
PRE-CHECK (PC) PERMANENT MODULAR OR RELOCATABLE BUILDING DESIGNS CALGREEN/ENERGY CODE COMPLIANCE REVIEW

Division of the State Architect (DSA) documents referenced within this publication are available on the [DSA Forms](#) or webpages.

PURPOSE

This procedure outlines the requirements for the California Green Building Standards Code (CALGreen Code) and the California Energy Code (CEC) compliance review of pre-check (PC) permanent modular or relocatable building designs submitted to DSA for approval. This procedure details how a building design, which will be placed on various sites, is required to meet the requirements of the current version of the CALGreen Code and CEC.

BACKGROUND

All public school facility construction within the State of California must comply with all parts of Title 24, California Building Standards Code, including the energy efficiency standards contained in Title 24, Part 6, Energy Code and the mandatory measures contained in Title 24, Part 11, CALGreen Code.

SCOPE

This procedure is applicable to the CALGreen Code and Energy Code compliance for PC permanent or modular or relocatable building designs. See procedure *PR 07-01: Pre-Check Approval* for general requirements for PC designs.

The applicant has the option to meet the Energy Code using prescriptive or performance method.

Prescriptive Method

The prescriptive approach requires each component of the proposed building to meet a prescribed minimum efficiency. The approach offers little flexibility, but is easy to use, and may result in a faster review process. If the design fails to meet one requirement, then the project fails to comply with the Energy Code.

Performance Method

The performance approach allows greater flexibility than the prescriptive approach. It is based on an energy simulation model of the building. The performance approach requires an approved computer compliance program that models a proposed building, determines its allowed energy budget, calculates its energy use, and determines if it complies. Design options such as window orientation, glazing area, shading devices, thermal mass of building envelope, and zonal control are all considered in the performance approach. In addition to affording flexibility, the designer is able to choose building elements and systems that may result in the most cost-effective solution for compliance.

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The following definitions apply to review of permanent and modular relocatable buildings:

Module

A repetitive building assembly.

Modular Building

A singular or repetitive number of modules which make up a singular unconditioned building, or a singular or repetitive number of modules which make up a conditioned building typically serviced by a single Heating Ventilation and Air Conditioning (HVAC) unit.

1. PROCESS FOR REVIEW OF CALGREEN/ENERGY CODE COMPLIANCE

1.1 For intake review, the applicant shall submit documents electronically via DSA's standard project submittal process and concurrent with project submittal for other disciplines. Plan review for any discipline will not commence until all required information is provided. A complete submittal for all projects, at a minimum, consists of:

- A signed and completed form *DSA 403- Pre-Checked (PC) Prescriptive* or *DSA 403-Pre-checked (PC) Performance*, depending on the compliance path selected for the project.
- Construction documents incorporating all applicable information in Part 1, Part 2, and Part 3 of the applicable DSA 403-PC-PRE or DSA 403-PC-PERF.
- Product manufacturer specifications for mechanical and electrical equipment and controls (cut sheets).
- Required certificates of compliance in a Portable Document Format (PDF) format.
- Additional information is required for submittal by Section 1.2 if the project demonstrates compliance to the Energy Code under the Performance Method.

1.2 Project Compliance by Performance Method Required Documentation

- PDF copies of the applicable Building Energy Analysis Reports for each size modular building to demonstrate compliance, in accordance with the guidance in Section 4.0 of this document shall be submitted with the application. For each size modular building upload all the reports by climate zone
- The plans shall include 8 ½" x 11" full-size copies of the Building Energy Analysis Report (Certificate of Compliance NRCC-PRF-E) with the *least energy efficient orientation* for each size modular building. The "least compliance margin" is the *least energy efficient orientation*.
- Software files (Energy Runs) for the least efficient orientation for each size modular building must be uploaded with the application.
- Table of Performance Runs and Orientations

Energy performance runs shall address minimum compliance of the modeled building based on the following orientations: 30°, 75°, 120°, 165°, 210°, 255°, 300°, and 345°. For each climate zone in which the building may be sited, submit in a tabular form the compliance results of the performance runs indicating the orientation, the Time Dependent Value (TDV) of the standard design, the TDV of the proposed design, and the compliance margin the proposed design exceeds the energy efficiency of the standard design (see Attachment 1).

