

AGM RESIDENTIAL ~~MANUAL~~ APPENDIX RA2 -2008

7-RA2 - 2008 - Home Energy Rating Systems (HERS) Required Field Verification and Diagnostic Testing (Formerly RACM 7)

7.1-RA2.1 California Home Energy Rating Systems

Compliance credit for particular energy efficiency measures, which the Commission specifies, requires field verification and diagnostic testing of as-constructed dwelling units (as defined in Section ~~RA2-79~~) by a certified HERS (Home Energy Rating System) rater. The Commission approves HERS providers, subject to the Commission's HERS regulations, which appear in the California Code of Regulations, Title 20, Division 2, Chapter 4, Article 8, Sections 1670-1675. Approved HERS providers are authorized to certify HERS raters and maintain quality control over field verification and diagnostic testing ratings.

When compliance documentation indicates field verification and diagnostic testing of specific energy efficiency measures as a condition for complying with Title 24, Part 6, an approved HERS provider and certified HERS rater shall be used to conduct the field verification and diagnostic testing. HERS providers ~~and~~ ~~and~~ HERS raters shall be considered special inspectors by building departments, and shall demonstrate competence, to the satisfaction of the building official, for the visual inspections and diagnostic testing which they perform. The HERS provider and HERS rater shall be independent entities from the builder or subcontractor installer of the energy efficiency improvements being tested and verified, and shall have no financial interest in the installation of the improvements. Third Party Quality Control Programs approved by the Commission may serve some of the functions of HERS raters for field verification purposes as specified in Section ~~RA2-76~~.

The remainder of this chapter describes the:

- Measures that require field verification or diagnostic testing ~~(including references to test procedures or protocols that shall be followed by installers and HERS raters);~~
- Required documentation and communication steps;
- Requirements for installation certification by the installer ~~that the installation complies;~~
- ~~Requirements for~~ Procedures for HERS rater field verification ~~and diagnostic testing procedures;~~
- Requirements for sampling procedures;
- Requirements for Third Party Quality Control Programs ~~that are authorized to serve the function of HERS raters;~~
- Requirements for HERS sampling when field verification and diagnostic testing is required for compliance when performing for additions and alterations; ~~and~~
- Responsibilities ~~of assigned to~~ each of the parties involved in the field verification and diagnostic testing process;
- Definitions – some terms used in this chapter have specific meanings within the context of this chapter's information. Refer to section RA-9 for definitions and specific usage descriptions.

7.2.RA2.2 **Measures that Required Field Verification and Diagnostic Testing**

~~Table RA2-1~~ ~~Table RA2-1~~ describes the measures that require installer certification and HERS rater field verification and diagnostic testing, and identifies the protocol or test procedure in the appendices that shall be used for completing installer and HERS rater diagnostic testing and HERS rater field verification.

Table RA27-1 – Summary of Measures Requiring Field Verification and Diagnostic Testing

Measure Title	Description	Protocol or Test Procedure
Duct Measures		
Duct Sealing	Package D requires that space conditioning ducts be sealed. If sealed and tested ducts are claimed in the proposed design for compliance credit-ACM calculation, field verification and diagnostic testing is required to verify that approved duct system materials are utilized, and duct leakage is less than meets the specified criteria	Residential ACM Appendix RA4C-2008 ⁵
Supply Duct Location, Surface Area and R-factor value	If e Compliance credit is claimed can be taken for improved supply duct location, surface area and R-value. , f Field verification is required to verify that the duct system was installed according to the design, including location, size and length of ducts, duct insulation R-value and installation of buried ducts. ¹ The system must also meet the Adequate Airflow requirement.	Residential ACM Appendix RA4C-2008 ⁵
<u>Low Leakage Ducts in Conditioned Space</u>	<u>Compliance credit can be taken for verified duct systems that have air leakage to outside conditions equal to or less than 25 cfm when measured in accordance with Residential Appendix Section RA4-4.3.3. Field Verification for ducts in conditioned space is required. Duct sealing is required.</u>	<u>Residential Appendix RA4-2008</u>
<u>Low Leakage Air Handlers</u>	<u>Compliance credit can be taken for installation of a factory sealed air handler unit tested by the manufacturer and certified to the Commission to have achieved a 2 percent or less leakage rate. Field verification is required. Duct Sealing is required.</u>	<u>Residential Appendix RA4-2008</u>
Air Conditioninger Measures		
Improved Refrigerant Charge	Package D requires in some climate zones that split system air conditioners and heat pumps be diagnostically tested in the field to verify that they have the correct refrigerant charge (see <u>Residential ACM Manual</u> Section 4.7.3). For the performance method, t The Proposed Design is modeled with less efficiency if diagnostic testing and field verification is not performed. The system must also meet the Adequate Airflow requirement.	Residential ACM Appendix RA5D-2008 ⁵
Installation of <u>Charge Indicator Light</u> (Thermostatic) Expansion Valve (TXV)	<u>Package D specifies a TXV may</u> Charge Indicator Light can be installed as an alternative to refrigerant charge testing. The existence of a Charge Indicator LightTXV has the same calculated benefit as refrigerant charge testing, and requires f Field verification <u>is required.</u>	Residential ACM Appendix RA7I-2008 ⁵
Adequate Air Flow	Air conditioner efficiency requires adequate airflow across the evaporator coil. Compliance credit may can be taken when airflow is higher than the criteria specified. Field verification and diagnostic testing is required.	Residential ACM Appendix RA6E-2008 ⁵
Air Handler Fan Watt Draw	If e Compliance credit is can be taken for reductions in fan power. , t he installed fan power shall be d Diagnostically test ing ed and field verification is required ed in the field. The system must also meet the Adequate Airflow requirement.	Residential ACM Appendix RA6E-2008 ⁵
High Energy Efficiency Ratio (EER)	Compliance credit may can be taken for increase s in EER by installation of specific air conditioner or heat pump models. , b ut only if the installation of that high EER model is f Field verification <u>is required.</u> ²	Residential ACM Appendix RA7I-2008 ⁵
Maximum Cooling Capacity	An additional e Compliance credit may can be taken when the requirements for the combination of adequate air flow, duct sealing and i Improved refrigerant charge are met and air conditioners are sized according to the <u>cooling ACM load</u> calculations. Field verification <u>and diagnostic testing</u> is required.	Residential ACM Appendix RA1F-2008 ⁵
<u>Evaporatively Cooled Condensers</u>	<u>Compliance credit can be taken for installation of evaporatively cooled condensers. Duct Sealing is required. Field verification is required.</u>	<u>Residential Appendices RA4-2008; RA7-2008</u>
<u>Ice Storage Air Conditioners</u>	<u>Compliance credit can be taken for installation of Distributed Energy Storage equipment. Duct Sealing is required. Field verification is required.</u>	<u>Residential Appendices RA4-2008; RA7-2008</u>
Building Envelope Measures		
Building Envelope Sealing	The default building envelope s Specific l Leakage a Area (SLA) is specified in <u>Residential ACM Manual</u> Section 4.5.1. Compliance credit may can be taken for improved building envelope sealing. , b ut only if lower SLA values are f Field verification <u>and</u> ed through diagnostic testing <u>is required to confirm reduced infiltration.</u>	ASTM E779-03

