CalBEM
California Building Energy Modeling

CBECC-Com Modeling Features
Batch Processing

Frequently asked questions about CBECC-Com modeling for California's 2019 Building Energy Efficiency Standards, Title 24, Part 6.

Q: How to use the Batch Processing capability in CBECC-Com?

CBECC-Com includes a Batch Processing capability that allows users to simulate multiple project files (batch) located in a folder sequentially, without the need for manually opening and running each file individually. This is useful when users have multiple models with different parameters/configurations they want to analyze either during design development or for research. This feature helps consolidate the results of all the simulations performed successfully in one comma separated value (CSV) file. In addition to this, one consolidated log file is created for all the simulations listing details about any warnings or errors encountered during the batch process.

CBECC-Com versions 2019.2.x include an additional enhancement to the batch processing capability that allows users to simulate multiple variations of a project file(s) by including a "Run Set Definitions" CSV file. The "Run Set Definitions" CSV file contains capability to define a set of paratmeters that a user can vary to create instances of the main project file for parametric analysis.

An example "Run Set Definitions" file is included in the CBECC-Com installation in the CBECC-Com Projects folder. For the CBECC-Com 2019.2.0 Beta this file can be downloaded from the BEES website. It is currently not included in the Beta installation package. The example "Run Set Definitions" file included allows a project file to be simulated in 16 climate zones, without having the user create 16 copies of the file manually with the varying climate zones.

> **Tip:**
> Before you begin, make sure you have the latest version of CBECC-Com 2019.2.x installed on your computer. The latest version can be download from the CBECC-Com project website: https://bees.archenergy.com.

Open CBECC-Com 2019.2.x version and select "Perform Batch Processing" from the Startup Options dialog box.
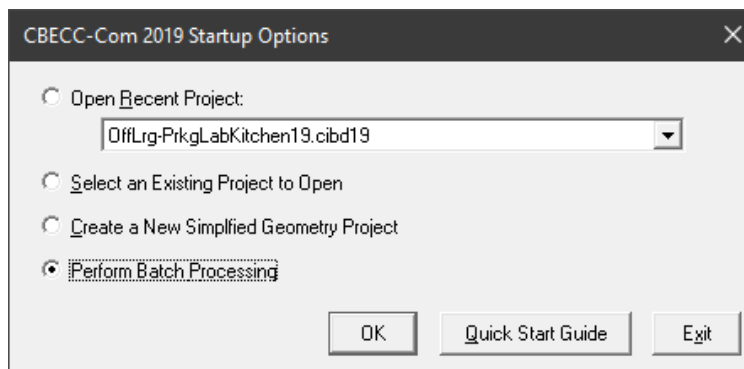
Alternatively, if CBECC-Com is already open you can intiate the batch processing from the menu by clicking on the Tools menu and then selecting Batch Processing option.

Both these options will bring up the Batch Processing User Interface (dialog box) as shown in the screenshot on next page.