- Run Codes (Calculation Date/Time): Run codes identify the time when the energy report was calculated and is unique to each revision made to an energy model. The "calculation date/time" can be found on the California Energy Commission's Certificate of

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Compliance NRCC-PRF-E. The run code on the least energy efficient Building Energy Analysis Report included in the drawings must match the run codes on the Table of Performance Runs and Orientations.

1.3 Fees

See PR 07-01 for fee requirement.

1.4 Backcheck Submittal

At time of backcheck, a complete and revised set of construction documents shall be submitted. The final project submittal documentation shall reflect all updates to the information listed in Section 1.1 and 1.2 if compliance by Performance Method of this document.

1.5 Revisions to the PC Design After Approval

No changes are permitted to the modular buildings that are less restrictive than that which has been demonstrated for Energy Code compliance in the approved drawings and certificates of compliance. For site-specific application, if modifications to the modular building that affect Energy Code compliance are desired, or if the manufacturer desires to revise the approved PC plans for all future submittals, the plans and revised certificates of compliance, including Building Energy Analysis Reports if applicable, must be submitted to DSA for approval under the original PC application number. While additional review by DSA may not be required, DSA reserves the right to thoroughly review of revised compliance documentation and require re-submission of deficient information prior to site-specific approval.

2. CALGREEN CODE COMPLIANCE REFERENCE MATERIAL

2.1 Title 24 Part 11 CALGreen Code

See Section 301.4 for mandatory measures for public schools and community colleges as adopted by DSA-Structural Safety (SS). Incorporate the mandatory measures for the project in the drawings and specifications as indicated on PART 3 of the forms DSA 403-PC Performance or DSA 403-Prescriptive.

2.2 Although not required for project submittal, the guideline *GL-4: Project Submittal Guideline: CALGreen Code* may be used as a reference document for the requirements indicated as applicable on the 403-PC-PER or 403-PC-PRE.

3. ENERGY CODE COMPLIANCE REFERENCE MATERIAL

3.1 Title 24 Part 6 California Energy Code: Currently enforced version.

3.2 Nonresidential Compliance Manual

Produced by the California Energy Commission, current version.

3.3 Reference Appendices

Joint Appendices and Nonresidential Appendices, including Nonresidential (NR) Appendix NA4 Compliance Procedures for Relocatable Public School Buildings current version produced by the California Energy Commission.

4. DEMONSTRATION OF ENERGY CODE COMPLIANCE

4.1 California Climate Zones

See Joint Appendix JA2, Table 2-1 California Standard Climate Zone Summary. The climate zone(s) for which the building has been designed shall be noted on the cover sheet of the construction documents.

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- Design for Specific California Climate Zones
For each size, the modular building with the *least energy efficient orientation* in California Climate Zones 1-16 shall be approved for placement only within the designed climate zone(s).
- All California Climate Zones: For each size, the modular building with the with the *least energy efficient orientation* in California Climate Zones 14, 15 and 16 is permitted to be built on any site in California.
- When differently sized modular buildings are grouped to form the building options in the project, the least energy efficient orientation respective to each modular building shall be used.

4.3 Prescriptive Method

- Design for Specific California Climate Zones: The modular building shall be designed to Energy Code Section 140.3 and Table 140.3-B. Climate Zones that have the same criteria may be addressed as a group.
- Design for All California Climate Zones: The modular building shall be designed to Energy Code Section 140.3 and Table 140.3-D.