Measure Title	Description	Protocol or Test Procedure
Field verification is required. High Quality Insulation Installation	ACMs recognize S standard and improved envelope construction. Compliance credit can be taken for improved envelope construction. requires field verification is required.	Residential ACM Appendix RA8H-2005

1. Note: Compliance credit for increased duct insulation R-value (not buried ducts) may be taken without field verification if the R-value is the same throughout the building, and for supply ducts located in crawlspaces and garages where all supply registers are either in the floor or within 2 feet of the floor. These two credits may be taken subject only to building department inspection.

2. Note: The requirement for verification of a high EER does not apply to equipment rated only with an EER.

All features that require verification and/or testing shall be listed in the *Field Verification and Diagnostic Testing* section of ~~on~~ the *Certificate of Compliance* (CF-1R). The listing shall include “eligibility and installation criteria” for such features. Field verified and diagnostically tested features shall be described in the *Compliance Supplement*. Installers shall certify that the requirements for compliance have been met on the *Installation Certificate* (CF-6R). Field Verification and diagnostic testing shall be performed by a HERS rater and documented on the *Certificate of Field Verification and Diagnostic Testing* (CF-4R).

7.3-RA2.3 Summary of Documentation and Communication

The documentation and communication process for measures that require field verification and diagnostic testing is summarized below. The subsequent sections of this chapter contain additional information and requirements that apply to all situations; however the section on alterations, RA2-7, applies specifically to the differences in the requirements for alterations. Section RA2-6 applies specifically to the differences in the requirements for Third Party Quality Control Programs.

- The documentation author shall complete the compliance documents, including the CF-1R, Certificate of Compliance. A CF-1R shall be prepared for each dwelling unit. For multi-family buildings a single CF-1R is typically prepared for a whole building, but separate compliance documentation shall be required for dwelling units that have measures requiring field verification and diagnostic testing.
- The documentation author shall provide a signed ~~Certificate of Compliance (CF-1R)~~ to the builder, which indicates ~~that~~ any HERS diagnostic testing and field verification measures ~~is~~ required for compliance. The CF-1R shall be verified and approved/signed by the principal designer/owner prior to submittal to the building department.
- The builder shall make arrangements for transmittal of the CF-1R information, for features requiring HERS verification, to the data registry of a HERS provider. The HERS provider shall insure that the CF-1R content and approval signatures are retained per Title 20 section 1673(d). The builder shall also arrange for the services of a certified HERS rater prior to installation of the measures, so that once the installation is complete the HERS rater has ample time to complete the field verification and diagnostic testing without delaying final approval of ~~occupancy the dwelling unit~~ by the building department. The Builder shall provide to the HERS Rater a copy of the CF-1R that was approved/signed by the principal designer/owner and submitted to the building department.
- The builder or subcontractor shall install the measure(s) that require field verification and diagnostic testing. The builder or subcontractor installer shall complete perform diagnostic testing and using the procedures specified in Section RA2-47.4. When the installation is complete, the builder or subcontractor responsible for the performance of the installation shall complete and sign the CF-6R, (*Installation Certificate*), keeping it post a copy at the building site for review by the building inspector, and submit a copy to the building department. The builder or subcontractor shall also provide a copy of the CF-6R ~~is also provided~~ to the HERS rater.
- The HERS rater shall manually enter or make arrangements for transmittal of the CF-6R information, for features requiring HERS verification, for each dwelling unit, to the HERS provider’s data registry. The HERS provider shall insure that the CF-6R content and approval signatures are retained per Title 20 section 1673(d). The HERS rater shall complete the field verification and diagnostic testing as

specified in Section RA2-7.5. The HERS rater shall enter the test results into the HERS provider's data registry.

- The HERS provider shall make available a certified copy of the and provides signed CF-4Rs, Certificate of Field Verification and Diagnostic Testing, to the HERS provider rater, builder, and building department.
- The building department shall not approve a dwelling unit for occupancy until the building department has received a completed CF-6R that has been signed by the builder or subcontractor, and a certified copy of a CF-4R that has been signed by the certified HERS rater.

RA2-7.4 Installer Requirements for - Installation Certificate Form (CF-6R)

CF-6R Installation eCertificates (CF-6R) are required for each and every dwelling unit. When the installation of a measures that requires HERS field verification and diagnostic testing is complete, the builder or the builder's subcontractor shall complete-perform diagnostic testing to confirm compliance, and follow the procedures specified in this sections RA2-4, RA2-4.1, RA2-4.2. When the builder or the builder's subcontractor's the installation is complete, diagnostic testing confirms that the installation complies with the Standards requirements, the builder or the builder's subcontractor shall complete the CF-6R, (Installation Certificate), and keep it post a copy at the building site for review by the building inspector, and submit a signed copy to the building department. The builder or the builder's subcontractor also shall also provide a copy of the Installation Certificate to the HERS rater for any measures requiring field verification and diagnostic testing.

