

DOCKETED

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DUCT LEAKAGE DIAGNOSTIC TEST

CEC-CF2R-MCH-20-H (Revised 01/19)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF INSTALLATION		CF2R-MCH-20-H
Duct Leakage Diagnostic Test		(Page 1 of 2)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City	Zip Code

A. System Information

01	Space Conditioning System Identification or Name	
02	Space Conditioning System Location or Area Served	
03	Indoor Unit Name	
04	Building Type from CF1R	
05	Verified Low Leakage Ducts in Conditioned Space (VLLDCS) Credit from CF1R?	
06	Verified Low Leakage Air-handling Unit Credit from CF1R?	
07	Duct System Compliance Category	
08	Any portions of Duct Located in Garage?	

MCH-20c - Low Leakage Air-Handling Unit (LLAHU)**B. Duct Leakage Diagnostic Test**

01	Air-Handling Unit Airflow (AHU Airflow) Determination Method	
02	Condenser Nominal Cooling Capacity (ton)	
03	Indoor Unit Nominal Cooling Capacity	
04	Heating Capacity (kBtu/h)	
05	Conditioned Floor Area Served by this HVAC System (ft ²)	
06	Measured AHU Airflow (cfm)	
07	Duct Leakage Test Conditions	
08	Duct Leakage Test Method	
09	Leakage Factor	
10	Calculated Target Allowable Duct Leakage Rate (cfm)	
11	Actual Duct Leakage Rate from Leakage Test Measurement (cfm)	
12	Air-Handling Unit Manufacturer Name	
13	Air-Handling Unit Model Number	
14	Compliance Statement:	

C. Additional Requirements for Compliance

01	The Low Leakage Air-handling Unit Model identified on this compliance document is included in the list of certified Low Leakage Air-Handling Units published on the Energy Commission Website at:
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Registration Number:

Registration Date/Time:

HERS Provider:

CA Building Energy Efficiency Standards - 2019 Residential Compliance

January 2019

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CERTIFICATE OF INSTALLATION		CF2R-MCH-20-H
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	http://www.energy.ca.gov/title24/equipment_cert/llahu/low_leakage_air_handling_units.pdf
02	System was tested in its normal operation condition. No temporary taping allowed.
03	Outside air (OA) duct connections to the central forced air duct system shall not be sealed/taped off during duct leakage testing. OA ducts used for Central Fan Integrated (CFI) Indoor Air Quality ventilation systems, or Central Fan Ventilation Cooling Systems, that utilize dampers that open only when OA is required and automatically close when OA is not required, may configure the OA damper to the closed position during duct leakage testing.
04	All supply and return register boots were sealed to the drywall.
05	Building cavities were not used as plenums, or platform returns, in lieu of ducts.
06	If cloth backed tape was used it was covered with Mastic and draw bands.
07	All connection points between the air handler and the supply and return plenums are completely sealed.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT		
1. I certify that this Certificate of Installation documentation is accurate and complete.		
Documentation Author Name:	Documentation Author Signature:	
Documentation Author Company Name:	Date Signed:	
Address:	CEA/CEPE/HERS certification identification (if applicable):	
City/State/Zip:	Phone:	
RESPONSIBLE PERSON'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 Installation is true and correct.		
2. I am either: a) a responsible person eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction, or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Installation and attest to the declarations in this statement, or b) I am an authorized representative of the responsible person and attest to the declarations in this statement on the responsible person's behalf.		
3. The constructed or installed features, materials, components or manufactured devices (the installation) identified on this Certificate of Installation conforms to all applicable codes and regulations and the installation conforms to the requirements given on the Certificate of Compliance, plans, and specifications approved by the enforcement agency.		
4. I understand that a HERS rater will check the installation to verify compliance and if such checking determines the installation fails to comply, I am required to offer any necessary corrective action at no charge to the building owner.		
5. I will ensure that a registered copy of this Certificate of Installation shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Installation is required to be included with the documentation the builder provides to the building owner at occupancy.		
Responsible Builder/Installer Name:	Responsible Builder/Installer Signature:	
Company Name: (Installing Subcontractor or General Contractor or Builder/Owner)	Position With Company (Title):	
Address:	CSLB License:	
City/State/Zip:	Phone:	Date Signed:
Third Party Quality Control Program (TPQCP) Status:	Name of TPQCP (if applicable):	

