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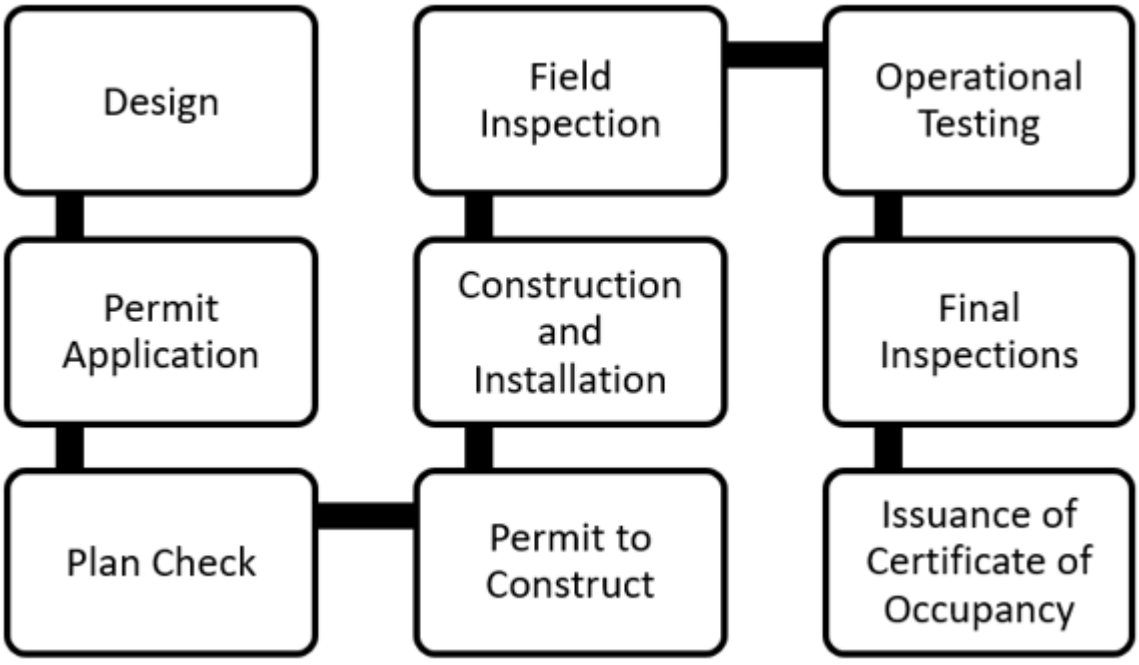
2. Compliance and Enforcement

2.1. Overview

The California Energy Commission (CEC) does notdirectly enforce the Building Energy Efficiency Standards (Energy Code), Title 24, Part 6 of the California Code of Regulations. Authorities having jurisdiction (AHJ) have the responsibility of issuing building permits for newly constructed buildings or additions and alterations to existing buildings and enforcing the California Building Code (CBC), Title 24 of the California Code of Regulations in totality, including the Energy Code. Most AHJs are local enforcement agencies, typically associated with a city or county government, but can also include other agencies such as the Division of the State Architect (for schools). This chapter of the Single-Family Compliance Manual will show how compliance and enforcement of the Energy Code is achieved in the typical single-family residential building project permitting process used by most AHJs, which follow some version of the permitting process prescribed by the International Code Council (ICC). Figure 2.1-1 shows an idealized version of the ICC permitting process.

Figure 2.1-1: Idealized International Code Council Permitting Process for Building Permit Applications



Source: California Energy Commission staff

To assist the enforcement agency, the CEC created three categories of compliance documents for single-family construction projects used to demonstrate compliance with the Energy Code:

- Certificate of compliance documents (CF1R) are completed by the project proponent and submitted to the enforcement agency during the plan review phase (§10-103[a]1).
- Certificates of installation (CF2R) are completed by the installing technician or contractor during construction and submitted to the enforcement agency during inspections throughout the construction phase (§10-103[a]3).
- Certificates of verification (CF3R) are completed by HERS Rater certified by a CEC-approved HERS Provider and submitted to the enforcement agency during the final inspection phase and prior to the enforcement agency issuing the certificate of occupancy (§10-103[a]5).

HERS Raters are independent, third-party agents, made available through the CEC's Home Energy Rating System (HERS) program. The HERS program consists of HERS Providers, approved by the CEC to train, certify, and oversee HERS Raters, who perform verification and diagnostic testing as required for compliance with the Energy Code.

HERS verification ensures the proposed HERS measures are installed and meet code compliance. The compliance and enforcement process requires participation from the architect, building designer, engineers, energy consultants, contractors, the owner, HERS Raters, and others. This chapter describes the overall compliance and enforcement process and responsibilities throughout the permit process.

2.1.1 Manufacturer Certification for Equipment, Products, and Devices

During the permit application development phase, certain equipment, products, and devices must be selected for installation or use that are certified to be compliant with the Energy Code. These items are identified on the CF1Rs and are verified during inspection by the enforcement agency. The equipment, products, and devices must be certified to the CEC by the manufacturer that it meets requirements under the Energy Code. The CEC makes no claim that the listed equipment, products, or devices meet the indicated requirements or, if tested, will confirm the indicated results. Inclusion on these lists only confirms only that a manufacturer certification has been submitted to and accepted by the CEC. Additional information about the required information for manufacturers to certify products and for lists of certified products may be found at http://www.energy.ca.gov/title24/equipment_cert/.

In single-family buildings, the following must be certified by the manufacturer:

- Air economizers
- Airflow measurement apparatus — forced air systems
- Airflow measurement apparatus — ventilation systems
- Airflow measurement apparatus — whole house fan systems
- Battery and energy storage systems

- Central heat pump water heater performance map
- Demand responsive lighting control systems
- Drain water heat recovery
- Ducted variable-capacity heat pump
- Economizer fault detection and diagnostics
- Intermittent mechanical ventilation systems
- JA13 heat pump water heater demand management system
- Low leakage air-handling unit
- Occupant-controlled smart thermostats
- Residential fault indicator display

2.1.2 HERS Program Compliance Document Registration

§10-103;
Reference Residential Appendix RA2;
Reference Joint Appendix JA7

The CEC developed the HERS program in part to help ensure compliance with the Energy Code for residential projects that require field verification and diagnostic tests (HERS Verification). Registration of compliance documentation (CF1Rs, CF2Rs, and CF3Rs) is required for any residential construction project for which a CF3R is required. (Not all residential construction projects require a CF3R.) Reference Residential Appendix RA2 *and Reference Joint Appendix JA7* provide detailed descriptions of procedures and responsibilities for the registration of CF1R, CF2R, and CF3R.

Compliance document registration is required for all newly constructed homes, most additions, and many alterations. When registration is required, compliance documents must be electronically submitted to a CEC-approved HERS Provider. The HERS Provider services include a HERS data registry (HERS registry) for the registration and retention of compliance documents.

All compliance documents (CF1Rs, CF2Rs, and CF3Rs) submitted to the registry must be certified and signed by the applicable responsible person (§10-103) as well as any other required signatories. The registry will assign a unique registration number to each document when completed, and certification (by an electronic signature) is provided by all signatories. The registry will retain the unique registered documents, which are available via secure Internet access to authorized users. This allows authorized users download unalterable electronic certificates or to make paper copies of the registered documents for purposes such as submittal to the enforcement agency, posting in the field for inspections, or sharing with the building owner. (See Section 2.2.9 of this manual.)

Types of registry users include energy consultants, builders, building owners, construction contractors and installers, HERS Raters, enforcement agencies, and the CEC. Document authors are typically employed by the person responsible for the document, with specific exceptions. Authorized users are granted access rights to the electronic data associated with the projects under their direct control.

2.2. Compliance Phases

2.2.1 Compliance Documentation

Complying with and enforcing the Energy Code in residential buildings involves many parties. Those involved may include the architect or designer, builder/developer, purchasing agent, general contractor, subcontractor/installer, energy consultant, plan examiner, inspector, Realtor®, and owner/first occupant. All these parties must communicate and cooperate for the compliance and enforcement process to run efficiently.

The Energy Code specifies detailed reporting requirements intended to provide design, construction, and enforcement parties with the information to ensure that the energy features are properly installed. Each party is accountable to ensure that the features that it is responsible for are correctly installed. This section outlines each phase of the process, responsibilities, and requirements.

The energy compliance documentation has been revised and reorganized. Prescriptive (Chapter 1.6) versions of the certificate of compliance (CF1R) have been designed to be used specifically with:

1. Single-family residential newly constructed buildings (CF1R-NCB-01).
2. Single-family residential additions (CF1R-ADD-01).
3. Single-family residential alterations (CF1R-ALT-01).
4. Single-family residential HVAC changeouts (CF1R-ALT-02).
5. Solar water heating worksheet (CF1R-STH-01).

The certificate of installation (CF2R) is separated into:

1. Envelope (CF2R-ENV).
2. Lighting (CF2R-LTG).
3. Mechanical (CF2R-MCH).
4. Plumbing (CF2R-PLB).
5. Photovoltaic and battery storage, solar-ready zone area, and solar thermal water heating (CF2R- PVB, SRA, and STH, respectively).

These categories and most compliance measures have a separate CF2R form that is specific to a particular installation. CF2R forms also incorporate references to applicable mandatory requirements. The HERS certificate of verification (CF3R) forms are categorized and organized in the same way as the CF2R forms. Refer to

Appendix A of this manual for more information about the forms and to view samples of the forms. Additional information about the compliance documents will be provided throughout this manual.

When HERS Verification is required for compliance, the Energy Code requires all residential energy compliance documents to be registered with a HERS data registry. This registration accomplishes retention of a completed and signed copy of the submitted energy compliance documentation. To simplify the permit process for HVAC changeouts, §10-103 of the Energy Code allows the registered CF1R-ALT-02 document to be submitted to an enforcement agency at final inspection and not before obtaining a permit. More details are in Chapter 9 of this manual. Document retention is vital to compliance and enforcement follow-up and other quality assurance follow-up processes that ensure energy savings from installed energy features. Reference Residential Appendix RA2 and Reference Joint Appendix JA7 has more details about document registration procedures building energy code compliance and enforcement process.

