



TITLE 24, PART 6

2025 CODE CYCLE



High Performance Windows

Codes and Standards Enhancement (CASE) Proposal
Building Type | System Type



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May 17th, 2023

Utility Sponsored Stakeholder Meeting – Round 2



Agenda

Overview of Code Change Proposal

Summary of Stakeholder Feedback

Cost-effectiveness and Energy Savings

Data Gaps and Additional Feedback Requested

Next Steps





Code Change Proposal

- Code Change Proposal
- Code Change Language

Proposed Code Change

- Lower prescriptive U-factor maximum:

Climate Zones	Existing	Proposed
All	0.3	0.28

No change for small homes 500 square feet and less in CZs 6-10 & 15.

- SHGC requirements:

Climate Zones	Existing	Proposed
1, 3, 5, 16	Not Required	No change*
All others	Maximum 0.23	No change*

* Require that installed SHGC match CF1R (performance model)

- Reduce mandatory U-factor maximum: 0.45 → 0.40 in all CZs

Existing and proposed requirements apply to new construction, additions, alterations

Draft Code Change Language

Title 24, Part 6	ACM Reference Manual	Compliance Documents	Reference Appendices
<ul style="list-style-type: none">- Mandatory U-factor requirements (Subchapter 7)- Prescriptive U-factor requirements (Subchapter 8)	Fenestration subsection (Section 2.5.6)	SHGC requirements (CF1R and CF2R)	N/A



Summary of Stakeholder Feedback

- Summary of Feedback Received
- Measure Evolution
- Potential Barriers and Solutions

Evolution of the Measure since Last Stakeholder Meeting

Prescriptive U-factor maximum:

Climate Zone	Previously (February 24 th)	Now
1 & 16	0.25	0.28
2 through 15	0.28	

Prescriptive SHGC requirement:

Climate Zone	Previously (February 24 th)	Now
1, 3, 5, & 16	Min 0.35	No change to current code

Additional revisions: CF1R/CF2R forms specifying installed SHGC must match installed window performance rating.



Summary of Feedback Received

- **Windows with a U-factor of 0.28:**
 - In general, the window industry and other market actors are supportive of lowering U-factor requirements from 0.30 to 0.28.
- **Windows with a U-factor of 0.25:**
 - Are more expensive compared to the cost model applied in the CASE Report.
 - Typically requires a triple pane, which also increases the overall weight and thus need of additional labor to install.
 - If only required in relatively low populated areas will require increased stocking volumes for retailers.

Proposed reduction in prescriptive U-factor requirement changed to 0.28 for all California climate zones.

- **Mandatory U-factor maximum of 0.4:**
 - In general, the window industry and other market actors are supportive of lowering mandatory U-factor requirements from 0.45 to 0.4.

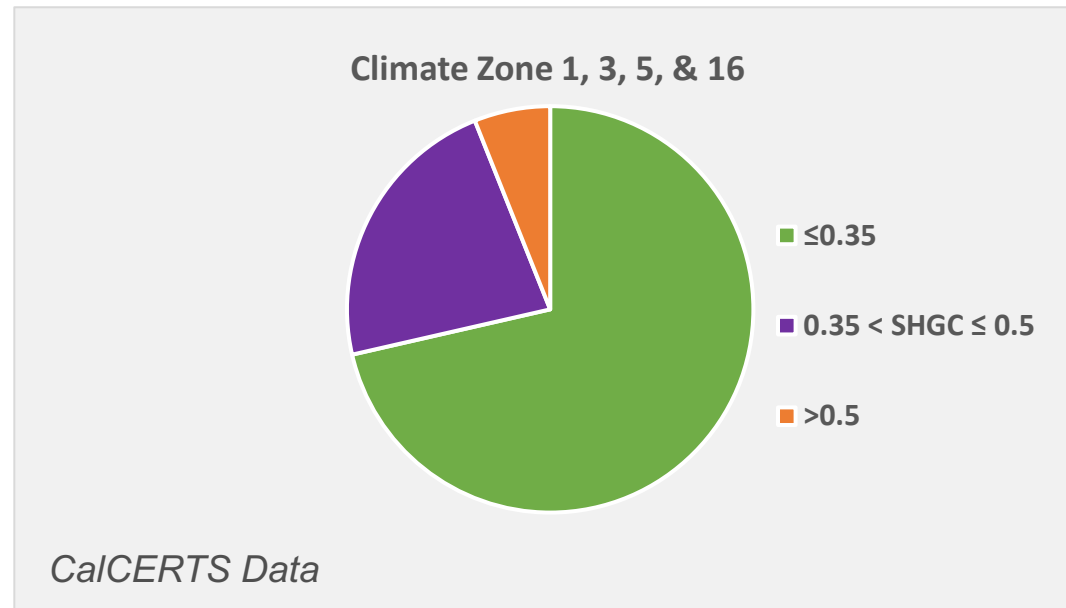
Summary of Feedback Received

- **A minimum SHGC of 0.35 in Climate Zone 1, 3, 5 and 16:**
 - Creates confusion that higher SHGC is better in some climates and lower SHGC is better in others.
 - May cause potential discomfort issues.
 - Will prescriptively prohibit the adoption of ENERGY STAR Version 7 Climate Zone 3 and 5, and parts of 1 and 16.

The previously proposed introduction of a SHGC minimum is withdrawn.