RA2-7.4.1 Installer Requirements - Measures Requiring Diagnostic Testing and Field Verification

When compliance the CF-1R, Certificate of Compliance includes indicates a requirement for HERS verification and diagnostic testing of installed building features duct sealing, improved air conditioner refrigerant charge and airflow across the evaporator coil, reduced air conditioner fan power or building envelope sealing, the builder employees or subcontractors shall:

- complete-perform diagnostic testing for each feature in accordance with procedures specified in the Residential Appendices, and
- record the test results on the CF-6R, and
- certify on the CF-6R that the diagnostic test results and that the installation work meets the requirements for compliance credit.

For refrigerant charge and airflow measurement when the outside temperature is below 55°F, the installer shall follow the alternate charge and airflow measurement procedure described in Appendix RD, Section RD3. Builder employees or subcontractors using these procedures shall certify on the CF-6R that they used these procedures, the diagnostic results, that the work meets the requirements for compliance credit, and that they will return to correct refrigerant charge and airflow if the HERS rater determines at a later time when the outside temperature is above 55°F that correction is necessary.

For duct sealing diagnostic testing completed at the rough-in stage of construction, builder employees or subcontractors shall:

- at rough-in, complete the fan pressurization test and certify on the CF-6R the diagnostic results,
- after installation of the interior finishing wall, complete the installer visual inspection at final construction stage (See ACM RC-2005), and
- certify on the CF-6R the diagnostic results and that the work meets the requirements for compliance credit.

RA2-7.4.2 Installer Requirements - Measures Requiring Field Verification

When compliance includes supply duct location, surface area and R-value improvements, installation of an air conditioner ~~refrigerant thermostatic expansion valve charge indicator light~~, high air conditioner EER, ~~and~~ high quality building envelope construction, ~~or special installation eligibility requirements, the~~ builder employees or subcontractors shall:

- record the feature on the CF-6R,
- record on the CF-6R ~~field measurements information~~ required to field verify the measure, ~~and and~~
- certify on the CF-6R that the ~~installation~~ work meets the requirements for compliance credit.

RA257-5 HERS Procedures – Verification, Testing, and Sampling Procedures

At the builder's option HERS field verification and diagnostic testing shall be completed either for each dwelling unit, or for a sample ~~of from a designated group of~~ dwelling units in which the ~~same~~ measure(s) requiring field verification and diagnostic testing is installed ~~in each dwelling unit in the group~~. Note that if multiple measures requiring field verification and diagnostic testing are installed in dwelling units, sample testing does not have to be completed for all of the measures in the same dwelling unit. Dwelling units in ~~thea designated sample group~~ shall ~~all~~ be ~~located within in~~ the same ~~enforcement agency jurisdiction, and~~ subdivision or multifamily housing development.

~~Field verification and diagnostic testing for compliance credit for duct sealing shall use follow procedures for the diagnostic duct leakage from fan pressurization of ducts in Section RC3.1, ACM RC-2005. Field verification and diagnostic testing for compliance credit for refrigerant charge and airflow measurement shall use the standard charge and airflow measurement procedure specified in ACM RD-2005. Field verification and diagnostic testing shall not use the alternate charge and airflow measurement procedure. Field verification and diagnostic testing shall be scheduled and completed when the outside temperature is above 55°F.~~

The builder ~~or subcontractor~~ shall provide ~~to~~ the HERS rater a copy of the ~~CF-1R approved/signed by the principal designer/owner, and a copy of the~~ CF-6R containing the installation certifications required in Section ~~RA2-7.4~~. Prior to completing field verification and diagnostic testing, the HERS rater shall ~~first~~ verify that the installation certifications have been completed ~~as required, and that the installer's diagnostic test results and the installation certification information shows compliance consistent with the~~ CF-1R.

~~If field verification and diagnostic testing determines that the requirements for compliance are met, the HERS rater shall transmit the test results to the HERS provider's data registry, whereupon the provider shall make available a certified copy of the CF-4R, Certificate of Field Verification and Diagnostic Testing, to the HERS rater, the builder, and the building department. Printed copies, electronic or scanned copies, and photocopies of the provider's certified CF-4R are allowed, subject to verification that the information contained on the copy conforms to the current unique certifying information on file in the provider's data registry for the dwelling.~~

~~The HERS rater shall provide a "wet" signature on certified copies of CF-4R's. The CF-4R shall be submitted to the building department. At the discretion of the jurisdiction, provisions shall be made to accommodate submittal of the certified CF-4R in an electronic file format that can be verified as "electronically" signed by the HERS rater, thus entirely sufficient for purposes of documenting the HERS rater's approval and compliance with field verification and diagnostic testing requirements without a "wet" signature.~~

~~The HERS provider shall make available via phone or internet communications interface a way for building officials, builders, and HERS raters to verify that the information displayed on copies of submitted CF-4R's conforms to the unique identifying information stored in the provider's data registry for the certified CF-4R. See Section RA2-5.2 for required CF-4R information.~~

If the builder chooses the sampling option, the procedures described in ~~this s~~Sections RA2-5, RA2-5.1, RA2-5.2, RA2-5.3 shall be followed. Sampling procedures described in the ~~eseis~~ sections shall be included in the Residential Compliance Manual.