CF2R-MCH-20c-H User Instructions**A. System Information**

1. *HVAC System Identification or Name:* This field is filled out automatically. It is referenced from the CF2R-MCH-01, which must be completed prior to this document.
2. *HVAC System Location or Area Served:* This field is filled out automatically. It is referenced from the CF2R-MCH-01, which must be completed prior to this document.
3. *Indoor Unit Name:* This field is filled out automatically. It is referenced from the CF2R-MCH-01, which must be completed prior to this document.
4. *Building Type:* This field is filled out automatically. It is referenced from the Certificate of Compliance (CF1R), which must be completed prior to this document.
5. *Verified Low Leakage Ducts in Conditioned Space (VLLDCS):* This field is filled out automatically. It is referenced from the Certificate of Compliance (CF1R), which must be completed prior to this document.
6. *Verified Low Leakage Air-Handling Unit (VLLAHU) Credit:* This field is filled out automatically. It is referenced from the Certificate of Compliance (CF1R), which must be completed prior to this document.
7. *Duct System Compliance Category:* Choose from New, Replacement, Alteration, Replacement Using Smoke Test, Alteration Using Smoke Test.
 - a. **New:** Use this choice for newly constructed buildings, additions with all-new systems dedicated to the addition, or new systems installed in existing homes where the equipment is newly installed and the ducts are at least 75% or more newly installed duct material (up to 25% of the finished system may consist of reused parts from the dwelling unit's previously existing duct system, such as registers, grilles, boots, air handler, coil, plenums, duct material).
 - b. **Replacement:** For existing buildings where the equipment is not newly installed but the ducts are at least 75% or more newly installed duct material (up to 25% of the finished system may consist of reused parts from the dwelling unit's previously existing duct system, such as registers, grilles, boots, air handler, coil, plenums, duct material). Sometimes referred to as a "re-ducted" system.
 - c. **Alteration:** For existing buildings where any of the following are newly installed or replaced as part of the project and the system does not meet one of the other compliance categories:
 - i. 40 feet of space-conditioning system ducts are installed in unconditioned space or indirectly conditioned space.
 - ii. Air conditioning or heat pump condenser
 - iii. Heating or cooling coil
 - iv. Air handler (e.g., furnace, fan coil, package unit)
 - d. **Replacement using Smoke Test:** Similar to "Replacement" but the target leakage could not be met due to the equipment not being new. Smoke is used to show that leaks are only coming from the previously existing equipment. All accessible leaks visible by smoke must be sealed.
 - e. **Alteration using Smoke Test:** Similar to "Alteration" but the target leakage could not be met due to the equipment not being new or due to inaccessible leaks. Smoke is used to show that leaks are only coming from the previously existing equipment or are inaccessible. All accessible leaks visible by smoke must be sealed.
8. *Any portions of Duct Located in Garage:* User select from Yes or No.

B. Duct Leakage Diagnostic Test - Low Leakage Air-Handling Unit (LLAHU)

1. *Air-Handling Unit Airflow (AHU Airflow) Determination Method:* User will select from the following options:
 - a. **Cooling System Method:** For systems with cooling, this selection must be made, and the nominal air handler airflow shall be 400 CFM per nominal ton of condensing unit cooling capacity as specified by the manufacturer or the heating only value, whichever is greater (See Section RA3.1.4.2.2 of the 2019 Reference Appendices).
 - b. **Heating System Method:** For heating only systems the nominal air handler airflow shall be 21.7 CFM per kBtu/h of rated heating output capacity.
 - c. **Measured Airflow Method:** The system airflow can be used as the air-handler airflow for the purpose of establishing duct leakage percentage (See Section RA3.1.4.2.3 of the 2019 Reference Appendices).