2.2.2 Design Phase

§10-103(a)2

This phase sets the stage for the construction project, whether it be a newly constructed building, an addition, or an alteration to an existing home. In addition to issues concerning zoning, lot orientation, property line easements, and infrastructure (such as utility hookups), the overall design and energy features of the building are described in the construction documents and specifications. The project owner must ensure that the building complies with the Energy Code and that the significant features required for compliance are documented on the plans and specifications and are consistent with the CF1Rs.

During the design process, an energy consultant or other professional may assist the building designer by providing energy compliance documentation services that determine the effect of building features being proposed for the design. These services help ensure that the final building design plans and specifications submitted to the enforcement agency will comply with the Energy Code. Throughout this phase, energy consultants or the documentation author may suggest recommendations or alternatives to help the designer achieve compliance.

The building design plans submitted to the enforcement agency must include the specifications for the building energy features needed to achieve compliance. The building features are insulation levels, window performance, equipment performance, lighting fixture types and controls, exhaust fan performance, envelope sealing, weather-stripping requirements, and any other feature that was used for compliance or is mandatory. The building design plans and specifications must be consistent with respect to the energy efficiency features information on the CF1R submitted to the enforcement agency. Any change in the building plans or specifications, during any phase of design or construction, that changes the energy

feature specifications for the design may require recalculation of the building energy compliance. A revised CF1R that is consistent with the updated plans and specifications for the proposed building may need to be submitted to the enforcement agency for approval. If recalculation indicates that the building no longer complies, alternate building features must be selected so that it complies with the Energy Code.

2.2.3 Permit Application

§10-103(a)2
§10-103(a)1C

When the design is complete, the construction documents are prepared (CF1Rs), and other approvals (planning department, water, and so forth) are secured, the owner or contractor applies for a building permit with the enforcement agency. This application is the last step in the planning and design process.

To help the enforcement agency verify that the proposed building complies with the Energy Code, compliance documents are submitted with the building permit application. These documents consist of a CF1R, which is required by the Energy Code. (See §10-103.) The length and complexity of the documentation vary depending on the scope of the project. For example, the number and type of components being replaced (windows, space conditioning equipment, roof replacement, ceiling insulation, and so forth), the number of buildings being constructed, the size of an addition, whether an orientation-independent permit is being requested, and whether the performance approach or the prescriptive approach is being used. An energy consultant who understands the code and is able to help the builder or owner comply with the standards often prepares the CF1R.

The administrative regulations in §10-103(a)2 require that documentation be submitted with permit applications that will enable the plans examiner to verify compliance. The forms used to demonstrate compliance must be readily legible and shall conform to a format and informational order and content approved by the CEC. If registration is required, the CF1R that is submitted to the enforcement agency must be a registered copy from an approved HERS registry.

2.2.4 Plan Check

The registration process requires the builder or designer to submit the certificate of compliance information and an electronic signature to an approved HERS registry to produce a completed, signed, and dated electronic CF1R that is retained by the registry. Copies of the registered CF1R are available to authorized users of the HERS registry for use in making electronic or paper copies of the registered document(s) for submitting to the enforcement agency as described in Section 10-103.

Local enforcement agencies check plans to ensure that the building design conforms to the Energy Code. This check focuses primarily on the fire, life, and safety requirements of the CBC and secondarily on the building energy efficiency

requirements. Vague, missing, or incorrect information on the construction documents are identified by the plans examiner. The permit applicant is required to make corrections or clarifications then resubmit revised plans and specifications. Submitting complete and accurate plans and specifications provides the plans examiner with the information needed to complete the plan check review quickly.

The plans examiner verifies that the information on the construction documents is consistent with the requirements specified on the CF1R. Examples of how the plans examiner will verify that the features detailed on the CF1R are specified in the respective sections of the building plans include:

1. Verifying the window and skylight U-factor and solar heat gain coefficient (SHGC) values from the CF1R on the structural/architecture plans in a window/skylight schedule, window/skylight legend for the floor plan.
2. Verifying the HVAC equipment and distribution information from the CF1R is clearly documented on the plans, such as SEER, EER, AFUE, mandatory, prescriptive, and elective HERS measures, and other values necessary to verify compliance.

The plans examiner compares the data on the CF1Rs against the rest of the plans and documents submitted for the permit applications, including all the following subject areas:

- Envelope (walls, ceiling, floors)
    - Windows, skylights, and doors solar heat gain coefficients
    - Insulation and air sealing
    - Advanced wall and ceiling construction and insulation
- Roofing materials and construction
    - Roof-deck insulation
    - E-barrier
    - Ventilation or sealed attic
    - Cool roof reflectivity requirements
- Heating, ventilating, and air conditioning (HVAC)
    - SEER, EER and AFUE (if applicable) for HVAC equipment
    - Ducting design and register placement
    - Ventilation and indoor air quality requirements
    - Duct insulation and placement (in or outside conditioned space)
    - Thermostat requirements
    - Manufacturer certification check
- Lighting requirements
    - Luminaire efficacy requirements

  - Switching and control devices
  - Outdoor lighting and controls
- Domestic hot water
  - Manufacturer certification check
  - Water piping design and insulation

The enforcement agency should clearly articulate to the builder/designer the acceptable methods of specifying energy features on the building plans for approval.

Since those buying building materials and the construction staff may rely solely on a copy of the approved plans and specifications, it is important that the building design represented on the approved plans and specifications complies with the Energy Code as specified on the CF1R.

The enforcement agency's plans examiner must also verify that the CF1R does not contain errors. Newly constructed buildings using the performance approach are required to use CEC-approved computer software; additions and alterations generally use the prescriptive method, with the option of using performance modeling software. When the CF1R is produced by CEC-approved computer software applications, there is less chance that there will be computational errors. The plans examiner must still verify that the design on the plans is consistent with the energy features on the certificate of compliance documents (CF1Rs). A list of CEC-approved energy code compliance software applications is available online at the CEC Compliance Software website (https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/online-resource-center/compliance).

The Building Energy Efficiency Standards Hotline at 1-800-772-3300 can assist with locating and installing this software.

With production homes, where a builder may be constructing several identical houses at roughly the same time, the compliance documentation may be prepared in such a way that a house or model can be constructed in any orientation. The plans examiner will verify that the home complies facing all four main compass points (north, south, east, and west) on the CF1R form.

2.2.5 Building Permit

After the plans examiner has approved the plans and specifications for the project, the enforcement agency may issue the building permit at the builder's request. Issuing the building permit is the first significant milestone in the compliance and enforcement process. The building permit is the green light for the contractor to begin the work. In some cases, the building permits are issued in phases. Sometimes, there is a permit for site work and grading before the permit for actual building construction.

2.2.6 Construction Phase

Upon receiving a building permit from the enforcement agency, the contractor begins construction. The permit requires the contractor to follow the plans and specifications, but often there are variations. Some variations are formalized through change orders. When change orders are issued, the permit applicant and the AHJ are responsible for verifying that the changes do not compromise compliance with the code. It is clear in some cases such as when a single-glazed, metal-frame window is substituted for a high-performance double-pane, vinyl-frame window. It may be difficult to determine compliance with changes such as orientation of the house or the location of a window. Field changes that result in noncompliance require enforcement agency approval of revised plans and revised energy compliance documentation to confirm that the building still complies with the Energy Code.

During construction, the general contractor or specialty subcontractors are required to complete various CF2Rs. These certificates verify that the contractor is aware of the Energy Code requirements and has followed the CEC-approved procedures for installation. These certificates are to identify the energy efficiencies and features of the installed building components. The CF2Rs are a collection of energy compliance information forms that apply to each regulated energy feature that may be included in the construction. The certificates are required to be completed by each of the applicable specialty contractors when they install regulated energy features such as windows, water heater and plumbing, HVAC ducts and equipment, lighting, and insulation.

The licensed person responsible for the building construction or installation of an energy-related feature must ensure their work is done in accordance with the approved plans and specifications for the building. The person must complete and sign a certificate of installation to certify that the installed features, materials, components, or manufactured devices for which they are responsible conform to the plans and specifications and the certificate of compliance documents approved by the enforcement agency for the building. A copy of the completed, signed, and dated CF2R must be posted at the building site for review by the enforcement agency in conjunction with requests for final inspection for the building. Copies of the registered CF2R forms shall be provided to the homeowner.

When any HERS verification is required for compliance, all CF2R forms must be registered with an approved HERS data registry. When registration is required, the builder or installing contractor must submit information to an approved registry to produce a completed, signed, and dated electronic CF2R that is retained by the registry for use by authorized users of the registry. After the information to complete the CF2R document is transmitted to the HERS registry and the form is electronically signed, the CF2R is assigned a registration number. Copies of the unique registered CF2R are made available to authorized users of the registry to make electronic or paper copies of the registered document(s) for submittal to the

enforcement agency as required. The builder or installing contractor must provide a copy of the completed, signed, and registered CF2R to the HERS Rater and post a copy at the building site for review by the enforcement agency in conjunction with requests for final inspection and provide copies of the registered CF2R forms to the homeowner.

More information about registering CF2R documents can be found in Reference Residential Appendix RA2 and Reference Joint Appendix JA7.

2.2.7 Enforcement Agency Field Inspection

§10-103(d)

Enforcement agency representatives inspect construction projects to ensure compliance with the Energy Code. Field construction changes and noncompliant energy features require parties associated with previous phases to repeat and revise their original energy compliance documents or reinstall building components that meet the building specifications and energy compliance documents.

Enforcement agencies make several visits to a building site to verify construction. The first visit is typically made before the slab or building foundation is poured. The building inspector verifies that the proper reinforcing steel is in place and necessary wiring and plumbing that will be embedded in the slab meet the requirements of the standards. The inspector should verify features that are to be installed in or under concrete slab floors, such as slab edge insulation or hot water recirculation loops that involve piping that must be installed in the slab. The inspector should also verify the front orientation and floor assembly types (such as slab on grade, raised floor, and others) of the building during this construction phase. Details of how the inspector should verify these components are in Chapter 3 of this manual.

