2013

RESIDENTIAL ALTERNATIVE CALCULATION METHOD

APPROVAL MANUAL

FOR THE BUILDING
ENERGY EFFICIENCY
STANDARDS

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ABSTRACT

The 2013 Building Energy Efficiency Standards for Low-Rise Residential Buildings allow compliance by either a prescriptive or performance method. Performance compliance uses computer modeling software to trade off efficiency measures. For example, to allow more windows, the designer will specify more efficient windows, or to allow more west-facing windows they will install a more efficient cooling system. Computer performance compliance is typically the most popular compliance method because of the flexibility it provides in the building design.

Energy compliance software must be certified by the Energy Commission, following rules established for the modeling software. This document establishes the rules for the process of creating a building model, describing how the proposed design (energy use) is defined, how the standard design (energy budget) is established, and ending with what is reported on the Certificate of Compliance (CF1R).

This Residential Alternative Calculation Methods (ACM) Reference Manual explains how the proposed and standard designs are determined. If the minimum heating system has 78% AFUE and the proposed building has a 92% AFUE furnace, the standard design is based on 78% and the proposed design gets credit for a 92% AFUE furnace. The desired result is a positive compliance margin showing how the building performs as compared to the standard design for heating, cooling, water heating, indoor air quality/ventilation, and water heating.

The 2013 Compliance Manager is the simulation and compliance rule implementation software specified by the Energy Commission. The Compliance Manager, called California Building Energy Code Compliance (CBECC), models all features that affect the energy performance of the building. This document establishes the process of creating a building model. Each section describes how a given component, such as a wall, is modeled for the proposed design, standard design, and ends with what is reported on the Certificate of Compliance (CF1R) for verification by the building enforcement agency.

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1. Overview

This Manual explains the requirements for approval of residential Alternative Calculation Methods (ACMs or compliance software). Residential Compliance Software is used to demonstrate compliance with the performance approach to the California Energy Efficiency Standards for Low-Rise Residential Buildings (Standards).

The approval procedure is one of self-testing and self-certification by the Compliance Software vendor. The vendor conducts the specified tests, evaluates the results and certifies in writing that the Compliance Software passes the tests. The California Energy Commission (Commission) will perform spot checks and may require additional tests to verify that the proposed Compliance Software is suitable for compliance purposes. The vendor is required to develop a compliance supplement (program user manual) explaining how to use the program to show compliance with the Standards. The compliance supplement will also be checked by the Commission for accuracy and ease of use.

Residential Compliance Software that implements the 2013 Standards must use the energy simulation and compliance rule implementation software specified by the Commission. This open source software, called the Compliance Manager in this document, will be made available at no cost to potential Compliance Software vendors. The ACM tests submitted by the vendor will confirm that the Compliance Manager has been successfully integrated into the vendor software.

This chapter presents the general requirements for residential compliance software. . Chapter 2 describes the required content of the Compliance Supplement. The certification tests are documented in detail in the Residential ACM Reference Manual, a document that is developed and maintained by the Energy Commission to document the details of the performance compliance modeling implemented in the Compliance Manager software, and to explain the certification tests all Compliance Software must pass. The Residential ACM Reference Manual is approved by the Commission after the adoption of each Building Energy Efficiency Standards update, and updated as necessary to resolve issues identified during the implementation of the performance compliance approach using Compliance Software.

1.1 Application Checklist

The following is a list of the items that shall be included in an application package for Compliance Software certification by the Commission:

- **Compliance Software Vendor Certification Statement.** A statement from the Compliance Software vendor certifying the reliability and accuracy of the software when used for Standards compliance purposes (see Residential ACM Approval Manual Appendix A).

- **Computer Runs and Summary Sheets**. Copies of the computer runs specified in the Residential ACM Reference Manual, including complete input and output files, provided electronically to the Commission in computer readable form. Summary sheets of all the required computer runs also provided electronically to the Commission.

- **Compliance Supplement.** A copy of the Compliance Supplement discussed in Chapter 2. The Compliance Supplement and the Compliance Software User's Manual may be combined into the same document.

- **Copy of the Compliance Software.** An executable version of the Compliance Software for the Commission's use during the software certification process.