**5. ENERGY CODE MODELING FOR MODULAR BUILDINGS WITH MULTIPLE OPTIONS
(PERFORMANCE METHOD)**

5.1 (See PR 07-01 Appendix A for guidelines for multiple-options in a single modular building.) The following energy modeling guidelines will be used for each size modular building with multiple design options:

- Optional window locations: Model the modular building envelope with the greatest area of windows, doors, and skylight openings.
- Roof assembly with variations for the roofing material: Model the roof assembly that will give the least compliance margin.
- Variations in type of HVAC system: Model the HVAC system that will result in the least compliance margin.

6. EQUIPMENT SIZING

Equipment must be sized to meet the heating and cooling load of the building.

6.1 Performance Method

For each size modular building HVAC equipment must be sized to meet the Unmet Load Hours (UMLH) of 150 or less. UMLH represents the number of hours during a year when the HVAC system serving the thermal zone is unable to maintain the setpoint temperatures for heating and/or cooling during occupied hours. If the UMLH is over 150, the the size of the equipment must be increased or the building envelope must be modified so there is less load on the building. When increasing the size of the equipment to meet UMLH, the size equipment must match the size available from the manufacturer. For example, if a manufacturer's product line for heating was 38,204 British Thermal Units per Hour (Btu/h), 41,378 Btu/h, and 50,712 Btu/h these are the values that would be entered into the Building Energy Analysis Report under Total Heating Output. No other values are allowed.

6.2 The compliance run must show the HVAC System Heating and Cooling Loads Summary if using Energy Pro.

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6.3 For single climate zone applications, the UMLH listed in the compliance run for the climate zone is the minimum equipment size allowed to be installed. The size of the equipment and any back-up heat must be entered on ATTACHMENT 3, on the mechanical sheet.

6.4 For all climate zone applications, the minimum size equipment modeled must meet the largest UMLH for heating and the largest UMLH for cooling for Climate Zone (CZ) 14, 15, and 16. The size of the equipment and any back-up heat modeled must be entered on ATTACHMENT 3, on the mechanical sheet.

6.5 Prescriptive Method

Load calculations for proper equipment sizing per Energy Code Section 140.4(b) will be requested by DSA for plan approval. Equipment must be sized to meet the load per Section 140.4(a). Backup heat is allowed to be used as long as the heat pump is designed to meet over 75 percent of the design heating load.

7. OUTDOOR VENTILATION REQUIREMENTS

Building Energy Analysis Reports shall be designed according to the following requirements for HVAC systems:

- For each size modular building size, the outdoor air-ventilation rate and air-distribution assumptions made in the design of the ventilating system shall be listed in the table provided in ATTACHMENT 3 and included in the plans.
- Spaces shall be designed with outdoor ventilation requirements supplied by mechanical means in accordance with Energy Code Section 120.1.(b)2. Minimum outdoor air for classrooms shall be 0.38 cubic feet per minute (cfm) per square feet (sf). If the HVAC system for classrooms is designed to meet only the minimum requirements under the CEC, and does not contain an economizer and demand control ventilation devices, the following note must be included in the plans.
- “Per the CEC, classrooms are designed for minimum outside air of 0.38 cfm per sf or to 15 cfm per occupant, whichever is greater. PC manufacturer or designer shall verify with the school district the expected number of occupants in the classroom so that the outdoor ventilation rate for mechanical systems can be adequately adjusted upon site installation of the building. PC manufacturer or designer shall also confirm with HVAC equipment manufacturer that the selected equipment will be able to perform to accommodate the additional outdoor air requirements under peak design conditions for the climate zone in which the building is located. At occupancy, the building manufacturer shall provide to the building owner a description of the quantities of outdoor and recirculated air that the ventilation systems are designed to provide to each area.”

8. SOLAR READY REQUIREMENTS

Refer to Title 24, Part 6, Section 110.10. Illustrate the solar zone for each modular building in compliance with California Fire Code Section 1206. In addition, for modular buildings with roof slopes of 2:12 or higher, provide a solar zone diagram on the plans showing the solar zone orientation requirements for future installation of solar/photovoltaic panels (See ATTACHMENT 2).