The second visit occurs after the walls have been framed, and the HVAC equipment and ducting, fenestration, lighting cans, electrical wiring, plumbing, and other services have been constructed or installed. This inspection should be done before insulation is installed to ensure sealing and caulking around windows is completed, and the caulking and sealing of any holes bored through the framing members for installation of hot and cold water piping and electrical wiring. During the rough frame inspection, the inspector should also verify the installation of the high-efficacy lighting so that the contractor can make any necessary corrections before the final inspection. This verification avoids having to remove drywall, insulation, and so forth to remove an incandescent can. The inspector should also verify the window/skylight U-factor and SHGC values, proper sealing/installation of HVAC ducts and duct insulation R-value, installation of exhaust fan housing and ducting in bathrooms and kitchens (ASHRAE 62.2), and installation of a radiant barrier or cool roof or a combination thereof when required. Details of how the inspector should verify these components will be discussed in the respective chapters of this manual.

The third visit is the insulation inspection, which takes place after the wall, ceiling, and floor insulation have been installed. This inspection occurs before the drywall is

installed to verify that the insulation R-value matches the CF1R form, and the insulation has been properly installed without compressions, voids, or gaps. The inspector should verify that insulation is installed correctly around and behind piping and all exterior walls are insulated (especially behind obstructing objects like a bathtub). Details of how the inspector should verify these components are in Chapter 3.

The next visit is a drywall inspection, where the inspector verifies that the drywall is installed properly to limit infiltration and exfiltration, especially at locations surrounding lighting cans, HVAC registers and vents, and electrical sockets.

The final inspection is conducted after the walls have been closed and the final electrical and plumbing fixtures are in place. The inspector should verify HVAC efficiency values, water heating efficiency values, exhaust fan and other ventilation system noise level ratings in bathrooms and kitchens (ASHRAE 62.2), filter MERV rating and thickness, exterior lighting and controls, and weatherstripping on exterior/demising doors. The inspector will also verify that all required CF2R and CF3R forms have been completed, signed, and registered. Copies of these forms should be provided to the building owner. Details of how the inspector should verify these components will be discussed in this manual.

The typical enforcement agency inspection sequence can vary from jurisdiction to jurisdiction. It can be difficult for the enforcement agency to verify every energy efficiency measure required to be installed in the building. For example, exterior wall insulation will likely not be installed at the time of the framing inspection. If the enforcement agency does not include the insulation inspection in its field inspection, the exterior wall insulation would be concealed from an inspector's view at the final inspection.

The CF2Rs and, when required, the CF3Rs are crucial. When inspection of an installed energy feature would be impossible because of subsequent construction, the enforcement agency may require the CF2R for the concealed feature to be posted at the site or made available to the inspector upon completion/installation of the feature. To simplify the inspection, the inspector would reference the efficiency values and building components specified on the submitted CF2R form to verify compliance with the Energy Code.

When registration is required, all certificates of installation must be registered through an approved HERS data registry. For all measures requiring field verification, a registered certificate of verification shall also be made available to the building inspector.

2.2.8 Field Verification and Diagnostic Testing

Some building features require field verification and diagnostic testing completed by a HERS Rater as a condition for compliance with the Energy Code. When compliance with the Energy Code is based on energy features that require a HERS verification, a certified HERS Rater is required to perform the test according to procedures in

Reference Residential Appendix RA2 using the protocols in Reference Residential Appendix RA3.

There are mandatory requirements, prescriptive requirements, and performance credits (Chapter 1) that require HERS testing. Many requirements that require verification and testing involve air-conditioning equipment and forced-air ducts that deliver conditioned air to the dwelling. Examples of measures requiring HERS testing are refrigerant charge measurement and duct sealing. An example of an installed feature that does not require HERS testing is lighting control in spaces like a laundry room or bathroom.

The Energy Code mandates that all newly constructed homes with central HVAC systems have duct sealing (leakage testing), duct system airflow and fan watt draw (and installed HSPP/PSPP), and exhaust fans/systems (ASHRAE 62.2) verified by a HERS Rater when those systems are installed. Details about these measures are in Chapter 4 of this manual.

Additional measures requiring field verification include reduced duct surface area, increased duct R-value, high SEER and EER cooling equipment, and quality installation of insulation (QII). A full list of measures requiring field verification or diagnostic testing is in Table RA2-1 of the *2022 Reference Residential Appendices*. The requirements for field verification and diagnostic testing apply only when equipment or systems are installed. If a house has no air distribution ducts, then a HERS Rater does not have to test them.

The HERS Rater must verify the required features and transmit all required data describing the feature and the test results to an approved HERS registry. The rater must confirm that the installed energy feature being verified is consistent with the requirements for that feature as specified on registered copies of the CF1R approved by the enforcement agency for the dwelling. The HERS Rater must confirm the information on the CF2R is consistent with the CF1R. The test results reported on the CF2R by the person responsible for the installation must be consistent with the HERS verification results determined by the HERS Rater's diagnostic verification and meet the criteria for standards compliance. A copy of the registered CF2R must be posted at the building site for review by the enforcement agency and made available for applicable inspections. A copy of the registered CF2R must also be left in the dwelling for the homeowner at occupancy.

Results from the rater's field verification or diagnostic test are reported to the HERS registry with "pass" or "fail." If the results are "pass," the registry will make a registered copy of the CF3R available. A copy of the registered CF3R must be posted at the building site for review by the enforcement agency and made available for all applicable inspections. Copies must be given to the builder and left in the dwelling for the homeowner at occupancy. If results are "fail," that failure must be entered into the registry. HERS Providers shall not permit any user of the registry to print or access forms for noncompliant entries unless the CF3R form contains a watermark

with the word "FAIL" or "FAILURE." Corrective action shall be taken by the builder or installer on the failed requirement. The rater will retest the requirement to verify that the corrective action was successful. Once the correction is made, the passing CF3R shall be entered into the registry.

2.2.9 Approval for Occupancy

For newly constructed buildings and additions, the final step in the permitting process is for the enforcement agency to issue an occupancy permit so occupants can move in. Single-family homes and duplexes are often approved for occupancy without an occupancy permit being issued. Often a signed-off final inspection serves as an approval for occupancy, but this depends on the enforcement agency. When HERS verification is required before occupancy approval, the HERS Rater must post paper copies of the registered CF3Rs for site review by the building owner, installers, and inspectors.

For alterations to existing buildings, the signed-off final inspection is all that is required. Since the project is in a building with an existing occupancy permit, the enforcement agency is not required to issue a new occupancy permit. It should be noted that the extent of the alteration is limited by the Energy Code and, typically, the local codes and standards. If an alteration is too extensive, it can be considered a newly constructed building. For example, removing all wallboards, insulation, and exterior walls from a building could be considered a newly constructed building and not an alteration by the enforcement agency.

2.2.10 Occupancy

At the occupancy phase, the enforcement agency must require the builder to leave all compliance documentation in the building, which includes at a minimum the CF1R and all applicable CF2R forms. When HERS field verification is required, copies of the registered CF3Rs must be left on site with the compliance documentation. When registration is required, the CF1R and all required CF2R compliance documentation shall be registered copies. The builder is required to provide the homeowner with a manual that contains instructions for operating and maintaining the features of his or her building efficiently. More details are in Section 2.3.5.

2.3. Compliance Documentation

Compliance documentation includes the forms, reports, and other information that are submitted to the enforcement agency with an application for a building permit. It also includes documentation completed by the contractor or subcontractors to verify that certain systems and equipment have been installed correctly. It may include reports and test results by HERS Raters. The compliance documentation (CF1R, CF2R, and CF3R) is included with a homeowner's manual so that the end user knows what energy features are installed in the house.

Compliance documentation is completed at the building permit phase, the construction phase, the field verification and diagnostic testing phase, and the final

inspection phase. The required forms and documents are in Table 2.3-1 and described later. When registration is required, all the compliance documentation shall be registered copies from an approved HERS data registry.

Table 2.3-1: Documentation Requirements, Prescriptive and Performance Compliance Methods

A complete list and samples of energy compliance forms is in Appendix A.

Phase	Method	Documentation Required When Applicable
Building Permit	Performance	CF1R-PRF-E, Certificate of Compliance
Building Permit	Prescriptive	CF1R-NCB-01-E, Certificate of Compliance
Building Permit	Prescriptive	CF1R-ADD-01-E, Certificate of Compliance (Additions less than 1,000 ft2)
Building Permit	Prescriptive	CF1R-ALT-01-E, Certificate of Compliance (Residential Alterations)
Building Permit	Prescriptive	CF1R-ALT-02-E, Certificate of Compliance (Alterations to HVAC systems)
Building Permit	Prescriptive	CF1R-ENV-02-E, Worksheet for area weighted average
Building Permit	Prescriptive	CF1R-ENV-03-E, Worksheet for solar heat gain coefficient (SHGC)
Building Permit	Prescriptive	CF1R-ENV-04-E, Worksheet for cool roofs and SRI
Building Permit	Prescriptive	CF1R-PLB-01-E, Worksheet for hydronic heating systems
Building Permit	Prescriptive and Performance	CF1R-STH-01-E, Worksheet for OG 100 solar water heating systems
Construction	Prescriptive and Performance	CF2R-E, Certificate of Installation
Construction	Prescriptive and Performance	CF2R-H, HERS Certificate of Installation

Phase	Method	Documentation Required When Applicable
Field Verification and Diagnostic Testing	Prescriptive and Performance	CF3R-H, Certificate of Verification (HERS Rater)
Field Verification and Diagnostic Testing	Performance	CF3R-EXC-20-H, Certificate of Verification for Existing Conditions (HERS Rater) Note: This document must be completed before registering the CF1R-PRF-01-E when using the performance approach for an E+A+A and verification of existing conditions.

