



CABEC 2014 Conference



CBECC-Res Title 24 Software

**Presented by
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California Energy Commission**

How Did We Get Here



- Public Resources Code Sections 25402 and 25402.1 enacted in the 1970s
- Global Warming Solutions Act (2006)
- California Long-Term Energy Efficiency Strategic Plan (2008) [includes goal of “zero net energy” by 2020]
- Governor Brown’s Clean Energy Jobs Plan (2010)

Zero Net Energy by 2020



- “Zero net energy” means that the buildings would:
- Be energy efficient, and
- Where necessary, have on-site energy production facilities (such as solar photovoltaic electricity-generating panels on rooftops)
- The buildings produce as least as much energy as they consume from electricity and natural gas

Software Landscape



- Often the right thing is not the easiest
- Software literally had not changed in 30+ years
- New program version \neq updated calculation method
- Could take 3 years to correct errors
- There are many moving parts
- The entire industry is experiencing growing pains

CBECC-Res Software



- California Building Energy Code Compliance (CBECC)
- Open source software
- Public Domain Residential compliance program
- Free
- Produces the XML file for HERS provider registration
- No load calculations

Are you on the list?



2013 RESIDENTIAL COMPLIANCE SOFTWARE PROJECT

CBECC-Res 2013 is a free public domain software program developed by the California Energy Commission for use in complying with the 2013 Residential Building Energy Efficiency Standards. **To download the latest version of CBECC-Res, see the Current Downloads section below.** The CBECC-Res 2013 software development project is managed by Bruce A. Wilcox, P.E. The California Energy Commission contract manager is Martha Brook, P.E.

For a list of all approved compliance programs for the 2013 Residential and Nonresidential Building Energy Efficiency Standards, go to www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html. For information about California's Building Energy Efficiency Standards, go to www.energy.ca.gov/title24/2013standards.

SIGN UP to be notified when we release new versions of CBECC-Res.

Email Address:

Submit

CBECC-RES AND TITLE 24 TRAINING

Recordings of the Energy Commission's recent training webinars on the 2013 California Building Energy Code Compliance software (CBECC-Res and CBECC-Com) are available on the [Title 24 Training webpage](#). Scroll down to "2013 CBECC Software Training Webinars" and click on the links to access webinar recordings or the presentation slide decks. The training webinars are designed to help you learn how to use the software, and are intended to assist your business in preparing for the 2013 Building Energy Efficiency Standards. The webpage also lists other Title 24 training opportunities.

CURRENT DOWNLOADS

- [CBECC-Res 2013 3](#) 9-16-2014 ([Alternate download link](#))

Click on this link to download the installer. This is CBECC-Res 2013 v3, approved by the California Energy Commission on August 27, 2014.

Registered CF1R



- Watermark:
 - “Not Registered” (correct)
 - “Not Useable” (you selected “draft” or program expired)
- CBECC-Res produces the XML file for registering
- No watermark/registration for Existing+Addition if
 - < 1,000 ft² - no IAQ verification,
 - existing HVAC system, and
 - < 40 feet of new duct or no ducts

Registering Your CF1R



Go to either

- CalCERTS (www.calcerts.com), or
- USERA (www.usenergyraters.com)

For what types of projects are they approved?

