Residential HVAC Changeouts

Handout No: 16
Revised: 1/18/17

This informational handout addresses residential Heating, Ventilation, and Air Conditioning (HVAC) replacements (changeouts), repairs and alterations, including ductwork.

Permit Requirements

A permit is required to install, remove, replace, or alter an HVAC system or its components. A permit must be obtained before beginning the work. Work performed prior to obtaining a permit is subject to investigation/penalty fees.

Smoke & Carbon Monoxide Alarms

Smoke and carbon monoxide alarms must be installed in accordance with Sections R314 and Section R315 of the 2016 California Residential Code as follows:

Smoke Alarms shall be installed in new residential construction or additions, alterations or repairs to residential buildings where the value of the work exceeds $1,000. Smoke alarms shall receive their primary power from the building wiring, shall have a battery backup and shall be interconnected with all other smoke alarms to be clearly audible in all bedrooms except in existing areas of buildings undergoing alterations or repairs that can't be installed without the removal of interior finishes. Smoke alarms shall be installed in the following locations in accordance with CRC Section R314:

- In each sleeping room.
- Outside each separate sleeping area in the immediate vicinity of the bedrooms.
- On each additional story of the dwelling, including basements and habitable attics, but not including crawl spaces and uninhabitable attics. In dwellings or dwelling units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level, provided that the lower level is less than one full story below the upper level.

Carbon Monoxide Alarms shall be installed where fuel-burning appliances are installed and in dwelling units that have attached garages in new residential construction or additions, alterations or repairs to residential buildings where the value of the work exceeds $1,000. Carbon monoxide alarms shall receive their primary power from the building wiring, shall have a battery backup and shall be inter-connected with all other carbon monoxide alarms in the individual unit, except in existing areas of buildings undergoing alterations or repairs that can't be installed without the removal of interior finishes. Carbon monoxide alarms shall be installed in the following locations (R315):

- Outside of each separate dwelling unit sleeping area in the immediate vicinity of the bedroom(s).
- On every level of a dwelling unit including basements.
- In every bedroom where a fuel burning appliance is installed in the bedroom or its attached bathroom.

Compliance with the 2016 California Building Standards Code

The new installation, removal, replacement, or alteration of an HVAC system or its components is subject to the various applicable requirements of the 2016 Building Standards Code including the 2016 editions of the California Residential Code, the California Mechanical Code, the California Electrical Code , the California Plumbing Code and the California Energy Code. All unsafe conditions related to the HVAC installation must be mitigated as a condition of final inspection approval.

Compliance with the 2016 California Energy Code

The California Energy Code specifies mandatory and prescriptive requirements related to HVAC replacements (changeouts), repairs and alterations. The energy code requires documentation be completed prior to issuance of a permit and prior to issuance of final inspection approval for HVAC related work.

In most cases, testing and verification is required by a certified Home Energy Rater (HERS) for HVAC changeouts. See the attached 2016 Residential HVAC Alterations Trigger Sheet for more information on when HERS testing and verification is required.

Prior to issuance of a permit for HVAC replacements (changeouts), repairs and alterations, one of the following energy documentation forms must be completed and submitted for building department approval:

- 2016-CF1R-ALT-02-E-PrescriptiveAlterationsHVAC.pdf (completed online – Registration with a HERS provider is required – See the CA Energy Commission web page at http://www.energy.ca.gov/HERS/providers_2016standards.html for 2016 approved HERS providers);

or

- 2016-CF1R-ALT-04-E-PaperVersionOfALT-HVAC-CZ 2,8-15.pdf (paper version) [attached]

Incomplete or incorrectly filled-out forms will result in a delay of the issuance of a permit. The forms completed and approved for permit issuance will help to determine the documentation required to be on-site for final inspection approval. **Completed CF1R forms (and other forms as required) must be registered with a HERS Provider prior to calling for building department final inspection.**

2016 ENERGY CODE

Ace Resources Title 24, Part 6 Triggers

Residential

HVAC – Alterations

Split Systems and Packaged Systems

	Mandatory Requirements					Prescriptive Requirements	
Change This ***(and nothing else)***	Setback Thermostat §110.2(c), §150.2(b)1Fi	Cooling Load Calcs §150.0(h), §150.2(b)1C	Heating Load Calcs §150.0(h), §150.2(b)1C	HERS: Duct Seal and Test §150.0(m)1-3 & 11 §150.2(b)1C, D, & E	Air Filtration and HERS: Cooling Coil Airflow and Fan Watt Draw §150.2 (b)1C, D	Duct Insulation §150.2(b)1D	HERS: Refrigerant Charge §150.2(b)1F
Whole Split or Packaged System *(no ducts added or replaced)*	**YES**	no	no[C]	**YES**[D]	no	no	**YES**[H, I]
Evaporator Coil (cooling coil), Condenser Coil, or Outdoor Condensing Unit	**YES**	no	no[C]	**YES**[D]	no	no	**YES**[H, I]
Furnace *(air handler)*	**YES**	no	no[C]	**YES**[D]	no	no	**YES**[H, I]
Compressor, Refrigerant Metering Device	**YES**	no	no[C]	no	no	no	**YES**[H, I]
Some Ducts >40 feet of new or replacement	no	maybe[B]	maybe[C, B]	**YES**[E]	no	**YES**[G]	no
"All New" Ducts[A]	no	maybe[B]	maybe[C, B]	**YES**[E]	**YES**[F]	**YES**[G]	no
Whole Split or Packaged System and All New Ducts	**YES**	**YES**[B]	**YES**[C, B]	**YES**[E]	**YES**[F]	**YES**[G]	**YES**[H, I]

Note:
- Replacing the blower wheel fan is considered a repair and does NOT trigger the Energy 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 0.75" thick insulation.