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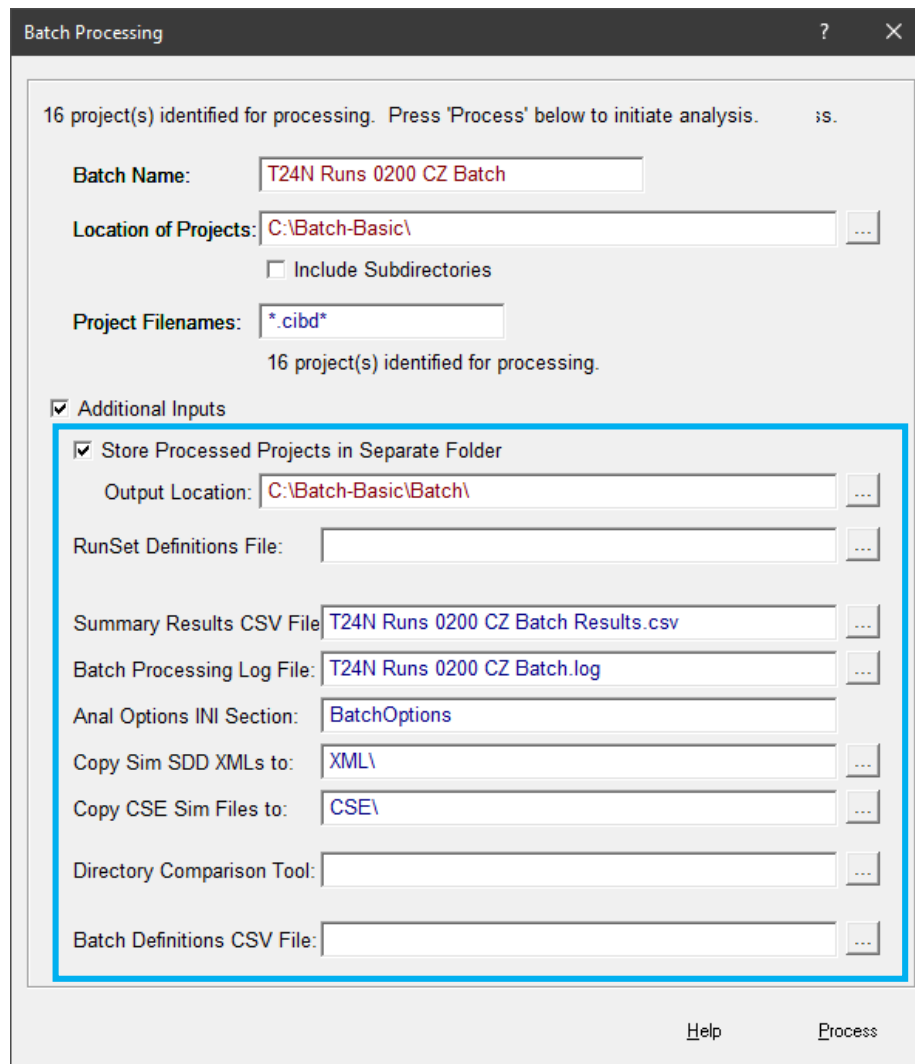
Batch Name: Name for the batch run that is going to be simulated.

Location of Project: Location of the project files which are to be included in the batch run. It is recommended the user has all the files that need to be analyzed in one directory/folder. There is also an option that allows for project files in subdirectories/subfolders to be included in the batch if desired. To enable this option the "Include Subdirectories" should be checked.

Project Filenames: Specify the project files that are to be simulated (e.g. specifying *.cibd* will include all the files in the directory that have the extension .cibd).

Additional Inputs: Checking this option triggers some additional capabilities included in the Batch Processing as shown in the blue box above.

Store Processed Projects in Separate Folder: Checking this option allows the program to create copies of the original project file(s) in a separate directory/folder as selected in the **Output Location** field.

> **Tip:**
> It is recommended to use the separate folder option as it allows the batch processing to simulate a copy of the original project file thereby preventing any changes/damage to the original file in case of any unforeseen program error/crash.

RunSet Definitions File: This field is optional and allows the user to specify a "Run Set Definitions" file (described later in this FAQ). The definitions file allows the user to change parameters in all the project files referenced in the **Location** field. If not specified, the batch processing will process the project files referenced in the **Location** field without changing any parameter within those project files.

Summary Results CSV file: Name of the results CSV file created at the end of batch processing. This contains summary results of all the runs that were successfully simulated in the batch processing.

Batch Processing Log File: Name of the log file created at the end of batch processing. Reviewing this file is helpful in diagnosing any errors that are encountered during batch processing.