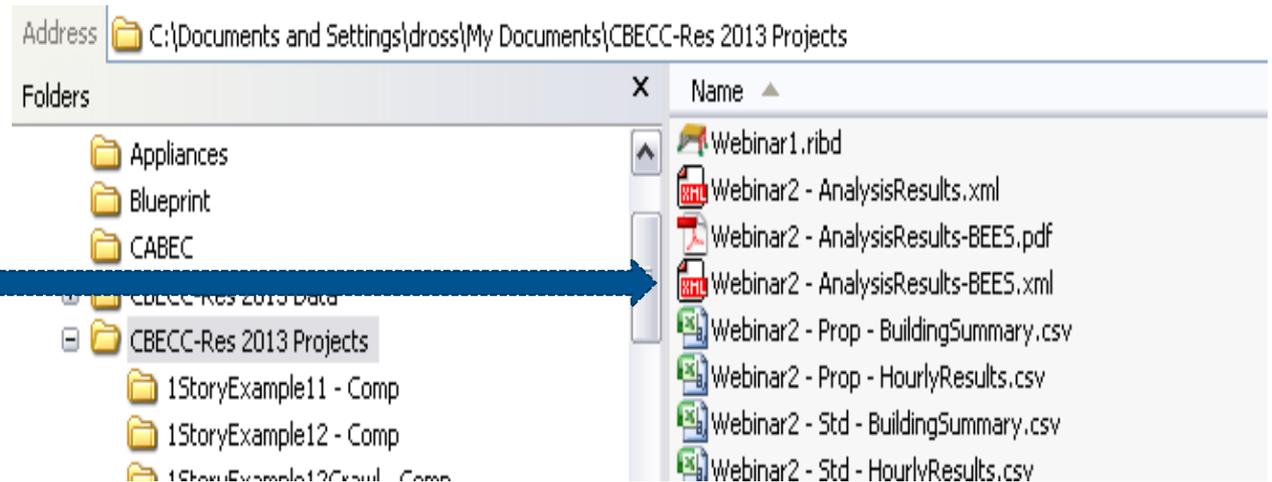
<http://www.energy.ca.gov/HERS/providers.html>

Where is the File for Uploading



Where: My Documents\CBECC-Res 2013 Projects

- HERS upload
(BEES.xml)



See also:

- HERS – 1.8 of User Manual

Useful Tools



- User Manual
 - Accessible from Help
- Quick Start Guide
 - Accessible from Help
- Frequently Asked Questions
 - Found on the Website
- View Project Log File (* * * Errors * * *)

Latest Information



The CF1R now has a list of HERS Features on the 2nd page (after Special Features). It looks like this:

REQUIRED SPECIAL FEATURES

The following are features that must be installed as condition for meeting the modeled energy performance for this computer analysis.

- PV System: 2.0 kW
- Cool roof

HERS FEATURE SUMMARY

The following is a summary of the features that must be field-verified by a certified HERS Rater as a condition for meeting the modeled energy performance for provided in the building components tables below.

Building-level Verifications:

- IAQ mechanical ventilation

Cooling System Verifications:

- Verified EER
- Verified SEER
- Refrigerant Charge
- Fan Efficacy Watts/CFM

HVAC Distribution System Verifications:

- Duct Sealing
- Low-leakage Air Handling Unit

Domestic Hot Water System Verifications:

- -- None --

Not registered

Non-Mouse Ways of Getting Around



- Up/down arrow - moves up/down the tree
- <Alt> Enter – opens data for object highlighted / tab to the field
- <Alt>F1 – opens right mouse quick menu. Then:
 - up/down arrows to highlight selections, and <enter> or type a letter such as “E” to edit, “R” to rename
 - When "Create“ is selected - right/left arrow keys open/close submenu of windows or doors
 - <esc> key to close
- Left /right arrows – when on an object w/ children (i.e., a wall with windows) left contracts/right expands

Still not happy about speed



- If you need to multi-task, there is a way to set your computer to not use all of your resources for running compliance:
 1. Start task manager
 2. Right-Click on CBECC-Res13.exe
 3. Select “Set Affinity . . .”
 4. Uncheck any CPUs you do not want CBECC to use
- Have to set every time you start CBECC. Tip for creating a shortcut is in the Frequently Asked Questions for October 3

New Tools/Tips



- View Project Log File (Tools Menu)
- Right click / move up/move down
 - Windows/walls get added to the bottom of the list
 - This allows them to be in clockwise or counterclockwise order, regardless of how they were input
- More sample files

Example Files*



- *1StoryHVACExample16.ribd* (mini-split, ground source, and air to water heat pumps)
- *2StoryCombHydNoCoolExample16*
- *2StoryZonalExample16* (zonal control)
- *EAAExample 16.ribd* (existing + addition)
- *AAExample 16.ribd* (addition alone)
- *MFexample16Central.ribd* (central DHW in a multi-family building)

*See User Manual p. 2-2 for the complete list

Capabilities



- All construction project types
- Wall furnaces
- Combined hydronic and hydronic
- Mass

Coming Soon



- Below Grade surfaces
- Sealed Attics
- Addition Alone w/ Existing HVAC (no watermark)

