
  - Refrigerant metering device
  - Outdoor condensing unit

OR

- Air handler

Acceptable fuel types for replacement space-conditioning systems include:

- Natural gas
- Liquefied petroleum gas
- The fuel type of the system being replaced

If the fuel type of the system being replaced is gas, the replacement space-conditioning system may be a heat pump.

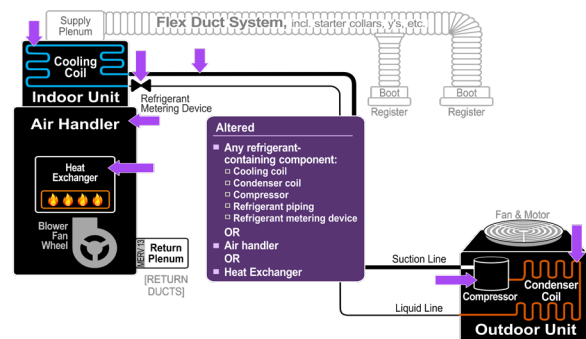


Figure 2: Altered Space-Conditioning System: §150.2(b)1E,F

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. Repairs do not trigger Title 24, Part 6 code requirements.

## What is Entirely New versus Complete Replacement of a Space-Conditioning System?

When all of the following are installed or replaced:

- All the system heating/cooling components
- >75% new duct material

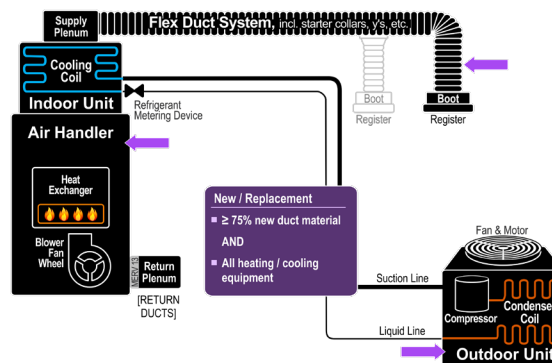


Figure 3: Entirely New or Complete Replacement Space-Conditioning System: §150.2(b)1C

## Setback Thermostats: §110.2

Only altered or new/replacement cooling systems trigger installation of setback thermostat. It is not required for heating-system-only replacements, unless the entire heating system including ducts is replaced, per Sections 150.0(i) and 150.2(b)C.

## Equipment Efficiency: §110.2

Most heating and cooling equipment installed in California homes is regulated by the National Appliance Efficiency Conservation Act (NAECA) and/or the California Appliance Efficiency Regulations (Title 20).

## Duct Sealing and Testing (HERS measure)

Duct Sealing and Testing (HERS measure) is required for both altered duct systems and new/replacement duct systems.

- Extension of Existing Ducts >40 ft:** The measured leakage must be ≤15% of system air handler air flow. (There are alternatives to meeting the maximum 15% leakage. Consult your Building Department or Section 150.2(b)1Diib).
- Altered Space Conditioning System:** The measured leakage must be ≤15% of system air handler air flow. (There are alternatives to meeting the maximum 15% leakage. Consult your Building Department or Section 150.2(b)1E). In addition, the system must have a cooling coil airflow >300 CFM per ton of nominal cooling capacity or >250 CFM per ton of nominal cooling capacity for small duct high velocity systems and verified by the HERS Rater. Refrigerant Charge verification is Prescriptively required for Climate Zones 2 and 8-15.
- New/Replacement Space Conditioning System:** The Duct Sealing and Testing (HERS measure) must demonstrate a leakage rate ≤5% of the system air handler airflow. In addition, verification of Cooling Coil Airflow and Fan Watt Draw (HERS measure) is required. Refrigerant Charge verification is Prescriptively required for Climate Zones 2 and 8-15.
- Altered Ducts in Garage Spaces:** The measured leakage must be ≤6% of system air handler air flow. If measured leakage is not possible an alternative would be to have all accessible leaks sealed and verified through visual inspection and smoke tested by a certified HERS Rater.

# Forms: Which & When

In addition to a permit, typically HVAC alterations require the following:

- **CF1R: Certificate of Compliance: Alteration to an HVAC System**
  - **CF1R-ALT-02-E**
    - Completed and signed by the installing contractor
    - Must be registered with a HERS Provider prior to permit application
- **CF2R-MCH-01 (Tables a-e): 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
  - Must be registered with a HERS Provider prior to final inspection
- **CF3R-MCH Forms: Certificate of Verification**
  - **CF3R-MCH-20\*-H: Certificate of Verification for Duct Leakage Diagnostic Test**
    - Completed by the HERS rater and made available for final inspection by building department
    - Must be registered with a HERS Provider prior to final inspection
  - **CF3R-MCH-22\*-H: Certificate of Verification for Fan Efficacy**
    - Completed by the HERS rater and made available for final inspection by building department
    - Must be registered with a HERS Provider prior to final inspection
  - **CF3R-MCH-23\*-H: Certificate of Verification for Airflow Rate**
    - Completed by the HERS rater and made available for final inspection by building department
    - Must be registered with a HERS Provider prior to final inspection
  - **CF3R-MCH-25\*-H: Certificate of Verification Refrigerant Charge**
    - Completed by the HERS rater and made available for final inspection by building department
    - Must be registered with a HERS Provider prior to final inspection

\* Correct version (e.g., "a," "b" and "c") varies depending upon the project scope and approach used to demonstrate compliance

**ALTERATIONS TO SPACE CONDITIONING SYSTEMS**  
**CERTIFICATE OF COMPLIANCE**  
 Alterations to Space Conditioning Systems

**A. General Information**  
 CF1R-ALT-02-E is required for multiple space conditioning systems contained within a single dwelling unit. When multiple dwelling units must be addressed, use the CF1R-ALT-02-E form for each dwelling unit.