The following fields are defaulted by the program and it is recommended the user not modify these:
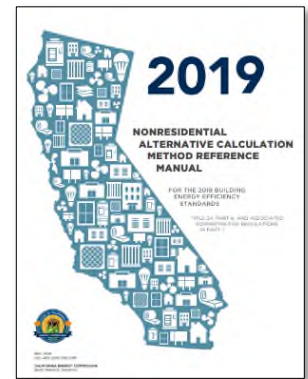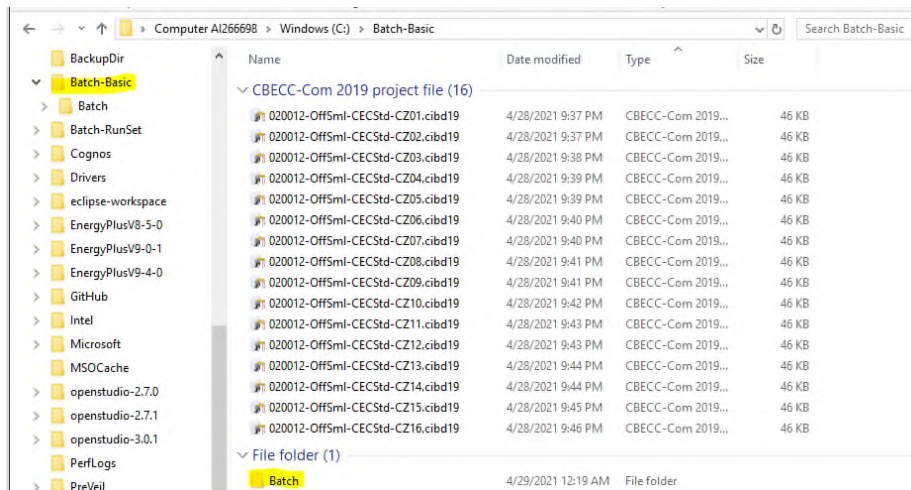
- Anal Options INI section
- Copy Sim SDD XMLs to
- Copy CSE Sim Files to

Directory Comparison Tool: Optional input specifying the path to the executable for the tools used for directory comparisons e.g. DiffMerge, WinMerge etc.

Batch Definitions CSV File: Path to the directory referencing the batch processing CSV file containing batch processing directives. This is a version of the CSV file originally developed to allow batch processing in CBECC-Com (using a developer option) before the current User Interface for batch processing was developed.

Process (button): Clicking this will initiate the batch processing based on the options selected in the dialog box.

The screenshot below shows an example folder (Batch-Basic) containing project files that will be simulated using the batch processing options shown above. A subfolder named "Batch" is defined to store the processed files separately. This folder will contain the results CSV, the log file and all the individual run folders for the project files once the batch processing is complete.