- d. **Default Airflow Method:** The Default Airflow Method may only be used for homes where the duct system is being tested before the conditioning and heating system is installed and the equipment specification is not known (See Section RA3.1.4.2.1 of the 2019 Reference Appendices).
- e. **Indoor Unit Method**
2. **Condenser Nominal Cooling Capacity (ton):** Same data given on MCH-01.
 3. **Indoor Unit Nominal Cooling Capacity:** Same data given on MCH-01.
 4. **Heating Capacity (kBtu/h):** Same data given on MCH-01;
 5. **Conditioned Floor Area Served by this HVAC System (ft²):** User will input CFA for zone which should be consistent with the value from the CF1R. User will have the option to leave this field blank because the zone CFA is only required for the default airflow calculation.
 6. **Measured AHU Airflow (cfm):** If "Measured Airflow Method" is selected, user must input measured airflow.
 7. **Duct Leakage Test Conditions:** User must select from the following options:
 - a. **Test Final:** Test conducted at final inspection (testing at rough is not an option with this test. See Section RA3.1.4.3.1 of the 2019 Reference Appendices).
 8. **Duct Leakage Test Method:** User will select from the following options: Total Leakage.
 9. **Leakage Factor:** Value will be automatically populated from in CF1R.
 10. **Calculated Target Allowable Duct Leakage Rate (cfm):** This value will be automatically populated depending on values in B06, B07, and B08.
 11. **Actual Duct Leakage Rate from Leakage Test Measurement (cfm):** User will input this value from actual measurements from leakage test.
 12. **Air-Handling Unit Manufacturer Name:** This will be automatically populated from information entered in the MCH-01.
 13. **Air-Handling Unit Model Number:** This will be automatically populated from information entered in the MCH-01.
 14. **Compliance Statement:** If Actual Duct Leakage Rate from leakage test is less than or equal to Calculated Target Allowable Duct Leakage Rate, "System passes leakage test" will automatically populate. If not, "System fails leakage test will automatically populate.

A. System Information		
01	Space Conditioning System Identification or Name	<<text (data from MCH-01)>>
02	Space Conditioning System Location or Area Served	<<text (data from MCH-01)>>
03	Indoor Unit Name	<<text (data from MCH-01)>>
04	Building Type from CF1R	<<text (data from CF1R)>>
05	Verified Low Leakage Ducts in Conditioned Space (VLLDCS) Credit from CF1R?	<<calculated result: (= true or false depending on CF1R data: if true =>display message directing use of <u>VLLDCS</u> method 20b)>>
06	Verified Low Leakage Air-handling Unit Credit from CF1R?	<<calculated result: (= true or false depending on CF1R data: if true =>display message directing use of <u>VLLAHU</u> method 20c)>>
07	Duct System Compliance Category	<<If parent is MCH-01b and B08 or B09 = Yes, then user pick from list: <u>New</u> ; or <u>Replacement</u> ; Else user pick one from list: <u>New</u> ; or <u>Replacement</u> ; or <u>Alteration</u> ; or <u>Replacement using Smoke Test</u> ; or <u>Alteration using Smoke Test</u> >>
08	Portions of Ducts Located In Garage?	<<user entry, -Yes -No>>
09	Determine compliance method for this document; display applicable tables below; (this row not visible to user)	<<Calculated Result: if A07= <u>Replacement using Smoke Test</u> or <u>Alteration using Smoke Test</u> ; then display method: 20e. Altered or Replacement Duct System using Smoke Test elseif A07= <u>Replacement</u> or <u>Alteration</u> ; then display method: 20d. Altered or Replacement Duct System elseif A07= <u>New</u> and 05= <u>VLLDCS</u> (true); then display method: 20b. Low Leakage Ducts in Conditioned Space elseif A07= <u>New</u> and 06= <u>VLLAHU</u> (true); then display method: 20c. Low Leakage Air-Handling Unit elseif A07= <u>New</u> then display method: 20a. Completely New Duct System >>

MCH-20c - Low Leakage Air-Handling Unit (LLAHU)

