Docket number 10-BSTD-01, Oct. 13th, 14th 2011 Workshop
Comments to the California Energy Commission by Mike Gabel on the Initial Draft Language of the 2013 Standards

Please review the following comments on the 2013 Standards draft language which are listed in the order that the relevant sections appear. If minor changes in wording are recommended, existing language is included with red underlined changes shown.
Note that these are my own comments, and do not represent either CABEC or the utilities.

Section 10-102 – DEFINITIONS.
RESIDENTIAL DATA REGISTRY is a HERS provider data registry approved by the Energy Commission [look up the reference], or other data registry approved by the Executive Director.

You probably should leave the door open to having a residential registry that replaces HERS providers, just in case it comes to that at some point.

Section 10-103 – PERMIT, CERTIFICATE, INFORMATIONAL …
(a)1.D. *Beginning on ~~January 1~~ July 1, 2015, contingent upon approval of data registry(s) by the Executive Director, all nonresidential buildings …*

I would give the Commission more time to get the Registry working, especially given the experience of the HERS registry and database.

(a)2.C. *The enforcement agency shall have the authority to require submittal of any supportive documentation that was used to generate the Certificate(s) of Compliance, including but not limited to the electronic compliance software input file used to generate the performance method Certificate(s) of Compliance submitted for permit; and shall have the authority to require submittal of any other supportive documentation that is necessary to demonstrate the building design conforms to the requirements of Part 6.*

Without the statutory requirement that the permit applicant must submit the electronic input file upon request, the CEC will never be able to fully enforce (and research the enforcement of) the standards. This is really crucial to include for future evaluation of how well energy modeling is being done; and whether, for example, CEAs are generally doing a better job than non-CEAs.

Section 10-109 – COMPLIANCE SOFTWARE, ALTERNATIVE COMPONENT PACKAGES, EXCEPTIONAL MTHODS AND DATA REGISTRIES

(c)1.D. Public Domain Computer Programs. *In addition to the present approved public domain computer programs … may be used to demonstrate that proposed building designs meet energy budgets in Part 6, providing that they also meet all requirements in (c)2.A.*

Without saying this explicitly, the proposed language leaves the door open that the public domain program need not go through the same ACM tests and review as the non-public domain programs.

Section 110.6 MANDATORY REQUIREMENTS FOR FENESTRATION PRODUCTS AND EXTERIOR DOORS

(a)2. U-factor and (a)3. SHGC. *~~EXCEPTION to Section 116(a)2 and 3.~~*

Completely eliminating the center-of-glass (COG) calculation in NA6 is, in my professional view, a serious implementation mistake. There is great uncertainty how and whether the industry using CMAST software will generate CMAST-certified values; how those values will be accessible on the NFRC web site; and how much rated nonresidential fenestration will be available to meet the 2013 prescriptive fenestration requirements. As I've expressed in previous communications, either (a) re-institute this compliance option in the standards in this section with a glazing area maximum less than 10,000 sf; or (b) add a phrase that gives the Commission flexibility to bring it back in some form as needed. For example:

U-factor. *A fenestration product's U-factor shall be rated in accordance with NFRC 100, or use the applicable default U-factor set forth in TABLE 110.6; or as set forth in an alternative calculation approved by the Executive Director.*

Section 110.10 MANDATORY REQUIREMENTS FOR SOLAR READY BUILDINGS

(a) Buildings listed below which have SOLAR ACCESS shall provide for the future installation of a solar electric or solar thermal system.

Then you need a simple but reasonably appropriate definition of SOLAR ACCESS to put in here or in the DEFINITIONS section; and you also need to edit the other language in this section to conform. For example, the 70 percent of single family homes would go away, since the builders would evaluate each lot to see if solar ready was required. The following definition is simply a possible option based on a quick Google search:

SOLAR ACCESS. The ability of sunlight to strike a solar energy system on a building property such that shadows from adjacent buildings or topological features or existing trees will not obstruct more than 10% of the sunlight available to the solar energy system between the hours of 10:00 a.m. and 2:00 p.m., Pacific Standard Time, on December 21.

Section 120.7 MANDATORY INSULATION REQUIREMENTS

Any new construction in ~~a~~ nonresidential, high-rise residential and hotel/motel buildings shall meet the minimum requirements in this Section.

(b) Wall Insulation, 2. Metal Framed. Should be **R-7.5** not R-8 insulation so that 1.5" of R-5/inch of polystyrene will work; or 1.25" of R-6.5 polyisocyanurate.

There are significant problems with alterations being forced to meet some of these requirements as my comments for 141.0(b)1 address.

Section 130.1 INDOOR LIGHTING CONTROLS THAT SHALL BE INSTALLED

(d)1.A. SKYLIT DAYLIT ZONE ..

Although the *Nonresidential Compliance Manual* will explain the definition further, the language in the standards should include some language on what happens when a skylight is mounted (a) in a sloped roof or (b) at the top of a deep light well. These are quite common, and the standards should address these scenarios directly and not leave them to the Compliance Manual.

Section 140.1 ENERGY BUDGETS

After the first sentence, add a sentence which references the Nonresidential ACM Approval Manual and ACM Manual Appendices. For example:

A building complies with the performance standard if the permit applicant uses a state-approved version of a compliance software program to demonstrate that the energy budget calculated for the Proposed Design Building under Subsection (b) is no greater than the energy budget calculated for the Standard Design Building under Subsection (a). The state-approved compliance software program must meet all applicable requirements of the Nonresidential ACM Approval Manual and ACM Manual Appendices.