Sooner or Later

- Multiple attics
- Controlled vent crawl space
- Duplex/townhome

Known Limits



- Addition Alone gets a watermark (unless you model it incorrectly as an Existing+Addition)
- One attic (either need to put a radiant barrier or whole house fan in the whole thing, or not at all)
- Sample files sometimes have mistakes
 1. Combined hydronic does not have the right DHW device
 2. EAA file has a whole house fan

So be sure to read your CF1R

2-Story 1-Zone - Bottom / Floor Elevation

- 1 zone 2 story building



Floor Area:	<input type="text" value="2,700"/>	ft ²
Stories:	<input type="text" value="2"/>	
Ceiling Height:	<input type="text" value="9"/>	ft
Floor to Floor:	<input type="text" value="10"/>	ft
Bottom:	<input type="text" value="0.7"/>	ft
Win Head Height:	<input type="text" value="7.67"/>	ft



Interior Floor Name:	<input type="text" value="FloorOverGarage"/>	
Belongs to Zone:	<input type="text" value="Conditioned"/>	
Surface Status:	<input type="text" value="New"/>	
Construction:	<input type="text" value="Flr Over Gar"/>	
Outside:	<input type="text" value="Garage"/>	
Floor Area:	<input type="text" value="200"/>	ft ²
Floor Elevation:	<input type="text" value="10.7"/>	ft

- # of Stories (in the **zone/not** in the **building**)
- A slab on grade floor elevation is 0.7, not 0
- A 2-ft crawl space is 2 feet
- A 2nd floor, or a floor over garage, has a value of floor to floor (10) + bottom (0.7) = 10.7