A 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.

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

C Heating equipment must meet CBC minimum capacity requirements.

D 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. §150.2(b)1E applies.

E Unless exceptions apply, duct systems must be sealed and verified if >40 feet of new or replacement ducts are installed. In all climate zones, when new duct systems are installed in unconditioned space, leakage must be ≤5% of the air handler airflow.

F 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-B or Table 150.0-C (Return Duct Sizing and Filter Sizing).

G 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-4.2) apply to all new or replacement ducts (not existing or unaltered ducts).

H 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.

I Although there are no commercially available HVAC systems with approved Fault Indicator Displays (FID) devices at the time of publication (July 2016) the Energy Standards do allow use of a CEC-approved FID should such equipment become available during the 2016 code cycle.

STATE OF CALIFORNIA

ALTERATIONS - HVAC

CEC-CF1R-ALT-04-E (Revised 01/16) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	CF1R-ALT-04-E
Alterations - HVAC CZ 2, and 8-15	(Page 1 of 1)

Site Address:				**Enforcement Agency:**	**Date Prepared:**	**Permit#:**
Equipment Type		Equipment Efficiency		New Ducting or Lineset: Required R-value	Conditioned Floor Area (ft^2)	Thermostat
☐ Packaged System ☐ Split System ☐ Mini Split ☐ Furnace	☐ Evaporator Coil ☐ Condensing Unit ☐ Compressor ☐ Lineset ☐ TXV	_____AFUE _____SEER _____EER	_____COP _____HSPF	☐ R-6 *(CZ 1-10, 12&13)* Ducts ☐ R-8[1] *(CZ 11, 14-16)* Ducts ☐ ≥ R-2.8 Lineset[4]	Served by system _____ft^2	☐ Setback *(If not already present, must be installed)*

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/Furnace[2] **(Can include new ducting)**	CF1R-ALT-02-E CF2R-MCH-01-E, MCH-20-H, MCH-(23 or 24)[2]-H, MCH-25-H[2] CF3R-MCH-20-H, MCH-(23 or 24)-H[2], MCH-25-H[2]

Installer Requirement: Duct leakage (≤ 15%, or ≤10% to outside, or seal all accessible leaks), Air Flow ≥ 300 CFM/ton, Refrigerant Charge.
Exempted from duct leakage testing if:
☐ 1. Duct system registered with HERS provider as previously sealed, or ☐ 2. There is less than 40 linear feet of duct in unconditioned space, or
☐ 3. Existing duct systems are constructed, insulated or sealed with asbestos (list manufacture date of building _____)

☐ 2. **New HVAC System**	**Required Compliance Documents to be left on site for Final**:
All new equipment and All New Ducts[3] including Mini Split	CF1R-ALT-02-E CF2R-MCH-01-E, MCH-20-H, MCH-22-H, MCH-(23 or 24)-H[2], MCH-25-H[2] CF3R-MCH-20-H, MCH-22-H, MCH-(23 or 24)-H[2], MCH-25-H[2] Mini Splits require CF1R-ALT-02-E, CF2R-MCH-01-E, and (CF2R-CF3R) MCH-25-H

Installer Requirement: Duct leakage ≤ 5%, Fan Efficacy (0.58W/CFM), Air Flow ≥ 350 CFM/ton (or alternative), Refrigerant Charge

☐ 3. **All New Ducts with Replacement**	**Required Compliance Documents to be left on site for Final**:
All New Ducts[3] and one or more of the following replaced: Condenser Unit, Evaporator Coil, Compressor, TXV, Lineset, Furnace[2]	CF1R-ALT-02-E CF2R-MCH-01-E, MCH-20-H, MCH-(23 or 24)-H, MCH-25-H CF3R-MCH-20-H, MCH-(23 or 24)-H, MCH-25-H

Installer Requirement: Duct leakage ≤ 5%, Air Flow ≥ 350 CFM/ton (or alternative), Refrigerant Charge
Exempted from duct leakage testing if: ☐ 1. Existing duct systems are constructed, insulated or sealed with asbestos

☐ 4. **New Ducting over 40 feet**	**Required Compliance Documents to be left on site for Final**:
New ducting but less than All New Ducts[3]	CF1R-ALT-02-E, CF2R-MCH-20-H, CF3R-MCH-20-H

Installer Required to: Duct leakage (≤ 15% or, ≤10% to outside or, or seal all accessible leaks)
☐ EXCEPTION: Existing duct systems constructed, insulated or sealed with asbestos.

[1] All **new** ducting requires R-8 insulation when more than 40 ft installed in CZs 11 & 14-16 and R-6 in CZs 1-10, 12 &13, and R-6 insulation 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 MCH-(23 or 24), or Refrigerant Charge verification MCH-25
[3] All New Ducts is when at least 75%of the duct system is new duct material, and up to 25%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-2.8 (1" thick insulation) for linesets 1" and less.

Contractor (Documentation Author's /Responsible Designer's Declaration Statement)

I certify the following under penalty of perjury, under the laws of the State of California:
1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the California Business and Professions Code to accept responsibility for the information on this document.
3. That the energy features and performance specifications for the design identified on this Certificate of Compliance conform to the requirements of Title 24, Parts 1 and 6 of the California Code of Regulations (CCR).
4. That the energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the CCR.
5. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.

Responsible Designer Name:	Responsible Designer Signature:	Date Signed:	License:
Company :	Address:	City/State/Zip:	Phone:

For assistance or questions regarding the Energy Standards, contact the Energy Hotline at: 1-800-772-3300