Section 140.3 Nonresidential Prescriptive Envelope

(a)9. Air Barrier

Something here needs to be worded better to make clear why this prescriptive requirement is different from the mandatory measure description in 110.7(a) and (b). The current language is very confusing.

TABLE 140.3-A: Roofing Products, Low-sloped Aged Reflectance

Given the comments at the CEC hearings regarding achieving a 0.67 value with different roof types, I would recommend that the CEC goes to a 0.63 value at least for alterations (e.g., re-roofing). Just to provide a sense of the magnitude of this proposed revision, Gabel Associates has used a one-story prototype office building that it developed for a 2008 Standards reach codes cost-effectiveness study look at this. Running a special version of Energy Pro which has the 2013 Standards TVD energy multipliers and 2013 weather files, here are results in Climate Zones 12 and 16 which address the different values:

Nonresidential Low-sloped Roof Aged Reflectance Study

Description	Climate Zone	TDV Energy Kbtu/sf-yr	Reduction in TDV Energy	% Reduction in TDV Energy
Base Case 2008 Building, No Cool Roof	12	347.20	na	na
Aged Reflectance = 0.55	12	333.89	13.31	3.83%
Aged Reflectance = 0.63	12	331.64	15.56	4.48%
Aged Reflectance = 0.67	12	330.27	16.93	4.88%
Base Case 2008 Building, No Cool Roof	15	471.34	na	na
Aged Reflectance = 0.55	15	450.83	20.51	4.35%
Aged Reflectance = 0.63	15	446.93	24.41	5.18%
Aged Reflectance = 0.67	15	445.04	26.30	5.58%

Even in a one-story building, and one which meets current standards, the difference in overall TDV performance between 0.63 and 0.67 reflectance is only 0.4%. In a two-story building that will be on the order of 0.2%; and in a three story building around 0.13%. Since existing older buildings undergoing re-roofing use on the order of twice the TDV energy of 2008 new buildings, these percentages of total TDV energy reduction will be cut in half. In order to encourage the re-roofing industry to meet a more-stringent cool roof requirement than the current 0.55, perhaps ramping up to 0.63 for re-roofing moves far enough along that path with causing undue industry resistance to the standards.

TABLES 140.3-A and B: Fenestration Values

As Gary Farber has correctly pointed out, “Windows” should be listed as “Vertical Glazing”.

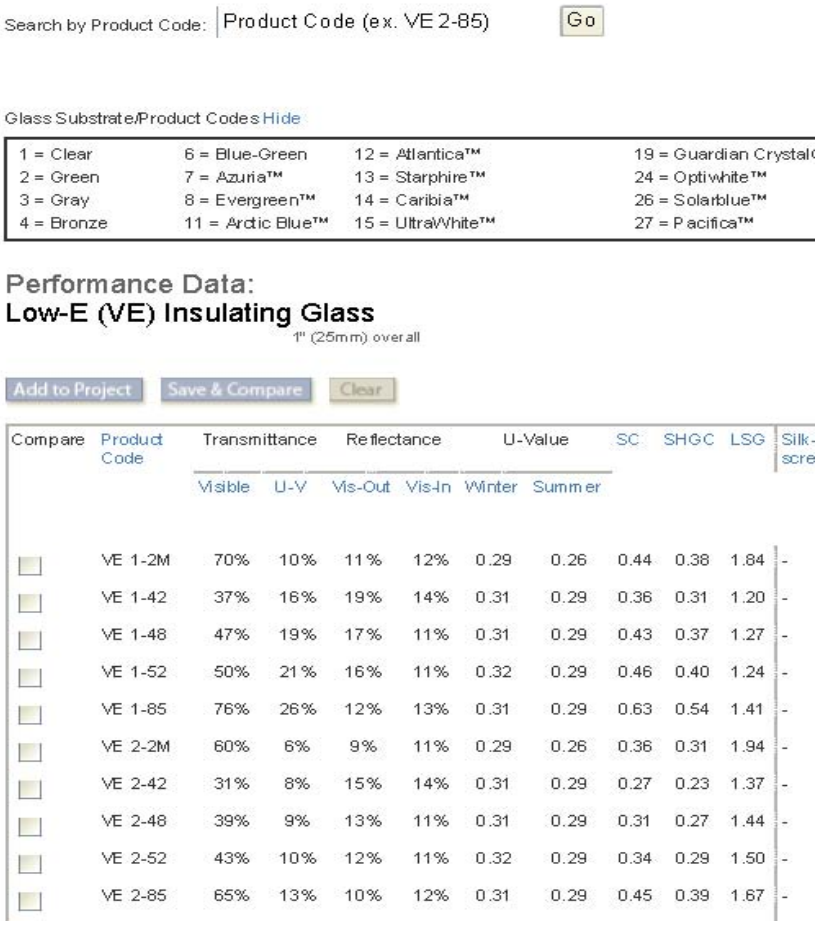
My research shows that the category called “Glazed Doors” is too broad, and should be subdivided into “Swinging Doors” and “Sliding Doors”. I cannot find any metal thermally broken sliding doors that meet the listed U-factor of 0.45, but only a value of 0.51. Is it the intention of the Commission to disallow any kind of metal sliding doors from using a prescriptive approach? If so, then the table is okay. Otherwise, for new construction:

- U-factors seem achievable with the best metal thermally broken frames.