RA27.5.1 HERS Procedures - Initial Model Field Verification and Diagnostic Testing

The HERS rater shall diagnostically test and field verify the first dwelling unit of each model within a subdivision or multifamily housing development. To be considered the same model, dwelling units shall ~~be in the same subdivision or multifamily housing development and~~ have the same basic floor plan layout, energy design, and compliance features as shown on the CF-1R for each dwelling unit. ~~Variations, including the same~~in the basic floor plan layout, energy design, compliance features, zone floor area, and or zone volume, that do not change the HERS features to be tested, the heating or cooling capacity of the HVAC unit(s), or the number of HVAC units specified for the dwelling units, shall not cause dwelling units to be considered a different model for each dwelling unit, as shown on the CF-1R. For multi-family buildings, variations in exterior surface areas caused by location of dwelling units within the building shall not cause dwelling units to be considered a different model. This initial testing allows the builder to identify and correct any potential construction flaws or practices in the build out of each model. If field verification and diagnostic testing determines that the requirements for compliance are met, the HERS rater shall transmit the test results to the HERS provider registry, whereupon the provider shall make available a certified copy of the CF-4R, Certificate of Field Verification and Diagnostic Testing, to the HERS rater, the builder, and the building department. ~~provide a signed and dated Certificate of Field Verification and Diagnostic Testing (CF-4R) to the builder the HERS provider, and the building department.~~

RA27.5.2 HERS Procedures - Group Sample Field Verification and Diagnostic Testing

~~to e~~After the initial model field verification and diagnostic testing is completed, the builder or the HERS rater shall identify a group of up to seven dwelling units from which a sample will be selected, ~~for testing, and notify the HERS provider.~~ If multiple measures requiring field verification and diagnostic testing are installed, each dwelling unit in the group shall have the same measures requiring field verification and diagnostic testing as the other dwelling units in the group. If some dwelling units have installed a different set of measures requiring field verification and diagnostic testing, these dwelling units shall be in a separate group. If dwelling units have forced-air space conditioning equipment that introduces outside air into the conditioned space using means that connect directly to the dwelling unit's air conditioning duct system, these outside air ducted systems shall be considered separate measures and must be placed in separate groups from other dwelling units not having the same outside air measure.

The builder shall identify the group of dwelling units by location of County, City and either the street address or the subdivision and lot number, or the multifamily housing project name and shall identify the names and license numbers of subcontractors responsible for installations requiring diagnostic testing or field verification. The HERS rater shall manually enter or make arrangements for the transmittal of the CF-6R information for features requiring HERS verification into the provider's data registry for all dwelling units contained in the group, and the group shall be closed prior to selection of the sample that will be field verified and diagnostically tested. The builder or the HERS rater may request removal of dwelling units from the group by notifying the HERS provider prior to selection of the sample that will be tested and shall provide justification for the change. Removed dwelling units ~~which are constructed~~ shall ~~either be~~ field verified and diagnostically tested individually or shall be included in a subsequent group for sampling.

There are exceptions to the requirement to have completed CF6R Installation Certificate data entered into the provider's data registry prior to selection of the dwelling unit to be sampled.

Some HERS measures require multiple verifications during the construction process. The sample group is not required to be closed, before HERS field verification and diagnostic testing can begin, for the

following measures. For these measures the HERS rater is allowed to randomly select the dwelling unit to be field verified from those that are at the proper stage of construction to enable the first of the multiple verifications to be completed.

- Quality Installation of Insulation measure requires inspection of the air barrier and inspection of the insulation behind tubs and showers at framing rough-in. Verification of the wall, floor and ceiling insulation must be completed prior to drywall installation. Attic insulation installation may require follow-up verification.
- Buried Ducts measure requires verification of the duct design prior to verification of the attic insulation.
- Duct Surface Area requires verification of the duct design prior to installation of the attic insulation.

The HERS rater with no direction from the installer or builder shall randomly select a minimum of one dwelling unit out of from the closed group for field verification and diagnostic testing. ~~and field verification. When several dwelling units are ready for testing at the same time, the HERS rater shall randomly select the dwelling units to be tested.~~ The HERS rater shall diagnostically test and field verify the selected dwelling unit(s) selected by the HERS rater. The HERS rater shall enter the test and/or field verification results into the HERS provider's data registry regardless of whether the results indicate a pass or fail. If the test fails then the failure must be entered into the providers data registry even if the installer immediately corrects the problem. In addition the procedures in section RA2-5.3 shall be followed.

If field verification and diagnostic testing determines that the requirements for compliance are met, the HERS rater shall ~~provide a signed and dated Certificate of Field Verification and Diagnostic Testing to the builder, the HERS provider, and the building department.~~ enter the test results into the HERS provider's data registry. Whereupon the provider shall make available to the HERS rater, the builder, and the building department, a certified copy of form CF-4R, Certificate of Field Verification and Diagnostic Testing. The Certificate of Field Verification and Diagnostic Testing CF-4R shall report the successful diagnostic testing results and conclusions regarding compliance for the tested dwelling unit. The CF-4R shall also provide:

- Building permit number for the dwelling unit
- Certification Number – a HERS provider-designated identification number unique to the dwelling unit
- Group Number – a HERS provider-designated identification number unique to the sample group
- Time and date stamp of the provider's issuance of the certified CF-4R
- Provider's logo or official seal

The HERS ~~rater/provider~~ shall also ~~provide~~ make available to the HERS rater, the builder, and the building department a signed and dated Certificate of Field Verification and Diagnostic Testing-certified copy of form CF-4R, to the builder and the HERS provider for up to six additional all other dwelling units in the group. The Certificate shall not be provided for dwelling units in which the feature requiring field verification and diagnostic testing has not been installed, sealed or completed. Each CF-4R issued for the group shall disclose the unique Certification Numbers and the building permit numbers for all of the dwelling units contained in the group and shall indicate which home was actually tested.

Whenever the builder changes subcontractors who are responsible for the feature that is being diagnostically field verified and tested, the builder shall notify the HERS rater of any subcontractors who have changed, and terminate sampling for the identified group. All dwelling units using *HERS Required Verification* features for compliance that were installed by previous subcontractors or were subject to verification and testing under the supervision of a previous HERS provider, for which the builder does not have a completed *Certificate of Field Verification and Diagnostic Testing*, shall either be individually tested or included in a separate group for sampling. Dwelling units with installations completed by new subcontractors shall either be individually tested or shall be included in a new sampling group. ~~following a new Initial Field Verification and Testing.~~

The HERS rater shall not notify the builder when sample testing will occur prior to the completion of the work that is to be tested, or prior to entry of the CF-6R data into the provider's data registry. After the HERS rater selects the sample dwelling unit to test, and notifies the builder that testing will occur, the builder shall not do additional work on the features being tested.