Source: California Energy Commission

2.3.1 Building Permit Phase Documentation

§10-103(a)

The compliance documentation required at the building permit phase consists of the CF1R and is based on the building plans. Depending on the compliance approach, the energy compliance documentation package may also include the area weighted average calculation worksheet (CF1R-ENV-02-E), the solar heat gain coefficient (SHGC) worksheet (CF1R-ENV-03-E), and the cool roof and SRI worksheet (CF1R-ENV-04-E). Blank copies of these worksheets are in Appendix A of this manual to use in the prescriptive compliance approach. When the performance approach is used, only the CF1R-STH worksheets are needed since the CEC-approved software performs the calculations and provides the necessary documentation contained in all other worksheets. When the performance approach is used, only the registered CF1R-PRF documents are required on the building plans.

The compliance documentation enables the plans examiner to verify that the building design shown in the plans and specifications complies with the Energy Code. It enables the field inspector to identify which building features are required for compliance and will be verified in the field.

2.3.2 Certificate of Compliance (CF1R)

The Energy Code requires the CF1R to be incorporated into the plans for the building and submitted to the enforcement agency. The CF1R form identifies the minimum energy performance specifications selected by the building designer or building owner for compliance and may include the results of the heating and cooling load calculations.

To meet the requirement for filing a copy of the CF1R with the building plans for a permit application, builders/contractors should ask the enforcement agency for

information about their preferences or requirements for document submittal procedures. Most local jurisdictions may require the CF1R to be embedded in the building design computer-aided drafting (CAD) file for plotting on sheets that are the same size as the plan set sheets of the building design. Thus, the CF1R documentation would be submitted as energy compliance design sheets integral to the entire plan set for the building. Some jurisdictions may allow taping CF1R document sheets to the submitted design drawings for the building. Others may allow attaching 8½-inch x 11-inch printed CF1R document reports to the submitted design drawing package.

When the prescriptive approach is used for additions and alterations, a shorthand version of the certificate of compliance shall be submitted with the building plans or with the permit application when no plans are required. In these instances, a CF1R-ADD form is required to be submitted for additions, a CF1R-ALT-01 form is required for alterations, and a CF1R-ALT-02 form is required for HVAC changeouts. More details are in Chapter 9.

For low-rise residential buildings for which compliance requires field verification, the CF1R submitted to the enforcement agency must be a registered copy from an approved HERS data registry. More information is in the Reference Residential Appendix RA2 and Reference Joint Appendix JA7.

2.3.3 Construction Phase Documentation (CF2R)

§10-103(a)3

The CF2Rs are separated into envelope (CF2R-ENV), lighting (CF2R-LTG), mechanical (CF2R-MCH), plumbing (CF2R-PLB), and solar (CF2R-PVB and CF2R-STH) categories. Most compliance requirements have a separate CF2R form that is specific to a particular installation. The CF2R forms must be completed during the construction or installation phase. The documents must be completed by the applicable contractors responsible for installing regulated energy features such as windows (fenestration), the air distribution ducts and the HVAC equipment, the exhaust fans/ventilation system, the measures that affect building envelope tightness, the lighting system, and the insulation. The CF2Rs must be posted at the job site in compliance with instructions from the enforcement agency. Most typically, these forms will be with the building permit folder in a window or other accessible location.

When HERS verification of a feature is required for compliance (as shown in the HERS required certification section of the CF1R), the builder or the builder's subcontractor must perform the initial field verification or diagnostic testing of the installation to confirm and document the applicable CF2R compliance with the standards using the applicable procedures specified in Reference Residential Appendix RA3. The builder, the builder's subcontractor, or authorized representative must submit the CF2R information to an approved registry. All CF2R information submittals must be done electronically when HERS verification/testing is required.

2.3.4 Field Verification and Diagnostic Testing Documentation (CF3R)

§10-103(a)5

Within the Energy Code, some mandatory requirements, some prescriptive requirements, and some requirements that may be used for compliance credit in the performance approach may require field verification or diagnostic testing or both. This testing must be performed by a HERS Rater who is specially trained and independent from the builder or general contractor.

When HERS verification is required, the HERS Rater must complete, register, and sign/certify the CF3R. The CF3R documents include information about the measurements, tests, and field verification results that were required to be performed. The HERS Rater must verify that the requirements for compliance have been met.

The HERS Rater chosen for the project must transmit the CF3R information to an approved HERS registry. This must be the same HERS registry through which the previous compliance documents (CF1R, CF2R) for the project were registered. The HERS Rater used for the project must be certified by the HERS provider. A registered CF3R is made available to the enforcement agency and the builder when HERS testing confirms compliance. The builder ensures that the enforcement agency has received the CF3R. The enforcement agency cannot issue the certificate of occupancy before receiving all required compliance documents, including the CF3Rs.

The HERS Rater shall provide a separate registered CF3R form for each house that the HERS Rater determines has passed the HERS verification performed for compliance. The rater shall not sign a CF3R for a house that does not have a registered CF2R that has been signed/certified by the installer. The only exception is for homes or projects within a sample group.

Sampling is a process wherein a builder or contractor may coordinate with a HERS Rater to allow the HERS verification for one home or project stand for all homes or projects within the sample group. Sample groups may include similar homes or projects from one builder, contractor, or installer for a particular HERS verification. For example, an HVAC contractor, after installing or replacing a ducted HVAC system, may request up to seven existing homes in one sample group. Working with one HERS Rater, the contractor will test only one of the seven homes for fan watt draw, duct air leakage, and refrigerant charge. If it passes, the HERS verification on this one home will stand for all seven installations in the sample group.

If the building was included in a sample group, the CF3R will identify whether the requirement passed compliance by testing or by sampling. The CF3R form for the tested home of a sample group will include the HERS test results, but the untested homes will not. CF3Rs for tested and untested homes in a sample group will still have a registration number, date, time, and watermark of the HERS provider's seal as any other CF3R that is not included in sampling. Refer to Reference Residential

Appendix RA2 for more details on HERS verification and CF3R documentation procedures.

2.3.5 Compliance, Operating, Maintenance, and Ventilation Information to Be Provided by Builder

§10-103(b)

The final documentation in the process is the information that is provided to the homeowner. At the completion of construction and before occupancy (for newly constructed homes and additions) and before final inspections (for alterations), the enforcement agency will require the builder to leave in the building the applicable completed, signed, and dated compliance documentation. Provide at a minimum, the applicable CF1R forms, CF2R forms, and, if compliance required HERS verification, the applicable CF3R forms. When registration is required, these compliance documents shall be registered copies. In addition to the compliance documentation, the builder must leave in the building operating and maintenance information for all installed features, materials, components, and manufactured devices. The operating and maintenance information must contain the details needed to provide the building owner/occupant with instructions on how to operate the home in an energy-efficient manner that ensures satisfactory indoor air quality and to maintain it so that it will continue to work efficiently. Paper or electronic copies of these documents are acceptable.

Example 2-1

Question

What are the plan check and field inspection requirements related to the CF2R?

Answer

A CF2R (certificate of installation) is not submitted with compliance documentation at the time of permit application. It is posted or made available for field inspection after installation of an applicable feature. A field inspector should review the "Required Special Features" on the CF1R, then check for the equipment and characteristics that are actually installed against what is reported on the CF2Rs. The field inspector should do this for all installed building components indicated on a CF2R (HVAC, fenestration, insulation, water heating, and so forth).

When HERS verification is required for compliance, the field inspector should review the "HERS Features Summary" on the CF1R to identify the required installer tests and confirm that these tests were performed and documented on the applicable CF2Rs.

Any required forms will be indicated on the HERS registry in the project status report (PSR) for the residence.

The enforcement agency may request additional information to verify that the installed efficiency requirements are consistent with the approved plans and specifications. When material properties or equipment efficiencies greater than the minimum requirements are shown on the CF1R, the enforcement agency may have procedures for verifying the actual material or equipment specifications. For example, the enforcement agency may require the installer to provide a copy of the applicable page(s) from a directory of certified equipment.

Example 2-2

Question

What happens to the CF2R after the final inspection?

Answer

§10-103(b) requires the builder to leave a copy of the CF2R in the building for the building owner at occupancy.

Example 2-3

Question

As a general contractor, when I have finished building a home, is there a list of materials I am supposed to give to the building owner?

Answer

Section 10-103(b) requires that at final inspection the enforcement agency shall require the builder to leave compliance, operating, maintenance, and ventilation information in the building for the "building owner at occupancy," which includes the:

1. Certificate of compliance (CF1R).

2. Certificate(s) of installation (CF2R).

3. Certificate(s) of verification (CF3R) if applicable.

4. Operating information for all applicable features, materials, components, and mechanical devices installed in the building.

5. Maintenance information for all applicable features, materials, components, and manufactured devices that require routine maintenance for efficient operation.

2.4. Roles and Responsibilities

2.4.1 Designer

5537 and 6737.1 of California Business and Professions Code

The designer is responsible for the overall building design. The designer specifies the building features that determine compliance with the Energy Code and other applicable building codes. The designer is required to sign the certificate of compliance (CF1R) to certify that the building complies with the Energy Code.

The designer may personally prepare the documents or delegate preparation of the energy analysis and certificate of compliance documents to an energy documentation author or energy consultant. If preparation of the compliance documentation is delegated, the designer must remain in charge of the building design specifications, energy calculations, and all building feature information represented on the certificate of compliance. The designer's signature on the certificate of compliance affirms his or her responsibility for the information submitted.

The designer may be an architect, engineer, or other California-licensed professional; however, a licensed design professional may not always be required for single-family residential buildings. *The California Business and Professions Code* allows unlicensed designers to prepare design documentation for wood-framed single-family residential buildings if the dwellings are no more than two stories high, not counting a possible basement. For homes that do not require a licensed design professional, the builder may sign the CF1R in the "Responsible Building Designer" signature block.

When the designer is a licensed professional, the signature block on the certificate must include the designer's license number. When registration is required, the certificate of compliance must be submitted to an approved HERS data registry. All submittals to the registry must be made electronically.

2.4.2 Documentation Author

a. §10-103(a)1

The person who designs the building may delegate the energy analysis and preparation of the certificate documentation to a building energy consultant or documentation author. A completed CF1R must be submitted to the enforcement agency during the building permit phase. The certificate demonstrates to the enforcement agency plan examiner that the building design complies with the Energy Code. The information submitted on the CF1R must be consistent with the building design features in the plans and specifications for the building submitted to the enforcement agency.