- SHGC (“Max RSHG”) values are barely achievable with a very limited percentage of the best metal thermally broken frames, based on the research I’ve done on the NFRC web site and looking at manufacturers’ data such as that by Kawneer. More plausible prescriptive SHGC values would be to set the value to 0.27 for all these

categories, which implies a COG value of 0.27 (i.e., triple silver low-e visually clear with a high VT) and any thermally broken metal frame that does not degrade the COG value. Even this relatively minor adjustment will result in enormously better fenestration performance than current standards as the following graphics – based on the CEC draft values – illustrate (see Appendix to Gabel Comments).

- Minimum VT is good as a goal, but alone cannot completely address Effective Aperture and adequate distribution of glazing area that also matter in daylighting effectiveness. Since automatic daylighting controls will be required in Primary Sidelit Daylit Areas, the *Compliance Manual* should point out the key ingredients to good daylighting design. As a new requirement in the standards, I would not set a prescriptive Minimum VT above 40% based on a sampling of dual silver low-e glass from, for example, Viracon which could meet the SHGC with fixed shading:



Search by Product Code: Product Code (ex. VE 2-85) Go

Glass Substrate/Product Codes Hide

1 = Clear	6 = Blue-Green	12 = Atlantica™	19 = Guardian Crystal(
2 = Green	7 = Azuria™	13 = Starphire™	24 = Optiwhite™
3 = Gray	8 = Evergreen™	14 = Caribia™	26 = Solarblue™
4 = Bronze	11 = Arctic Blue™	15 = UltraWhite™	27 = Pacifica™

Performance Data:
Low-E (VE) Insulating Glass
1" (25mm) overall

Add to Project | Save & Compare | Clear

Compare	Product Code	Transmittance		Reflectance		U-Value		SC	SHGC	LSG	Silk-scre
		Visible	U-V	Vis-Out	Vis-In	Winter	Summer				
☐	VE 1-2M	70%	10%	11%	12%	0.29	0.26	0.44	0.38	1.84	-
☐	VE 1-42	37%	16%	19%	14%	0.31	0.29	0.36	0.31	1.20	-
☐	VE 1-48	47%	19%	17%	11%	0.31	0.29	0.43	0.37	1.27	-
☐	VE 1-52	50%	21%	16%	11%	0.32	0.29	0.46	0.40	1.24	-
☐	VE 1-85	76%	26%	12%	13%	0.31	0.29	0.63	0.54	1.41	-
☐	VE 2-2M	60%	6%	9%	11%	0.29	0.26	0.36	0.31	1.94	-
☐	VE 2-42	31%	8%	15%	14%	0.31	0.29	0.27	0.23	1.37	-
☐	VE 2-48	39%	9%	13%	11%	0.31	0.29	0.31	0.27	1.44	-
☐	VE 2-52	43%	10%	12%	11%	0.32	0.29	0.34	0.29	1.50	-
☐	VE 2-85	65%	13%	10%	12%	0.31	0.29	0.45	0.39	1.67	-

For example: visually clear low-e glass with a VT of 47% (e.g., VE 1-48) and a framing factor of 15% will yield an overall VT of around 40%. With enough fixed shading, it could meet an RSHG value of 0.26 or lower.

Section 141.0 Nonresidential Additions, Alterations, Repairs
(b)1 Alterations, Prescriptive Approach

There are significant problems with alterations being forced to meet some of these insulation or overall U-factor requirements. As one example: existing metal stud walls which are opened up for alterations cannot reasonably be expected to have rigid insulation added inside them. Existing windows in those walls not being replaced have an established sill width that cannot be easily modified. And how does the building owner or architect handle alterations to these types of walls in which only small scattered areas of wall are being opened up? Maybe there needs to be one or more skillfully written EXCEPTIONs which define when portions of this Section are not feasible for alterations.

(b)1.A Fenestration

There are several reasons why replacement nonresidential and high-rise residential fenestration should not be treated as exactly the same as fenestration installed in new buildings under the 2013 standards. I suggest that replacement windows be granted some slight leniency as compared with new construction values under both the prescriptive and performance approach:

(1) Building owners often only partially replace windows of an existing building because of cost or because only selected windows need to be replaced (based on location or problems with moisture, etc.) This means that replacement fenestration must match or at least not be dramatically different in appearance from existing glazing, especially in buildings where the existing architectural style is well-defined. This fact somewhat limits the choice of frame types, which in term may limit potential thermal performance.

(2) Building owners frequently choose to replace windows and not include other energy upgrade measures, partially because of the large cost. This means that there are sometimes no trade-offs that can be made (as with new construction), and the prescriptive values effectively become mandatory measures. In all climate zones, in all orientations, and for all Window Wall ratios, the 2013 fenestration standards for new construction are extremely aggressive for any metal frame windows or glass doors. They require NFRC or CMAST rated products which are likely to be very difficult for the industry to adapt to. While residential homeowners may choose to upgrade their HVAC or water heating in order to make trade-offs using a performance approach, commercial building owners may not have that option based on a pre-defined and fixed scope of work that involves only glazing replacement.

(3) With other envelope upgrades, the 2013 standards give no credit for insulating roofs, walls and floors except when they go beyond the new mandatory levels. So the historical credits for simply insulating these surfaces is going away. And there will be no Overall TDV energy method to make simple envelope trade-offs.

(4) Faced with the choice of what owners may perceive as very stringent requirements and small number of fairly costly choices, a larger percentage of owners may choose to have window replacements done without a permit, in which case very poor fenestration may be installed instead.