On completion of the batch processing, the user will be presented with the dialog box below. This will list how many runs were successful and how many runs were aborted due to errors. Clicking on the button options shown below (e.g. View Results CSV, View Processing Log) will open up the respective file in the default text editor on the user's computer.
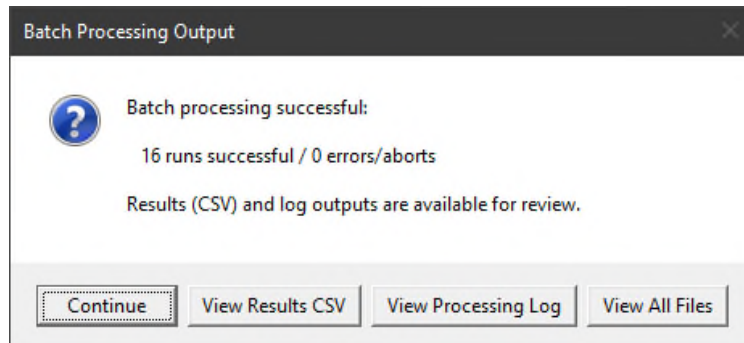
Below is a sample screenshot showing the results CSV file generated for the batch processing run. Each row contains the results of the simulation of the project file indicated in Column B.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1								Analysis:				Proposed Model:			Pr
2						Condition	Total Floor			Pass /	Complian	Elapsed			Ele
3	Start Date & Time	Filename (saved to)	Run Title	Weather Station	Results Se	Area (SqF	Area (SqF	Analysis T	Elapsed Ti	Fail	Margin	Time	Rule Eval	Simulatio	Sp
4	4/28/2021 21:37	020012-OffSml-CECStd-CZ01	CZ01	ARCATA_725945	Summaryl	5502.05	5502.05	Title24Co	0:27	FAIL	-14.16	--	--	Successfu	
5	4/28/2021 21:37	020012-OffSml-CECStd-CZ02	CZ02	SANTA-ROSA_724957	Summaryl	5502.05	5502.05	Title24Co	0:27	FAIL	-4.53	--	--	Successfu	
6	4/28/2021 21:38	020012-OffSml-CECStd-CZ03	CZ03	OAKLAND_724930	Summaryl	5502.05	5502.05	Title24Co	0:27	FAIL	-8.31	--	--	Successfu	
7	4/28/2021 21:38	020012-OffSml-CECStd-CZ04	CZ04	SAN-JOSE-INTL_724945	Summaryl	5502.05	5502.05	Title24Co	0:29	FAIL	-4.49	--	--	Successfu	
8	4/28/2021 21:39	020012-OffSml-CECStd-CZ05	CZ05	SANTA-MARIA_723940	Summaryl	5502.05	5502.05	Title24Co	0:29	FAIL	-8.91	--	--	Successfu	
9	4/28/2021 21:40	020012-OffSml-CECStd-CZ06	CZ06	TORRANCE_722955	Summaryl	5502.05	5502.05	Title24Co	0:30	FAIL	-2.42	--	--	Successfu	
10	4/28/2021 21:40	020012-OffSml-CECStd-CZ07	CZ07	SAN-DIEGO-LINDBERGH_722900	Summaryl	5502.05	5502.05	Title24Co	0:33	FAIL	-4.94	--	--	Successfu	
11	4/28/2021 21:41	020012-OffSml-CECStd-CZ08	CZ08	FULLERTON_722976	Summaryl	5502.05	5502.05	Title24Co	0:31	PASS	2.24	--	--	Successfu	
12	4/28/2021 21:41	020012-OffSml-CECStd-CZ09	CZ09	BURBANK-GLENDALE_722880	Summaryl	5502.05	5502.05	Title24Co	0:31	PASS	1.17	--	--	Successfu	
13	4/28/2021 21:42	020012-OffSml-CECStd-CZ10	CZ10	RIVERSIDE_722869	Summaryl	5502.05	5502.05	Title24Co	0:31	PASS	11.47	--	--	Successfu	
14	4/28/2021 21:43	020012-OffSml-CECStd-CZ11	CZ11	RED-BLUFF_725910	Summaryl	5502.05	5502.05	Title24Co	0:30	PASS	7.31	--	--	Successfu	
15	4/28/2021 21:43	020012-OffSml-CECStd-CZ12	CZ12	SACRAMENTO-EXECUTIVE_72483(	Summaryl	5502.05	5502.05	Title24Co	0:30	PASS	0.01	--	--	Successfu	
16	4/28/2021 21:44	020012-OffSml-CECStd-CZ13	CZ13	FRESNO_723890	Summaryl	5502.05	5502.05	Title24Co	0:32	PASS	5.51	--	--	Successfu	
17	4/28/2021 21:44	020012-OffSml-CECStd-CZ14	CZ14	PALMDALE_723820	Summaryl	5502.05	5502.05	Title24Co	0:31	PASS	12.09	--	--	Successfu	
18	4/28/2021 21:45	020012-OffSml-CECStd-CZ15	CZ15	PALM-SPRINGS-INTL_722868	Summaryl	5502.05	5502.05	Title24Co	0:33	PASS	18.5	--	--	Successfu	
19	4/28/2021 21:46	020012-OffSml-CECStd-CZ16	CZ16	BLUE-CANYON_725845	Summaryl	5502.05	5502.05	Title24Co	0:32	PASS	15.05	--	--	Successfu	
20															

RunSet Definitions File

An enhancement to the batch processing capability in CBECC-Com includes a new feature that allows users to specify a comma separated value (CSV) file for changing various parameters in an individual or group of project files during batch processing. This CSV file is referred to as the RunSet Definitions File. This file comes packaged as part of the installation in CBECC-Com and is installed in the CBECC-Com Projects directory. The file is included both as an Excel (.xlsx) and a CSV version. Users can make changes to the Excel file and then save a copy of it as a CSV version for use in batch processing.