Data/Information Gaps

- Impact of solar heat gains on indoor climate, room-specific discomfort issues, need of venting, and potential benefits during heating season on overall heating demand.
 - Evaluations based on simulations only.
 - Helps during the heating season but also increases cooling demand.
 - Benefits vary across California climates.
 - Influence on overall heating and cooling demands too large to disregard...



Barriers and Solutions

Results of energy modeling confirmed that the compliance impacts of higher or lower SHGC are not always intuitive. Energy use may increase or decrease depending on the climate zone, size of the home, orientation of the window, building characteristics, and other factors.

As a result, the Statewide CASE Team proposes to require that the installed window SHGC match what was modeled in the performance simulation calculation (within ± 0.01).

Poll

Windows with higher SHGC can contribute to higher cooling demand, but also reduce heating demand. In your climate, do you typically install window SHGC values in accordance with the prescriptive code requirement? If not, what would be reasons not to?

Climate Zones	Existing
1, 3, 5, 16	Not Required*
All others	Maximum 0.23

- *SHGC of 0.35 assumed as the standard design.*
- Yes (please specify your Climate Zone)
- No (please specify reason(s) and your Climate Zone)

Cost Effectiveness and Energy Savings

Methodology and Assumptions

- Energy Savings Methodology and Results
- Cost Impacts Methodology and Results
 - Incremental costs
 - Energy cost savings



Preliminary Energy Savings Estimates

Per Home: 2100/2700 Weighted Prototype

Savings	CZ 1	CZ 16	CZs 2–15
Annual Electricity Savings (kWh/yr)	21	0	-11 to 84
Annual Natural Gas Savings (therms/yr)	33.6	34.4	0 to 9
Peak Demand Reduction (W)	2	3	0 to 30
Annual Life Cycle Energy Cost Savings (\$2026 PV)	4,272	4,335	279 to 1,066
Annual Source Energy Savings (kBtu/yr)	3,106	3,106	129 to 817

Key Assumptions:

- 0.28 U-factor for all CZs
- Savings apply statewide

Incremental Per Home Cost

Over 30 Year Period of Analysis

2100/2700 Weighted Prototype

Incremental First Cost 0.3 → 0.28	
Materials	\$287
Installation	\$0
Total	\$287

500 ft² Small Home Prototype

Incremental First Cost 0.3 → 0.28	
Materials	\$59
Installation	\$0
Total	\$59

Cost data came from:

- ENERGY STAR
- Stakeholders

**Do you foresee
other costs?**

Cost Effectiveness: 2100/2700 Weighted Prototype, Prescriptive U-factor

Conclusion: Despite Climate Zone 7 coming up \$8 short of being cost-effective, a reduction in U-factor requirement from 0.3 to 0.28 is still recommended statewide. A single U-factor requirement for all California climates is preferred over an exception for one single Climate Zone.

Climate Zone	Benefits <i>Life Cycle Energy Cost Savings + Other PV Savings (2026 PV\$)</i>	Costs <i>Total Incremental PV Costs (2026 PV\$)</i>	<i>Benefit-to-Cost Ratio</i>
1	\$4,272	\$287	14.91
2	\$1,159	\$287	4.04
3	\$499	\$287	1.74
4	\$597	\$287	2.08
5	\$900	\$287	3.14
6	\$328	\$287	1.14
7	\$279	\$287	0.97
8	\$293	\$287	1.02
9	\$401	\$287	1.40
10	\$426	\$287	1.49
11	\$977	\$287	3.41
12	\$953	\$287	3.33
13	\$419	\$287	1.46
14	\$674	\$287	2.35
15	\$300	\$287	1.05
16	\$4,335	\$287	15.13

Cost Effectiveness: 500 ft² Small Home Prototype, Prescriptive U-factor

Conclusion: Simulations of small homes in Climate Zone 6 through 10 indicate negative savings, and marginal savings in Climate Zone 16. An exception to the decrease in U-factor requirement is proposed for small homes in these Climate Zones.

Climate Zone	Benefits <i>Life Cycle Energy Cost Savings + Other PV Savings (2026 PV\$)</i>	Costs <i>Total Incremental PV Costs (2026 PV\$)</i>	<i>Benefit-to-Cost Ratio</i>
1	\$595	\$59	10.14
2	\$155	\$59	2.64
3	\$70	\$59	1.19
4	\$85	\$59	1.45
5	\$45	\$59	0.77
6	-\$20	\$59	-0.34
7	-\$45	\$59	-0.77
8	-\$30	\$59	-0.51
9	-\$20	\$59	-0.34
10	-\$20	\$59	-0.34
11	\$135	\$59	2.30
12	\$125	\$59	2.13
13	\$75	\$59	1.28
14	\$105	\$59	1.79
15	\$5	\$59	0.09
16	\$630	\$59	10.74



Data Gaps and Additional Feedback Requested

- Additional Data Needs
- Feedback Requested

Poll

The Statewide CASE Team proposes to require that installed window SHGC matches what is modeled in the performance simulation calculation within a range of ± 0.01 . Do you find the range sufficient to allow for flexibility?

- Yes, the range is sufficient.
- No, the range is too small.
- The range is not needed, you install what you model.
- I see issues with the proposed requirement (please specify).
- I don't know.



Discussion and Next Steps

We want to hear from you!

- Provide **any last comments or feedback** on this presentation now verbally or over the GoTo Webinar Questions Pane
- More information on pre-rulemaking for the 2025 Energy Code at <https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2025-building-energy-efficiency>

Comments on this measure are due by May 31, 2023. Please send comments to info@title24stakeholders.com and copy CASE Authors (see contact info on following slide).

Thank You

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