The HERS provider shall close the group within 6 months after the signature date shown on any CF-6R in the group. The HERS provider shall notify the HERS rater that the group has been closed, and a sample must be selected for field verification and diagnostic testing. Thus if a group is required to close due to the 6-month limit, field verification and diagnostic testing shall be conducted on a minimum of one dwelling unit randomly selected from the dwellings assigned to the group regardless of how many dwellings are assigned to the group.

RA27.5.3 HERS Procedures - Re-sampling, Full Testing and Corrective Action

When a failure is encountered during sample testing, the failure must be entered into the provider's data registry. Corrective action shall be taken and the dwelling unit shall be retested to verify that corrective action was successful. Corrective action and retesting on the dwelling unit shall be repeated until the testing indicates compliance and the results have been entered into the HERS provider's data registry, or the dwelling unit complies using an alternative method. In addition, the HERS rater shall conduct re-sampling to assess whether that the first failure in the group is unique, or if the rest of the dwelling units in the group are likely to have similar failings. The HERS rater shall randomly select for re-sampling one of the remaining up to six untested dwelling units in the group for retesting of the feature that failed.

If testing in dwelling units in the re-sample confirms that the requirements for compliance credit are met, then the dwelling unit with the failure shall not be considered an indication of failure in the other dwelling units in the group. The HERS rater shall transmit the re-sample test results to the HERS provider registry. Whereupon the provider shall make available to the HERS rater, the builder, and the building department, a certified copy of form CF-4R, Certificate of Field Verification and Diagnostic Testing for the remaining dwelling units in the group including the dwelling unit in the re-sample. provide a signed and dated Certificate of Field Verification and Diagnostic Testing to the builder, the HERS provider, and the building department for up to six additional dwelling units in the group, including the dwelling unit in the re-sample. The builder shall take corrective action for the dwelling unit with the failure, and then the HERS rater shall retest to verify compliance and issue a signed and dated Certificate of Field Verification and Diagnostic Testing to the builder.

If field verification and testing in the re-sample results in a second failure, the HERS rater shall report the second failure to the HERS provider, the builder, and the building department. T, the builder shall take corrective action in all unoccupied dwelling units in the group that have not been tested. In cases where corrective action would require destruction of building components, the builder may choose to reanalyze compliance and choose different measures that will achieve compliance. In this case a new Certificate of Compliance, form CF-1R -shall be completed and submitted to the HERS provider, the HERS rater and building department. When a builder chooses to take corrective action, the HERS rater shall conduct field verification and diagnostic testing in each of these dwelling units to verify that problems have been corrected and that the requirements for compliance have been met. Upon verification of compliance, the HERS rater shall enter the test results into the HERS provider data registry. Whereupon the provider shall make available to the HERS rater, the builder, and the building department, a certified copy of form CF-4R for each individual dwelling in the group., and shall report to the HERS provider, the builder, and the building department.

Builders shall offer to complete field verification and diagnostic testing and any necessary corrective action at no charge to building owners (for a definition of "building owner" and of other terms used see Section RA27.-9) in occupied dwelling units in the group, to complete field verification and testing and corrective action if necessary. Builders shall report to the HERS provider the identifying location of any dwelling unit in which the building owner declines field verification and diagnostic testing and corrective action. The HERS provider shall verify that the builder has made this offer. If a building owner in an occupied dwelling unit declines this offer, field verification, testing and corrective action will not be

required for that dwelling unit and the dwelling unit will no longer be considered a part of the group. If a building owner accepts this offer, the builder shall take corrective action, and the HERS rater shall conduct field verification and diagnostic testing to verify that problems have been corrected. Upon verification of compliance, the HERS rater shall transmit the test results to the HERS provider data registry. Whereupon the provider shall make available to the HERS rater, the builder, and the building department, a certified copy of form CF-4R for the dwelling unit. ~~—The HERS rater shall then conduct field verification and diagnostic testing to verify that problems have been corrected and that the requirements for compliance have been met, and shall report to the HERS provider, builder, and the building department.~~

The HERS provider shall file a report with the building department explaining all actions taken (including field verification, diagnostic testing, corrective action, offers to building owners for testing and corrective action, per RA2-7, and/or building owner declines of such offers) to bring into compliance dwelling units for which full testing has been required. If corrective action requires work not specifically exempted by the CMC or the CBC, the builder shall obtain a permit from the building department prior to commencement of any of the work.

~~If additional dwelling units in the group are completed during the time required to correct, field verify and test the previously completed dwelling units in the group, the rater shall individually field verify and diagnostically test those additional dwelling units to confirm that the requirements for compliance credit are met.~~

Corrections to avoid reporting a failure to the HERS provider data registry shall not be made to a sampled or re-sampled dwelling unit after the HERS rater selects the sample dwelling unit, or during the course of HERS testing of the dwelling to avoid a failure. If it becomes evident that such corrections are made to a sampled or re-sampled dwelling unit to avoid reporting a failure, corrections, field verification and diagnostic testing shall be required to be performed on 100% of the dwelling units in the group.

RA2.7.6 **Third Party Quality Control Programs**

The Commission may approve Third Party Quality Control Programs that serve some of the functions of HERS raters for field verification purposes, but do not have the authority to sign compliance documentation as a HERS rater. Third Party Quality Control Programs shall provide training to installers regarding compliance requirements for measures for which diagnostic testing and field verification is required. Third Party Quality Control Programs shall collect data from participating installers for each installation completed for compliance credit, complete provide data checking analysis to evaluate the validity and accuracy of the data to independently determine whether compliance has been achieved, provide direction to the installer to retest and correct problems when data checking determines that compliance has not been achieved, require resubmission of data when retesting and correction is directed, and maintain a database of all data submitted by installers in a format that is acceptable to the Commission and available to the Commission upon request. The data that is collected by the Third Party Quality Control Program shall be more detailed than the data required for showing compliance with the Standards, shall provide an independent check on the validity and accuracy of the installer's claim that compliance has been achieved, and shall not be alterable by the installer to indicate that compliance has been achieved when in fact compliance has not been achieved.