- **Application Fee.** An application fee of $1,000.00 (one thousand dollars) is required to cover the costs of evaluating the application. The total fee shall cover the Commission's cost of reviewing and analyzing the application. Within 75 days of receipt of an application, the Commission will provide an estimate of the total maximum cost to review and analyze the application. After the Commission determines the total costs, if the costs exceed the initial fee, the Commission shall assess an additional fee to cover the total costs. If actual cost is less than the initial or any estimated maximum fee, the Commission shall refund the difference to the applicant.

1.2 Types of Approval

This Manual addresses three types of Compliance Software approval: full approval, streamlined approval of new program features, and amendments to full approvals.

1.2.1 Full Approval

Full approval is required when a Compliance Software product has never been previously approved by the Commission or when the Compliance Software vendor makes a change that significantly affects the results. The Commission may also require that all Compliance Software be approved again when the Standards are updated or whenever substantial revisions are made to the approval process.
When re-approval is mandated by the Commission, all Compliance Software vendors will be notified of the renewal timetable. Full approval is required for all Compliance Software changes, unless they qualify for the streamlined approval process discussed below.

1.2.2 Streamlined Approval

Certain types of changes may be made to approve Compliance Software through a streamlined process. Examples of changes that qualify for streamlined approval are modifications to the user interface or implementation on a different operating system, as long as there are no changes to the compliance results calculated by the software. Changes to the Compliance Manager by the Energy Commission that must be integrated into Compliance Software is another example of when streamlined approval is appropriate. If a Compliance Software modification qualifies for streamlined approval, then the following procedure is followed:

- When the Energy Commission makes a minor change to the Compliance Manager, Compliance Software vendors can update their Compliance Software voluntarily upon release of the modified Compliance Manager software, and must update their Compliance Software by January 1 of the following year.

- When the Energy Commission makes a major change to the Compliance Manager, Compliance Software vendors can update their Compliance Software voluntarily upon release of the modified Compliance Manager (CM) software, and must update their Compliance Software within 45 days of the CM release date, unless otherwise stated by the Energy Commission in the CM release notice.

- The Compliance Software vendor prepares an addendum to the compliance supplement, when appropriate, describing the change to the Compliance Software.

- The Compliance Software vendor notifies the Commission by letter of the change. The letter shall describe in detail the nature of the change and why it is being made. The notification letter shall be included in the Compliance Supplement.

- The Compliance Software vendor provides the Commission with an updated copy of the Compliance Software.

- The Commission responds in 45 days. The Commission response may take several forms. The Commission may approve the updated software, request additional information, refuse to approve the change or require that the Compliance Software vendor make specific changes to either the Compliance Supplement addendum or the Compliance Software.

- With Commission approval, the vendor may issue new copies of the Compliance Software with the Compliance Supplement addendum and notify Compliance Software users and building officials.

1.2.3 Amendments

Compliance Software approval shall be amended when optional modeling capabilities are added. The vendor shall provide the additional computer runs required for the optional modeling capability. It is not necessary to include computer runs previously submitted.

An amendment to approved Compliance Software shall be accompanied by a cover letter explaining the type of amendment requested, and copies of other documents as necessary. All items on the application checklist should be submitted, when applicable. The timetable for approval of amendments is the same as for full approval.

1.2.4 When Approval Is Not Required

Changes that do not affect compliance with the Standards do not require full or streamlined approval. However, the Compliance Software vendor shall notify the Commission and provide the Commission with an updated copy of the program and user manual. Re-approval is required for any Compliance Software change that affects the compliance results, the format and/or content of compliance forms, or any other change that would affect a building's

compliance with the Standards. Any questions regarding applicable approval procedures should be directed to the Energy Commission.

1.3 Challenges

Building officials, program users, program vendors or other interested parties may challenge any residential Compliance Software approval. If any interested party believes that a compliance program, an algorithm, or method of calculation used in a Compliance Software, or other aspect of a program provides inaccurate results, the party may challenge the program.

1.4 Decertification of Compliance Software

The Commission may decertify (rescind approval of) Compliance Software through various means:

• All Compliance Software products are decertified when the Standards undergo substantial changes, usually occurring with each Standards update.