I recommend that replacement ("altered") fenestration meet U-factor and SHGC values 0.03 higher than the values in Section 140.3-A and 140.3-B for new construction. In the performance approach, I recommend that these values always be fixed in the Standard Design and not changed to the existing fenestration values when the Proposed fenestration meets or exceeds the prescriptive values, This is explained further in similar comments for the Residential fenestration values for Section 150.2(b). Note that this approach to Nonresidential ACM rules will make adding glass areas to existing buildings and non-compliant additions much more difficult to meet the 2013 standards than the 2008 performance rules which give a huge, discontinuous energy credit for replacement windows that meet the prescriptive values. To this point, there has been no time to carefully study the impacts of this proposed change in ACM rules on adding glazing and the impacts on additions. If staff is open to considering this, further studies can be done. My hypothesis is that, overall, this set of performance compliance rules will save more TDV energy across the full range of projects that include glazing replacements than having the 2013 standards follow the 2008 rules. *(Please be aware that this proposal has not been vetted yet by CABEC members who may be concerned about the consequences affecting certain types of alterations and additions.)*

Also discussed in comments on Section 150.2(b) is the need to correct the current ACM rules which unfairly penalize replacement windows as compared with new windows by always assuming the existing shading (overhangs, side fins) in the Standard Design. The Standard Design – just as it does in new construction – should always model the appropriate prescriptive values without any exterior shading. Then the Proposed fenestration receives any credit for fixed shading. This makes sense if, as I'm proposing, the Standard Design never sets the energy budget with the Existing glazing values.

Section 150.2 Residential Additions, Alterations, Repairs
(a)2.B EXCEPTION 1 to Section 150.2(a)2B WALL INSULATION

Leave the minimum R-value at R-11. Since these walls have to be modeled, the Commission is not giving anything away in energy efficiency. It's just that it's not cost-effective to force a permit applicant to tear out R-11 and put in R-13. So the standards would impose an unnecessary expense to meet the R-13 requirement.

(b)1.A and (b)2.B.iv Fenestration

The same basic rationale for treating replacement windows somewhat differently from new windows is outlined in the comments above on Section 141(b)1.A for nonresidential and high-rise residential buildings. Specifically, with respect to low-rise residential buildings, I recommend the following replacement fenestration values and modeling rules:

(1) As discussed previously, the ACM rules must be corrected so that the Standard Design models the appropriate fenestration values without any exterior shading for replacement windows, exactly as it's done with new construction. The current 2008 ACM rules unfairly penalize replacement windows by keeping the same overhang and side fin conditions in the Standard Design as are input for the Altered glazing. Fixed exterior shading is considered a credit in new construction, and should be for replacement windows as well. Again, this makes sense as part of my overall proposal (explained next) in which the Standard Design never sets the energy budget using the Existing glazing values.

(2) Although residential buildings are different from nonresidential buildings, many of the same reasons to have slightly more lenient prescriptive fenestration values for replacement windows make sense. In particular, homeowners who wish to upgrade only their windows and cannot easily find or don't like the choices in say Home Depot that meet the 2013 new construction prescriptive values (U=0.32 and SHGC=0.25) may instead decide to buy substantially poorer windows and have work done without a permit. This may be true for homeowners who, for aesthetic or other reasons, wish to use thermally good windows which don't happen to quite meet the 2013 values. In conjunction with new performance modeling rules that will eliminate the huge credit for meeting prescriptive values, I propose that the 2013 residential standards set the 2009 IECC values for replacement windows: U=0.35 and SHGC=0.30. (The exception would be CZs 3 and 5 with no shading requirement, as is the case with the

new construction values.) The advantage of this approach is that national window manufacturers will be supplying home supply stores with windows that meet the IECC 2009 requirements which will be taking effect in many states next year and in 2013.

(3) Finally, I propose to eliminate the 2008 and proposed 2013 modeling credit for replacement windows that meet the requisite prescriptive values. Under current performance rules, any replacement window which meets the 2008 prescriptive values (U=0.40, SHGC=0.40) is compared to the Standard Design which then models the Existing glazing values (e.g., single pane wood U=0.99, SHGC=0.76). This allows the permit applicant to gain a sudden, large and discontinuous energy credit that can be used to add a lot more glazing to the existing house, and/or get a significantly non-compliant addition to meet the standards with the Existing+Addition +Alteration modeling approach. My recommendation is that this credit goes away, and the Standard Design always puts the U=0.35 and SHGC=0.30 values in with no exterior shading for all replacement window areas.

The obvious question then is: what is the impact of these combined recommendations with the 2013 standards? To answer this, I ran a case study of an existing house in Climate Zones 12, 15 and 3 to illustrate effects in a valley cooling climate, a desert climate and a coastal climate.

Case Study

An 1,800 square foot, existing one-story house (30' x 60') has a total of 20% glazing equally distributed on all four orientations. The house has an R-11 attic, R-0 walls, slab-on-grade in CZ12 and 15 and R-0 raised floor in CZ3. A existing windows are single wood operable.