The ~~Third Party Quality Control Program HERS provider~~ shall also obtain arrange for the services of a HERS rater to conduct independent field verifications of the installation work performed by the participating installing contractor and Third Party Quality Control Program, completing all of the responsibilities of a HERS rater as specified in this Chapter RA2 with the exception that sampling shall be completed for a group of up to thirty dwelling units (or thirty HVAC systems) with a minimum sample of one out of every thirty sequentially completed dwelling units (or thirty HVAC systems) from the group. The HERS rater shall be an independent entity from the Third Party Quality Control Program. Re-sampling, Full Testing and Corrective Action shall be completed as specified in section RA2-7.5.3 with the exception that re-sampling shall be completed for a minimum of one out of every thirty dwelling units from

the group. The Third Party Quality Control Program shall not impose restrictions on the HERS rater or the HERS provider that limit their independence, or the ability of the HERS rater or the HERS provider to properly perform their functions. For example, the Third Party Quality Control Program shall not impose restrictions on the HERS rater's use of equipment beyond those required by the Energy Commission.

The Third Party Quality Control Program shall meet ~~all of~~ the requirements ~~of imposed on~~ a HERS rater specified in the Commission's HERS Program regulations (California Code of Regulations, Title 20, Division 2, Chapter 4, Article 8, Sections 1670 -1675), including the requirement to be an independent entity from the builder, ~~and~~ the HERS rater that provides independent field verifications, ~~and the~~ subcontractor installer as specified by section 1673(i). However, a Third Party Quality Control Program may have business relationships with installers participating in the Program to advocate or promote the Program and an installer's participation in the Program, and to advocate or promote products that the Third Party Quality Control Program sells to installers as part of the Program.

Prior to approval by the Commission, the Third Party Quality Control Program shall provide a detailed explanation to the Commission of 1) the data that is to be collected from the installers, 2) the data checking process that will be used to evaluate the validity and accuracy of the data, 3) the justification for why this data checking process will provide strong assurance that the installation actually complies, and 4) the format for the database that will be maintained and provided to the Commission upon request. The Third Party Quality Control Program may apply for a confidential designation of this information as specified in the Commission's Administrative Regulations (California Code of Regulations, Title 20, Division 2, Chapter 7, Article 2, Section 2505). The Third Party Quality Control Program shall also provide a detailed explanation of the training that will be provided to installers, and the procedures that it will follow to complete independent field verifications.

The Third Party Quality Control Program licensed/certified installing contractor and the installing contractor's responsible installing technicians shall be required to be trained in quality installation procedures; the requirements of this appendix RA2; and any other applicable specialized Third Party Quality Control Program-specific procedures as a condition to participation in the program. The training requirements also apply to the installing contractor's specialty subcontractors who provide Third Party Quality Control Program services. All installation verification and diagnostic work performed in the program shall be subject to the same quality assurance procedures as required by the Energy Commission's HERS program regulations.

The Third Party Quality Control Program shall be considered for approval as part of the rating system of a HERS Provider, which is certified as specified in the Commission's HERS Program regulations, Section 1674. A Third Party Quality Control Program can be added to the rating system through the recertification of a certified HERS Provider as specified by Section 1674(d).

RA27.7 Installer Requirements and HERS Procedures Sampling for Additions or Alterations

This section on alterations is intended to describe the differences that apply to alterations. Otherwise the procedures and requirements detailed in previous sections shall also apply to procedures and requirements for alterations where "HVAC system" is substituted for "dwelling unit". For alterations, building owners or their agents may carry out the actions that are assigned to builders in previous sections of this document (RA2).

When compliance for an ~~addition or~~ alteration requires field verification and diagnostic testing ~~and field verification~~, the building owner may choose for the testing and field verification to be completed for the dwelling unit ~~alone individually~~, or alternatively as part of a designated sample group of dwelling units for which the same installing company has completed work that requires testing and field verification for compliance. The building owner or agent of the building owner shall complete the applicable portions of a Certificate of Compliance (CF-1R). The building owner or agent shall make arrangements for transmittal of CF-1R data to the provider data registry identifying the building features and measures requiring HERS verification. The building owner shall also submit a copy of the approved/signed CF-1R to the HERS rater.

The installer shall perform diagnostic testing and the procedures specified in Section RA2-4. When the installation is complete, the installer shall complete the CF-6R Installation Certificate, post a copy at the building site for review by the building inspector, and submit a signed copy to the building department. The installer shall also provide a signed copy of the CF-6R to the HERS rater.

The HERS rater shall manually enter, or make arrangements for transmittal of the CF-6R installation certification information, for features requiring HERS verification to the HERS provider data registry. If group sampling is utilized for compliance, the HERS rater shall define the group for sampling purposes, as requiring that all dwelling units where-for which the building permit applicant has chosen to have testing and field verification completed as part of a sample, shall have been for-served by the same installing company. The group shall be no larger than seven. The installing company may request a smaller group for sampling. Whenever the HERS rater for the group is changed, a new group will-shall be established. Initial Field Verification and Testing shall be completed for the first dwelling unit in each group.

Re-sampling, Full Testing and Corrective Action shall be completed if necessary as specified by section 7.5.3. For alterations, the installing company shall offer to complete field verification and diagnostic testing and any necessary corrective action at no charge to building owners in the group.

Field verification may be completed by an approved Third Party Quality Control Programs, as specified in section RA2-7.6, may also be used with alterations. The group for sampling purposes shall be no larger than thirty when a Third Party Quality Control Program is used. The Third Party Quality Control Program may define the group instead of the Provider. When a Third Party Quality Control Program is used, the CF-6R shall document that data checking has indicated that the dwelling unit complies.