• Any Compliance Software product can be decertified by a letter from the Compliance Software vendor requesting that a particular version (or versions) of the product be decertified. The decertification request shall briefly describe the nature of the program errors or "bugs" which justify the need for decertification.

• Any "initiating party" may commence a procedure to decertify a Compliance Software product according to the steps outlined below. The intent is to include a means whereby serious program errors, flawed numeric results, improper forms and/or incorrect program documentation not discovered in the certification process can be verified, and use of the particular Compliance Software version discontinued. In this process, there is ample opportunity for the Commission, the Compliance Software vendor and all interested parties to evaluate any alleged errors in the Compliance Software program.

Following is a description of the process for challenging Compliance Software or initiating a decertification procedure:

1. Any party may initiate a review of Compliance Software's approval by sending a written communication to the Commission's Executive Director. (The Commission may be the initiating party for this type of review by noticing the availability of the same information listed here.) The initiating party shall:
   (a) State the name of the Compliance Software and the program version number(s) that contain the alleged errors;
   (b) Identify concisely the nature of the alleged errors in the Compliance Software that require review;
   (c) Explain why the alleged errors are serious enough in their effect on analyzing buildings for compliance to justify a decertification procedure; and

(d) Include appropriate data electronically (in a format agreed to by the Commission staff) and/or information sufficient to evaluate the alleged errors.

2. The Executive Director shall make a copy or copies of the initial written communication available to the Compliance Software vendor and interested parties within 30 days. Comments from interested parties must be received within 60 days of the acceptance of the original application.

3. Within 75 days of receipt of the written communication, the Executive Director may request any additional information needed to evaluate the alleged Compliance Software errors from the party who initiated the decertification review process. If the additional information is incomplete, this procedure will be delayed until the initiating party submits complete information.

4. Within 75 days of receipt of the initial written communication, the Executive Director may convene a workshop to gather additional information from the initiating party, the Compliance Software vendor and interested parties. All parties will have 15 days after the workshop to submit additional information regarding the alleged program errors.

5. Within 90 days after the Executive Director receives the application or within 30 days after receipt of complete additional information requested of the initiating party, whichever is later, the Executive Director shall either:
    (a) Determine that the Compliance Software need not be decertified; or
    (b) Submit to the Commission a written recommendation that the Compliance Software be decertified.

6. If the Commission approves the Compliance Software decertification, it shall take effect 60 days later. During the first 30 days of the 60 day period, the Executive Director shall send out a Notice to Building Officials and Interested Parties announcing the decertification.

All initiating parties have the burden of proof to establish that the review of alleged Compliance Software errors should be granted. The decertification process may be terminated at any time by mutual written consent of the initiating party and the Executive Director.

The Compliance Software vendor may use the 180 to 210-day period outlined here to update the Compliance Software, get it re-approved by the Commission, and release a revised version that does not contain the errors initially brought to the attention of the Commission.

1.5 Compliance Software Tests

The Compliance Software vendor may propose alternate tests when the vendor believes that one or more of the standard tests are not appropriate for the Compliance Software. Alternate tests will be evaluated by the Commission and will be accepted if they are considered reasonable. If accepted, the alternate test(s) will be added to the Residential ACM Reference Manual as an addendum and the alternate test(s) will be available for use by all Compliance Software.

1.6 Approval of New Exceptional Methods

The Commission may approve new exceptional methods. Exceptional methods are special modeling capabilities or calculation methods necessary to recognize building features that cannot be adequately modeled with existing Compliance Software. When an Exceptional Method is approved, a new optional capabilities test may be approved as part of the process. To be approved for the new optional capability, vendors shall amend their Compliance Software approval.

Even if the Compliance Software already incorporates the Exceptional Method, the vendor shall receive approval to use the Exceptional Method in the compliance process. The Compliance Software vendor shall demonstrate that the Compliance Software automatically uses the correct fixed and restricted inputs for the Exceptional Method and that the standard reports identify the building feature(s) recognized by the Exceptional Method. Additionally, the ACM compliance supplement shall be updated, referencing the use of the new Exceptional Method.