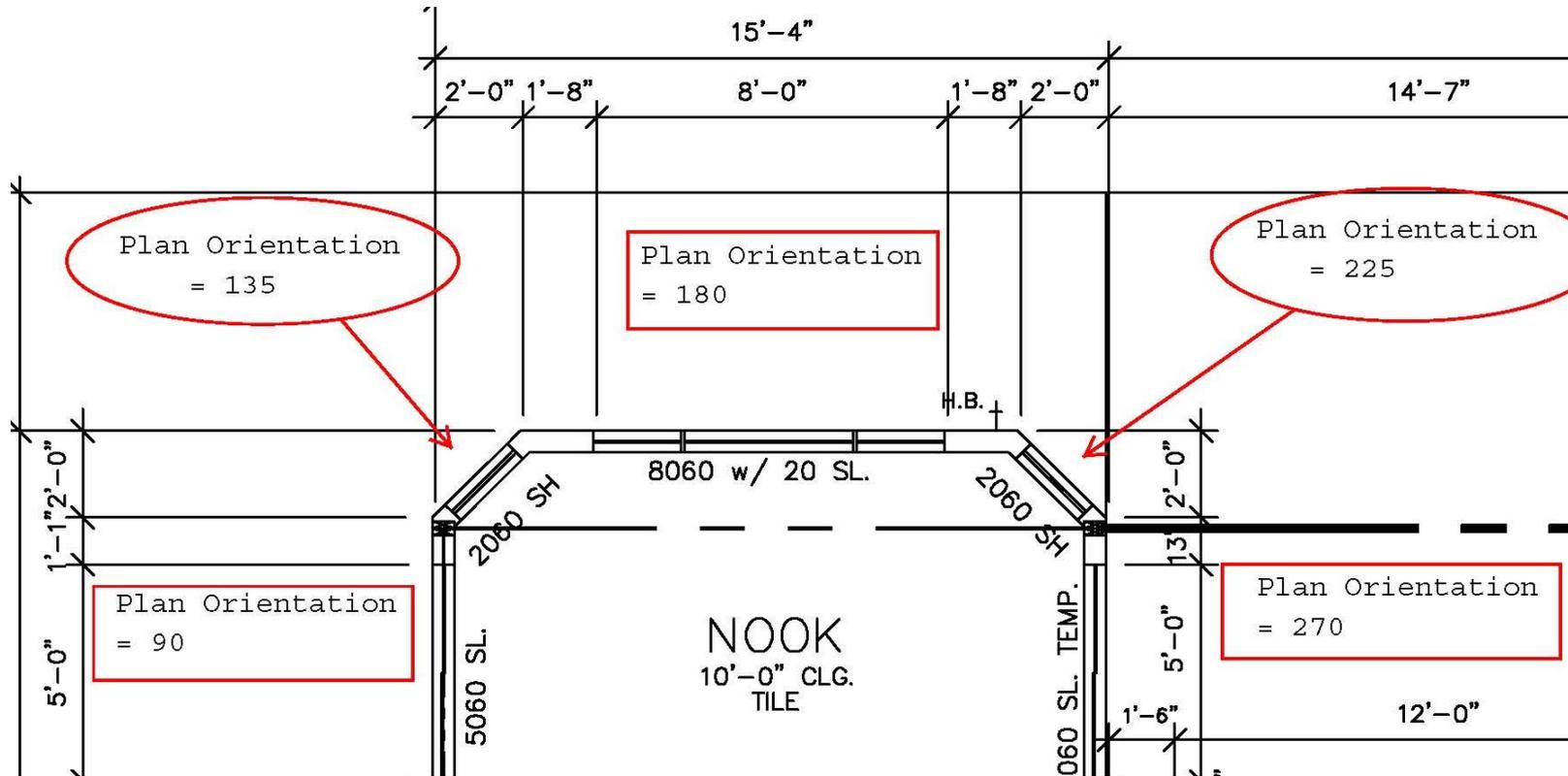
2-Story 2-Zone - Bottom/Floor Elevation



Bottom & Floor Elevation

Floor Area:	<input type="text" value="1,250"/> ft2		Floor Area:	<input type="text" value="1,450"/> ft2		Construction:	<input type="text" value="R19 IntFloor Cons"/>
Stories:	<input type="text" value="1"/>		Stories:	<input type="text" value="1"/>		Outside:	<input type="text" value="Garage"/>
Ceiling Height:	<input type="text" value="9"/> ft		Ceiling Height:	<input type="text" value="9"/> ft		Floor Area:	<input type="text" value="200"/> ft2
Floor to Floor:	<input type="text" value="10"/> ft		Floor to Floor:	<input type="text" value="10"/> ft		Floor Elevation:	<input type="text" value="10.7"/> ft
Bottom:	<input type="text" value="0.7"/> ft		Bottom:	<input type="text" value="10.7"/> ft			
Win Head Height:	<input type="text" value="7.67"/> ft		Win Head Height:	<input type="text" value="7.67"/> ft			

Plan Orientation/Not Actual



Front (0), Left (90), Back (180), Right (270)
 Angled Walls 315, 45, 135, 225

➡ #s are relative to the front

Back bay windows if Front is 270 West



OPAQUE SURFACES						
01	02	03	04	05	06	V
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft ²)	
Front	Conditioned	R15 R4 Stucco Wall	270	Front	270	
Left	Conditioned	R15 R4 Stucco Wall	0	Left	324	
BL Wall	Conditioned	R15 R4 Stucco Wall	45	- specify -	22.5	
B Wall	Conditioned	R15 R4 Stucco Wall	90	Back	48.0	
BR Wall	Conditioned	R15 R4 Stucco Wall	135	- specify -	22.5	
Right	Conditioned	R15 R4 Stucco Wall	180	Right	414	

WINDOWS									
01	02	03	04	05	06	07	08	09	10
Name	Type	Surface (Orientation-Azimuth)	Width(ft)	Height (ft)	Multiplier	Area (ft ²)	U-factor	SHGC	Exterior Shading
F1	Window	Front (Front-270)	10.0	5.0	1	50.0	0.32	0.25	Insect Screen (default)
F2	Window	Front (Front-270)	10.0	5.0	1	50.0	0.32	0.25	Insect Screen (default)
L1	Window	Left (Left-0)	6.0	4.7	2	56.0	0.32	0.25	Insect Screen (default)
BL 2060	Window	BL Wall (- specify --45)	2.0	6.0	1	12.0	0.32	0.25	Insect Screen (default)
B 8060	Window	B Wall (Back-90)	8.0	6.0	1	48.0	0.32	0.25	Insect Screen (default)
BR 2060	Window	BR Wall (- specify --135)	2.0	6.0	1	12.0	0.32	0.25	Insect Screen (default)
R1	Window	Right (Right-180)	6.0	4.7	2	56.0	0.32	0.25	Insect Screen (default)

Zonal Control



- Sample file 2StoryZonalExample16.ribd
- Select at Building Tab “Zonal Control Credit”
- Set zone condition to “living” or “sleeping”
- Not an easy credit to achieve
- Not as much credit as in the past
- Not available for heat pumps