The building department shall not close a building permit until the building department has received a completed CF-6R that has been signed by the installer, and a completed, certified copy of the CF-4R from the provider that has been signed by the HERS rater.

The building official may approve compliance based on the CF-6R on the condition that if sampling indicates that re-sampling, full testing and corrective action is necessary, such work shall be completed.

SRA27.8 Summary of Responsibilities

This section summarizes responsibilities described previously in this chapter and organizes them by the responsible party.

RA27.8.1 Builder

The builder shall make arrangements for transmittal of the CF-1R information, for features requiring HERS verification, to the data registry of a HERS provider. The builder shall make arrangements for the services of a certified HERS rater prior to installation of the measures, so that once the installation is complete the HERS rater has ample time to complete the field verification and diagnostic testing without delaying final approval of the building permit occupancy by the building department. The Builder shall provide to the HERS Rater a copy of the CF-1R that was approved/signed by the principal designer/owner and submitted to the building department.

The Builder's employees or subcontractors responsible for completing the performance of the installation either diagnostic testing, visual inspection or verification as specified in Section 7.4 shall sign the CF-6R to certify that e-diagnostic testing results and that the installation work meets the requirements for compliance credit shown on the CF-16R, and the verification and diagnostic test results information reported on the CF-6R are accurate. The builder or subcontractor shall post a copy of the CF-6R at the construction site for review by the building inspector, and submit a signed copy of the CF-6R to the building department in conjunction with requests for final inspection for each dwelling unit. The builder, or subcontractor shall also provide a copy of the CF-6R to the HERS rater.

If the builder utilizes group sampling for HERS compliance, The builder or the HERS rater shall provide the HERS rater with the identifying location of the group of dwelling units to be included in the sample

~~group~~ for field verification and diagnostic testing. ~~The builder shall provide the HERS provider a copy of the CF-6R signed by the builder employees or sub-contractors certifying that diagnostic testing and installation meet the requirements for compliance credit.~~

The builder shall ~~provide~~ arrange for the submittal of a certified copy of the CF-4R, Certificate of Field Verification and Diagnostic Testing, (CF-4R) signed and dated by the HERS rater as specified by Section RA2-5, to the building official in conjunction with requests for final inspection for each dwelling unit.

When re-sampling reveals a failure, ~~the builders is required to~~ shall offer, at no charge to all building owners in occupied dwelling units in the group, to complete field verification, testing and corrective action if necessary. Building owners may decline to have field verification and testing and corrective action completed. ~~B~~The builder shall report the identifying location of any dwelling unit in which the building owner declines field verification and diagnostic testing and corrective action to the HERS provider. ~~B~~The builders shall take corrective action as required in all unoccupied dwelling units in the group and in occupied dwelling units in the group where building owners have accepted field verification, testing and corrective action.

RA2-7.8.2 HERS Provider and Rater

The HERS provider shall maintain a list of the dwelling units in the group, and the number of HVAC systems within each dwelling unit from which sampling is drawn, the dwelling units selected for sampling, the dwelling units sampled and the results of the sampling, the dwelling units selected for re-sampling, the dwelling units that have been tested and verified as a result of re-sampling, the corrective action taken, and ~~copies shall retain records of all information content and approval signatures for Certificates of Field Verification and Diagnostic Testing completed forms CF-1R, CF-6R, and CF-4R~~ for a period of five years.

The HERS rater providing the diagnostic testing and verification shall transmit all test results to the provider data registry, sign and date a Certificate of Field Verification and Diagnostic Testing certifying that he/she has verified that the requirements for compliance credit have been met. Certificates of Field Verification and Diagnostic Testing Certified CF-4R forms from the provider and signed by the rater shall be provided for the tested dwelling unit and each of up to six other dwelling units from ~~the a designated~~ group for which compliance is verified based on the results of the sample. The ~~HERS provider's certified copy of the CF-4R rater shall provide this certificate be made available or submitted~~ to the HERS rater, the builder, the HERS provider, and the building department.

The HERS rater shall provide produce a separate Certificate of Field Verification and Diagnostic Testing CF-4R for each dwelling unit ~~the rater determines that has met~~ meets the diagnostic requirements for compliance. The ~~HERS rater shall identify on the Certificate of Field Verification and Diagnostic Testing certified CF-4R shall have unique HERS provider-designated identifiers for lot location, certification number and sample group number, and shall include building permit number, time and date stamp, provider Logo or seal, and indicate~~ if the dwelling unit has been tested or if it was an untested dwelling unit approved as part of sample testing. The HERS rater shall not sign a CF-4R certificate of Field Verification and Diagnostic Testing for a dwelling unit that does not have a CF-6R signed by the installer as required in Section RA2-7.4.

If field verification and diagnostic testing on a sampled dwelling unit identifies a failure to meet the requirements for compliance credit, the HERS rater shall report to the HERS provider, the builder, and the building department that re-sampling will be required.

If re-sampling identifies another failure, the HERS rater shall report to the HERS provider, the builder, and the building department that corrective action and diagnostic testing and field verification will be required for all the untested dwelling units in the group. This report shall specify the identifying location of all dwelling units that shall be fully tested and corrected.

The HERS provider shall also report to the builder once diagnostic testing and field verification has shown that the failures have been corrected in all of the dwelling units except those for which the building owner has declined field verification, testing and corrective action.

When individual dwelling unit testing and verification confirms that the requirements for compliance have been met, the HERS ~~rater-provider~~ shall ~~provide-make available~~ a Certified copy of the CF-4R ~~rate-of~~ Field Verification and Diagnostic Testing for each dwelling unit in the group.

The HERS provider shall file a report with the building department if there has been a sample group failure, explaining all actions taken (including field verification, testing, corrective actions, offers to building owners for testing and corrective action, and building owner declines of such offers) to bring into compliance dwelling units for which full testing has been required.