A current version of Energy Pro (v.5.1.5.6), which has the ability to use the 2013 standards TDV energy multipliers and 2013 weather files, is used to model the existing house conditions; and then is used to run a series of replacement window options:

(a) Generic, dual pane wood frame windows: U=0.58, SHGC=0.65.
(b) 2008 standards windows: U=0.40, SHGC=0.40
(c) 2013 standards windows: U=0.32, SHGC=0.25
(d) IECC standards windows: U=0.35, SHGC=0.30

The first set of runs includes no overhangs to shade the windows. The second set of runs assume a 60 degree cut-off angle overhang on all existing windows. Results are as follows:

2013 Residential Standards Fenestration Replacement Study on an Existing House

Note 1: All TDV energy use is based on the 2013 TDV multipliers and 2013 weather files
Note 2: The Standard Design of Altered fenestration has no fixed shading to be consistent with same rules for New fenestration;
Note 3: Same shading assumption as Note 2; and the rule that the proposed glazing which meets or exceeds the the prescriptive values does not set the Standard Design glazing values to the Existing fenestration values.

1A. Base Case: Fenestration Only, No Overhangs Replacement Fenestration Run Description	CZ	Run Name	TDV Energy (kBtu/sf-yr)	TDV Energy Reduction (kBtu/sf-yr)	% Reduction TDV Energy	% Compliance Margin vs. 2008 Std. Design	% Compliance Margin vs. CEC's 2013 Std. Design	% Compliance Margin vs. Modified CEC 2013 Std. Design[2]	% Compliance Margin vs. IECC 2009 as 2013 Std. Design[3]
(Existing) Single Wood Windows: U=0.99, SHGC=0.74	12	CZ12_1A_0	187.66	n/a	n/a	-23%	-33%	-33%	-29%
Default Dual Non-Metal: U=0.58, SHGC=0.65	12	CZ12_1A_1	171.25	16.41	9%	-13%	-21%	-21%	-18%
2008 Stds values: U=0.40, SHGC=0.40	12	CZ12_1A_2	152.17	35.49	19%	19%	-8%	-8%	-5%
2013 Stds values: U=0.32, SHGC=0.25	12	CZ12_1A_3	141.51	46.15	25%	25%	25%	25%	3%
IECC 2009 values: U=0.35, SHGC=0.30	12	CZ12_1A_4	145.20	42.46	23%	23%	-3%	-3%	0%
(Existing) Single Wood Windows: U=0.99, SHGC=0.74	15	CZ15_1A_0	273.38	n/a	n/a	-23%	-34%	-34%	-30%
Default Dual Non-Metal: U=0.58, SHGC=0.65	15	CZ15_1A_1	252.07	21.31	8%	-14%	-24%	-24%	-20%
2008 Stds values: U=0.40, SHGC=0.40	15	CZ15_1A_2	221.54	51.84	19%	19%	-9%	-9%	-5%
2013 Stds values: U=0.32, SHGC=0.25	15	CZ15_1A_3	204.10	69.28	25%	25%	25%	25%	3%
IECC 2009 values: U=0.35, SHGC=0.30	15	CZ15_1A_4	210.04	63.34	23%	23%	-3%	-3%	0%
(Existing) Single Wood Windows: U=0.99, SHGC=0.74	3	CZ3_1A_0	117.30	n/a	n/a	-17%	-20%	-20%	-18%
Default Dual Non-Metal: U=0.58, SHGC=0.65	3	CZ3_1A_1	105.45	11.85	10%	-5%	-8%	-8%	-7%
2008 Stds values: U=0.40, SHGC=0.76	3	CZ3_1A_2	100.56	16.74	14%	14%	-3%	-3%	-2%
2013 Stds values: U=0.32, SHGC=0.76	3	CZ3_1A_3	97.99	19.31	16%	16%	16%	16%	1%
Modified IECC values: U=0.35, SHGC=0.76	3	CZ3_1A_4	99.00	18.30	16%	16%	-1%	-1%	0%
U=0.35, SHGC=0.30	3	CZ3_1A_5	97.35	19.95	17%	17%	1%	1%	2%

Values in **red type** indicate a large credit and discontinuity by meeting prescriptive values; and this credit can be used for large increases in glazing areas and non-compliant additions (with the E+A+A approach). Values in **green type** show recommended ACM rules will not provide this unwarranted credit.

2A. Base Case: Fenestration Only, w/ 60° Cutoff Angle Overhangs Replacement Fenestration Run Description	CZ	Run Name	TDV Energy (kBtu/sf-yr)	TDV Energy Reduction (kBtu/sf-yr)	% Reduction TDV Energy	% Compliance Margin vs. 2008 Std. Design	% Compliance Margin vs. CEC's 2013 Std. Design	% Compliance Margin vs. Modified CEC 2013 Std. Design[2]	% Compliance Margin vs. IECC 2009 as 2013 Std. Design[3]
(Existing) Single Wood Windows: U=0.99, SHGC=0.74	12	CZ12_2A_0	174.79	n/a	n/a	-22%	-29%	-24%	-20%
Default Dual Non-Metal: U=0.58, SHGC=0.65	12	CZ12_2A_1	158.27	16.52	9%	-10%	-16%	-12%	-9%
2008 Stds values: U=0.40, SHGC=0.40	12	CZ12_2A_2	143.50	31.29	18%	18%	-6%	-1%	1%
2013 Stds values: U=0.32, SHGC=0.25	12	CZ12_2A_3	135.90	38.89	22%	22%	22%	28%	6%
IECC 2009 values: U=0.35, SHGC=0.30	12	CZ12_2A_4	138.58	36.21	21%	21%	-2%	2%	5%
(Existing) Single Wood Windows: U=0.99, SHGC=0.74	15	CZ15_2A_0	250.22	n/a	n/a	-20%	-27%	-23%	-19%
Default Dual Non-Metal: U=0.58, SHGC=0.65	15	CZ15_2A_1	230.70	19.52	8%	-11%	-18%	-13%	-10%
2008 Stds values: U=0.40, SHGC=0.40	15	CZ15_2A_2	208.62	41.60	17%	17%	-6%	-2%	1%
2013 Stds values: U=0.32, SHGC=0.25	15	CZ15_2A_3	196.26	53.96	22%	22%	22%	28%	7%
IECC 2009 values: U=0.35, SHGC=0.30	15	CZ15_2A_4	200.53	49.69	20%	20%	-2%	2%	5%
(Existing) Single Wood Windows: U=0.99, SHGC=0.74	3	CZ3_2A_0	113.38	n/a	n/a	-21%	-25%	-16%	-15%
Default Dual Non-Metal: U=0.58, SHGC=0.65	3	CZ3_2A_1	101.60	11.78	10%	-9%	-12%	-4%	-3%
2008 Stds values: U=0.40, SHGC=0.76	3	CZ3_2A_2	93.51	19.87	18%	18%	-3%	5%	6%
2013 Stds values: U=0.32, SHGC=0.76	3	CZ3_2A_3	90.63	22.75	20%	20%	20%	23%	8%
Modified IECC values: U=0.35, SHGC=0.76	3	CZ3_2A_4	91.77	21.61	19%	19%	-1%	6%	7%
IECC 2009 values: U=0.35, SHGC=0.30	3	CZ3_2A_5	97.33	16.05	14%	14%	-7%	1%	2%