Zonal Control (1)



Project | Analysis | Building | Dwelling Units | Lighting | Appliances | IAQ | Cool Vent | People | CAHP/CMFNH

Building Description: 2700 ft2 CEC Prototype

Air Leakage Status: New

Air Leakage: 5 ACH @ 50Pa

Insul. Construction Quality: Standard

Perform Multiple Orientation Analysis

Front Orientation: 30 deg

Single Family Multi-family

Number of Bedrooms: 4

Natural Gas is available at the site

Zonal Control Credit (living vs. sleeping)

Has attached garage

OK

Zonal (2) Cooling System Inputs



Cooling System Data

Currently Active Cooling System:

Name:

Type:

SEER: (kBtu/h)/kW

EER: kBtu/h/kW Use this EER in compliance analysis

CFM per Ton: CFM/ton Multi-Speed Compressor

AC Charge:

Refrigerant Type:

Zonally Controlled

Sizing Factor: ratio

Allowed as low as 150 CFM/Ton. Has negative effect on results but harder to meet with zonal control/bypass duct, which is why there is an exception.

Reported on CF1R

Zonal (3) Distribution System Inputs



Distribution System Data

Currently Active Distribution System:

Name:

Type:

Has Bypass Duct

Use defaults for all inputs below Low Leakage Air Handler

Duct Leakage:

Duct Insulation R-value: °F-ft²-h/Btu

Verified Duct Design

Your CF1R for Zonal Control



HVAC - COOLING SYSTEMS						
01	02	03	04	05	06	07
Name	System Type	EER	SEER	Zonally Controlled	Multi-speed Compressor	HERS Verification
Cooling 14 11.7	SplitAirCond - Split air conditioning system	11.7	14	Yes	Yes	Cooling 14 11.7-hers-cool

HVAC COOLING - HERS VERIFICATION					
01	02	03	04	05	06
Name	Verified Airflow	Airflow Target	Verified EER	Verified SEER	Verified Refrigerant Charge
Cooling 14 11.7-hers-cool	Required	150	Not Required	Not Required	Required

HVAC - DISTRIBUTION SYSTEMS							
01	02	03	04	05	06	07	08
Name	Type	Duct Leakage	Insulation R-value	Supply Duct Location	Return Duct	Bypass Duct	HERS Verification
Distribution System	Ducts located in attic	Sealed and tested	6	Attic	Attic	Has Bypass Duct	Distribution System-hers-dist

is not registered

Space Heating part of Hydronic / Combined Hydronic



Heating System Data

Currently Active Heating System:

Name:

Type:

CombHydro: Water heating system can be storage gas (StoGas, LgStoGas), storage electric (StoElec) or heat pump water heaters (StoHP). Distribution systems can be Radiant, Baseboard, or any of the ducted systems and can be used with any of the terminal units (FanCoil, RadiantFlr, Baseboard, and FanConv).

Sizing Factor: ratio

Combined Hydronic Water Heater:

OK

Name: Call it what you want

This is the only hydronic type available

The water heating device for the space heating

HVAC System for Hydronic/Combined Hydronic



Hydronic is one of the systems that can be ducted or ductless - check the appropriate box

Distribution/Fan depend on the heating system / None are acceptable inputs since no cooling is a default ducted split system equivalent to Package A

HVAC System Data | Heating Equipment | Cooling Equipment | Heat Pump Equipment

Currently Active HVAC System: **CombHydrBoiler**

System Name: **CombHydrBoiler**

System Type: **Other Heating and Cooling System** Area Served: **2,700** (2 stories)

Heating: **1** Unique Heating Unit Types Heating Unit: **CombHydronic** Count: **1**
 Ducted Heating
 Autosize Capacity
1 'CombHydro' unit(s), AFUEeff 78.0