The documentation author is not subject to the same limitations and restrictions of the *Business and Professions Code* as is the building designer because the documentation author is not responsible for specification of the building design features. The documentation author may provide the building designer with recommendations for building energy features. If building designer approves the recommendations, the features must be incorporated into the design plans and specification documents submitted to the enforcement agency at plan check. The documentation author's signature on the certificate of compliance certifies that the documentation is accurate and complete but does not indicate documentation author responsibility for the specification of the features that define the building design. The documentation author provides completed certificate of compliance documents to the building designer, who must sign the certificate before submitting it to the enforcement agency at plan check.

If registration of the CF1R is required, it must be submitted to the registry and signed electronically by both the designer and documentation author before submitting to the enforcement agency. When document registration is required, only registered certificates of compliance that display the registration number assigned to the certificate by an approved HERS registry are acceptable for submittal to the enforcement agency at plan check.

A list of recommended documentation authors is at the California Association of Building Energy Consultants' (CABEC), CABEC Homepage (https://cabec.org/).

2.4.3 Builder or General Contractor

Chapter 9 of the *Business and Professions Code* specifies the term "contractor" is synonymous with the term "builder." This manual uses "builder" to refer to the general contractor responsible for construction. For additions and alterations to existing homes, the contractor can act as the builder or general contractor (typically for smaller projects). For production homes, the builder may also be the developer responsible for arranging financing, acquiring the land, subdividing the property, securing the necessary land planning approvals, and attending to the other necessary tasks that are required before actual construction. Many production builders are involved in marketing and sales of homes after they are constructed.

During construction, the builder or general contractor usually hires specialty subcontractors to provide specific services, such as installing insulation, designing, and installing HVAC systems, installing windows and skylights, installing water heating systems, and others. For homes that do not require a licensed design professional, the builder may sign the CF1R in the "Responsible Building Designer's" signature block.

The builder or general contractor must ensure that CF2Rs are submitted to the enforcement agency by the person(s) responsible for the construction/installation of regulated features, materials, components, or manufactured devices. The builder or general contractor may sign the CF2R on behalf of the specialty subcontractors they hire, but the preparation and signature responsibility reside with the specialty subcontractor who provided the installation services. The CF2R identifies the installed features, materials, components, or manufactured devices detailed in the plans and specifications, and the CF1R approved by the enforcement agency. If the installation requires HERS verification, the CF2R must report the results of the installer's testing of the regulated installations to measure performance. The CF1R and the CF2R shall be submitted to an approved HERS registry. A copy of the registered CF2R is required to be posted at the building site for review by the enforcement agency in conjunction with requests for intermediate and final inspections.

When the Energy Code requires registration of the compliance documents, the builder or general contractor must ensure the transmittal/submittal of the required information to an approved HERS registry. The builder or general contractor must arrange for the services of a certified HERS Rater if the CF1R indicates that HERS verification is required. The builder or general contractor must ensure that a copy of the CF1R that was approved by the designer/owner and submitted to the enforcement agency during the permitting phase is transmitted to the HERS registry. The CF1R should be made available to the HERS Rater, who will perform any required HERS testing.

When installation is complete, the builder or general contractor must ensure that the persons responsible for the installation have transmitted/submitted the required CF2R information to the registry. The builder must ensure that the HERS Rater receives a copy of the completed CF2R or provide access to the HERS registry that has been registered and signed by the builder or subcontractors responsible for the installation. When registration of the CF2R is required, the completed and signed copies that are posted at the building site for review by the enforcement agency, in conjunction with requests for final inspection, are required to be registered copies.

At final inspection, the builder or general contractor is required to leave in the building all applicable completed, signed, dated, and registered (when applicable) compliance documents (CF1R, CF2R, and CF3R if applicable) for the building owner at occupancy. These forms must be in paper or electronic format and must conform to the applicable requirements of §10-103(a).

2.4.4 Specialty Subcontractors

Specialty subcontractors provide the builder with services from specific building construction trades for installation of features such as wall and ceiling insulation, fenestration, HVAC and air distribution, or water heating and plumbing. These subcontractors may perform other trade-specific specialty services during building construction. The builder is responsible for all aspects of building construction and has the authority to complete and sign/certify all sections of the required CF2Rs. The licensed specialty subcontractor, however, should be expected to complete and sign/certify all applicable CF2Rs that document the completion of the work they have performed. The subcontractor's responsibility for documentation should include providing a registered (when applicable) and signed copy of all applicable CF2Rs to the builder and posting a registered (when applicable) and signed copy of all applicable CF2R at the building site for review by the enforcement agency. The subcontractors should make the registered and signed copies of the applicable CF2Rs available to the HERS Rater if HERS verification is required for compliance, as specified on the CF1R or any CF2R.

When the Energy Code requires document registration, all copies of the CF2Rs submitted to the builder, the enforcement agency, and the HERS Rater are required to be registered copies prepared by following the procedures in Reference Residential Appendix RA2, Reference Joint Appendix JA7, and Section 2.3 of this manual.

2.4.5 Enforcement Agency

§10-103

The enforcement agency is the authority having jurisdiction (AHJ) to issue building permits and verify compliance with applicable codes and standards (including the Energy Code). The agency performs several key roles in compliance and enforcement.

2.4.5.1 **Plan Check**

The enforcement agency performs plan check review of the CF1R and the plans and specifications that define the building design submitted to the enforcement agency at the building permit phase. During the plan check, the agency compares CF1R to the plans and specifications for the building design to confirm that the building features are specified consistently in all the submitted documents. If the specification for design features on the CF1R does not conform to the specifications on the designer's submitted plans and specifications for the building, the designer must revise the submitted documents to make the design specification consistent in all documents.

If the CF1R indicates the building complies, and it is consistent with the features on the plans and specifications for the building design, then the plan check can confirm that the design complies with the Energy Code. If the enforcement agency determines that the building design complies with the Energy Code, in addition to all

the other applicable codes and standards, it may issue a building permit. When the Energy Code requires document registration, the CF1R submitted for a plan check must be a registered document from an approved HERS registry. The one exception is the CF1R-ALT-02-E for HVAC changeouts. If approved by the enforcement agency, permit applicants may use unregistered CF1R-ALT-03-E or CF1R-ALT-04-E documents (dependent upon climate zone) to apply for permits and present the registered CF1R-ALT-02-E to the inspector at the time of the final permit.

2.4.5.2 Construction Inspection

During building construction, the enforcement agency should make several visits to the construction site to verify that the building is being constructed in accordance with the approved plans, specifications, and CF1R. At each site visit, the agency should review any applicable CF2Rs that have been posted or made available with the building permit(s). The enforcement agency should confirm that the energy efficiency features installed in the house are consistent with the requirements given in the CF1R for the building approved during plan check, that the installed features are described accurately on the CF2R, and that all applicable sections of the CF2R have been signed by the responsible licensed person(s). The enforcement agency should not approve a dwelling unit until it has received the applicable certificate(s). When the Energy Code requires registration of the energy compliance documents, the CF2R must be registered with an approved HERS registry.

2.4.5.3 Corroboration of Field Verification and Diagnostic Testing Procedures

As described in Reference Residential Appendix Section RA2.4.4, at its discretion, the enforcement agency may require that HERS verification by the builder or subcontractors or the HERS Rater be scheduled so that the enforcement agency's field inspector can observe the HERS verification procedures to corroborate the results reported on the CF2R and CF3R.

2.4.5.4 Sampling Within Enforcement Agency Jurisdictions

When sampling is used for HERS testing for newly constructed buildings, all dwellings in a designated sample group must be located within the same enforcement agency jurisdiction and subdivision as specified in Reference Residential Appendix Section RA2.6.3.1

When sampling is used for HERS testing for alterations, the dwellings in a designated sample group are not required to be located within the same enforcement agency jurisdiction. They are required to have the same installing contractor and must be assigned to the same rater. The building owner may choose for the HERS verification to be completed as part of a designated sample group composed of dwelling units for which the same installing company has completed the work that requires HERS testing, as specified in Reference Residential Appendix Section RA2.8. However, to enable the enforcement agency to schedule testing to accomplish the corroboration described in the previous section, it may choose to

require that a separate dwelling unit from the sample group that is located within the respective jurisdiction be tested.

2.4.5.5 **Final Approval**

The enforcement agency may approve the dwelling at the final inspection phase if all field inspections have determined all of the following:

- The dwelling conforms to the requirements of the plans and specifications as approved by the enforcement agency.
- The dwelling conforms with the CF1R approved by the enforcement agency.
- The dwelling conforms with all other applicable codes and standards requirements.
- The enforcement agency is in receipt of all CF2R required by the Energy Code and as identified by the CF1R for the dwelling unit.
- The CF1R and CF2R are signed and registered (when applicable) by the builder or subcontractor.
- For dwelling units requiring HERS testing, the enforcement agency has received a copy of the CF3R as registered with a HERS register
- The CF3R has been signed and dated by the HERS Rater.

The builder must ensure that all such required energy compliance documentation has been completed properly and posted at the job site or submitted to the enforcement agency in conjunction with the required inspections. However, the enforcement agency, in accordance with §10-103(d), as a prerequisite to approval of the building, must examine all required copies of the CF1R, CF2R, and CF3R posted at the site or made available with the building permits for the required inspections. This examination confirms that these compliance documents have been properly prepared and are consistent with the plans and specifications approved by the enforcement agency.

When an alteration has been performed by a participating Third Party Quality Control Program (TPQCP) contractor (see Section 2.4.8 of this manual), the enforcement agency may conditionally approve the building based on the CF2Rs if the TPQCP data checking has indicated that the installation complies. However, if subsequent HERS testing determines that resampling, full testing, or corrective action is necessary for such conditionally approved dwellings in the group, the corrective work must be completed and tested. Additional information is in Reference Residential Appendix RA2.4.3, RA2.7, and RA2.8.

2.4.5.6 **Corroboration of Information Provided for the Owner/Occupant**

At final inspection, the enforcement agency shall require the builder to leave in the building (for the building owner at occupancy) Energy Code compliance documents, operating and maintenance manuals, and ventilation information, as specified by §10-103(b).