8.1 Operating and maintenance information to be provided by building manufacturer

The following note shall be provided on the cover sheet of the plans:

- “Building manufacturer or Contractor shall leave for the building owner at occupancy operating information for all applicable mechanical and electrical features, materials,

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components and devices installed in the building related to efficient energy use. In addition, the building manufacturer shall leave maintenance information for all features, materials, components, and manufactured devices that require routine maintenance for efficient operation of mechanical equipment and lighting systems.”

- A DSA procedure documents a process or series of steps that DSA staff and/or external stakeholders must complete in order to fulfill one or more administrative requirements of DSA's plan and construction review programs.

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ATTACHMENT 1: Sample Performance Runs and Orientation Table

For each size modular building, provide the compliance margins for all orientations and **highlight the least compliance margin** for each climate zone for easy reference. This table must be created by the designer and is not generated by the energy compliance software.

PC DESIGN REVIEW INFORMATION				
Title 24, Part 6, Energy Code				
DSA Application #:				
Calculation Date/Time of Energy Report:				
Model Name and Option:				
Total Floor Area:				
HVAC System Type:				
Climate Zone (Reference City)	Azimuth (Front Orientation)	TDV - Standard Design	TDV – Proposed Design	Compliance Margin
14 (Palmdale)	30	257.82	233.46	9.4
	75	261.14	235.35	9.9
	120	259.99	234.10	10.0
	165	255.30	231.32	9.4
	210	259.54	233.97	9.4
	255	236.94	236.48	10.4
	300	261.29	235.16	10.0
	345	251.70	231.75	7.9
15 (Palm Springs-Intl)	30	236.54	208.71	11.8
	75	239.98	210.81	12.2
	120	240.02	209.79	12.6
	165	232.26	206.84	10.9
	210	237.05	209.26	11.7
	255	243.07	211.73	12.9
	300	242.88	210.55	13.3
	345	233.05	207.02	11.2
16 (Blue Canyon)	30	292.72	255.26	12.8
	75	297.24	258.17	13.1
	120	296.13	257.14	13.2
	165	288.26	253.01	12.2*
	210	294.87	255.86	13.2
	255	300.46	259.25	13.7
	300	299.06	257.98	13.7
	345	288.52	253.24	12.2*

