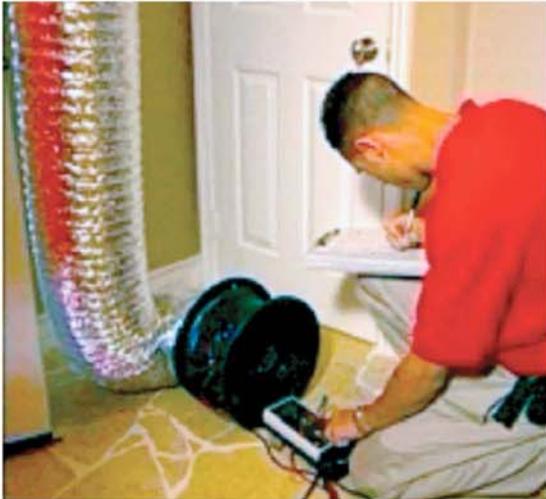


2005 BUILDING ENERGY EFFICIENCY STANDARDS

CALIFORNIA
ENERGY
COMMISSION



COMMISSION CERTIFIED MANUAL

RESIDENTIAL COMPLIANCE MANUAL

CEC-400-2005-005-CMF
Revision 3

Arnold Schwarzenegger
Governor



4Q-05

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1.6.2 Prescriptive Packages

§151(f)

The prescriptive requirements are organized by packages. The prescriptive packages are the simplest and least flexible compliance path. The central prescriptive package, Package D, establishes the stringency of the Standards for the performance approach. Approved computer programs model a house with the features of Package D to determine the space conditioning and water heating budgets.

Each prescriptive package is a set of pre-defined performance levels for various building components. Each building component must meet or exceed the minimum efficiency level specified in the package. There are two packages to choose from: Package C (the all-electric house, applied to locations where natural gas is not available) and Package D. (Packages A and B were eliminated in the 2001 Standards.)

Package D and the Package D Alternative are presented in Table 151-C (and its footnotes) in the Standards (also in Appendix B of this document). Package C is presented in Table 151-B of the Standards (Appendix B of this document).

- Standard Package D. The Package D prescriptive requirements serve as the basis of the standard design in the performance approach and determine the energy budget of a proposed design. These prescriptive requirements require that split system air conditioners or heat pumps (for definition see Joint Appendix I) be diagnostically tested to verify that they have the correct refrigerant charge (or field-verified that they are equipped with a thermostatic expansion valve) and that air distribution ducts be diagnostically tested to verify that leakage is less than 6%.
- Alternative Package D. This is a modification to Standard Package D that does not require field verification and/or diagnostic testing. Fenestration performance and space cooling system (or in some cases the heating system) efficiency is more stringent instead. This alternative package achieves equal energy savings to Standard Package D.
- Package C. This package allows electric resistance space heat, but increases stringency for most envelope features to make up for the additional TDV energy that would be used by the electric heating systems. Electric resistance water heating may also be used with Package C if the water heater is located within the building envelope and 25% of the water heating is provided by solar or a wood stove boiler where allowed. See Section 151(f)8.

1.6.3 Performance Approach

The performance approach, also known as the computer method, requires that the annual TDV energy be calculated for the proposed house and compared to the TDV energy budget. TDV energy is the “currency” for the performance approach. TDV energy not only considers the type of energy that is used (electricity, gas, or propane), but also when it is used. Energy saved during periods when California is likely to have a statewide system peak is worth more

The Energy Commission's website now includes references to listings of the most energy efficient appliances for several appliance types. The website address is:

<http://www.energy.ca.gov/efficiency/appliances/index.html>



The complete appliance databases can be downloaded from the Energy Commission's website at:

<http://www.energy.ca.gov/efficiency/appliances/>

The appliance databases, as well as manufacturer and brand codes, are spreadsheet files. After downloading, these files must be decompressed and can be viewed in Excel or other compatible software.

Directory of Certified Insulation Materials

Manufacturers whose insulating materials are certified for sale in California are listed in the Department of Consumer Affairs' *Consumer Guide and Directory of Certified Insulation Material*. Each building department receives a copy of this directory. If an insulating product is not listed in the directory, or to purchase a directory, contact the Department of Consumer Affairs, Thermal Insulation Program, at (916) 574-2041.

1.9.2 Training Opportunities

If you are interested in attending a training seminar on the Standards, sign up to receive a free subscription to the *Blueprint* (see above).

Some colleges provide classes on building energy conservation and the energy standards. Information about these classes should be obtained directly from the college.

California utilities, organizations of energy consultants, building industry, and trade associations, and organizations that serve building officials often sponsor or conduct classes on compliance and enforcement of the Title 24 Building Energy Efficiency Standards. These classes are often listed in the *Blueprint* or posted on the Energy Commission's website at <http://www.energy.ca.gov/title24>

1.9.3 Energy Consultants

The California Association of Building Energy Consultants (CABEC) maintains a directory of consultants who provide compliance assistance. The listing is available at <http://www.CABEC.org>

1.9.4 On-Line Videos

The Energy Commission has a series of streaming videos that explain energy efficiency concepts and the application of the standards. They can be viewed at <http://www.energyvideos.com>.

readily legible and of substantially similar format and informational order as those specified in this compliance manual.

2.2.3 Plan Check

Local building departments check plans for conformance to building standards. This includes health and safety requirements, such as fire and structural, along with energy requirements. Vague and/or missing details on the construction documents must be corrected or clarified. Complete plans help to speed the plan check process, as the plans examiner would have all the information that they need to complete the review. Having to go back to the applicant and request more information is always a time consuming process that can be minimized with more complete construction documents.

From the building department's perspective, their job is to verify that the information contained on the construction documents matches the information that is contained on the energy efficiency compliance documents. Contractors in the field will seldom look at the compliance document when they do their job. Instead, they will rely on the plans and specifications for direction. It is essential that the building represented on the plans and specifications complies with the energy efficiency standards. The compliance documents are a tool to ensure this.

The building department also verifies that the compliance documents do not contain errors. When the compliance documents are produced by Energy Commission-approved computer programs, there is less chance that there will be computational errors, but it is still essential that the plans examiner verify that the building represented on the plans is the same building that is represented in the compliance documents. To obtain a list of Energy Commission approved compliance programs visit their Website at:

http://www.energy.ca.gov/title24/2005standards/2005_computer_prog_list.html



Or call the Efficiency Standards Hotline at 916-654-5106.

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. When an application is filed for orientation independence, it usually follows the performance approach – if the house is shown to comply when oriented along the four main compass points, it can be assumed to comply in any orientation.

2.2.4 Building Permit

When the plans examiner is satisfied that the building meets the standards, the building permit is issued. This 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 that precedes the permit for actual building construction.

2.3.1 Building Permit Phase Documentation

§10-103(a)2

Compliance documents at the building permit phase include:

- Certificate of Compliance (CF-1R)
- Mandatory Features Checklist (MF-1R)

Depending on the compliance approach, the building permit compliance documentation may also include the Solar Water Heating Calculation Form (CF-SR), the Thermal Mass Worksheet (WS-1R), the Area Weighted Average Calculation Worksheet (WS-2R), the Solar Heat Gain Coefficient (SGHC) Worksheet (WS-3R), however; the Residential Kitchen Lighting Worksheet (WS-5R) is required for both compliance approaches. Blank copies of these documents are included in Appendix A for use with the prescriptive compliance requirements. When the performance approach is used, see Table 2-1 for applicable required forms needed for Energy Commission-approved software.

The purpose of the compliance documentation is to enable the plans examiner to verify that the building design complies with the standards and to enable the field inspector to readily identify building features that are required for compliance.

Certificate of Compliance (CF-1R)

The standards require that a certificate of compliance be included on the plans. The performance CF-1R form summarizes the minimum energy performance specifications needed for compliance including the results of the heating and cooling load calculations.

Placing a copy of the CF-1R on the drawings, taping a CF-1R to the drawings or printing the CF-1R information directly on the drawings may meet the requirement that the certificate be on the plans. Verify with the local enforcement agency which is acceptable.

Mandatory Measures Checklist (MF-1R)

The mandatory measures checklist serves two purposes: it allows the designer to acknowledge their responsibility to include the features in the design and it is used in the field to verify that each of the mandatory measures is in compliance. The information on the mandatory measures checklist may be placed on the plans along with the Certificate of Compliance. Alternatively, the designer must ensure that all applicable mandatory features are indicated on the plans and specifications.

- Air handler fan power
- High energy efficiency ratio (EER)
- Maximum cooling capacity
- Building envelope sealing
- High quality insulation installation.

Field verification and testing is only required when measures or equipment are installed that require field verification and/or testing. If such measures or equipment are not installed, then field verification and testing is not required. For example, if there are no air distribution ducts or no new ducts in the case of additions, then no testing of ducts is required. Similarly, if there is no split system air conditioner or heat pump in a building using package C or D for compliance, then it is not necessary to diagnostically test the refrigerant charge. 

2.5.2 Sampling

At the builder's option, HERS field verification and diagnostic testing may be completed either for each dwelling unit or for a sample of dwelling units. Sampling is permitted only when multiple dwelling units of the same type are constructed within the same subdivision by the same specialty contractors.

With the sampling approach, the HERS rater tests the first home for each model. As additional homes of the same model are constructed, the builder shall identify a group of up to seven dwelling units from which a sample will be selected for testing and the HERS provider is notified. The HERS rater then randomly selects at least one dwelling unit from the group and performs the tests on that unit. If the sampled unit passes, then all homes in the group are deemed to pass the tests.

If a sampled home fails, the HERS rater shall determine whether the failure was unique or that the rest of the dwelling units are likely to have similar failings. If the failing is considered unique, then the HERS rater chooses at random another house from the sample and performs tests on that house.

If the second house fails, then the builder is required to take corrective action in all unoccupied dwelling units in the group that have not been tested. The builder may also choose another path to compliance that does not involve a feature requiring field verification and/or diagnostic testing.

