1. Overview

This Manual explains the requirements for approval of residential Alternative Calculation Methods (ACMs or compliance software). Residential Cccompliance Sssoftware 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 Cccompliance Sssoftware vendor. The vendor conducts the specified tests, evaluates the results and certifies in writing that the Cccompliance Sssoftware passes the tests. The California Energy Commission (Commission) will perform spot checks and may require additional tests to verify that the proposed Cccompliance Sssoftware is suitable for compliance purposes. The vendor is required to develop a compliance supplement (program user manual) explaining how to use the program for showingto show compliance with the Ssstandards. 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.
When energy analysis techniques are compared, there are two basic sources of discrepancies: differences in user interpretation when entering the building specifications, and differences in the compliance software's algorithms for estimating energy use. The approval tests in this manual are designed to minimize differences in interpretation by providing explicit detailed descriptions of the test buildings that shall be analyzed.

This chapter presents the general requirements for residential compliance software. Chapter 2 addresses the standard reports that all Compliance Software must generate. Chapter 3 lists the Compliance Software vendor requirements. Chapter 3 has the rules for defining the Standard Design and algorithms and modeling assumptions used in the reference method. Chapters 34 and 45 describes the have certification testsaccuracy tests to be completed by the Compliance Software vendors and spot checked by the Commission. Chapter 6 has requirements for compliance software vendors. Chapter 4 describes the required content of the Compliance Supplement.

1.1 Minimum Modeling Capabilities

Minimum modeling capabilities shall be included in all compliance software. If candidate compliance software does not have all of these capabilities, then it cannot be approved for compliance. The minimum modeling capabilities are summarized below:

- Conditioned Zone Model (CZM) Includes conductive and radiant energy transfer using energy balance simulation method.nduction gains and losses through opaque and fenestration surfaces
- Attic Modeling (UZM)
- Slab edge gains and losses

- ~~Infiltration gains and losses~~
- ~~Solar gains through glazing including the effects of internal shading devices.~~
- ~~Natural ventilation cooling~~
- ~~Mechanical Ventilation for Indoor Air Quality (IAQ)~~
- ~~Thermal mass effects to dampen temperature swings~~
- ~~Space conditioning equipment efficiency and distribution systems~~
- ~~Water heating equipment efficiency and distribution systems~~
- ~~Maximum Cooling Capacity~~
- ~~Building additions~~
- ~~Building alterations~~
- ~~Attic Modeling (UZM)~~
- ~~Maximum Cooling Capacity~~

~~1.2 Optional Modeling Capabilities~~

~~Candidate compliance software may have more capabilities than the minimum required. Compliance software can be approved for use with none, a few, or all of the optional capabilities. The following optional capabilities are recognized for residential compliance software:~~

- ~~Raised floors with automatically operated crawl space vents~~
- ~~Zonal control or multi-zone modeling of the sleeping and living areas of the house[rh1]~~
- ~~Attached sunspaces for collection and possible storage of heat for transfer to the main house~~
- ~~Passive Solar Unconditioned SpacesExterior mass walls[rh2]~~
- ~~Overhangs and Side Fin Shading~~
- ~~Combined hydronic space and water heating~~
- ~~Building alterations~~
- ~~Solar water heating~~
- ~~Gas fired and Absorption Cooling~~
- ~~Evaporatively cooled condensing units~~
- ~~Ice storage air conditioner~~
- ~~Evaporative coolers~~
- ~~Photovoltaic performance modeling~~

~~Many of the optional modeling capabilities have been previously approved by the Commission through the exceptional methods process. The approval tests for optional modeling capabilities are included in Chapter 5.~~

1.31.1 Application Checklist

The following is a checklist of all the items that shall be included in an application package for Ccompliance Ssoftware certification by the Commission:. Some materials are required only for general purpose compliance software and are so indicated.

- **Compliance Ssoftware Vendor Certification Statement.** A statement from the Ccompliance Ssoftware vendor certifying the compliance software, and, its reliability and accuracy of the software when used for Standards compliance purposes (see Residential ACM Approval Manual Appendix A).
- Computer Run Summary Sheets. Hard copy summary sheets of all the required computer runs (see Residential ACM Manual Appendix A).
- **Computer Runs and Summary Sheets**. Copies of the computer runs specified in Chapters 4and 3 and 45 of this Manual, including complete input and output files, on diskettes or inprovided electronically to the Commission in computer readable form acceptable to the Commission to enable spot checks. Summary sheets of all the required computer runs also provided electronically to the Commission (see Residential ACM Approval Manual Appendix A).
- **Compliance Supplement.** A copy of the Compliance Supplement discussed in Chapter 46. The Compliance Supplement and the Compliance Ssoftware User's Manual may be combined into the same document.
- **Copy of the Ccompliance Ssoftware.** An executable computer readable versioncopy of the Ccompliance Ssoftware (in a format agreed to by the Commission staff) for the Commission's use during the software certification process verification of analyses and random verification of compliance analyses. Weather data shall be included.
- **Application Fee.** An application fee of $12,000.00 (onetwo thousand dollars) is required to cover the costs of evaluating the application.