**B. Space Conditioning (SC) System Information**

SC System Identification	SC System Description	SC System Location	SC System Capacity	SC System Efficiency	SC System Installation Date	SC System Alteration Date	SC System Alteration Description	SC System Alteration Type
01	02	03	04	05	06	07	08	09

**C. Extension of Existing Duct System, Greater Than 40 Feet (Section 5.0.2.2)(2019)**

SC System Identification: 01  
 SC System Description: 02  
 SC System Location: 03  
 SC System Capacity: 04  
 SC System Efficiency: 05  
 SC System Installation Date: 06  
 SC System Alteration Date: 07  
 SC System Alteration Description: 08  
 SC System Alteration Type: 09

Registeration Number: CA Building Energy Efficiency Standards - 2019 Residential Compliance  
 Registration Date/Time: \_\_\_\_\_  
 HERS Provider: \_\_\_\_\_  
 January 2019

**SPACE CONDITIONING SYSTEMS, DUCTS, AND FANS**  
**CERTIFICATE OF INSTALLATION**  
 Space Conditioning Systems Ducts and Fans

**A. General Information**  
 01 Ducted Unit Name  
 02 Ducted Unit Location  
 03 Ducted Unit Capacity  
 04 Ducted Unit Efficiency  
 05 Ducted Unit Installation Date  
 06 Ducted Unit Alteration Date  
 07 Ducted Unit Alteration Description  
 08 Ducted Unit Alteration Type

**B. Design Space Conditioning (SC) System Component Specifications (Table 5.0.2.1)**

Zone	SC System Identification	SC System Description	SC System Location	SC System Capacity	SC System Efficiency	SC System Installation Date	SC System Alteration Date	SC System Alteration Description	SC System Alteration Type
01	02	03	04	05	06	07	08	09	10

**MCH-01a - Space Conditioning Systems Ducts and Fans - For use with performance Certificate of Compliance**

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 HERS Provider: \_\_\_\_\_  
 January 2019

**DUCT LEAKAGE DIAGNOSTIC TEST**  
**CERTIFICATE OF VERIFICATION**  
 Duct Leakage Diagnostic Test

**A. System Information**  
 01 Space Conditioning System Identification  
 02 Space Conditioning System Description  
 03 Space Conditioning System Location  
 04 Space Conditioning System Capacity  
 05 Space Conditioning System Efficiency  
 06 Space Conditioning System Installation Date  
 07 Space Conditioning System Alteration Date  
 08 Space Conditioning System Alteration Description  
 09 Space Conditioning System Alteration Type

**B. Duct Leakage Diagnostic Test**  
 10 Duct Leakage Test Method  
 11 Duct Leakage Test Results  
 12 Duct Leakage Test Conditions  
 13 Duct Leakage Test Results  
 14 Duct Leakage Test Results  
 15 Duct Leakage Test Results  
 16 Duct Leakage Test Results  
 17 Duct Leakage Test Results  
 18 Duct Leakage Test Results  
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 22 Duct Leakage Test Results  
 23 Duct Leakage Test Results  
 24 Duct Leakage Test Results

Registeration Number: CA Building Energy Efficiency Standards - 2019 Residential Compliance  
 Registration Date/Time: \_\_\_\_\_  
 HERS Provider: \_\_\_\_\_  
 January 2019

## For More Information

### Primary Sources

- Energy Code Section 110.2 – Mandatory Requirements for Space-Conditioning Equipment  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1102mandatoryrequirementsforspaceconditioningequipment.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1102mandatoryrequirementsforspaceconditioningequipment.htm)
- Energy Code Section 150.0 – Mandatory Features and Devices  
[energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1500mandatoryfeaturesanddevices.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1500mandatoryfeaturesanddevices.htm)
- Energy Code Section 150.1 – Performance and Prescriptive Compliance Approaches for Newly Constructed Residential Buildings  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1501performanceandprescriptivecomplianceapproachesfornew.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1501performanceandprescriptivecomplianceapproachesfornew.htm)
- Energy Code Section 150.2 – Energy Efficiency Standards for Additions and Alterations to Existing Low-Rise Residential Buildings  
[energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1502energyefficiencystandardsforadditionsandalterationsto.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1502energyefficiencystandardsforadditionsandalterationsto.htm)
- Energy Code Residential Compliance Manual, Chapter 4 – HVAC Building Requirements  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/4buildinghvacrequirements.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/4buildinghvacrequirements.htm)

### California Energy Commission Information & Services

- Energy Code Hotline: 1-800-772-3300 (Free) or [Title24@energy.ca.gov](mailto:Title24@energy.ca.gov)
- Online Resource Center:  
[www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/online-resource-center](http://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/online-resource-center)
  - The Energy Commission’s main web portal for the Energy Code, 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.

*Of special interest:*

Trigger Sheets

[energycodeace.com/content/resources-trigger-sheets/](http://energycodeace.com/content/resources-trigger-sheets/)

- Residential HVAC Alterations 2019

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