For multifamily buildings, variations in exterior surface areas caused by location of dwelling units within the building shall not cause dwelling units to be considered a different model for the purpose of sampling.

2.5.3 For More Information

More detail on field verification and/or diagnostic testing is provided in the *2005 Residential ACM Manual*, as described below:

- Chapter 7 of Residential ACM, Home Energy Rating Systems (HERS) Required Field Verification And Diagnostic Testing, has detailed procedures on who can perform third-party inspections, the type of inspections that can be performed, and procedures for sampling.
- Appendix ACM RC-2005 has procedures for testing air distribution ducts.
- Appendix ACM RD-2005 has procedures for verifying refrigerant charge.
- Appendix ACM RE-2005 has procedures for testing fan flow and fan power.
- Appendix ACM RF-2005 has procedures for HVAC sizing.
- Appendix ACM RH-2005 has procedures for high quality insulation installation.
- Appendix ACM RI-2005 has procedures for verifying air conditioning features such as thermal expansion valves and high EER ratings.

Example 2-8

Question

How does the sampling procedure for diagnostic testing for air distribution ducts apply to multifamily buildings?

Answer

If the builder chooses to do sampling, then the sampling is done on a dwelling unit basis. Under sampling, first a determination needs to be made of how many different types of dwelling units there are in the development.

For multi-family 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. In this dwelling unit, the duct system associated with every HVAC unit in this dwelling unit must be tested. After that a sample of the remaining dwelling units must be tested, according to the procedure in Section 7.5 of the *2005 Residential ACM Manual*. In a dwelling unit that is to be tested in sampling, the duct system associated with every HVAC unit in that dwelling unit must be tested. No duct systems have to be tested in dwelling units that are not selected for sampling. In other words this is a sampling of dwelling units within buildings. 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 or not. 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. For this single family counterpart case, both duct systems must be tested to get the duct sealing compliance credit.

Source: California Appliance Efficiency Regulations

Type	Capacity	AFUE	Combustion Efficiency
Gas Steam Boilers (Single Phase)	Less than 300,000 Btu/h	75%	80%
Gas Packaged Boilers	300,000 Btu/h or larger		
Other Boilers (Single Phase)	Less than 300,000 Btu/h	80%	83%
Oil Package Boilers	300,000 Btu/h or larger		

Non-central gas space heaters shall be certified to have AFUE values greater than or equal to those listed in Table 4-2 below:

Table 4-2 – Minimum Heating Efficiency for Non-Ducted, Non-Central Gas Fired Heating Equipment

Source: California Appliance Efficiency Regulations

Type	Capacity	AFUE
Wall Furnace (fan type)	up to 42,000 Btu/hour	73%
	over 42,000 Btu/hour	74%
Wall Furnace (gravity type)	up to 10,000 Btu/hour	59%
	over 10,000 Btu/hour up to 12,000 Btu/hour	60%
	over 12,000 Btu/hour up to 15,000 Btu/hour	61%
	over 15,000 Btu/hour up to 19,000 Btu/hour	62%
	over 19,000 Btu/hour up to 27,000 Btu/hour	63%
	over 27,000 Btu/hour up to 46,000 Btu/hour	64%
Floor Furnace	up to 37,000 Btu/hour	56%
	over 37,000 Btu/hour	57%
Room Heater	up to 18,000 Btu/hour	57%
	over 18,000 Btu/hour up to 20,000 Btu/hour	58%
	over 20,000 Btu/hour up to 27,000 Btu/hour	63%
	over 27,000 Btu/hour up to 46,000 Btu/hour	64%
	over 46,000 Btu/hour	65%

The AFUE of mobile home furnaces shall be certified not to be less than 75 percent.

Heat Pumps and Electric Heating

Table 4-3 summarizes the energy efficiency requirements for heat pumps. Note that the minimum heating seasonal performance factor (HSPF) changes on January 23, 2006 for single phase air source heat pumps.

Duct Leakage

§151(f)10

Duct sealing, including field verification and diagnostic testing, is required in all climate zones in both prescriptive packages C and D. The details of the sealing methods are covered in Appendix RC in the *Residential ACM Manual*. The bottom line requirement for new duct systems is that leakage is less than 6% of the supply air flow. (Note that the requirement is slightly less stringent for testing of existing duct systems as described in Chapter 8, Additions and Alterations.)

To comply with the duct sealing requirement, the installer must first perform the tests and document the results in the appropriate portion of the CF-6R form. In addition, a HERS rater must provide independent diagnostic testing and verification and then record the findings on the CF-4R form.

There are two alternatives to the duct testing requirement. The first is to meet the alternative Package D requirements that are listed in the notes that follow Table 151-C in the Standards (or Appendix B of this document). These alternative packages contain more stringent window and HVAC efficiency requirements as a tradeoff for not performing duct testing. For example, in climate zones 10, 11, and 12, the alternative package sets the maximum window U-factor at 0.38 (vs. 0.57), the maximum SHGC at 0.31 (vs. 0.40), and the minimum SEER at 13.0 (vs. mandatory minimums that vary by type and size).

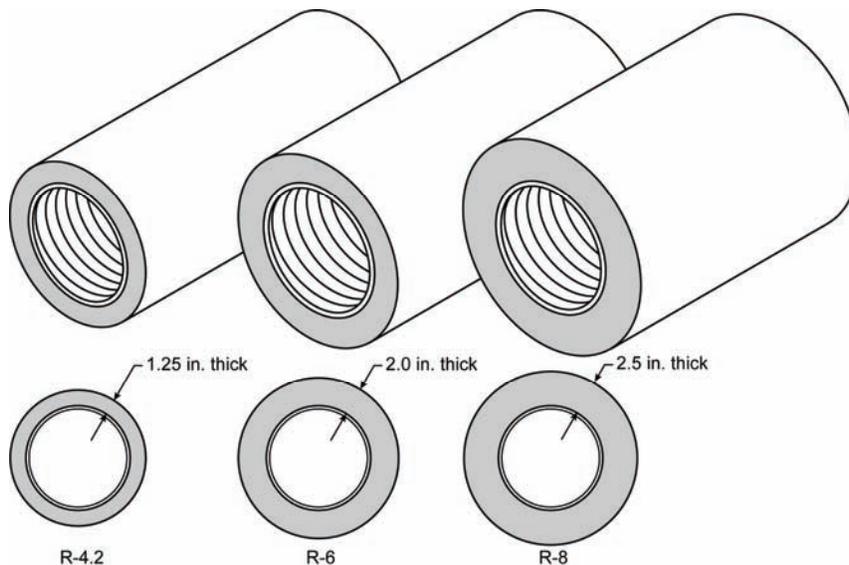


Figure 4-4 – R-4.2, R-6, and R-8 Ducts

The second alternative to duct testing is to use the performance compliance method. In this case, the computer program will automatically assume that the standard design (baseline) has been tested and sealed, while the proposed design will default to a higher leakage value.

Table 5-2 – Minimum Energy Factor Small Water Heaters

Source: Energy Commission Appliance Efficiency Regulations, Table F-4 – Standards for Small Federally-Regulated Water Heaters

Type	Size	Energy Factor (EF)
Gas Storage	≤ 75,000 Btu/hr	0.67-(0.0019*V)
Gas Instantaneous	≤200,000 Btu/hr	0.62-(0.0019*V)
Oil Storage	≤105,000 Btu/hr	0.59-(0.0019*V)
Oil Instantaneous	≤210,000 Btu/hr	0.59-(0.0019*V)
Electric Storage (exc. Table top)	≤ 12KW	0.97-(0.00132*V)
Electric Table Top	≤ 12KW	0.93-(0.00132*V)
Electric Instantaneous (exc. table top)	≤ 12KW	0.93-(0.00132*V)
Heat pump Water Heater	≤ 24 Amps	0.97-(.00132*V)

Note: V refers to tank volume (gal). Effective Date January 20, 2004

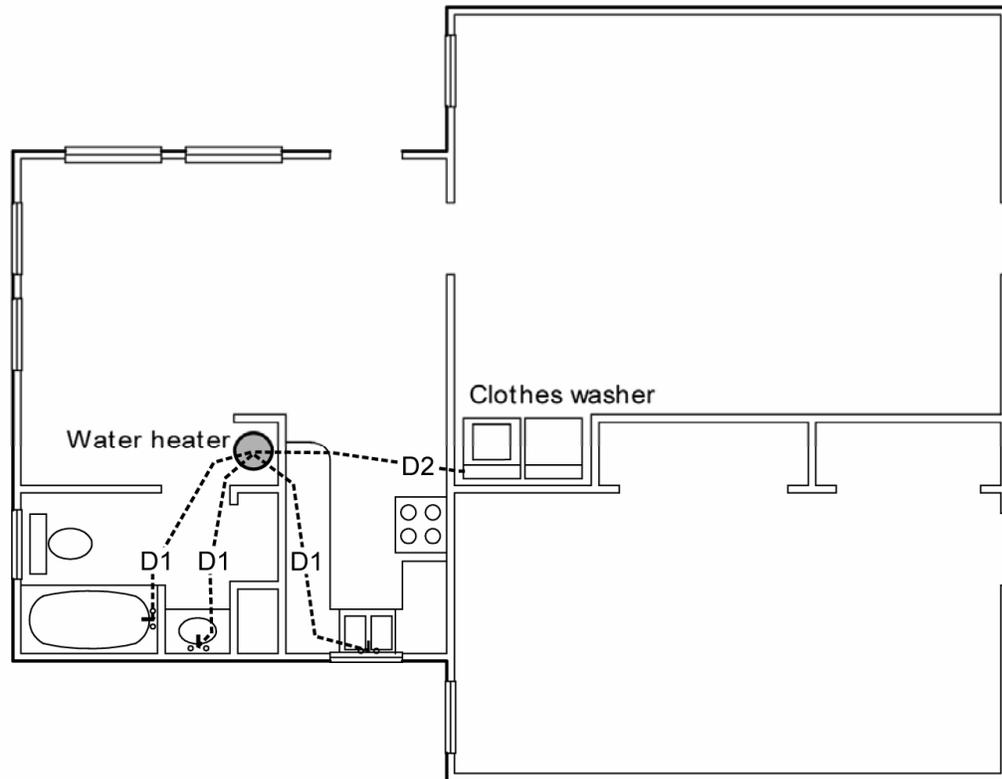
The energy efficiency of equipment that is larger than the sizes indicated in Table 5-2, are regulated by the California Appliance Efficiency Regulations. Energy factor is not used for larger equipment, but rather minimums are specified for thermal efficiency and standby loss as shown in Table F-3 (see Appendix B).