Values in red type indicate a large credit and discontinuity by meeting prescriptive values; and this credit can be used for large increases in glazing areas and non-compliant additions (with the E+A+A approach). Values in green type show recommended ACM rules will not provide this unwarranted credit.

1B. Base Case: Fenestration and Upgrade Roof/Wall Insulation, No Overhangs Replacement Fenestration Run Description	CZ	Run Name	TDV Energy (kBtu/sf-yr)	TDV Energy Reduction (kBtu/sf-yr)	% Reduction TDV Energy	% Compliance Margin vs. 2008 Std. Design	% Compliance Margin vs. CEC's 2013 Std. Design	% Compliance Margin vs. Modified CEC 2013 Std. Design[2]	% Compliance Margin vs. IECC 2009 as 2013 Std. Design[3]
(Existing) Single Wood Windows: U=0.99, SHGC=0.74	12	CZ12_1B_0	153.42	n/a	n/a	-1%	-55%	-55%	-48%
Default Dual Non-Metal: U=0.58, SHGC=0.65	12	CZ12_1B_1	134.32	19.10	12%	12%	-36%	-36%	-30%
2008 Stds values: U=0.40, SHGC=0.40	12	CZ12_1B_2	112.36	41.06	27%	40%	-14%	-14%	-8%
2013 Stds values: U=0.32, SHGC=0.25	12	CZ12_1B_3	98.96	54.46	35%	47%	35%	35%	5%
IECC 2009 values: U=0.35, SHGC=0.30	12	CZ12_1B_4	103.69	49.73	32%	45%	-5%	-5%	0%
(Existing) Single Wood Windows: U=0.99, SHGC=0.74	15	CZ15_1B_0	229.64	n/a	n/a	-4%	-51%	-51%	-38%
Default Dual Non-Metal: U=0.58, SHGC=0.65	15	CZ15_1B_1	208.06	21.58	9%	6%	-37%	-37%	-25%
2008 Stds values: U=0.40, SHGC=0.40	15	CZ15_1B_2	178.13	51.51	22%	35%	-17%	-17%	-7%
2013 Stds values: U=0.32, SHGC=0.25	15	CZ15_1B_3	152.38	77.26	34%	44%	34%	34%	8%
IECC 2009 values: U=0.35, SHGC=0.30	15	CZ15_1B_4	166.39	63.25	28%	39%	-9%	-9%	0%
(Existing) Single Wood Windows: U=0.99, SHGC=0.74	3	CZ3_1B_0	94.20	n/a	n/a	6%	-26%	-26%	-24%
Default Dual Non-Metal: U=0.58, SHGC=0.65	3	CZ3_1B_1	81.23	12.97	14%	19%	-9%	-9%	-7%
2008 Stds values: U=0.40, SHGC=0.76	3	CZ3_1B_2	77.33	16.87	18%	23%	-3%	-3%	-2%
2013 Stds values: U=0.32, SHGC=0.76	3	CZ3_1B_3	74.83	19.37	21%	36%	21%	21%	1%
Modified IECC values: U=0.35, SHGC=0.76	3	CZ3_1B_4	75.73	18.47	20%	35%	-1%	-1%	0%
IECC 2009 values: U=0.35, SHGC=0.30	3	CZ3_1B_5	71.42	22.78	24%	39%	5%	5%	6%

Values in red type indicate a large credit and discontinuity by meeting prescriptive values; and this credit can be used for large increases in glazing areas and non-compliant additions (with the E+A+A approach). Values in green type show recommended ACM rules will not provide this unwarranted credit.