The example RunSet Definitions file included in the installation is setup to allow users to simulate project files in 16 California climate zones. This allows the user to use one project file for simulating in the 16 climate zones without having to manually create 16 different versions of the same file. The RunSet Definitions file consists of two tables – Run Set Table and an Analysis Action Table.

Tip:
It is recommended to place the RunSet Definitions file (CSV) in the same folder as the project files.

Run Set Table

This table is used to define the project files and their location that are to be used in the batch processing along with the data for the various parameters (defined in the Analysis Action Table) that will be modified.

A	B	C	D	E	F
;	Run Set Table				
; Input File(s)	Output	Append to			
; (incl. *)	Subdirectory	Filename	Proj:RunTitle	Proj:CliZn	Proj:WeatherStation
InputFN	OutSubdir	AppendOutFN	**RunTitle**	**CZ**	**Weather**
*		...-CZ01	CZ01	ClimateZone1	ARCATA_725945
*		...-CZ02	CZ02	ClimateZone2	SANTA-ROSA_724957
*		...-CZ03	CZ03	ClimateZone3	OAKLAND_724930
*		...-CZ04	CZ04	ClimateZone4	SAN-JOSE-INTL_724945
END_RUN_SET	; end of Run Set table				

Run Set Table Key:

A	The inputs in this column are used to describe which file(s), residing in the batch Input directory (& subdirectories), that are to be processed with data described on this row of the run set table. For example:
	* processes ALL input files using this run set row
	<specific filename> processes only the input files with this name
	XYZ* processes all input files whose names begin with "XYZ" (case insensitive)
B	The inputs in this column are used to identify a specific subdirectory which will be used to process and save the output batch runs (for this run set row).
	Leaving blank means output project files will be stored in the main Output directory specified in the Batch Processing User Interface.
C	The inputs in this column are used to specify the output batch run filename (for this run set row). When beginning w/ ellipsis ('…'), the text specified will be APPENDED to the default output filename.
	Leaving blank means output project files will be the same as the input files specified in the Batch Processing User Interface.
	Note: If BOTH B & C columns are left blank then output projects will overwrite each other anytime multiple input files are processed for a run set row
D - XX	The inputs in these columns is the Data (numeric, strings or left blank) that feed into the changes made to each model processed for this run set row, as referenced in Analysis Action table.

Analysis Action Table

This table is used to define the project files and their location that are to be used in the batch processing along with the data for the various parameters (defined in the Analysis Action Table) that will be modified.

	A	B	C	D	E	F
;		**AnalysisAction Table**				
;	Type	AnalysisPhase	BeforeAfterPhase	Obj:Prop	Obj to alter	Run Set Table Column
	AppendString	LoadModel	BeforeDefaulting	Proj:RunTitle	*	**RunTitle**
	SetString	LoadModel	BeforeDefaulting	Proj:CliZn	*	**CZ**
	SetString	LoadModel	BeforeDefaulting	Proj:WeatherStation	*	**Weather**
	END	; end of AnalysisAction table				

AnalysisAction Table Key:

(Note: The most common inputs are listed in the key. There are additional inputs for each column which can be reference in the Table Key provided in the RunSet Definition file (.xlsx or CSV).

A	**Type**		The inputs in this column are used to describe how a model is changed using data specified out in column F of this table.
		SetFloat	Floating point data stored in the Run Set table above (labeled in col F) is posted to the building database.
		SetInteger	Integer data stored in the Run Set table above (labeled in col F) is posted to the building database.
		SetString	Character string data stored in the Run Set table above (labeled in col F) is posted to the building database.
		AppendString	Character string data stored in the Run Set table above (labeled in col F) is APPENDED to the building database.
B	**AnalysisPhase**		The inputs in this column describe at what phase of analysis should the run set data/rules be applied to the building model.
		LoadModel	This defines the phase when the model is loaded into CBECC-Com.
C	**BeforeAfterPhase**		The inputs in this column describe additional specifics about when the run set data/rules are to be applied to the building model. Note: BeforeAfterPhase options are dependent on the AnalysisPhase options (in col B).
		BeforeDefaulting	*LoadModel*
		AfterDefaulting	*LoadModel*
D	**Obj:Prop**		The inputs in this column are the identity of the object type and property modified using the run set-defined data. E.g. Proj:CliZn
E	**Obj to alter**		The input in this column is the name of the object to be altered (w/ run set data). Note: columns D & E used only for Set* and Append* AnalysisAction types
F	**Run Set Table Column**		The inputs in this column define the label used to identify which column of data in the Run Set Table to reference.