The minimum efficiency of new water heaters is not something that needs to be checked at the building counter when the prescriptive method is used, since this is an appliance standard and applies at the point of sale. Water heater efficiency may be a factor in compliance, however, when the performance method is used.

Energy Factor

Used to measure the efficiency of water heaters, the Energy Factor (EF) is “the ratio of energy output to energy consumption of a water heater, expressed in equivalent units, under designated operating conditions over a 24-hour use cycle, as determined using the applicable test method in the Appliance Efficiency Regulations.” [§101]





D1 (distance between water heater and hot water fixture) $\leq 8'-0"$ D2 (distance between water heater and clothes washer) $\geq 8'-0"$

Figure 5-2 – Point of Use Distribution System

Pipe Insulation

Credit is available for insulation of hot water pipes in addition to insulation required by the mandatory requirements. For systems serving a single dwelling unit, this credit applies only to non-circulating systems. For systems serving multiple dwelling units, there is a pipe insulation credit for recirculating piping external to dwelling units if pipes are insulated to a higher R-value than the mandatory minimum.

Installation Criteria (Single Dwelling Unit):

Insulation must meet the level required in the mandatory requirements. Note that pipes buried under ceiling insulation can meet the mandatory requirements.

Note: Heat tape – electric resistance heating tape wrapped around hot water pipes – may be used only for freeze protection and cannot be used instead of mandatory pipe insulation (see Section §150(j)) or pipe insulation receiving distribution credit.

facing fenestration area in climate zones 2, 4, and 7-15, exceeds 5% of the CFA, the performance compliance approach must be used.

- If the addition has a floor area of 100 ft² or less, then up to 50 ft² of fenestration area is allowed, additions that add less than 50ft² of fenestration area need to meet the Package D requirements for fenestration U-factor and SHGC, but are exempt from the fenestration maximum total area limits (this includes both 20% of conditioned floor limit and the 5% west facing limit). There is no credit for glazing removed when using this option. For additions with floor areas of 100 ft² or less that have greater than 50 ft² of fenestration area, the performance compliance is optional or use the less than 1,000 ft² column.
- If the addition has a floor area equal to or less than 1,000 ft², then only R-13 wall insulation is required in all climate zones and shall meet all the requirements of Package D as indicated in Table 8-2. The allowed 20% CFA limit and of which a maximum 5% CFA is allowed as west facing glazing (in climate zones 2, 4, and 7-15) non-west orientations may be increased by the amount of glazing removed in the wall that separates the addition from the existing house. Note Performance approach is an alternative when not able to comply prescriptively.
- If the addition has a floor area greater than 1,000 ft² the fenestration need to meet the Package D requirements for fenestration U-factor and SHGC. The allowed 20% CFA limit and of which a maximum 5% CFA is allowed as west facing glazing (in climate zones 2, 4, and 7-15).

Table 8-2 – Prescriptive Envelope Requirements for Additions

Component	Size of Addition		
	100 ft ² or less	1,000 ft ² or less	More than 1,000 ft ²
Ceiling Insulation	R-19	Package D	Package D
Wall Insulation ¹	R-13	R-13	Package D
Floor Insulation	R-13	Package D	Package D
Fenestration U- factor ³	Package D	Package D	Package D
Glazing Area	≤ 50 ft ²	Package D (20%) + Glass Removed ⁴	Package D
Solar Heat Gain Coefficient (SHGC)	Package D	Package D	Package D
Radiant Barrier ²	N/A	Package D	Package D

¹ Heavy mass and light mass walls may meet the Package D requirements for mass wall insulation instead of R-13.

² The radiant barrier requirement applies only to the roof area of the addition. It is not necessary to retrofit a radiant barrier in the existing attic.

³ Dual-glazed greenhouse windows and dual-glazed skylights are assumed to meet the applicable U-factor requirement.

⁴ No more than 5% of the CFA is allowed for west facing regardless of glass area removed to make way for the addition. The balance of removed glass area can be added to the rest of the orientations plus the maximum allowed 20% of the CFA.

The Package D Alternative, which requires more energy efficient windows and space conditioning equipment in lieu of measures that require field verification and diagnostic testing, may also be used with addition alone, provided that if space conditioning equipment is installed, it will have the specified efficiency,

requirements described in Chapter 4 (Building HVAC Requirements) of this manual.

Compliance with these measures requires verification by a HERS rater. However, there are three alternative compliance options as shown in Table 8-3 that take the place of duct sealing and possibly refrigerant charge measurement.

The table provides three options as alternatives to duct sealing in the indicated climate zones as described below:

The first option requires an efficiency upgrade of the furnace only. It requires installation of a furnace with an AFUE of 0.92.

The second option is an efficiency upgrade on the cooling side only. It requires the installation of high SEER & EER equipment, plus TXV (or refrigerant charge measurement instead of TXV), and Increased Duct Insulation.

The third option requires an efficiency upgrade in both heating and cooling equipment. It requires installation of a high SEER & EER unit with TXV (or refrigerant charge measurement instead of TXV), plus 0.92 AFUE (or 0.82 AFUE plus Increased duct Insulation instead of 0.92 AFUE).

In climate zone 8, to avoid TXV or refrigerant charge measurement requirements, a SEER 14 air conditioner or a 0.82 AFUE furnace may be used.

Table 8-3 – Alternatives to Duct Sealing



	Option 1	Option 2	Option 3
Climate Zone	0.92 AFUE	SEER-14 & EER-12, with either TXV or refrigerant charge measurement, plus Increased Duct Insulation	SEER-14 & EER-12 with either TXV or refrigerant charge measurement, plus either 0.92 AFUE or 0.82 AFUE with Increased Duct Insulation
CZ2	Yes	No	Yes
CZ9	No	No	Yes
CZ10	No	Yes	Yes
CZ11	No	No	Yes
CZ12	Yes	No	Yes
CZ13	No	Yes	Yes
CZ14	No	No	Yes
CZ15	No	Yes	Yes
CZ16	Yes	No	Yes

1. Increased duct insulation refers to an additional R-4 insulation wrap on existing ducts and R-8 duct insulation for all new ducts. 2. Package systems may use Option 2 or 3 without meeting the requirement for a TXV (or refrigerant charge measurement)

Note - There are no duct sealing requirements in climate zones 1 and 3-8.

Setback Thermostat

§152(b) 1 C

If the thermostat is to be replaced as part of the alteration, then a setback thermostat is required as described in Chapter 4.

depending on whether or not the refrigerant charge and airflow have been diagnostically tested.

Example 8-39

Question

When using the existing plus addition performance method, can compliance credit be gained by sealing the existing ducts when it was not required for prescriptive compliance?

Answer

Yes. The standard design must be selected as either “untested duct systems in homes built after June 1, 2001” or “untested duct systems in homes built prior to June 1, 2001.” If the entire duct system is designed and tested to have a leakage less than 6% and is diagnostically verified by a HERS rater, then significant compliance credit may be available. See the discussion of the performance approach in the text above.

Example 8-40

Question

Where do radiant barriers need to be installed when using the performance approach where no credit is taken for retrofitting a radiant barrier in the existing house?

Answer

The radiant barrier only needs to be installed on the underside of the roof assembly associated with the addition.

Example 8-41

Question

When using the existing plus addition performance compliance method, can credit be gained by installing a radiant barrier in the existing house attic? If so, where does the radiant barrier need to be installed?

Answer

Yes, installing a radiant barrier in the existing building will result in a credit relative to the standard design for existing buildings permitted (or constructed) prior to June 1, 2001. The radiant barrier must be installed over the entire attic/roof area including gable walls. If there are roof/ceiling assemblies where it is not possible to reach the underside of the roof, such as roof/ceiling assemblies using enclosed rafters which are not proposed to be exposed as part of the project, the radiant barrier cannot be properly installed and compliance credit is not possible.

Example 8-42

Question

I am adding a room to an existing building. I am upgrading a single-pane clear glass window as part of an alteration to an existing building in climate zone 12. Do I receive credit toward the addition compliance for installing a window with a U-factor of 0.65 and an SHGC of 0.50?”

Answer

No. There will be a penalty toward achieving compliance since the window is not as efficient as required by the prescriptive package for climate zone 12 which requires a U-factor of 0.57 and

CERTIFICATE OF COMPLIANCE: RESIDENTIAL (Page 1 of 5) CF-1R

Project Title	Date	Building Permit #
Project Address		
		Plan Check / Date
Documentation Author	Telephone	Field Check / Date
Compliance Method (Prescriptive)	Climate Zone	Enforcement Agency Use Only

Alternative Component Package Method: (check one) C D D (Alternative)

- Package C and Package D choices require HERS rater field verification and/or diagnostic testing (see CF-1R page 3)
- For Package D Alternative see Appendix B Table 151-C Footnotes 8-14 in the Residential Compliance Manual (RCM)

GENERAL INFORMATION

Total Conditioned Floor Area (CFA) _____ ft²

Average Ceiling Height: _____ ft

Check Applicable Boxes

Building Type: (check one or more) Single Family Multifamily Addition Alteration
 (If adding fenestration fill-out WS-4R, Fenestration Maximum Allowed Area Worksheet and see Section 8.3.2 for Additions and 8.3.3 for Alterations in the RCM.)