Compliance documents for the building shall include all valid certificates of compliance (CF1R), certificate of installation (CF2R), and certificate of verification (CF3R). These documents must conform to the applicable requirements of §10-103(a).

Operating information shall include instructions on how to operate or maintain the energy features, materials, components, and mechanical devices of the building correctly and efficiently. Such information shall be in a folder or otherwise bound to provide all information in §10-103(b). This operating information shall be in paper or electronic format. For dwelling units, buildings, or tenant spaces that are not individually owned and operated, or are centrally operated, such information shall be provided to the person(s) responsible for operating the feature, material, component, or mechanical device installed in the building. This information shall be in paper or electronic format.

Maintenance information shall be provided for all features, materials, components, and manufactured devices that require routine maintenance for efficient operation. Required routine maintenance actions shall be clearly stated and incorporated on a readily accessible label. The label may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of feature, material, component, or manufactured device. For dwelling units, buildings, or tenant spaces that are not individually owned and operated, or are centrally operated, such information shall be provided to the person(s) responsible for maintaining the feature, material, component, or mechanical device installed in the building. This information shall be in paper or electronic format.

Ventilation information shall include a description of the quantities of outdoor air that the ventilation system(s) are designed to provide to the conditioned space of the building, and instructions for proper operation and maintenance of the system. For buildings or tenant spaces that are not individually owned and operated, or are centrally operated, such information shall be provided to the person(s) responsible for operating and maintaining the feature, material, component, or mechanical ventilation device installed in the building. This information shall be in paper or electronic format.

Example 2-5

Question

We are an enforcement agency with jurisdiction over the replacement of the outdoor compressor/condenser unit of an HVAC unit (an alteration), and the HVAC contractor who pulled the permit for replacing the unit has requested that we approve the final inspection and close out the permit based only on the certificate of installation (CF2R) for this job. This job requires HERS verification, and I thought it was necessary to receive the HERS Rater's completed and signed certificate of verification (CF3R) before the job could comply as a condition to final approval of the installation. Is there an allowance for compliance based only on the CF2R?

Answer

Yes. The enforcement agency may provide a conditional final approval of the installation based upon the CF2R for alterations jobs only, and only if the installing contractor is an approved Third Party Quality Control Program (TPQCP) installing contractor. The conditional final approval is allowed if TPQCP data checking has scrutinized the diagnostic test data submitted by the approved contractor's diagnostic test for the installation, and such data checking indicates the installation complies as shown on the CF2R.

The permittee is still required to complete all HERS verification procedures and comply with all HERS verification criteria. A CF3R is still required to be submitted to the enforcement agency, builder, and homeowner for the documentation procedure to be complete. If HERS verification of the approved TPQCP contractor's installation work determines that resampling, full testing, or corrective action is necessary to bring the installation into compliance, such work must be completed before issuing the CF3R. Sampling procedures for HERS verification for installation work performed by an approved TPQCP contractor allows testing of one sample from a designated group of up to 30 dwellings for which the work was performed by the same approved TPQCP installing contactor. Refer to Reference Residential Appendix Sections RA2.4.3, RA2.7 and RA2.8 (and Chapter 9 of this manual) for additional information.

2.4.6 HERS Provider

A HERS provider is an organization that the CEC has approved to administer a HERS program. The provider certifies, trains, and oversees HERS Raters. HERS Raters provide HERS verification on installed energy efficiency features in dwellings when required for compliance with the Energy Code. Visit the CEC website for the list of approved HERS providers at http://www.energy.ca.gov/HERS/

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The HERS provider must also maintain a HERS registry that incorporates a website-based user interface that accommodates the needs of the authorized users of the data registry who administer HERS compliance document registration. The HERS registry must receive, and record information required by HERS testing in a specific

dwelling. The HERS registry must have the capability to verify that the recorded information complies with the XML schema developed by the CEC. When the input data are verified, the HERS registry must make available a unique registered certificate available to authorized users. These registered certificates (CF1R, CF2R, and CF3R) are used in complying with document submittal requirements to local enforcement agencies, builders, building owners, HERS Raters, and other interested parties. The HERS registry helps simplify electronic submittal of the registered certificates to an CEC document repository for retention of the certificates for use in regulations enforcement.

The HERS provider must make available (via phone or Internet communications interface) a way for authorized users of the registry to verify the information displayed on copies of registered documents. Refer to Reference Residential Appendices Section RA2.4.2 and Reference Joint Appendix JA7 for additional information.

2.4.7 HERS Rater

The HERS Rater is trained and certified by a CEC-approved HERS provider to perform the HERS verification that may be required to demonstrate and document compliance with the Energy Code. HERS Raters receive special training in diagnostic techniques and building science as part of the certification administered by the HERS providers. The HERS Raters operate independently from the HERS providers and are to act as independent, third-party agents to the project contractor installing the energy efficiency requirements for the construction project. HERS Raters shall be considered "special inspectors" by enforcement agencies, which is not to be confused with the same term used by local enforcement agencies regarding inspectors with specific ICC training and certification. HERS Raters are not special inspectors for the local enforcement agencies; they are special inspectors for the project proponents, including the installing contractor. HERS Raters may be required to attain business licenses in some jurisdictions.

The CEC has determined that a HERS Rater may act as a document author for the CF2R for a residential project with no violation of the provisions of "Conflict of Interest" (Title 20, Section 1673[j]). If requested to do so by the builder or subcontractor, the HERS Rater may aid the builder or subcontractor register the CF2R with a HERS registry. However, the HERS Rater may not certify the information on a CF1R as the responsible person (that is, sign the CF1R as if they were the builder or subcontractor).

The builder or subcontractor responsible for the installation must provide the certification by electronic signature to confirm the information submitted to the registry. Refer to Reference Residential Appendix Section RA2.5 and Reference Joint Appendix JA7 for more information. The HERS Rater may not certify the information on a CF2R as the responsible person, unless the rater and installer have signed a written agreement that the Rater is an authorized representative that may sign on

behalf of the installer. The installing contractor remains the responsible person. Qualifications for delegation of signature authority are detailed in §10-103(a)3A.

The HERS Rater conducts the HERS verification of the installed energy efficiency features when required by the CF1R or CF2R. The HERS Rater must transmit the results of the HERS verification to the HERS registry. The HERS Rater must provide to the registry all information required to complete the CF3R and must certify those data as accurate and complete to the registry. The registry will make available registered copies of the CF3R to authorized users. Printed copies, electronic or scanned copies, and photocopies of the completed, signed, and registered CF3R are allowed for document submittals, subject to verification that the information contained on the copy conforms to the registered document information on file in the registry for the dwelling. A copy of the registered CF3R must be posted at the building site or made available to the inspector for review by the enforcement agency in conjunction with requests for final inspection for each dwelling unit.

Go to Reference Residential Appendix Section RA2.4.2 for more information.

Example 2-6

Question

Can a certified HERS Rater who performs and registers the HERS testing for a dwelling also perform the HERS verification required of the builder or installer to certify compliance with the Title 24, Part 6, installation requirements on the CF2R?

Answer

Yes. This approach is allowed when the HERS Rater is doing HERS verification for every dwelling (100 percent testing), but it is not allowed when the HERS Rater performs verification using a designated sample group of dwellings.

When 100 percent testing is used for HERS verification, the builder or the installer may use the information from the HERS Rater's HERS test results when completing the CF2R. When doing so, builders or installers signing the certification statement on the CF2R are assuming responsibility for the information in the form and are certifying that the installation conforms to all applicable codes and regulations. The HERS Rater may sign using the installer's delegated signature authority but cannot be assigned the responsibilities of the builder or installer, as stated on the CF2R and as prescribed by the Energy Code. Refer to §10-103(a)3A for authorized representation.

If the HERS Rater determines that the compliance requirements are not met (in other words, the HERS verification results in a failure), the HERS Rater will submit the data of the failed HERS testing into a HERS registry for retention. The builder or installer must make the needed corrections. Once corrections have been made and the HERS Rater determines that all compliance requirements are met, the builder or installer may certify the work by completing and signing the applicable section of the CF2R. The HERS Rater can complete the CF3R documentation for the dwelling.

Example 2-7

Question

I heard that there are conflict of interest requirements that HERS Raters must abide by when doing HERS verification. What are these requirements?

Answer

Raters are expected to be objective, independent third parties as field verifiers and diagnostic testers. By law, raters must be independent from the builder or subcontractor installer of the energy efficiency features being tested and verified. They can have no financial interest in the installation of the improvements. Raters cannot be employees of the builder or subcontractor whose work they are verifying. Also, they cannot have a financial interest in the builder's or contractor's business or advocate or recommend the use of any product or service that they are verifying.

The CEC expects HERS Raters to enter into a contract with the builder (not with subcontractors) to provide independent, third-party HERS verification. The procedures adopted by the CEC call for direct reporting of results to the HERS registry where the project has been established by the builder. Although not recommended by the CEC, a three-party contract among builder, rater, and subcontractor is possible, provided that the contract delineates the independent responsibilities of the HERS Rater and the responsibilities of a subcontractor to take corrective action in response to deficiencies found by a HERS Rater. Such contracts may also establish the role for a subcontractor to serve as administrator for the contract, including scheduling the HERS Rater, invoicing, and payment, provided the contract ensures that money paid by the builder to the HERS Rater can be traced through an audit. It is critical that such contractors preserve the HERS Rater's independence in carrying out the responsibilities specified in CEC-adopted HERS testing procedures. Even though such contracts do not violate the conflict of interest requirements, the closer that the working relationship is between the HERS Rater and the subcontractor whose work is being inspected, the greater the potential for compromising the HERS Rater's independence.

Compliance cannot be shown using sampling if a three-party contract is used. One hundred percent of homes must be tested by a HERS Rater when a three-party contract is used. HERS Raters must use their own diagnostic equipment and not the installing contractor's equipment when verifying work performed when a three-party contract is used.

HERS providers must provide ongoing monitoring of the propriety and accuracy of HERS Raters in the performance of their duties and to respond to complaints about the HERS Rater's performance. Where there may be real or perceived compromise of the HERS Rater's independence, the HERS provider is responsible for increasing scrutiny of the HERS Rater and acts to ensure objective, accurate reporting of HERS testing results in compliance with the Energy Code.