2B. Base Case: Fenestration and Upgrade Roof/Wall Insulation, w/ 60° Cutoff Angle Overhangs Replacement Fenestration Run Description	CZ	Run Name	TDV Energy (kBtu/sf-yr)	TDV Energy Reduction (kBtu/sf-yr)	% Reduction TDV Energy	% Compliance Margin vs. 2008 Std. Design	% Compliance Margin vs. CEC's 2013 Std. Design	% Compliance Margin vs. Modified CEC 2013 Std. Design[2]	% Compliance Margin vs. IECC 2009 as 2013 Std. Design[3]
(Existing) Single Wood Windows: U=0.99, SHGC=0.74	12	CZ12_2B_0	137.89	n/a	n/a	4%	-51%	-39%	-33%
Default Dual Non-Metal: U=0.58, SHGC=0.65	12	CZ12_2B_1	118.75	19.14	14%	17%	-30%	-20%	-15%
2008 Stds values: U=0.40, SHGC=0.40	12	CZ12_2B_2	100.99	36.90	27%	42%	-10%	-2%	3%
2013 Stds values: U=0.32, SHGC=0.25	12	CZ12_2B_3	91.41	46.48	34%	48%	34%	40%	12%
IECC 2009 values: U=0.35, SHGC=0.30	12	CZ12_2B_4	94.71	43.18	31%	46%	-4%	4%	9%
(Existing) Single Wood Windows: U=0.99, SHGC=0.74	15	CZ15_2B_0	205.89	n/a	n/a	1%	-35%	-35%	-24%
Default Dual Non-Metal: U=0.58, SHGC=0.65	15	CZ15_2B_1	187.36	18.53	9%	10%	-23%	-23%	-13%
2008 Stds values: U=0.40, SHGC=0.40	15	CZ15_2B_2	164.79	41.10	20%	34%	-8%	-8%	1%
2013 Stds values: U=0.32, SHGC=0.25	15	CZ15_2B_3	152.38	53.51	26%	39%	26%	34%	8%
IECC 2009 values: U=0.35, SHGC=0.30	15	CZ15_2B_4	156.67	49.22	24%	37%	-3%	-3%	6%
(Existing) Single Wood Windows: U=0.99, SHGC=0.74	3	CZ3_2B_0	88.76	n/a	n/a	5%	-35%	-19%	-24%
Default Dual Non-Metal: U=0.58, SHGC=0.65	3	CZ3_2B_1	75.91	12.85	14%	19%	-16%	-1%	-6%
2008 Stds values: U=0.40, SHGC=0.76	3	CZ3_2B_2	68.67	20.09	23%	27%	-5%	8%	4%
2013 Stds values: U=0.32, SHGC=0.76	3	CZ3_2B_3	65.66	23.10	26%	42%	26%	30%	8%
Modified IECC values: U=0.35, SHGC=0.76	3	CZ3_2B_4	66.81	21.95	25%	41%	-2%	11%	6%
IECC 2009 values: U=0.35, SHGC=0.30	3	CZ3_2B_5	71.66	17.10	19%	37%	-9%	4%	0%

Values in **red type** indicate a large credit and discontinuity by meeting prescriptive values; and this credit can be used for large increases in glazing areas and non-compliant additions (with the E+A+A approach). Values in **green type** show recommended ACM rules will not provide this unwarranted credit.

Analysis

The **% Compliance Margin vs. 2008 Std. Design** shows how that scenario compares to the current standards. In the tables labeled “1B” and “2B” those can be positive for Default Dual Non-Metal windows since there is credit for insulating walls and attic as part of the remodel. Note the huge compliance margin once the 2008 prescriptive glazing values are met. This margin can be traded against large increases in glazing and/or non-compliant additions.

The **% Compliance Margin vs. 2013 Std. Design** shows the impact of retaining the same exact same logic to the 2013 Residential ACM rules as the current 2008 ACM rules. Note that the sudden large energy compliance margin occurs with the new 2013 requirements of U=0.32 and SHGC=0.25.

The **% Compliance Margin vs. Modified 2013 Std. Design** illustrates what happens when the only change to the previous column is having the Standard Design model replacement window area with no existing overhangs or side fins, just as it sets the budget for new windows.

The **% Compliance Margin vs. IECC 2009 Std. Design** illustrates a combination of (a) the Standard Design setting replacement fenestration values without modeling any existing overhangs and side fins ; (b) IECC 2009 values of U=0.35 and SHGC=0.30 to set the budget in the Standard Design; and (c) the Standard Design never setting the energy budget with the Existing glazing values, even if the proposed replacement fenestration meets the prescriptive requirements.

While it is true that the IECC 2009 values indicate a 1% to 3% increase in TDV energy as compared with the 2013 new fenestration values (depending on climate zone and fixed shading), the overall reduction in compliance margin once the prescriptive values are met is in the range of 15% to 30%. The truth is that glazing performance exists on a continuum; and like almost every other type of energy measure that operates along a continuous curve (fixed shading, nonresidential lighting, equipment efficiencies), it should be credited or penalized accordingly within the Existing+Alteration+Addition calculation. I am suggesting that much greater overall TDV energy savings can be gained across a wider range of residential alterations and additions by a slight leniency on prescriptive replacement windows combined with the other change in rules outlined above than in maintaining the 2008 Residential ACM rules extended to the 20013 standards.

The Commission has already decided to change the alteration modeling rules for upgrading insulation in roofs, walls and raised floors to eliminate credit against the existing house conditions unless the mandatory insulation levels are exceeded. It is already a major paradigm shift from the history of the residential standards. So perhaps the time has come to do the same with glazing, with just adding the fixed shading credit and somewhat reduced requirements for replacement windows. If staff is willing to consider this, I am willing to put together a quick study which might illustrate whether this whole proposed rule set will make it unfairly difficult for permit applicants to get a large increase in glazing area and/or non-compliant additions to meet 2013 code.