- Maximum Allowed Total Fenestration Area _____ ft² (from WS-4R)
- Maximum Allowed West Facing Fenestration Area _____ ft² (from WS-4R)
- Number of Stories: _____ Number of Dwelling Units: _____
- Floor Construction Type: _____ Slab/Raised Floor (circle one or both)
- Front Orientation: _____ North / South / East / West : All Orientations (input front orientation in degrees from True North and circle one).

RADIANT BARRIER (check box if required in climate zones 2, 4, 8-15)

OPAQUE SURFACES INCLUDING OPAQUE DOORS

Component Type (Wall, Roof, Floor, Slab Edge, Doors)	Frame Type (Wood or Metal)	Cavity Insulation R-Value	Continuous Insulation R-Value	Assembly U-factor (for wood, metal frame and mass assemblies) ¹	Joint Appendix IV Reference	Roof Radiant Barrier Installed ² Yes or No	Location Comments (attic, garage, typical, etc.)

1) See Joint Appendix IV in Section IV.2, IV.3, and IV.4, which is the basis for the U-factor criterion. U-factors can not exceed prescriptive value to show equivalence to R-values.
 2) This column is for the Inspector to verify installation of roof radiant barrier.

CERTIFICATE OF COMPLIANCE: RESIDENTIAL (Page 2 of 5) CF-1R

<i>Project Title</i>	<i>Date</i>

FENESTRATION PRODUCTS – U-FACTOR AND SHGC

✓ FENESTRATION MAXIMUM ALLOWED AREA WORKSHEET WS-4R – must be included for New Construction, Additions, and Alterations.

Fenestration #/Type/Pos. (Front, Left, Rear, Right, Skylight)	Orientation, N, S, E, W ¹	Area (ft ²)	U-factor ²	U-factor Source ³	SHGC ⁴	SHGC Source ⁵	Exterior Shading/Overhangs ^{6,7} ✓ box if WS-3R is included
							<input type="checkbox"/>
							<input type="checkbox"/>
							<input type="checkbox"/>
							<input type="checkbox"/>
							<input type="checkbox"/>
							<input type="checkbox"/>
							<input type="checkbox"/>

- 1) Skylights are now included in West-facing fenestration area if the skylights are tilted to the west or tilted in any direction when the pitch is less than 1:12. See §151(f)3C and in Section 3.2.3 of the Residential Manual.
- 2) Enter values in this column from either NFRC Certified Label or from Standards Default Table 116-A.
- 3) Indicate source either from NFRC or Table 116-A,
- 4) Enter values in this column from NFRC or from Standards Default Table 116B or adjusted SHGC from WS-3R.
- 5) Indicate source either from NFRC, Table 116B or WS-3R
- 6) Shading Devices are defined in Table 3-3 in the Residential Manual and see WS-3R to calculate Exterior Shading devices.
- 7) See Section 3.2.4 in the Residential Manual.

HVAC SYSTEMS

Heating Equipment Type and Capacity (furnace, heat pump, boiler, etc.)	Minimum Efficiency (AFUE or HSPF)	Distribution Type and Location (ducts, attic, etc.)	Duct or Piping R-Value	Thermostat Type	Configuration (split or package)

Cooling Equipment Type and Capacity (A/C, heat pump, evap. cooling)	Minimum Efficiency (SEER or EER)	Distribution Type and Location (ducts, attic, etc.)	Duct or Piping R-Value	Thermostat Type	Configuration (split or package)

CERTIFICATE OF COMPLIANCE: RESIDENTIAL (Page 3 of 5) CF-1R

<i>Project Title</i>	<i>Date</i>
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SEALED DUCTS and TXVs (or Alternative Measures)

A signed CF-4R Form must be provided to the building department for each home for which the following are required.

<input checked="" type="checkbox"/>	
<input type="checkbox"/>	Sealed Ducts (all climate zones) (Installer testing and certification and HERS rater field verification required.)
<input type="checkbox"/>	TXVs, readily accessible (climate zones 2 and 8-15 only) (Installer testing and certification and HERS Rater field verification required.)
<input type="checkbox"/>	Refrigerant Charge (climate zones 2 and 8-15 only) (Installer testing and certification and HERS Rater field verification required.)

OR

<input type="checkbox"/>	Alternative to Sealed Ducts and Refrigerant Charge /TXVs (See Package D Alternative Package Features for Project Climate Zone in the RM Appendix B Table 151-C, Footnotes 7-14.
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OR

<input type="checkbox"/>	No ducts installed.
<input type="checkbox"/>	New ducts from existing space conditioning equipment, not exceeding 40ft. in length.
<input type="checkbox"/>	For additions and alterations, duct systems that are not documented to have been previously sealed as confirmed through field verification and diagnostic testing in accordance with procedures in the Residential ACM Manual. Duct systems with more than 40 linear feet in unconditioned spaces shall meet the requirements of Section 150(m) and duct insulation requirements of Package D.

WATER HEATING SYSTEMS

<input checked="" type="checkbox"/>	
<input type="checkbox"/>	Check box if system meets criteria of a “Standard” system. Standard system is one gas-fired water heater per dwelling unit. If the water heater is a storage type, 50 gallons is the maximum capacity and recirculation system is not allowed.
<input type="checkbox"/>	Check box when using Preapproved Alternative Water Heating table, Table 5-4 in Chapter 5 in the Residential Manual. No water heating calculations are required, and the system complies automatically.
<input type="checkbox"/>	Check box if system does not meet criteria of “Standard” system, and does not comply with the Preapproved Alternative Water Heating table. In this case, the Performance Method must be used and must be included in the submittal.
<input type="checkbox"/>	Check box to verify that a time control is required for a recirculating system pump for a system serving multiple units.

Systems serving single dwelling units (See RM Table 5-4, Alternative Water Heating Systems for recirculation requirements)

Water Heater Type/Fuel Type	Distribution Type	Number in System	Rated Input ¹ (kW or Btu/hr)	Tank Capacity (gallons)	Energy Factor ¹ or Thermal Efficiency	Standby ¹ Loss (%)	Tank External Insulation R-Value

System serving multiple dwelling units (See Residential Manual Section 5.3.3)

Water Heater Type	Distribution Type	Number in System	Rated Input ¹ (kW or Btu/hr)	Tank Capacity (gallons)	Energy Factor ¹ or Thermal Efficiency	Standby ¹ Loss (%)	Tank External Insulation R-Value

1) For small gas storage water heaters (rated inputs of less than or equal to 75,000 Btu/hr), electric resistance, and heat pump water heaters, list Energy Factor. For large gas storage water heaters (rated input of greater than 75,000 Btu/hr), list Rated Input, Recovery Efficiency, Thermal Efficiency and Standby Loss. For instantaneous gas water heaters, list Rated Input and Thermal Efficiencies.

Pipe Insulation (kitchen lines $\geq 3/4$ inches) All hot water pipes from the heating source to the kitchen fixtures that are $3/4$ inches or greater in diameter shall be thermally insulated as specified by Section 150 (j) 2 A or 150 (j) 2 B.

CERTIFICATE OF COMPLIANCE: RESIDENTIAL (Page 4 of 5) **CF-1R**

<i>Project Title</i>	<i>Date</i>
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SPECIAL FEATURES REQUIRING BUILDING OFFICAL or HERS RATER VERIFICATION

Indicate which special features are parts of this project. The list below only represents special features relevant to the prescriptive method. (Check Applicable boxes)

Category	Building Official Verification of Special Features	HERS Rater Verification	HERS Rater Diagnostic Testing	Measure
Ducts				
<input type="checkbox"/>	Y			100% of ducts in crawlspace/basement
<input type="checkbox"/>		Y		Buried ducts
<input type="checkbox"/>		Y		Diagnostic supply duct location, surface area, and R-value
<input type="checkbox"/>	Y			Duct increased R-value
<input type="checkbox"/>			Y	Duct leakage
<input type="checkbox"/>	Y			Ducts in attic with radiant barriers
<input type="checkbox"/>		Y		Less than 12 ft. of duct outside conditioned space
<input type="checkbox"/>		Y		Non-standard duct location
<input type="checkbox"/>	Y			Supply registers within two ft of floor
<input type="checkbox"/>				
Envelope				
<input type="checkbox"/>	Y			Air retarding wrap
<input type="checkbox"/>	Y			Cool roof
<input type="checkbox"/>	Y			Exterior shades
<input type="checkbox"/>	Y			High thermal mass
<input type="checkbox"/>	Y			Inter-zone ventilation
<input type="checkbox"/>	Y			Metal framed walls
<input type="checkbox"/>	Y			Non-default vent heights
<input type="checkbox"/>		Y		Quality insulation installation
<input type="checkbox"/>	Y			Radiant barrier
<input type="checkbox"/>			Y	Reduced infiltration (blower door). May also require mechanical ventilation.
<input type="checkbox"/>	Y			Solar gain targeting (for sunspaces)
<input type="checkbox"/>	Y			Sunspace with interzone surfaces
<input type="checkbox"/>	Y			Vent area greater than 10%
<input type="checkbox"/>				
HVAC Equipment				
<input type="checkbox"/>			Y	Adequate air flow
<input type="checkbox"/>		Y		Air conditioner size
<input type="checkbox"/>			Y	Air handler fan power
<input type="checkbox"/>		Y		High EER
<input type="checkbox"/>	Y			Hydronic heating systems
<input type="checkbox"/>		Y		Mechanical ventilation
<input type="checkbox"/>			Y	Refrigerant charge
<input type="checkbox"/>		Y		Thermostatic expansion valve (TXV)
<input type="checkbox"/>	Y			Zonal control
Water Heater				
<input type="checkbox"/>	Y			Combined hydronic
<input type="checkbox"/>	Y			High EF for existing water heaters
<input type="checkbox"/>	Y			Non-NAECA water heater
<input type="checkbox"/>	Y			Non-standard water heaters (wh/unit)
<input type="checkbox"/>	Y			Water heater distribution credits

CERTIFICATE OF COMPLIANCE: RESIDENTIAL (Page 5 of 5) CF-1R

Project Title	Date
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Special Remarks



COMPLIANCE STATEMENT

This certificate of compliance lists the building features and specifications needed to comply with Title 24, Parts 1 and 6 of the California Code of Regulations, and the administrative regulations to implement them. This certificate has been signed by the individual with overall design responsibility. The undersigned recognizes that compliance using duct design, duct sealing, verification of refrigerant charge and TXVs, insulation installation quality, and building envelope sealing require installer testing and certification and field verification by an approved HERS rater.