Enforcement agencies have authority to require HERS Raters to demonstrate their competence to the satisfaction of the building official. When the HERS Rater's independence is in question, building officials can prohibit a particular HERS Rater from being used in their jurisdiction or disallow practices that the building official believes will compromise the HERS Rater's independence. Building officials may require the use of a three-party contract. For additional information please contact the CEC Hotline.

2.4.8 Third Party Quality Control Program

A Third Party Quality Control Program (TPQCP) is a service that verifies the work of participating installers by gathering extensive diagnostic data and flagging potentially noncompliant installations.

The CEC may approve TPQCPs that serve some of the functions of HERS Raters HERS verification but do not have the authority to sign compliance documentation as a HERS Rater. A TPQCP:

A. Trains installers, contractors, technicians, and specialty subcontractors about compliance requirements for features that require field verification and diagnostic testing.
B. Collects more data than would be required to demonstrate compliance with the Energy Code from participating installers for each installation.
C. Performs validation and analysis of information from diagnostic HERS verification performed on a participating contractor's installation work to evaluate the validity and accuracy of the data and independently determine whether compliance has been achieved.
D. Provides direction to the installer to retest and correct problems when data checking indicates that compliance has not been achieved.
E. Requires submission of data when retesting and correction are directed.
F. Maintains a database of all data submitted by the participating TPQCP contractor in a format that is acceptable and made available to the CEC upon request.

The HERS provider must arrange for an independent HERS Rater to conduct independent HERS verification of the installation performed by the participating TPQCP contractor. If a group sampling is used for HERS verification for jobs completed by a participating TPQCP contractor, the sample from the group that is tested for compliance by the rater may be selected from a group composed of up to 30 dwellings for which the same participating contractor has performed the installation. For alterations, the installation performed by TPQCP contractors may be approved at the enforcement agency's discretion and on the condition that, if subsequent HERS verification determines that resampling, full testing, or corrective action is necessary for such conditionally approved dwellings in the group, the corrective work must be completed.

Refer to Reference Residential Appendix RA2.4.3, RA2.7, and RA2.8 for additional information.

2.4.9 Owner

"Building owner" refers to the owner of the dwelling unit. For production homes, the owner is the builder or the person(s) that buys the new home. In custom homes and remodels, the owner may be the homeowner, builder, developer, a general contractor, architect, or engineer.

As part of the compliance process, the owner must receive compliance, operating, maintenance, and ventilation information documents at the time of occupancy. The enforcement agency must require the builder to leave this information in the building for the building owner at occupancy as specified in §10-103(b). This requirement applies to newly constructed homes, additions, and alteration to an existing home. The exact compliance, operational, maintenance, and ventilation documents are based on the scope of the construction project.

Example 2-8

Question 1

What is my responsibility with respect to the CF2R (certificate of installation) as the enforcement agency inspector?

Answer 1

The field inspector for the enforcement agency has two general responsibilities, according to the Energy Code (§10-103[d]2:

The CF2Rs and CF3Rs (if applicable) are all consistent with the CF1Rs, plans, specifications, and change orders as approved by the enforcement agency. These include all installed features, materials, components, or manufactured devices regulated by the Appliance Efficiency Regulations or the Energy Code as indicated on the CF1Rs.

All required CF2Rs and CF3Rs are completed, signed, and posted or made available with the permit issued for the construction project.

The CF2Rs and CF3Rs (if applicable) are all consistent with the CF1Rs, plans, specifications, and change orders as approved by the enforcement agency. This includes all installed features, materials, components, or manufactured devices regulated by the Appliance Efficiency Regulations or the Energy Code as indicated on the CF1Rs.

All required CF2Rs and CF3Rs are completed, signed, and posted or made available with the permit issued for the construction project.

While the compliance documents (CF1R, CF2R, and CF3R) are required to be submitted to the enforcement agency, the agency is not required to use the compliance documents in any way.

The CEC recommends that the inspector verify CF2R during the applicable site inspections. For example, verify the CF2R for quality insulation installation during the framing, air sealing, and insulation inspections. Do not wait until the final inspection to check all CF2R documentation.

Question 2

What is my responsibility with respect to the CF2R (certificate of installation) as a builder?

Answer 2

The general contractor is responsible for completing and signing the CF2R form for the work performed. A homeowner acting as the general contractor for a project is authorized to sign the CF2R. The installing contractor should provide the CF2R since the certification statement is an installer's assurance to the owner that the work has been completed properly and complies with applicable codes and regulations. The CF2R certification statement and signature indicates that the equipment or feature 1) was installed properly and confirms that the information provided on the form properly identifies the installed building component or equipment, 2) is equivalent or more efficient than required by the approved plans (as indicated on the CF1R), and 3) meets all relevant certification or performance requirements.

Refer to §10-103(a)3 for more information about certificate of installation requirements.

2.5. HERS Field Verification and Diagnostic Testing

This section describes some procedures and requirements for HERS verification of energy efficiency features.

HERS testing is performed by HERS Raters who are trained and certified to perform these services. The HERS Raters cannot be employees of the builder or contractor whose work they are verifying. Also, they cannot have a financial interest in the builder's or contractor's business, or advocate or recommend the use of any product or service that they are verifying. The training, quality assurance, and general oversight of the HERS Raters are conducted by HERS providers.

2.5.1 Measures Requiring HERS Field Verification and Diagnostic Testing

HERS verification is required only when certain regulated efficiency requirements or equipment features are installed. If such efficiency requirements or equipment features are not installed, then HERS verification is not required. For example, if a dwelling that must comply with the Energy Code does not have air distribution ducts, then HERS verification for duct leakage is not required for compliance.

The following features require HERS verification:

- Duct sealing

- Duct location, surface area, and R-value
- Low-leakage ducts entirely in conditioned space
- Low-leakage air handlers
- Verification of return duct design
- Verification of air filter device design, filter MERV rating, and labeling
- Verification of prescriptive bypass duct requirements
- Refrigerant charge in ducted split-system and ducted packaged unit air conditioners and heat pumps, and mini-split systems
- Refrigerant fault indicator display (FID)
- Verified system airflow
- Air handler fan efficacy
- Verified energy efficiency ratio (EER)
- Verified seasonal energy efficiency ratio (SEER)
- Heat pump-rated heating capacity
- Evaporatively cooled condensers
- Variable-capacity heat pump credit
- Whole-house fan
- Central fan ventilation cooling systems
- Continuous whole-building mechanical ventilation airflow
- Intermittent whole-building mechanical ventilation airflow
- Kitchen exhaust (including vented range hoods)
- Building envelope air leakage
- Quality insulation installation (QII)
- Quality insulation installation for spray polyurethane foam
- Verified pipe insulation credit (PIC-H)
- HRV/ERV system fan efficacy
- Verified central parallel piping (PP-H)
- Verified compact hot water distribution system expanded credit (CHWDS-H-EX)
- Demand recirculation: manual control (R-DRmc-H)
- Demand recirculation: sensor control (R-DRsc-H)
- Multiple recirculation loop design for DHW systems serving multiple dwelling units
- Verified drain water heat recovery system (DWHR-H)

2.5.2 Verification, Testing, and Sampling

At the builder's option, HERS testing may be completed for each dwelling unit (100 percent testing) or for a group of dwelling units (sampling). Sampling for newly constructed units is permitted only when multiple dwelling units of similar design are constructed within the same subdivision by the same subcontractor. Sampling may also be used, at the builder's or installer's option, for alterations for groups composed of dwellings having the same requirements installed that require HERS testing, and where the same installing contractor has installed the requirements. More details are in Reference Residential Appendix Section RA2.6 and RA2.8.

To be included in a sample group, the builder or subcontractor must provide the HERS Rater with a copy of the registered CF1R and CF2R as specified in Reference Residential Appendix Section RA2.5. The building owner or installer must give the HERS Rater project access on the registry to facilitate planning and execution of sampling.

The installer must self-test every requirement and sign as the responsible person on the appropriate CF2Rs. The HERS Rater may test a representative home (referred to as the "model") to help the installer identify any issues before self-testing the remaining homes. See Section 2.5.3.

Prior to performing any HERS verification, the HERS Rater must confirm that the CF1R and CF2Rs have been registered for each dwelling unit to be tested. It is the HERS Rater that facilitates dwelling unit grouping without direction from the installer or builder. The HERS Rater also chooses the first of each type of HERS requirement to test without any forewarning.

The HERS Rater will transmit all test results to the registry and sign as the responsible person on the CF3Rs. The HERS provider will make available a registered copy of the completed and signed CF3Rs to all approved authorized users of the registry. Printed copies, electronic or scanned copies, and photocopies of the registered CF3Rs will be allowed for document submittals, subject to authentication between the copy and the registered certificate. A registered copy of the CF3R must be posted at the building site or made available for review by the enforcement agency in conjunction with requests for final inspection for each dwelling unit.

The HERS provider will make available, via phone or Internet, a way for authorized users of the HERS registry to verify that the information displayed on copies of registered documents on file in the registry for the dwelling unit.

If the builder chooses the sampling option, the procedures in Reference Residential Appendix Sections RA2.6 and RA2.8 must be followed.

2.5.3 Initial HERS Testing for Subdivision Projects

The HERS Rater must perform the required HERS verification on the first dwelling unit of each model within a subdivision. To be considered the same model, dwelling units must have the same basic floor plan layout, energy design, and compliance

features as shown on the CF1Rs. Variations in the basic floor plan layout, energy design, compliance features, zone floor area, or zone volume that do not change the features to be verified, the heating or cooling capacity of the HVAC unit(s), or the number of HVAC units specified for the dwelling units will not cause dwelling units to be considered a different model.

The initial model HERS verification allows the builder to identify and correct any potential construction flaws or practices in the build-out of each model. If HERS verification determines that the requirements for compliance are met, the HERS Rater will transmit the HERS verification results to the HERS registry.