If CEC Staff will consider this for the Residential standards, I would recommend taking the same general approach for the Nonresidential standards as well.

Appendix:
CEC's Proposed 2013 Fenestration vs. 2008 Standards

2013 Fenestration Proposal vs. 2008 Standards

NONRESIDENTIAL BUILDINGS:

Non-North Fenestration RSHG Values

Climate Zone(s)	WWR	2008 Stds RSHG	Proposed 2013 Standards: Fixed RSHG	Operable RSHG	Curtainwall RSHG	Glazed Doors RSHG
1, 16	0 - 9.99%	**0.49**	0.25	0.22	0.26	0.23
	10 - 19.99%	**0.43**	0.25	0.22	0.26	0.23
	20 - 29.99%	**0.43**	0.25	0.22	0.26	0.23
	30% +	**0.43**	0.25	0.22	0.26	0.23
2, 10 - 15	0 - 9.99%	**0.47**	0.25	0.22	0.26	0.23
	10 - 19.99%	**0.36**	0.25	0.22	0.26	0.23
	20 - 29.99%	**0.36**	0.25	0.22	0.26	0.23
	30% +	**0.31**	0.25	0.22	0.26	0.23
3, 4, 5	0 - 9.99%	**0.61**	0.25	0.22	0.26	0.23
	10 - 19.99%	**0.55**	0.25	0.22	0.26	0.23
	20 - 29.99%	**0.41**	0.25	0.22	0.26	0.23
	30% +	**0.41**	0.25	0.22	0.26	0.23
6, 7, 8, 9	0 - 9.99%	**0.61**	0.25	0.22	0.26	0.23
	10 - 19.99%	**0.61**	0.25	0.22	0.26	0.23
	20 - 29.99%	**0.39**	0.25	0.22	0.26	0.23
	30% +	**0.34**	0.25	0.22	0.26	0.23

Value same as 2008 Standards
Value < 2008 Stds by < 0.10
Value < 2008 Stds by 0.10 or more

NONRESIDENTIAL BUILDINGS:

Fenestration U-factors

Climate Zone(s)	Type	2008 Stds U-factor	Proposed 2013 Standards: Fixed U-factor	Operable U-factor	Curtainwall U-factor	Glazed Doors U-factor
1, 2	Windows	**0.47**	0.36	0.47	0.41	
	Sliding Doors	**0.50**				0.45
	Swinging Doors	**0.70**				0.45
3 - 9	Windows	**0.77**	0.36	0.47	0.41	
	Sliding Doors	**0.70**				0.45
	Swinging Doors	**1.45**				0.45
10 - 16	Windows	**0.47**	0.36	0.47	0.41	
	Sliding Doors	**0.70**				0.45
	Swinging Doors	**1.45**				0.45

HIGH-RISE RESIDENTIAL BUILDINGS:

Non-North Fenestration RSHG Values

Climate Zone(s)	WWR	2008 Stds RSHG	Proposed 2013 Standards			
			Fixed RSHG	Operable RSHG	Curtainwall RSHG	Glazed Doors RSHG
1, 16	0 - 9.99%	**0.46**	0.25	0.22	0.26	0.23
	10 - 19.99%	**0.46**	0.25	0.22	0.26	0.23
	20 - 29.99%	**0.36**	0.25	0.22	0.26	0.23
	30% +	**0.30**	0.25	0.22	0.26	0.23
2, 10 - 13	0 - 9.99%	**0.36**	0.25	0.22	0.26	0.23
	10 - 19.99%	**0.36**	0.25	0.22	0.26	0.23
	20 - 29.99%	**0.31**	0.25	0.22	0.26	0.23
	30% +	**0.26**	0.25	0.22	0.26	0.23
3, 4, 5	0 - 9.99%	**0.41**	0.25	0.22	0.26	0.23
	10 - 19.99%	**0.40**	0.25	0.22	0.26	0.23
	20 - 29.99%	**0.31**	0.25	0.22	0.26	0.23
	30% +	**0.26**	0.25	0.22	0.26	0.23
6, 7, 8, 9	0 - 9.99%	**0.47**	0.25	0.22	0.26	0.23
	10 - 19.99%	**0.40**	0.25	0.22	0.26	0.23
	20 - 29.99%	**0.36**	0.25	0.22	0.26	0.23
	30% +	**0.31**	0.25	0.22	0.26	0.23
14, 15	0 - 9.99%	**0.36**	0.25	0.22	0.26	0.23
	10 - 19.99%	**0.31**	0.25	0.22	0.26	0.23
	20 - 29.99%	**0.26**	0.25	0.22	0.26	0.23
	30% +	**0.26**	0.25	0.22	0.26	0.23

Value same as 2008 Standards

Value < 2008 Stds by < 0.10

Value < 2008 Stds by 0.10 or more

HIGH-RISE RESIDENTIAL BUILDINGS:

Fenestration U-factors

Climate Zone(s)	Type	2008 Stds U-factor	Proposed 2013 Standards			
			Fixed U-factor	Operable U-factor	Curtainwall U-factor	Glazed Doors U-factor
1, 2	Windows	**0.47**	0.36	0.45	0.40	
	Sliding Doors	**0.50**				0.45
	Swinging Doors	**0.70**				0.45
3 - 9, 10 - 16	Windows	**0.47**	0.36	0.45	0.41	
	Sliding Doors	**0.70**				0.45
	Swinging Doors	**1.45**				0.45