Designer or Owner (per Business and Professions Code)

Documentation Author

Name:	Name:
Title/Firm:	Title/Firm:
Address:	Address:
Telephone:	Telephone:
License #:	License #: (if applicable)
(signature) (date)	(signature) (date)

Enforcement Agency

Name: _____	Comments: _____ _____ _____ _____ _____
Title _____	
Agency: _____	
Telephone: _____	

(signature / stamp) (date)	

MANDATORY MEASURES SUMMARY: RESIDENTIAL (Page 1 of 2) MF-1R

Project Title	Date
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Note: Low-rise residential buildings subject to the Standards must contain these measures regardless of the compliance approach used. More stringent compliance requirements from the Certificate of Compliance supersede the items marked with an asterisk (*) below. When this checklist is incorporated into the permit documents, the features noted shall be considered by all parties as minimum component performance specifications for the mandatory measures whether they are shown elsewhere in the documents or on this checklist only.



Instructions: Check or initial applicable boxes or check NA if not applicable and included with the permit application documentation.

DESCRIPTION	NA	Designer	Enforce-ment
Building Envelope Measures:	✓	✓	✓
* § 150(a): Minimum R-19 in wood frame ceiling insulation or equivalent U-factor in metal frame ceiling.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(b): Loose fill insulation manufacturer's labeled R-Value: _____.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
* § 150(c): Minimum R-13 wall insulation in wood framed walls or equivalent U-factor in metal frame walls (does not apply to exterior mass walls).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
* § 150(d): Minimum R-13 raised floor insulation in framed floors or equivalent U-factor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(e): Installation of Fireplaces, Decorative Gas Appliances and Gas Logs.			
1. Masonry and factory-built fireplaces have:			
a. closeable metal or glass door covering the entire opening of the firebox	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. outside air intake with damper and control, flue damper and control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. No continuous burning gas pilot lights allowed.			
§ 150(f): Air retarding wrap installed to comply with § 151 meets requirements specified in the ACM Residential Manual.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(g): Vapor barriers mandatory in Climate Zones 14 and 16 only.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(l): Slab edge insulation - water absorption rate for the insulation material alone without facings no greater than 0.3%, water vapor permeance rate no greater than 2.0 perm/inch.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 118: Insulation specified or installed meets insulation installation quality standards. Indicate type and include CF-6R Form: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 116-§117: Fenestration Products, Exterior Doors, and Infiltration/Exfiltration Controls.			
1. Doors and windows between conditioned and unconditioned spaces designed to limit air leakage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Fenestration products (except field-fabricated) have label with certified U-factor, certified Solar Heat Gain Coefficient (SHGC), and infiltration certification.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Exterior doors and windows weather-stripped; all joints and penetrations caulked and sealed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Space Conditioning, Water Heating and Plumbing System Measures:			
§ 110-§113: HVAC equipment, water heaters, showerheads and faucets certified by the Energy Commission.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(h): Heating and/or cooling loads calculated in accordance with ASHRAE, SMACNA or ACCA.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(i): Setback thermostat on all applicable heating and/or cooling systems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(j): Water system pipe and tank insulation and cooling systems line insulation.			
1. Storage gas water heaters rated with an Energy Factor less than 0.58 must be externally wrapped with insulation having an installed thermal resistance of R-12 or greater.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Back-up tanks for solar system, unfired storage tanks, or other indirect hot water tanks have R-12 external insulation or R-16 internal insulation and indicated on the exterior of the tank showing the R-value.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The following piping is insulated according to Table 150-A/B or Equation 150-A Insulation Thickness:			
1. First 5 feet of hot and cold water pipes closest to water heater tank, non-recirculating systems, and entire length of recirculating sections of hot water pipes shall be insulated to Table 150B.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Cooling system piping (suction, chilled water, or brine lines), piping insulated between heating source and indirect hot water tank shall be insulated to Table 150-B and Equation 150-A.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Steam hydronic heating systems or hot water systems >15 psi, meet requirements of Table 123-A.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

MANDATORY MEASURES SUMMARY: RESIDENTIAL (Page 2 of 2) MF-1R

DESCRIPTION	NA	Designer	Enforcement
Space Conditioning, Water Heating and Plumbing System Measures: (continued)	✓	✓	✓
5. Insulation must be protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Insulation for chilled water piping and refrigerant suction piping includes a vapor retardant or is enclosed entirely in conditioned space.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Solar water-heating systems/collectors are certified by the Solar Rating and Certification Corporation.		<input type="checkbox"/>	<input type="checkbox"/>
* § 150(m): Ducts and Fans			
1. All ducts and plenums installed, sealed and insulated to meet the requirement of the CMC Sections 601, 602, 603, 604, 605 and Standard 6-5; supply-air and return-air ducts and plenums are insulated to a minimum installed level of R-4.2 or enclosed entirely in conditioned space. Openings shall be sealed with mastic, tape or other duct-closure system that meets the applicable requirements of UL 181, UL 181A, or UL 181B or aerosol sealant that meets the requirements of UL 723. If mastic or tape is used to seal openings greater than 1/4 inch, the combination of mastic and either mesh or tape shall be used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Building cavities, support platforms for air handlers, and plenums defined or constructed with materials other than sealed sheet metal, duct board or flexible duct shall not be used for conveying conditioned air. Building cavities and support platforms may contain ducts. Ducts installed in cavities and support platforms shall not be compressed to cause reductions in the cross-sectional area of the ducts.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Joints and seams of duct systems and their components shall not be sealed with cloth back rubber adhesive duct tapes unless such tape is used in combination with mastic and draw bands.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Exhaust fan systems have back draft or automatic dampers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Gravity ventilating systems serving conditioned space have either automatic or readily accessible, manually operated dampers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Protection of Insulation. Insulation shall be protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind. Cellular foam insulation shall be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation that can cause degradation of the material.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Flexible ducts cannot have porous inner cores.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 114: Pool and Spa Heating Systems and Equipment.			
1. A thermal efficiency that complies with the Appliance Efficiency Regulations, on-off switch mounted outside of the heater, weatherproof operating instructions, no electric resistance heating and no pilot light.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. System is installed with:			
a. at least 36" of pipe between filter and heater for future solar heating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. cover for outdoor pools or outdoor spas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Pool system has directional inlets and a circulation pump time switch.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 115: Gas fired fan-type central furnaces, pool heaters, spa heaters or household cooking appliances have no continuously burning pilot light. (Exception: Non-electrical cooking appliances with pilot < 150 Btu/hr)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 118(i): Cool Roof material meets specified criteria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Residential Lighting Measures:			
§ 150(k)1: HIGH EFFICACY LUMINAIRES OTHER THAN OUTDOOR HID: contain only high efficacy lamps as outlined in Table 150-C, and do not contain a medium screw base socket (E24/E26). Ballast for lamps 13 watts or greater are electronic and have an output frequency no less than 20 kHz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(k)1: HIGH EFFICACY LUMINAIRES - OUTDOOR HID: contain only high efficacy lamps as outlined in Table 150-C, luminaire has factory installed HID ballast	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(k)2: Permanently installed luminaires in kitchens shall be high efficacy luminaires. Up to 50 percent of the wattage, as determined in § 130 (c), of permanently installed luminaires in kitchens may be in luminaires that are not high efficacy luminaires, provided that these luminaires are controlled by switches separate from those controlling the high efficacy luminaires.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(k)3: Permanently installed luminaires in bathrooms, garages, laundry rooms and utility rooms shall be high efficacy luminaires. OR are controlled by an occupant sensor(s) certified to comply with Section 119(d) that does not turn on automatically or have an always on option.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(k)4: Permanently installed luminaires located other than in kitchens, bathrooms, garages, laundry rooms, and utility rooms shall be high efficacy luminaires (except closets less than 70ft ²): OR are controlled by a dimmer switch OR are controlled by an occupant sensor that complies with Section 119(d) that does not turn on automatically or have an always on option.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(k)5: Luminaires that are recessed into insulated ceilings are approved for zero clearance insulation cover (IC) and are certified airtight to ASTM E283 and labeled as air tight (AT) to less than 2.0 CFM at 75 Pascals.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(k)6: Luminaires providing outdoor lighting and permanently mounted to a residential building or to other buildings on the same lot shall be high efficacy luminaires (not including lighting around swimming pools/water features or other Article 680 locations) OR are controlled by occupant sensors with integral photo control certified to comply with Section 119(d).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(k)7: Lighting for parking lots for 8 or more vehicles shall have lighting that complies with Sec. 130, 132, and 147. Lighting for parking garages for 8 or more vehicles shall have lighting that complies with Sec. 130, 131, and 146.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 150(k)8: Permanently installed lighting in the enclosed, non-dwelling spaces of low-rise residential buildings with four or more dwelling units shall be high efficacy luminaires OR are controlled by occupant sensor(s) certified to comply with Section 119(d).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SOLAR WATER HEATING CALCULATION FORM

CF-SR

Project Title _____	Date _____
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CF-SR- Solar Water Heating Calculation Form	OG-300
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Property Name: _____	Building Type: (Single Family, Multi-family): _____
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Total Conditioned Floor Area (CFA)ft ² : _____	Climate zone (1-16): _____
---	----------------------------

INPUTS FOR SYSTEMS SRCC OG-300:

1. Solar Energy Factor of OG-300 solar water heating system as listed in SRCC directory	
2. Energy Factor of Water Heater (enter .6 for gas .9 for electric)	
3. Constant - 41045 (amount of energy used in SRCC test)	41045.0
4. Constant - 3500 average parasitic loss value in SRCC test	3500.0
5. Gallons per day use value calculated as: (21.5 x .0014 x CFA) from top of page	
6. Constant – 64.3 gallons used in SRCC test method	64.3
7. Hot water supply temperature 135 degrees	135.0
8. Enter inlet water temperature (inlet water temperature values are listed on Table 1 by Climate Zone)	
9. Difference in supply and inlet water temperature (subtract line 7 from line 8)	1500.0
10. Constant - 1500 Solar radiation value used in SRCC test	
11. Solar radiation level from Table 1 below	

CALCULATION FOR SYSTEM

12. Multiply line 2 by line 3	
13. Divide line 12 by line 1	
14. Divide line 5 by line 6	
15. Divide the result in line 9 by 77	
16. Subtract 1 by line 2	
17. Multiply lines 13 by line 14 by line 15	
18. Multiply lines 4 by line 16	
19. Add line 17 to line 18	
20. Divide line 19 by line 3	
21. Divide line 10 by line 11	
22. Multiply line 20 by line 21	
23. Subtract 1 from line 22	

Solar Fraction (from line 23)

Table 1

Climate Zone	Water Temperature	Solar Radiation	Climate Zone	Water Temperature	Solar Radiation
1	53.90	1220	9	63.76	1685
2	57.52	1220	10	63.76	1612
3	57.69	1533	11	61.00	1580
4	59.12	1601	12	59.65	1670
5	57.93	1602	13	63.99	1726
6	61.55	1599	14	61.48	1827
7	62.63	1586	15	73.55	1884
8	62.97	1682	16	50.54	1513

Note: For all solar water heating systems rated using the SRCC OG 300 test method a copy of the SRCC test result must be attached along with this form and with the rest of the documentation. To use this approach the water heater used in compliance has the same fuel type and energy factor that was used in the SRCC test.

EXAMPLE

CF-SR- Solar Water Heating Calculation Form

OG-300

Property Name: _____

Building Type: (Single Family, Multi-family): Single Family

Total Conditioned Floor Area (CFA)ft²: 2500

Climate zone (1-16): 2

INPUTS FOR SYSTEMS SRCC OG-300:

1.	Enter Solar Energy Factor of OG-300 solar water heating system as listed in SRCC directory	3.40
2.	Energy Factor of Water Heater (enter .6 for gas .9 for electric)	0.90
3.	Constant - 41045 (amount of energy used in SRCC test)	41045.00
4.	Constant - 3500 average parasitic loss value in SRCC test	3500.00
5.	Gallons per day use value calculated as: (21.5 x .0014 x CFA) from top of page	75.25
6.	Constant – 64.3 gallons used in SRCC test method	64.30
7.	Constant Hot water supply temperature 135 degrees	135.00
8.	Enter inlet water temperature (inlet water temperature values are listed on Table 1 by Climate Zone)	57.52
9.	Difference in supply and inlet water temperature (subtract line 7 from line 8)	77.48
10.	Constant - 1500 Solar radiation value used in SRCC test	1500.00
11.	Solar radiation level from Table 1 below	1219.58

CALCULATION FOR SYSTEM

12.	Multiply line 2 by line 3	36940.50
13.	Divide line 12 by line 1	10864.85
14.	Divide line 5 by line 6	1.17
15.	Divide the result in line 9 by 77	1.01
16.	Subtract 1 by line 2	0.10
17.	Multiply lines 13 by line 14 by line 15	12794.90
18.	Multiply lines 4 by line 16	350.00
19.	Add line 17 to line 18	13144.90
20.	Divide line 19 by line 3	0.32
21.	Divide line 10 by line 11	1.23
22.	Multiply line 20 by line 21	.39
23.	Subtract 1 from line 22	0.61
Solar Fraction		0.61

Table 1

Climate Zone	Water Temperature	Solar Radiation	Climate Zone	Water Temperature	Solar Radiation
1	53.90	1220	9	63.76	1685
2	57.52	1220	10	63.76	1612
3	57.69	1533	11	61.00	1580
4	59.12	1601	12	59.65	1670
5	57.93	1602	13	63.99	1726
6	61.55	1599	14	61.48	1827
7	62.63	1586	15	73.55	1884
8	62.97	1682	16	50.54	1513

FENESTRATION – MAXIMUM ALLOWED AREA WORKSHEET

WS-4R

Project Title

Date

FENESTRATION PRODUCTS – NEW CONSTRUCTION- NEW BUILDINGS

Use this table for new building construction to account for total building % of fenestration.

A	B	C	D	E	F	G
#/Type/Pos. (Front, Left, Rear, Right, Skylight)	Orientation	Total Fenestration, West Facing Area (ft ²)	Total Fenestration for N, S, E Orientations Area (ft ²)	CFA (ft ²)	Total Percent of West Facing Fenestration ¹ (C/E) x 100%	Total % of Fenestration ² Including West (D/E) x 100% + F
	North					
	South					
	East					
	West					
	Totals					

1) If west facing area exceeds 5% of CFA in climate zones 2, 4, and 7-15, the performance approach must be used.

2) If total percent of fenestration exceeds 20% including West facing orientations then performance approach must be used. West facing area includes skylights tilted to the west or tilted in any direction when the pitch is less than 1:12 for Package D only.

FENESTRATION PRODUCTS – NEW CONSTRUCTION- ADDITIONS

✓ Less than 100 ft², Less than or Equal to 1000 ft², Greater 1000 ft²

A	B	C	D	E	F	G	H
#/Type/Pos. (Front, Left, Rear, Right, Skylight)	Orientation	Proposed Addition's CFA ^{1,2,3}	Proposed Addition's Fenestration Area (ft ²) ⁴	Fenestration Area Removed to make way for Addition (ft ²) ²	Total Area Added Fenestration ² (D - E)	Total % of West Facing Fenestration ² (G/C) x 100%	Total % of Fenestration ^{2,3,4} (F/C) x 100%
	North						
	South						
	East						
	West ⁴						
					Total		

1) Additions ≤100 sf are allowed to install up to 50ft² of fenestration and are exempt from the 5% west facing and 20% maximum total area limits and shall meet the U-factor and SHGC requirements of Package D. See Table 8-2 in the Residential Manual. Note: Leave columns E, F, G, H, and I blank.

2) Additions ≤1,000 ft², the maximum net allowed fenestration is 20% and may be increased additionally to by the amount of glazing removed in the wall that separates the addition from the existing house. However, the total West facing fenestration can not exceed 5% of the proposed addition's CFA including skylights orientated in any direction and tilted with a pitch of < 1:12. Column G can not exceed 5% and Column H can not exceed 20%.

3) Additions >1,000 ft², must meet Package D requirements. See Table 8-2 and Table 151-C in Appendix B of the RM or use Performance Approach.

4) The 5%west orientation restrictions are only for Climate zones 2, 4, and 7-15; for Climate Zones 2, 4 and 7-15 enter zero (0) in column E.

FENESTRATION PRODUCTS: ALTERATIONS

Use this table for alterations to an existing building where fenestrations products (windows) are being removed and/or added.

A	B	C	D	E	F	G	H	I
Existing CFA (ft ²)	Existing Orientation	Existing Area (ft ²)	Removed Orientation	Removed Area (ft ²)	Proposed Installed Orientation	Proposed Installed New Area (ft ²)	Total Net Fenestration (ft ²) (C-E+G)	Total % of Fenestration ^{1,2} (H/A) x 100% Max of 20%
	North		North		North			
	South		South		South			
	East		East		East			
	West		West		West			
	Total		Total		Total			

1) When 50 ft² or more of fenestration area is added to an existing building, then the fenestration must meet the requirements of Package D.

2) The area requirement for the total fenestration area for the whole building, including the added fenestration, must not exceed 20%. Otherwise, the Performance Approach must be used. See Section 8.3.3 in the RM for further details.

RESIDENTIAL KITCHEN LIGHTING WORKSHEET

WS-5R

Project Title _____

Date _____

At least 50% of the total rated wattage of permanently installed luminaires in the kitchen must be in luminaires that are high efficacy luminaires as defined in Table 150-C. Luminaires that are not high efficacy must be switched separately.

Kitchen Lighting Schedule. Provide the following information for all luminaires to be installed in kitchens.

Luminaire Type	High Efficacy?	Watts	x	Quantity	=	High Efficacy Watts	or	Other Watts
_____	Yes <input type="checkbox"/> No <input type="checkbox"/>	_____	x	_____	=	_____	or	_____
_____	Yes <input type="checkbox"/> No <input type="checkbox"/>	_____	x	_____	=	_____	or	_____
_____	Yes <input type="checkbox"/> No <input type="checkbox"/>	_____	x	_____	=	_____	or	_____
_____	Yes <input type="checkbox"/> No <input type="checkbox"/>	_____	x	_____	=	_____	or	_____
_____	Yes <input type="checkbox"/> No <input type="checkbox"/>	_____	x	_____	=	_____	or	_____
Total: A:						_____	B:	_____

COMPLIES IF $A \geq B$ Yes No

Rules for Determining Residential Kitchen Luminaire Wattage

Screw Base Sockets §130(c) 1

(Not containing permanently installed ballasts) The maximum relamping rated wattage of the luminaire, as listed on a permanent factory-installed label (luminaire wattage is not based on type or wattage of lamp that is used).

Permanently or Remotely Installed Ballasts §130(c) 2

The operating input wattage of the rated lamp/ballast combination based on values published in manufacturer's catalogs based on independent testing lab reports.

Line Voltage Track Lighting (90 through 480 volts) §130(c) 3

1. Volt-ampere (VA) rating of the branch circuit(s) feeding the tracks;
2. For tracks equipped with an integral current limiter, the higher of;
 - The wattage (or VA) rating of an approved integral current limiter controlling the track system or
 - 15 watts per linear foot of the track; or
3. For tracks without an integral current limiter, the higher of;
 - 45 W per linear foot of the track or
 - The total wattage of all of the luminaires included in the system.