B. Duct Leakage Diagnostic Test		
01	Air-Handling Unit Airflow (AHU Airflow) Determination Method	<<pick one from list: <u>CoolingSystemMethod</u> ; <u>HeatingSystemMethod</u> ; <u>MeasuredAirflowMethod</u> ; <u>DefaultAirflowMethod</u> ; <u>IndoorUnitMethod</u> >>
02	Condenser Nominal Cooling Capacity (ton)	<< if B01 = CoolingSystemMethod, then user input is numeric x.xx; else =N/A >>
03	Indoor Unit Nominal Cooling Capacity (ton)	<< if B01 = IndoorUnitMethod, then user input is either numeric x.xx, else =N/A>>
04	Heating Capacity (kBtu/h)	<<if B01 = HeatingSystemMethod, then user input is numeric xxx.x; else =N/A >>
05	Conditioned Floor Area Served by this HVAC System (ft ²)	<< if B01 = DefaultAirflowMethod, user input is numeric xx,xxx; else = N/A (should be consistent with CF1R zone CFA data)>>
06	Measured AHU Airflow (cfm)	<<if B01 = MeasuredAirflowMethod, then user enter numeric x,xxx, else = N/A>>
07	Duct Leakage Test Conditions:	<< Auto filled field: <u>TestFinal</u> (this is the only allowable test condition for LLAHU)>>
08	Duct Leakage Test Method	<< Auto filled field: <u>TotalLeakage</u> (this is the only allowable test method for LLAHU)>>
09	Leakage Factor	<<numeric: 0.xx (referenced from CF1R)>>
10	Calculated Target Allowable Duct Leakage Rate (cfm)	<<calculated field: numeric xxx: if AHUAirflowMethod= <u>CoolingSystemMethod</u> then <u>AHUAirflow=CondenserNomCoolCapacityTon*400* LeakageFactor</u> ; elseif AHUAirflowMethod= <u>HeatingSystemMethod</u> then <u>AHUAirflow=HeatingCapacityKbtuh*21.7* LeakageFactor</u> ; elseif AHUAirflowMethod= <u>MeasuredAirflowMethod</u> then <u>AHUAirflow= Measured AHUAirflow * LeakageFactor</u> ; elseif AHUAirflowMethod= <u>DefaultAirflowMethod</u> then <u>AHUAirflow=ZonedCondFloorArea*0.5* LeakageFactor</u> ; elseif AHUAirflowMethod= <u>IndoorUnitMethod</u> then <u>AHUAirflow=IndoorAirUnitCoolingCapacityton*400*LeakageFactor</u> >>
11	Actual Duct Leakage Rate from Leakage Test Measurement (cfm)	<<user input: numeric xxx.x>>
12	Air-Handling Unit Manufacturer Name	<<text (data from MCH-01)>>
13	Air-Handling Unit Model Number	<<text (data from MCH-01)>>
14	Compliance Statement:	<<if measured leakage rate is ≤ to target allowable leakage rate: "system passes leakage test"; else if measured leakage rate is > target allowable leakage rate: "system fails leakage test">>

C. Additional Requirements for Compliance

01	The Low Leakage Air-handling Unit Model identified on this compliance document is included in the list of certified Low Leakage Air-Handling Units published on the Energy Commission Website at: http://www.energy.ca.gov/title24/equipment_cert/llahu/low_leakage_air_handling_units.pdf
02	System was tested in its normal operation condition. No temporary taping allowed.
03	Outside air (OA) duct connections to the central forced air duct system shall not be sealed/taped off during duct leakage testing. OA ducts used for Central Fan Integrated (CFI) Indoor Air Quality ventilation systems, or Central Fan Ventilation Cooling Systems, that utilize dampers that open only when OA is required and automatically close when OA is not required, may configure the OA damper to the closed position during duct leakage testing.
04	All supply and return register boots were sealed to the drywall.
05	Building cavities were not used as plenums, or platform returns, in lieu of ducts.
06	If cloth backed tape was used it was covered with Mastic and draw bands.
07	All connection points between the air handler and the supply and return plenums are completely sealed.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

For information and data collection only. Not valid until registered with a HERS provider