1.41.2 Types of Approval

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

1.4.11.2.1 Full Approval

Full approval is required when a candidate cCompliance Ssoftware product has never been previously approved by the Commission , and/or when the Ccompliance Ssoftware vendor makes a changes to the executable program code or algorithms, or any other change that significantlyin any way affects the results. The Commission may also require that all Ccompliance Ssoftware be approved again when the Sstandards are updated on the three-year cycle or whenever substantial revisions are made to the approval process, for instance, if new analysis capabilities come into widespread use, and the Commission declares them to be minimum capabilities for all compliance software.
When re-approval is necessary, themandated by the Commission, will notify all Ccompliance Ssoftware vendors will be notified of the renewal timetable for renewal. There will also be a revised ACMcompliance software Approval Manual published, with complete instructions for re-approval.

Full approval is required for all Ccompliance Ssoftware changes, unless they qualify for the streamlined approval process or for an addendum, as discussed below.

1.4.21.2.2 Streamlined Approval

Certain types of changes may be made to approve Cresidential compliance Ssoftware through a streamlined processedure. 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 complianceexecutable program code that would in any way affect the results calculated by the software. I
If a Ccompliance Ssoftware modification qualifies for streamlined approval, then the following procedure is followed:

- The Ccompliance Ssoftware vendor prepares an addendum to the compliance supplement, when appropriate, describing the change to the Ccompliance Ssoftware.
- The Ccompliance Ssoftware 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 Pprovides the Commission with an updated copy of the Ccompliance Ssoftware and include any new reports created by the compliance software (or modifications in the standard reports).
- 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 Ccompliance Ssoftware vendor make specific changes to either the Compliance Supplement addendum or the Ccompliance Ssoftware.
- With Commission approval, the vendor may issue new copies of the Ccompliance Ssoftware with the Compliance Supplement addendum and notify Ccompliance Ssoftware users and building officials.

1.4.31.2.3 Amendments

Compliance Ssoftware 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 Ccompliance Ssoftware 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.

1.4.41.2.4 When Approval Is Not Required

Changes that do not affect compliance with the Energy Efficiency Standards for residential buildings do not require full or streamlined approval. However, the Ccompliance Ssoftware 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 Ccompliance Ssoftware program change that affects the energy use calculations for compliance, the modeling capabilities for compliancecompliance results, the format and/or content of compliance forms, or any other change that which would affect a building's

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

1.51.3 Challenges

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

1.61.4 Decertification of Compliance Software

The Commission may decertify (rescind approval of) an alternative calculationCompliance Software method through various means:

- All Ccompliance Ssoftware products are decertified when the Sstandards undergo substantial changes, which usually occuroccurring with each Standards updates every three years.
- Any Ccompliance Ssoftware product can be decertified by a letter from the Ccompliance Ssoftware vendor requesting that a particular version (or versions) of the producte compliance software 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 Ccompliance Ssoftware 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 Ccompliance Ssoftware version discontinued. In this process, there is ample opportunity for the Commission, the Ccompliance Ssoftware vendor and all interested parties to evaluate any alleged errors in the Ccompliance Ssoftware program.

Following is a description of the process for challenging Ccompliance Ssoftware or initiating a decertification procedure:

1. Any party may initiate a review of Ccompliance Ssoftware'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 Ccompliance Ssoftware and the program version number(s) thatwhich contain the alleged errors;
(b) Identify concisely the nature of the alleged errors in the Ccompliance Ssoftware thatwhich 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 Ccompliance Ssoftware 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 Cccompliance Sssoftware 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 Cccompliance Sssoftware 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 Cccompliance Sssoftware need not be decertified; or
   (b) Submit to the Commission a written recommendation that the Cccompliance Sssoftware be decertified.
6. ~~The initial written communication, all other relevant written materials and the Executive Director's recommendation shall be placed on the consent calendar and considered at the next business meeting after submission of the recommendation. The matter may be removed from the consent calendar at the request of any person.~~
~~7~~6. If the Commission approves the Cccompliance Sssoftware 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 Cccompliance Sssoftware 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.

T~~As a practical matter, t~~he Cccompliance Sssoftware vendor may use the 180 to 210-day period outlined here to update the Cccompliance Sssoftwar~~ee program~~, get it re-approved by the Commission, and release a revised version that does not contain the error~~bug~~s initially brought to the attention of the Commission. ~~Sometimes the compliance software vendor may wish to be the initiating party to ensure that a faulty program version is taken off the market.~~

~~1.7~~1.5 Compliance Software Tests

This Manual provides tests to verify that Cccompliance Sssoftware is~~are~~ accurate. These tests are provided in Chapter~~s 4 and 5~~3 of this Manual. The Cccompliance Sssoftware vendor may propose alternate tests when the vendor believes that one or more of the standard tests are not appropriate for the Cccompliance Sssoftware. 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 this manual as an addendum and the alternate test(s) will be available for use by all Cccompliance Sssoftware. ~~The alternate test will coexist with the standard test presented in this Manual until the Manual is revised. When a new version of this Manual is produced, the alternative test may be substituted for the current test or may continue to coexist with the original test.~~

1.81.6 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 Ccompliance Ssoftware. When an Exceptional Method is approved, a new optional capabilities test may be approved as part of the process. Exceptional Methods do not necessarily produce optional capabilities for compliance software. For instance, radiant heating systems are recognized by an adjusted equipment efficiency that may be used directly in compliance software or other compliance methods. To be approved for the new optional capability, vendors shall amend their Ccompliance Ssoftware approval.

Even if the Ccompliance Ssoftware already incorporates the Exceptional Method, the vendor shall receive approval to use the Exceptional Method in the compliance process. The Ccompliance Ssoftware vendor shall demonstrate that the Ccompliance Ssoftware 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.

To receive a copy of the Exceptional Method contact the Building and Appliances Office at (916) 654-4064.