Low Voltage Track Lighting (less than 90 volts) §130(c) 4

Rated wattage of the transformer feeding the system, as shown on a permanent factory-installed label

Other Lighting §130(c) 5

(Lighting systems that are not addressed in §130 (c) 1-4) The maximum rated wattage, or operating input wattage of the system, listed on a permanent factory installed label, or published in manufacturer's catalogs, based on independent testing lab reports.

EXAMPLE

RESIDENTIAL KITCHEN LIGHTING WORKSHEET

WS-5R

Project Title _____

Date _____

Kitchen Lighting Schedule. Provide the following information for all luminaires to be installed in kitchens.

Luminaire Type	High Efficacy (y/n)	Watts	x	Quantity	=	High Efficacy Watts	or	Other Watts
CFL-1	Yes	26	x	5	=	130	or	_____
MR-16	No	55	x	2	=	_____	or	110
_____	_____	_____	x	_____	=	_____	or	_____
_____	_____	_____	x	_____	=	_____	or	_____
_____	_____	_____	x	_____	=	_____	or	_____
Total: A:						130	B:	110

COMPLIES IF $A \geq B$ Yes No

CERTIFICATE OF FIELD VERIFICATION & DIAGNOSTIC TESTING (Page 1 of 8) CF-4R

Project Address		Builder or Installer Name
Builder or Installer Contact	Telephone	Plan/Permit (Additions or Alterations) Number
HERS Rater	Telephone	Sample Group Number
Compliance Method (Prescriptive)		Climate Zone
Certifying Signature	Date	Sample House Number
Firm	HERS Provider	
Street Address:	City/State/Zip:	

Copies to: BUILDER, HERS PROVIDER AND BUILDING DEPARTMENT

HERS RATER COMPLIANCE STATEMENT

The house was: Tested Approved as part of sample testing, but was not tested

As the HERS rater providing diagnostic testing and field verification, I certify that the house identified on this form complies with the diagnostic tested compliance requirements as checked on this form. The HERS rater must check and verify that the new distribution system is fully ducted and correct tape is used before a CF-4R may be released on every tested building. The HERS rater must not release the CF-4R until a properly completed and signed CF-6R has been received for the sample and tested buildings.

- The installer has provided a copy of CF-6R (Installation Certificate).
- New ducts fully ducted (i.e., does not use building cavities as plenums or platform returns in lieu of ducts).
- New ducts with cloth backed, rubber adhesive duct tape is installed, mastic and draw bands are used in combination with cloth backed, rubber adhesive duct tape to seal leaks at duct connections.

MINIMUM REQUIREMENTS FOR DUCT LEAKAGE REDUCTION COMPLIANCE CREDIT

Procedures for field verification and diagnostic testing of air distribution systems are available in RACM, Appendix RC4.3.

Duct Diagnostic Leakage Testing Results

NEW CONSTRUCTION:			
	Duct Pressurization Test Results (CFM @ 25 Pa)	Measured Values	
1	Enter Tested Leakage Flow in CFM:		
2	Fan Flow: Calculated (Nominal) <input type="checkbox"/> Cooling <input checked="" type="checkbox"/> Heating) or <input checked="" type="checkbox"/> Measured Enter Total Fan Flow in CFM:		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
3	Pass if Leakage Percentage < 6% [100 x [_____(Line # 1) / _____(Line # 2)]]		<input type="checkbox"/> Pass <input type="checkbox"/> Fail
ALTERATIONS: Duct System and/or HVAC Equipment Change-Out			
4	Enter Tested Leakage Flow in CFM from CF-6R: Pre-Test of Existing Duct System Prior to Duct System Alteration and/or Equipment Change-Out.		
5	Enter Tested Leakage Flow in CFM: Final Test of New Duct System or Altered Duct System for Duct System Alteration and/or Equipment Change-Out.		
6	Enter Reduction in Leakage for Altered Duct System [_____(Line # 4) Minus _____(Line # 5)] (Only if Applicable)		
7	Enter Tested Leakage Flow in CFM to Outside (Only if Applicable)		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
8	Entire New Duct System - Pass if Leakage Percentage < 6% [100 x [_____(Line # 5) / _____(Line # 2)]]		<input type="checkbox"/> Pass <input type="checkbox"/> Fail
TEST OR VERIFICATION STANDARDS: For Altered Duct System and/or HVAC Equipment Change-Out			<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Use one of the following four Test Verification Standards for compliance:			
9	Pass if Leakage Percentage < 15% [100 x [_____(Line # 5) / _____(Line # 2)]]		<input type="checkbox"/> Pass <input type="checkbox"/> Fail
10	Pass if Leakage to Outside Percentage < 10% [100 x [_____(Line # 7) / _____(Line # 2)]]		<input type="checkbox"/> Pass <input type="checkbox"/> Fail
11	Pass if Leakage Reduction Percentage > 70% [100 x [_____(Line # 6) / _____(Line # 4)]] and Verification by Smoke Test and Visual Inspection		<input type="checkbox"/> Pass <input type="checkbox"/> Fail
	Pass if Sealing of all Accessible Leaks and Verification by Smoke Test and Visual Inspection		<input type="checkbox"/> Pass <input type="checkbox"/> Fail
	Pass if One of Lines # 9 through # 12 pass		<input type="checkbox"/> Pass <input type="checkbox"/> Fail

CERTIFICATE OF FIELD VERIFICATION & DIAGNOSTIC TESTING (Page 2 of 8)

CF-4R

Project Address	Builders Name
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Copies to: BUILDER, HERS PROVIDER AND BUILDING DEPARTMENT

✓ DIAGNOSTIC SUPPLY DUCT LOCATION, SURFACE AREA AND R-VALUE

Procedures for field verification and diagnostic testing for this group compliance credits are available in RACM, Appendix RC, RE & RH.

✓ LESS THAN 12 LINEAL FEET OF SUPPLY DUCT OUTSIDE OF CONDITIONED SPACE COMPLIANCE CREDIT

<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Less than 12 lineal feet of supply duct outside of conditioned space.	Yes to this compliance credit is a pass	<input checked="" type="checkbox"/> Pass	<input checked="" type="checkbox"/> Fail
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✓ SUPPLY DUCTS LOCATED IN CONDITIONED SPACE COMPLIANCE CREDIT

<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Ducts are located within the conditioned volume of building.	Yes to this compliance credit is a pass	<input checked="" type="checkbox"/> Pass	<input checked="" type="checkbox"/> Fail
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Duct System Design verification is required for a compliance credit for the following:

1. Supply duct surface area reduction
2. Buried supply ducts on the ceiling
3. Deeply buried supply ducts

✓ DUCT SYSTEM DESIGN VERIFICATION

<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Adequate airflow verified			
<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	The duct system design plan meets the requirements specified in RACM, Appendix RE, Section RE.4.2			
<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	The duct system design plan exists on building plans			
<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Duct sizes, duct system layout and locations of supply & return registers match the duct system design plan	Yes to all is a pass	<input checked="" type="checkbox"/> Pass	<input checked="" type="checkbox"/> Fail

✓ SUPPLY DUCTS SURFACE AREA REDUCTION COMPLIANCE CREDIT

Attic	Crawl Space	Basement	Covered	Deeply Covered	Other	Duct Diameter	R-4.2 Surface Area	R-6.0 Surface Area	R-8.0 Surface Area	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
Total Surface Area for Each R-Value =										
<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Duct Surface Area matches Performance's CF-1R?					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Yes to all is a pass								<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	

✓ BURIED DUCTS ON THE CEILING COMPLIANCE CREDIT

<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Buried Ducts on the Ceiling			
<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Verified High Insulation Installation Quality	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Yes to duct system design, supply duct surface area reduction and this compliance credit is a pass					<input type="checkbox"/> Pass	<input type="checkbox"/> Fail

✓ DEEPLY BURIED DUCTS COMPLIANCE CREDIT

<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Deeply Buried Ducts			
<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Verified High Insulation Installation Quality	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Yes to duct system design, supply duct surface area reduction and this compliance credit is a pass					<input type="checkbox"/> Pass	<input type="checkbox"/> Fail

CERTIFICATE OF FIELD VERIFICATION & DIAGNOSTIC TESTING (Page 3 of 8) CF-4R

Project Address		Builder Name
Builder Contact	Telephone	Plan Number
HERS Rater	Telephone	Sample Group Number
Compliance Method (Prescriptive)		Climate Zone
Certifying Signature	Date	Sample House Number
Firm	HERS Provider	
Street Address:		City/State/Zip:

Copies to: BUILDER, HERS PROVIDER AND BUILDING DEPARTMENT

HERS RATER COMPLIANCE STATEMENT

The house was: Tested Approved as part of sample testing, but was not tested

As the HERS rater providing diagnostic testing and field verification, I certify that the house identified on this form complies with the diagnostic tested compliance requirements as checked on this form.

The installer has provided a copy of CF-6R (Installation Certificate).

THERMOSTATIC EXPANSION VALVE (TXV)

Procedures for field verification of thermostatic expansion valves are available in RACM, Appendix RI.

				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Access is provided for inspection. The procedure shall consist of visual verification that the TXV is installed on the system and installation of the specific equipment shall be verified.	<input type="checkbox"/>	<input type="checkbox"/>
			Yes is a pass	Pass	Fail

REFRIGERANT CHARGE MEASUREMENT

Verification for Required Refrigerant Charge for Split System Space Cooling Systems without Thermostatic Expansion Valves

Outdoor Unit Serial #		
Location		
Outdoor Unit Make		
Outdoor Unit Model		
Cooling Capacity		Btu/hr
Date of Verification		
Date of Refrigerant Gauge Calibration		(must be checked monthly)
Date of Thermocouple Calibration		(must be checked monthly)

Standard Charge Measurement (outdoor air dry-bulb 55 °F and above):

Note: The system should be installed and charged in accordance with the manufacturer’s specifications and installer verification shall be documented on CF-6R before starting this procedure. If outdoor air dry-bulb is below 55 °F rater shall use the Alternative Charge Measure Procedure

Procedures for Determining Refrigerant Charge using the Standard Method are available in RACM, Appendix RD2.