The screenshot below shows the batch processing options when using the RunSet Definitions file. In this example, we are only using one model file (0200-OffSchSml-CECStd.cibd19) to generate 16 model files representing 16 climate zones by using the example RunSet Definitions file described above.
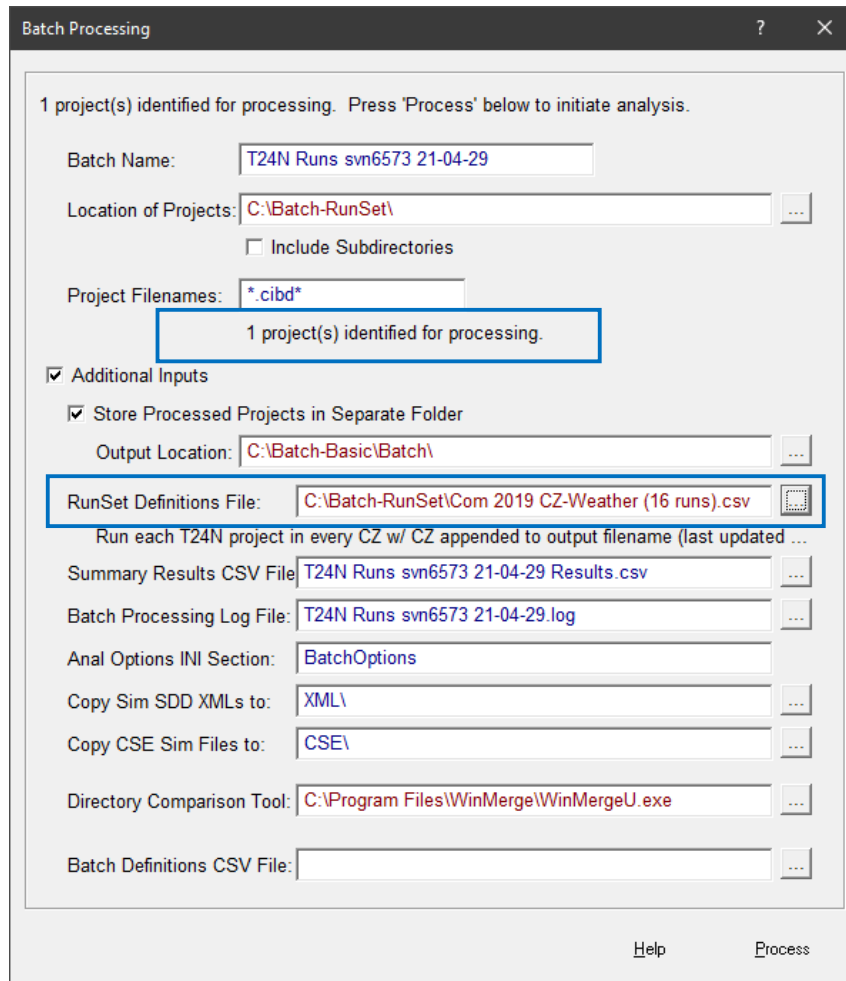
The screenshot below shows the project file that will be used in the batch processing in combination with the RunSet Definition file – Com 2019 CZ-Weather (16runs).csv to generate 16 instances each representing one climate zone as defined in the defintion file. The batch processing will simulate each instance sequentially and store the output files, the results and log file in the Batch subfolder shown below.