RA27.8.3 Third Party Quality Control Program

An approved Third Party Quality Control Program shall:

- Provide training to participating program installers, contractors, installing technicians, and specialty Third Party Control Program subcontractors regarding compliance requirements for measures for which diagnostic testing and field verification is required,
- Collect data from participating installers for each installation completed for compliance credit,
- Complete data checking analysis to evaluate the validity and accuracy of the data to independently determine whether compliance has been achieved,
- Provide direction to the installer to retest and correct problems when data checking determines that compliance has not been achieved,
- Require resubmission of data when retesting and correction is directed, and
- Maintain a database of all data submitted in a format that is acceptable to the Commission and available to the Commission upon request.

The ~~Third Party Quality Control Program~~ HERS provider shall obtain-arrange for the services of an independent HERS rater to conduct independent field verifications of the installation work performed by the participating installing contractor and Third Party Quality Control Program, completing all of the responsibilities of a HERS rater as specified in this Chapter with the exception that sampling shall be completed for a group of up to thirty dwelling units and sampling and re-sampling shall be completed for a minimum of one out of every thirty sequentially completed dwelling units from the group.

RA27.8.4 Building Department

The building department at its discretion may require independent testing and field verification to be scheduled so that it can be completed in conjunction with the building department's required inspections, and/or observe the diagnostic testing and field verification performed by builder employees or subcontractors and the certified HERS rater in conjunction with the building department's required inspections to corroborate the results documented in installer certifications, and in the *Certificate of Field Verification and Diagnostic Testing*.

For dwelling units that have used a compliance alternative that requires field verification and diagnostic testing:

~~¶~~The building department shall not approve a dwelling unit for occupancy until the building department has received a CF-6R, Installation Certificate that has been completed and signed by the builder or subcontractor, and a certified copy from the provider of the CF-4R, Certificate of Field Verification and Diagnostic Testing that has been signed and dated by the HERS rater.

If necessary to avoid delay of approval of dwelling units completed when outside temperatures are below 55°F, building departments may approve compliance credit for refrigerant charge and airflow measurement when installers have used the alternate charging and airflow measurement procedure described in Residential ACM Appendix RA5D-20085, Section RA5-D3. This approval will be on the condition that installers provide a signed agreement to the builder with a copy to the building department

to return to correct refrigerant charge and airflow if the HERS rater determines at a later time when the outside temperature is above 55°F that correction is necessary.

RA27.9 Definitions of Terms Used In This Chapter

The following definitions apply to the procedures described in this document.

Building Owner means the owner of the dwelling unit.

Builder means the general contractor responsible for construction.

Building Department means the city, county or state agency responsible for approving the plans, issuing a building permit and approving occupancy of the dwelling unit.

Certificate of Compliance (CF-1R) means a document with information required by the Commission that is prepared by the Documentation Author that indicates whether the building includes measures that require field verification and diagnostic testing.

Certificate of Field Verification and Diagnostic Testing (CF-4R) means a document with information required by the Commission that is prepared by the HERS rater to certify that measures requiring field verification and diagnostic testing comply with the requirements.

Documentation Author means the person responsible for completing the compliance documentation that demonstrates whether a building complies with the standards. Compliance documentation requirements are defined in the Residential Manual.

Dwelling Unit means ~~at~~ the building for single-family residences or each dwelling unit within a multifamily building project.

HERS Provider means an organization that the Commission has approved to administer a home energy rating system program, certify raters and maintain quality control over field verification and diagnostic testing required for compliance with the Energy Efficiency Standards.

HERS Provider Data Registry means the database maintained by the HERS provider that contains the records of the HERS rater's field verification and diagnostic testing results, including dwelling unit identification information, test/certification identification information, and builder identification information.

HERS Rater means a person certified by a Commission approved HERS Provider to perform the field verification and diagnostic testing required for demonstrating compliance with the standards.

Independent Entity means having no financial interest in, and not advocating or recommending the use of any product or service as a means of gaining increased business with, firms or persons specified in Section 1673(i) of the California Home Energy Rating System Program regulations (California Code of Regulations, Title 20, Division 2, Chapter 4, Article 8).

Installation Certificate (CF-6R) means a document with information required by the Commission that is prepared by the builder or installer verifying that the measure was installed to meet the requirements of the standards.

Financial Interest means an ownership interest, debt agreement, or employer/employee relationship. Financial interest does not include ownership of less than 5% of the outstanding equity securities of a publicly traded corporation.

NOTE: The definitions of "independent entity" and "financial interest," together with Section 1673(i), prohibit conflicts of interest between providers and raters, or between providers/raters and builders/subcontractors.

Installer means the builder's subcontractor or the person installing the equipment.

Documentation Author means the person responsible for completing the compliance documentation that demonstrates whether a building complies with the standards. Compliance documentation requirements are defined in the Residential Manual.

Model means a floor plan ~~and or~~ house design that is repeated throughout a subdivision or within a multi-family building. To be considered the same model, dwelling units shall ~~be in the same subdivision or multi-family housing development and~~ have the same basic floor plan layout, energy design, and compliance features as shown on the CF-1R for each dwelling unit, including the same Variations in the basic floor plan layout, energy design, compliance features, zone floor area, and/or zone volume, that do not change the HERS features to be tested, the heating or cooling capacity of the HVAC unit(s), or the number of HVAC units specified for each the dwelling units, shall not cause dwelling units to be considered a different model as shown on the CF-1R. For multi-family buildings, variations in exterior surface areas caused by location within the building shall not cause dwelling units to be considered a different model.

~~**Certificate of Field Verification and Diagnostic Testing (CF-4R)** means a document with information required by the Commission that is prepared by the HERS rater to certify that measures requiring field verification and diagnostic testing comply with the requirements.~~

~~**Certificate of Compliance (CF-1R)** means a document with information required by the Commission that is prepared by the Documentation Author that indicates whether the building includes measures that require field verification and diagnostic testing.~~

~~**Installation Certificate (CF-6R)** means a document with information required by the Commission that is prepared by the builder or installer verifying that the measure was installed to meet the requirements of the standards.~~