<input checked="" type="checkbox"/> <input type="checkbox"/> Yes <input type="checkbox"/> No	A copy of CF-6R (Installation Certificate) has been provided with refrigerant charge measurement documented.
--	--

CERTIFICATE OF FIELD VERIFICATION & DIAGNOSTIC TESTING (Page 4 of 8) CF-4R

Project Address

Builders Name

Copies to: BUILDER, HERS PROVIDER AND BUILDING DEPARTMENT

Measured Temperatures

Supply (evaporator leaving) air dry-bulb temperature (Tsupply, db)		°F
Return (evaporator entering) air dry-bulb temperature (Treturn, db)		°F
Return (evaporator entering) air wet-bulb temperature (Treturn, wb)		°F
Evaporator saturation temperature (Tevaporator, sat)		°F
Suction line temperature (Tsuction, db)		°F
Condenser (entering) air dry-bulb temperature (Tcondenser, db)		°F

Superheat Charge Method Calculations for Refrigerant Charge

Actual Superheat = Tsuction, db – Tevaporator, sat		°F
Target Superheat (from Table RD-2)		°F
Actual Superheat – Target Superheat (System passes if between -5 and +5°F)		°F

Temperature Split Method Calculations for Adequate Airflow

Split Method Calculation is not necessary if Adequate Airflow credit is taken

Actual Temperature Split = T return, db - Tsupply, db		°F
Target Temperature Split (Table RD3)		°F
Actual Temperature Split - Target Temperature Split (System passes if between -3°F and +3°F or, upon remeasurement, if between -3°F and -100°F)		°F

Standard Charge Measurement Summary:

System shall pass both refrigerant charge and adequate airflow calculation criteria from the same measurements. If corrective actions were taken, both criteria must be remeasured and recalculated

<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	System Passes
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Alternative Charge Measurement (outdoor air dry-bulb below 55 °F)

Note: The system should be installed and charged in accordance with the manufacturer’s specifications and installer verification shall be documented on CF-6R before starting this procedure. If outdoor air dry-bulb is 55 °F or above, rater shall use the Standard Charge Measure Procedure:

Procedures for Determining Refrigerant Charge using the Alternative Method are available in RACM, Appendix RD3.

<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	A copy of CF-6R (Installation Certificate) has been provided with refrigerant charge measurement documented.
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Weigh-In Charging Method for Refrigerant Charge

Actual liquid line length:		ft
Manufacturer’s Standard liquid line length:		ft
Difference (Actual – Standard):		ft

Manufacturer’s correction (ounces per foot) _____ x difference in length = _____ ounces (“+” = add ounces) (“-” = remove ounces)

Alternative Charge Measurement Summary:

System shall pass both refrigerant charge and adequate airflow calculation criteria from the same measurements. If corrective actions were taken, both criteria must be remeasured and recalculated.

<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	System Passes
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CERTIFICATE OF FIELD VERIFICATION & DIAGNOSTIC TESTING (Page 5 of 8) CF-4R

Project Address		Builder Name
Builder Contact	Telephone	Plan Number
HERS Rater	Telephone	Sample Group Number
Certifying Signature	Date	Sample House Number
Firm	HERS Provider	
Street Address:	City/State/Zip:	

Copies to: **BUILDER, HERS PROVIDER AND BUILDING DEPARTMENT**

HERS RATER COMPLIANCE STATEMENT

The house was: Tested Approved as part of sample testing, but was not tested

As the HERS rater providing diagnostic testing and field verification, I certify that the house identified on this form complies with the diagnostic tested compliance requirements as checked on this form.

The installer has provided a copy of CF-6R (Installation Certificate).

ADEQUATE AIRFLOW VERIFICATION

Procedures for field verification and diagnostic testing of adequate airflow are available in RACM, Appendix RE4.1.

Method For Airflow Measurement				
<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Duct design exists on plans	
<input type="checkbox"/>	RE4.1.1		Diagnostic Fan Flow Using Flow Capture Hood	
<input type="checkbox"/>	RE4.1.2		Diagnostic Fan Flow Using Plenum Pressure Matching	
<input type="checkbox"/>	RE4.1.3		Diagnostic Fan Flow Using Flow Grid Measurement	
			Measured Airflow:	
			Rated Tons:	
			✓	✓
✓	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Measured airflow is greater than the criteria in Table RE-2	
			Yes is a pass	
			Pass	Fail

MAXIMUM COOLING CAPACITY

Procedures for determining maximum cooling load capacity are available in RACM, Appendix RF3.

1	<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Adequate airflow verified (see adequate airflow credit)		
2	<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Refrigerant charge or TXV		
3	<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Duct leakage reduction credit verified		
4	<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Cooling capacities of installed systems are ≤ to maximum cooling capacity indicated on the Performance's CF-1R and RF-3.		
5	<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	If the cooling capacities of installed systems are > than maximum cooling capacity in the CF-1R, then the electrical input for the installed systems must be ≤ to electrical input in the CF-1R and RF-4.	✓	✓
Yes to 1, 2, and 3; and Yes to either 4 or 5 is a pass					<input type="checkbox"/>	<input type="checkbox"/>
					Pass	Fail

HIGH EER AIR CONDITIONER

Procedures for verification are available in RACM, Appendix RI.

1	<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	EER values of installed systems match the CF-1R		
2	<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	For split system, indoor coil is matched to outdoor coil	✓	✓
3	<input checked="" type="checkbox"/>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Time Delay Relay Verified (If Required)	<input type="checkbox"/>	<input type="checkbox"/>
Yes to 1 and 2; and 3 (If Required) is a pass					Pass	Fail

Site Address

Permit Number

INSTALLER COMPLIANCE STATEMENT FOR DUCT LEAKAGE

INSTALLER COMPLIANCE STATEMENT

The building was: Tested at Final Tested at Rough-in

INSTALLER VISUAL INSPECTION AT FINAL CONSTRUCTION STAGE FOR NEW DUCTS:

- Remove at least one supply and one return register, and verify that the spaces between the register boot and the interior finishing wall are properly sealed.
- If the house rough-in duct leakage test was conducted without an air handler installed, inspect the connection points between the air handler and the supply and return plenums to verify that the connection points are properly sealed.
- Inspect all joints to ensure that no cloth backed rubber adhesive duct tape is used *on new ducts*.

DUCT LEAKAGE REDUCTION

Procedures for field verification and diagnostic testing of air distribution systems are available in RACM, Appendix RC4.3

NEW CONSTRUCTION:		Measured Values	
	Duct Pressurization Test Results (CFM @ 25 Pa)		
1	Enter Tested Leakage Flow in CFM:		
2	Fan Flow: Calculated (Nominal: <input checked="" type="checkbox"/> Cooling <input checked="" type="checkbox"/> Heating) or <input checked="" type="checkbox"/> Measured If Fan Flow is Calculated as 400 cfm/ton x number of tons or as 21.7 cfm/(kBtu/hr) x Heating Capacity in Thousands of Btu/hr, enter total calculated or measured fan flow in CFM:		✓ ✓
3	Pass if Leakage Percentage < 6% for Final or < 4% at Rough-in without air handle: [100 x [_____ (Line # 1) / _____ (Line # 2)]]		<input type="checkbox"/> Pass <input type="checkbox"/> Fail
ALTERATIONS: Duct System and/or HVAC Equipment Change-Out			
4	Enter Tested Leakage Flow in CFM from Pre-Test of Existing Duct System Prior to Duct System Alteration and/or Equipment Change-Out.		
5	Enter Tested Leakage Flow in CFM from Final Test of New Duct System or Altered Duct System for Duct System Alteration and/or Equipment Change-Out.		
6	Enter Reduction in Leakage for Altered Duct System [_____ (Line # 4) Minus _____ (Line # 5)] – (Only if Applicable)		
7	Enter Tested Leakage Flow in CFM to Outside (Only if Applicable)		✓ ✓
8	Entire New Duct System - Pass if Leakage Percentage < 6% for Final. [100 x [_____ (Line # 5) / _____ Line # 2)]]		<input type="checkbox"/> Pass <input type="checkbox"/> Fail
TEST OR VERIFICATION STANDARDS: For Altered Duct System and/or HVAC Equipment Change-Out Use one of the following for Test or Verification Standards for compliance:			✓ ✓
9	Pass if Leakage Percentage < 15% [100 x [_____ (Line # 5) / _____ (Line # 2)]]		<input type="checkbox"/> Pass <input type="checkbox"/> Fail
10	Pass if Leakage to Outside Percentage < 10% [100 x [_____ (Line # 7) / _____ (Line # 2)]]		<input type="checkbox"/> Pass <input type="checkbox"/> Fail
11	Pass if Leakage Reduction Percentage > 60% [100 x [_____ (Line # 6) / _____ (Line # 4)]] and Verification by Smoke Test and Visual Inspection		<input type="checkbox"/> Pass <input type="checkbox"/> Fail
12	Pass if Sealing of all Accessible Leaks and Verification by Smoke Test and Visual Inspection		<input type="checkbox"/> Pass <input type="checkbox"/> Fail
Pass if One of Lines # 9 through # 12 pass			<input type="checkbox"/> Pass <input type="checkbox"/> Fail

I, the undersigned, verify that the above diagnostic test results were performed in conformance with the requirements for compliance credit. I, the undersigned, also certify that the newly installed or retrofit Air-Distribution System Ducts, Plenums and Fans comply with Mandatory requirements specified in Section 150 (m) of the 2005 Building Energy Efficiency standards.

Installing Subcontractor (Co. Name) OR General Contractor (Co. Name) OR Owner	
Signature:	Date:

Copies to: BUILDING DEPARTMENT, HERS RATER (IF APPLICABLE) BUILDING OWNER AT OCCUPANCY