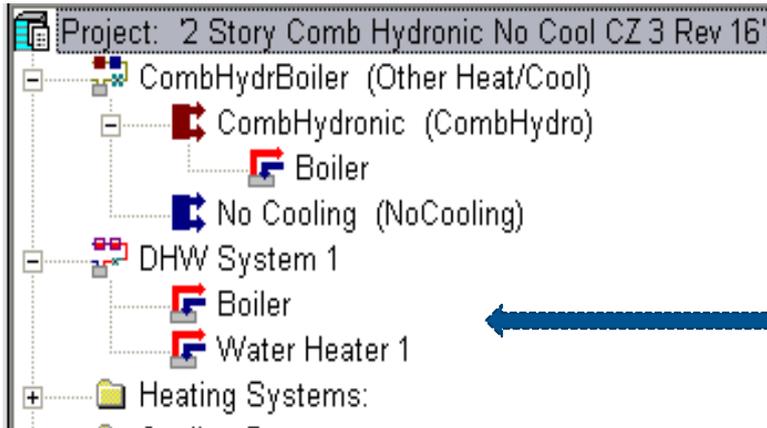
Cooling: **1** Unique Cooling Unit Types Cooling Unit: **No Cooling** Count: **1**
 Ducted Cooling
 Autosize Capacity
1 'NoCooling' unit(s), 14.0 SEER, 11.7 EER, 350.0 CFM/ton

Distribution: **- none -**

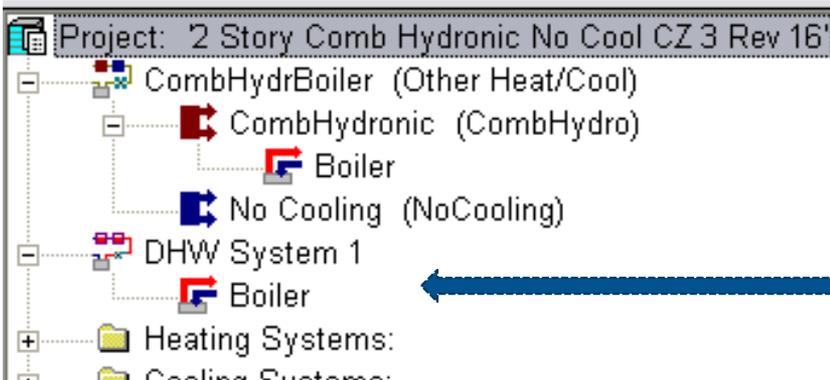
Fan: **- none -**

(activate CFI cool vent via Cool Vent tab of the Project data dialog)

Water heating part of Hydronic / Combined Hydronic



Hydronic or Hydronic Separate (2 DHW devices) [the hydronic system and separate water heater]



Combined hydronic (1 DHW device) [provides water and space heating]

Existing + Addition



- Use Sample EAA Example 16
- Pay attention to status fields – it affects results
 - New = compared to Pkg A
 - Altered = compared to Table 150.2-B
- Look at the CF1R carefully

Status Fields



ZONE:

- Existing = Heated space
 - New = Did not previously have heat
 - New = Newly constructed
-
- ***ALTERED*** IS NOT A VALID ZONE STATUS

Status - General Rules



SURFACES, HVAC, DHW in the **Existing Zone**:

- New (it did not exist before)
- Altered (it is being changed, replaced)

SURFACES in the **New Zone**:

- New (always)

HVAC & DHW

- Use equipment in the existing zone serves the new zone, specify the same status (existing or altered)
- Use new if a separate device is being installed for the addition

HVAC Status



- Existing: will not change (also appropriate for addition zone)
- New: equipment did not exist in this space before – ***only appropriate for the addition zone*** – new piece of equipment added for addition only
- Altered: equipment being replaced (use this same status for the addition if the same equipment is conditioning addition)

Duct Status



- **Existing** – only used if addition will have its own HVAC system, otherwise use the next one
- **Existing + New** – same equipment in E+A zones, new ducts for the addition / Check if < 40 ft of new duct
- **New (or altered)** – An existing non-ducted system is being replaced with a ducted system
- **Altered** - all the ducts to be replaced & new ducts in addition

DHW Status



- Existing: will not change
- New: equipment did not exist in this space before – ***only appropriate for the addition zone*** – new piece of equipment added for addition only
- Altered: equipment being replaced
- NOTE For the Addition Zone: Unless the status is New, set the DHW system name to ‘-none-’ to avoid any misunderstanding on the CF1R

Contacts



- CBECC-Res 2013 software can be downloaded
<http://www.bwilcox.com/BEES/BEES.html>
www.energy.ca.gov/title24/2013standards/
- To report problems
 - E-mail: cbecc.res@gmail.com
- Send the *.ribd / input file