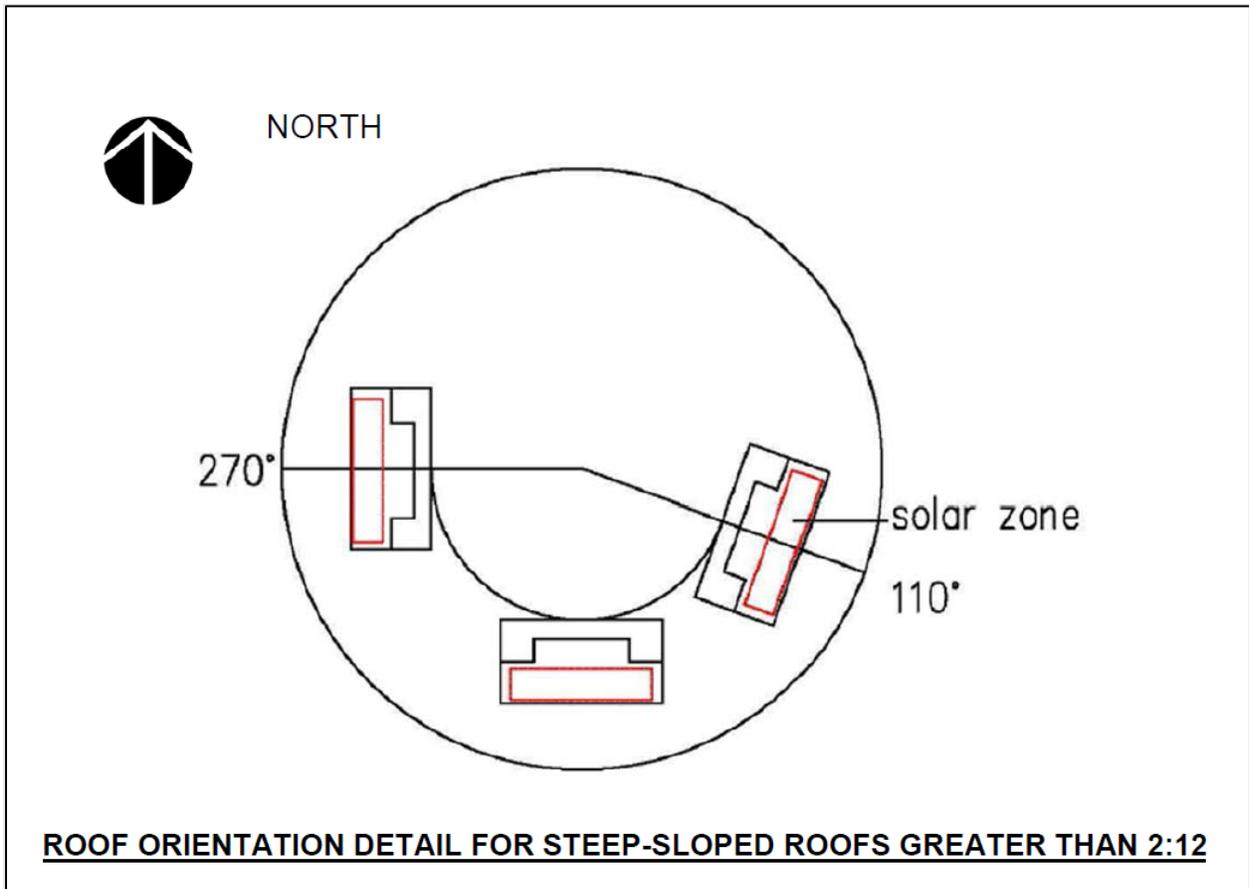
Notes:

*In the event that there are identical compliance margins, select one.

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ATTACHMENT 2: Illustration of Solar Ready Requirements

Detail to be affixed to construction documents for modular buildings with roofs sloped greater than 2:12 to meet the solar ready requirements of Title 24, Part 6.



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ATTACHMENT 3: Mechanical Equipment List

The following table is a sample of the information that shall be provided for each size modular building. The List of Mechanical Equipment must be included on first page of the mechanical drawings.

LIST OF MECHANICAL EQUIPMENT					
Any substitutions of equipment made to the approved PC must be equal or better than the equipment listed below.					
	24x40 Packaged Vertical Unit	24x40 Roof- mounted	36x40 Packaged Vertical Unit	36x40 Roof- mounted	Who is responsible for programming/commissioning
Make and Model of HVAC Equipment			Two units: each Bard W42HC		NA
Required Minimum BTUH of Heating Equipment			53,000 BTUH		NA
Maximum Strip Heating if included in any HVAC option (indicate Not Allowed if not applicable)			6 kW total for the building		NA
Required Minimum BTUH of Cooling Equipment			48,000 BTUH		NA
Minimum Efficiency Rating of HVAC Equipment (provide in order: SEER, EER, HSPF or COP, and indicated if equipment is single phase or 3-phase)			11 EER, 3.3 COP@47F and 2.3@17F 3 Phase		NA
Required Minimum Outdoor Air in cfm			547 cfm		
Required Damper Position to bring in outside air			7		
Make and Model of Thermostat			Honeywell T7350H		
Make and Model of Economizer (indicate N/A if not applicable)			BARD ECON-WD5		
Make and Model of Override Controls for HVAC equipment (indicate N/A if not applicable)			N/A		
Make and Model of Fault Detection Diagnostics (indicate N/A if not applicable)			Honeywell Jade, W72A****(T,W,Y,Z)*****		
Make and Model of Demand Control Ventilation Equipment (indicate N/A if not applicable)			BARD ECON-WD5		