2. User's Manual including Compliance Supplement

Each Compliance Software vendor is required to publish a User's Manual that includes a Compliance Supplement as a component of the user manual. The user manual shall contain sufficient information so that users can develop an understanding of how to run the program and correctly prepare complete and operable files. The Compliance Supplement shall describe the specific procedures for using the Compliance Software for compliance with the Building Energy Efficiency Standards. This includes instructions for preparing the building input and using the correct fixed and restricted inputs. In addition, the compliance supplement shall include a list of all error messages and information on how to resolve them. The compliance supplement requirement may be met with a user manual incorporated into the software, however, a printed version of the user manual which includes all help items must be submitted as part of the user manual, with the application that both the performance standards and the Compliance Software are implemented properly.

Also included are procedures for generating the standard reports and documenting the analysis. A sample of a properly documented building analysis shall be included.

All User's Manuals and Compliance Supplements shall be written in a clear and concise manner and with an organization and format that will allow users to quickly locate the topic and understand the instructions. Also, vendors of approved Compliance Software are required to make copies of their user manuals and compliance supplement available to all building departments in California.

The following sections describe the information that shall be included in all user manuals. It also presents the required organization for that information.

2.1 Energy Commission Approval

This section includes a copy of the official Energy Commission notice of approval of the Compliance Software. The notice may include restrictions or limitations on the use of the Compliance Software. It will also include the date of approval, and may include an expiration date for approval as well. The notice will indicate any restrictions on its use for compliance. The Energy Commission will provide this notice upon completion of evaluation of the Compliance Software application.

2.2 Software Capabilities

This section discusses the program capabilities, with supporting written material explaining, as necessary, how the Compliance Software treats each one. Reference may be made to non-compliance sections of the Compliance Software User's Manual for more complete descriptions, if appropriate.

2.3 Standard Input/Output Report

Inputs files shall be organized so that data is presented in the same order as that used by the required output reports.

2.4 Fixed and Restricted Inputs

Approved Compliance Software shall automatically use the standard fixed and restricted inputs for the standard design run. It shall also default to the standard assumptions for the proposed design run. When alternative fixed and restricted inputs are used for the proposed design run, the Compliance Software shall report this in the *Special Features and Modeling Assumptions* sections of the standard reports.

This section of the User's Manual explains the fixed and restricted inputs and how they are invoked in the Compliance Software. This is especially important if the Compliance Software offers the possibility of non-compliance runs which can deviate from the fixed and restricted inputs.

2.5 Preparing Basic Input

This section covers the basic use of the Compliance Software for compliance. Reference may be made to the User's Manual, but this section should include a complete summary of all inputs and/or commands necessary for compliance.

2.6 Special Features and Modeling Assumptions

This section explains the use of the Special Features and Modeling Assumptions listing to highlight the importance of verifying the special features and the aspects of those features that were modeled to achieve compliance.

2.7 Field Verification

This section explains the use of the Field Verification and Diagnostic Testing listing to highlight the special features that require diagnostic testing by a certified home energy rater under the supervision of an Energy Commission approved HERS provider to assure proper installation and verification. This section may rely on the information provided in Residential Reference Appendix RA3, and other sections of this manual, or may refer to other Commission documents.

2.8 Checklist for Compliance Submittal

This section should contain a concise checklist of all items that shall be included in a compliance submittal to a building official using the Compliance Software.

2.9   Sample Compliance Documentation

This section should include a complete set of compliance documentation for a sample building. The building need not be overly complex, nor need it include every software capability. The example should, however, include all documentation and standard reports that would normally be submitted. This example will serve as a model to Compliance Software users and building officials of what a proper compliance submittal should look like.

2.10 Compliance Statement

The following statement shall appear within the first several pages of the Supplement:
> [Compliance Software Name] may be used to show compliance with California's Residential Building Energy Efficiency Standards.

2.11 Related Publications

The User's Manual should refer users to the following related Energy Commission publications and where to obtain them:

* *2013 Building Energy Efficiency Standards* (publication number unknown at time of printing)

* *2013 Residential Compliance Manual* (publication number unknown at time of printing)

Both publications are available from:

California Energy Commission
Publications Unit
1516 Ninth Street
Sacramento CA 95814
(916) 654-5200