2.5.4 Group Sample HERS Testing for Subdivisions

After the initial model HERS verifications are completed, the builder or the builder's authorized representative determines which sampling procedure is to be used for the group of dwellings that require HERS testing. There are two procedures for HERS testing using group sampling: (1) sampling a closed group of up to seven dwellings and (2) sampling of an open group of up to five dwellings. The group sampling requirements for each procedure will be discussed in this section. If available, a TPQCP allows up to 30 dwelling units to be grouped.

Transmittal/submittal of the CF2R information, for at least one dwelling, to the HERS registry is required to open a new group. Additional dwellings may be entered into the registry and included in an "open" group over a specific period, subject to transmittal/submittal of the CF2R to the registry for each additional dwelling. However, the group shall not remain open to receive additional dwellings for a period longer than six months from the earliest date shown on any CF2R for a dwelling included in a group. A group may be closed at any time after the group has been opened at the option of the builder or builder's authorized representative. The size of a closed group may range from a minimum of one dwelling to a maximum of seven dwellings. When a group is closed, no additional dwellings shall be added to the group.

A. Sampling of a closed group of up to seven dwellings requires the following conditions to be met as prerequisite to receiving CF3R for the group:
    1. All the dwelling units in the sample group have been identified. Up to seven dwellings are allowed to be included in a closed sample group.
    2. Installation and diagnostic testing of all the features that require HERS verification have been completed by the installer in all dwellings in the group, and all CF2Rs are registered.
    3. The group has been classified as a closed group in the data registry.
    4. At the request of the builder or the builder's authorized representative, a HERS Rater will randomly select one dwelling unit from the closed sample group to begin HERS verification. If the dwelling unit meets the compliance requirements, this tested dwelling and each of the other nontested dwellings

in the group will receive a registered certificate of verification. Alternatively, the rater may test and verify requirements in different dwelling units in the group.

B. Sampling of an open group of up to five dwellings requires the following conditions to be met as prerequisite HERS verification on the group:

1. At least one dwelling unit from the sample group has been identified. Up to five dwellings are allowed to be included in an open sample group.
2. Installation of all the features that require HERS testing shall be completed by the installer in all dwellings. Registration of the CF2Rs for all the dwellings has been completed.
3. At the request of the builder or the builder's authorized representative, a HERS Rater will randomly select one dwelling unit from the open sample group for HERS verification. If the dwelling unit meets the compliance requirements, the tested dwelling and each of the other nontested dwellings shall receive a registered CF3R. If there are fewer than five dwelling units, the group shall be allowed to remain open and eligible to receive additional dwelling units. Dwelling units entered into the open group after the successful CF3R of the tested dwelling shall also receive a registered CF3R as a nontested dwelling subject to receipt of the registered CF2R by the HERS registry for the dwelling. The group shall be closed when it reaches the limit of five dwellings, when the six-month limit for open groups has been exceeded, or when the builder requests that the group be closed.

The HERS Rater must confirm that the CF2Rs have been registered and are consistent with the CF1R for the dwelling unit.

The HERS Rater must perform one or more HERS verification on the selected dwelling unit and enter the results into the HERS registry regardless of whether the results indicate a pass or fail. If the test fails, then the failure must be entered into the registry, even if the installer immediately corrects the problem. In addition, any applicable procedures for resampling, full testing, and corrective action must be followed as described in Section 2.5.5 below.

If HERS verification determines that the requirements for compliance are met, the HERS Rater will enter the test results into the HERS registry. The HERS provider will make available to approved users of the registry a registered copy of the CF3R for the tested requirement and for all other nontested requirements in the group at the time of the sample test. To avoid confusion by placing test results on untested requirements, the registry will not report the results of tested requirements on the corresponding CF3Rs for untested requirements in the sample group. The results will be reported only on the CF3R for the tested requirements within the sample group. However, CF3Rs for untested features will conform to all other registration requirements and specify that the feature was not tested but has passed compliance as part of a sample group. The HERS provider must close any open group within six

months after the earliest signature date shown on any CF2R for a dwelling entered in the group. When such group closure occurs, the provider shall notify the builder that the group has been closed and require that a sample dwelling be selected for HERS verification by a HERS rater if HERS verification has not yet been conducted on a sample dwelling entered in the group.

2.5.5 Resampling, Full Testing, and Corrective Action

When a failure is encountered during sample testing, the failure must be entered into the HERS registry for retention by the HERS Rater. Corrective action must be taken on the failed dwelling unit. The dwelling unit must be retested to verify that corrective action was successful, and the dwelling complies. Corrective action and retesting on the dwelling unit must be repeated (and registered) until the testing determines that the dwelling complies, and the successful compliance results have been entered into the registry. A registered CF3R for the dwelling shall be made available to authorized users of the registry.

In addition, the HERS Rater must resample and test a second randomly selected dwelling within the sample group to assess whether the first failure is unique or if the rest of the dwelling units are likely to have similar failings. "Resampling" is the procedure that requires testing of additional dwellings within a group when the initial selected sample dwelling from a group fails to pass HERS verification.

When resampling in a closed group, if the testing of a second randomly selected dwelling in the group confirms that the requirements for compliance credit are met for that unit, then the unit with the initial failure does not indicate failure in the remaining untested units. A copy of the CF3R will be made available for the remaining dwelling units in the group, including the unit in the resample. If the second sample results in a failure, the HERS Rater must report the second failure to the registry. All the nontested units in the group must be individually HERS-verified.

Additional information is in Reference Residential Appendix RA2.6.

2.5.6 Installer Requirements and HERS Procedures for Alterations

When compliance for an alteration requires HERS verification by a certified HERS Rater, the building owner may choose for the HERS verification to be completed for each dwelling unit or as part of a designated sample group of dwelling units. The building own may choose the same installing company that completed the work that requires HERS verification for compliance. The dwelling units in a designated sample group are not required to be within the same enforcement agency jurisdiction; however, a enforcement agency may require that a separate dwelling unit from the sample group that is located within its jurisdiction be tested. The only alterations that will require HERS verification are HVAC changeouts. When compliance requires HERS verification, the building owner or its agent must arrange for registration of the CF1R information to the registry, identifying the altered HVAC system and features that require HERS verification. The building owner must also submit an registered copy of the CF1R to the HERS Rater.

When the installation is complete, the person responsible for the performance of the installation must complete the CF2Rs. If the HERS Rater tests the features on behalf of the installer, this test disqualifies the associated dwelling from group sampling, and the dwelling must be removed from the group or else all dwellings in that group must be verified.

After confirming that the CF1R and all required CF2Rs are registered, the HERS Rater must perform the HERS verification for each HERS requirement. The sampling procedures described in Reference Residential Appendix RA2.6.3.3 and RA2.8 for sampling a closed group of up to seven dwellings must be used. It requires that all dwelling units (HVAC systems) within the group have been serviced by the same installing company. The installing company may request a group for sampling that is smaller than seven dwelling units (HVAC systems). Resampling, full testing, and corrective action must be completed, if necessary, as specified by Reference Residential Appendix RA2.6.4.

Whenever the HERS Rater for the group is changed, a new group must be established.

The enforcement agency(ies) cannot approve the alteration until the agency has a registered CF1R, CF2R, and CF3R for the altered HVAC system. The agency will also verify that the installing contractor provides copies of all these forms to the homeowner.

TPQCP, as specified in Reference Residential Appendix RA2.7, may also be used with alterations and must be limited to closed sample group sizes of 30 dwelling units or fewer. When a TPQCP is used, the enforcement agency may approve compliance based on the CF2Rs where data checking has indicated that the unit complies, on the condition that if the required HERS testing procedures determine that resampling, full testing, or corrective action is necessary, such work shall be completed.

2.5.7 For More Information

More details on HERS verification and HERS registries are in the *2022 Reference Residential Appendices and 2022 Reference Joint Appendices*, as described below:

1. Reference Joint Appendix JA7 – Data Registry Requirements
2. Reference Residential Appendix RA2 – Residential HERS Verification, Testing, and Documentation Procedures
3. Reference Residential Appendix RA3 – Residential Field Verification and Diagnostic Test Protocols

Example 2-9

Question

Given a multifamily building that has ducted HVAC systems and HERS-verified duct leakage verification for all the dwelling units in the building, what is the correct sampling procedure for HERS field verification and diagnostic testing for the air distribution ducts?

Answer

If the builder of a multifamily building chooses to comply using sampling, then the sampling is done using groups composed of dwelling units that have used the same HERS requirements for compliance but also share the same basic floor plan layout and energy design. (These similar features define the model.) Dwellings that do not have the same HERS requirements specified for compliance are not allowed to be placed in the same HERS sample group.

For multifamily buildings, variations in exterior surface areas caused by location of dwelling units within the building do not cause dwelling units to be considered a different model floor plan. When verifying a dwelling unit, all the duct systems associated with every HVAC unit in the dwelling must be tested to determine compliance for that dwelling.

For this example, since duct testing is the only HERS requirement specified for all the dwelling units, all the dwelling units in the building can be grouped together for HERS verification requirements. The procedures for assigning dwellings to groups and the HERS verification of a sample from each group must follow the same procedure as for single-family dwellings described in Section 2.5.2 in this chapter and in Reference Residential Appendix RA2.

The installer will designate a dwelling unit for each model in the building to be verified by the rater before the formation of sample groups.

After verification of the first dwelling of each model floor plan is complete, the rater must randomly select a sample dwelling unit from each group of dwellings that have been formed. These samples must be tested according to applicable procedures in Reference Residential Appendix RA3 and documented according to procedures in Reference Residential Appendix RA2. In a sampled dwelling unit that is to be tested to confirm compliance, the duct system associated with every HVAC unit in that dwelling unit must be tested. However, duct systems do not have to be tested in dwelling units that are not selected for sampling (nontested dwelling), provided the dwelling that was tested complies.

If the tested dwelling in the group complies with the verification, the remaining dwellings in the sample group are certified for compliance based on the results of the sample dwelling test result. Testing must be done on every duct system in a dwelling unit, regardless of whether it appears that the HVAC and duct system are in conditioned space. This is akin to a single-family residence with one HVAC unit serving upstairs with ducts in the attic and another serving downstairs with ducts between floors.