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Additional submitted attachment is included below.

California Energy Commission Docket 19-BSTD-03

2022 Energy Code Pre-Rulemaking

March 9, 2019

Comments on Proposed Changes to Fenestration in the Pre-rulemaking Draft of the Express Terms for the 2022 Update to the California Energy Code.

Thank you for the opportunity to submit comments on the draft proposed changes (as filed in the docket on February 22, 2021) to the 2022 Energy Code related to fenestration. I have offered comments previously on fenestration issues in this docket and in previous code cycles. With my review of the current draft, I have attempted to narrow my comments and recommendations at this point to certain key issues. As a result, I offer the following separate recommendations on fenestration in multifamily and in non-residential buildings.

I. Fenestration in Multifamily Buildings

The most important proposed change related to fenestration in multifamily buildings is the proposal to divide vertical fenestration products into three categories – "Curtain Wall or Storefront", "NAFS 2017 Performance Class AW" and "All Other Fenestration." (See Table 170.2-A at page 461 in the pdf.) Simplifying the performance requirements and establishing the same requirements (such as U-factor and SHGC) for fenestration no matter the height of the building is an important objective. That said, it should be noted at the outset that I don't think the proposal goes far enough – I think it would be better to have one set of prescriptive values for all fenestration rather than carving out two additional categories that amount to exceptions with weaker requirements – specifically Class AW and Curtain Wall or Storefront.

However, I do not intend to re-plow that ground here. Instead, my comments are focused on how to best make this new approach work. Since there has traditionally been a Curtain Wall or Storefront category for high-rise buildings in California, of greater concern is how to best ensure that the new Class AW category, where the values are substantially weaker than All Other Fenestration, is limited only to those windows that actually qualify as AW and where AW structural performance is necessary and outweighs the negative effects of reduced energy performance. For example, Class AW is permitted U-factors as high as 0.40 depending on the climate zone compared with as low as a 0.30 maximum U-factor for All Other Fenestration.

A. Certification and Labeling By An Independent Agency Should Be Required To Qualify As Class AW

If a category with reduced stringency is established, such as Class AW, it is extremely important to be sure that the window taking advantage of the reduced requirements actually qualifies for the special treatment. Otherwise, energy performance will be lost unnecessarily. In other words, there needs to be reasonable proof that a window claimed to be Class AW is actually a Class AW window. In this regard, the proposed code language takes the first step by requiring

that Class AW status for windows in new buildings be "certified" (see footnote 5 to Table 170.2-A on page 463 in the pdf).

I strongly support this certification requirement but think that it does not go far enough. In my view, the language should be modified to explicitly require labeling as well (it is possible that the requirement to be "certified" would include labeling, but it is better to be clear) and that the certification and labeling be under the supervision of an independent certification agency (similar to the requirement for an NFRC performance rating). By requiring independent certification and labeling, this approach would provide a boost to compliance and enforcement by simplifying the task of the code official to determine compliance as well as increase the likelihood that the window actually is a Class AW window and meets the requirements for such classification.

In this regard, I suggest the following modified language for the footnote:

> 5. To qualify as Class AW, product must be certified and labeled to meet the North American Fenestration Standard/Specification for an Architectural Window (AW) by an accredited independent certification agency.

I strongly recommend that a similar footnote be inserted for Class AW windows (both Fixed and Operable) in Table 180.2-A for alterations; my assumption is that a Class AW certification footnote was inadvertently omitted. (see page 516 in the pdf.)

Further, I think that ideally the window should only qualify for the Class AW exception if the architect/engineer actually specifies a Class AW window or the window is required to be Class AW in order to meet the requirements of the building code. This way, a Class AW designation would not serve to allow weaker efficiency where another more efficient window could be used.

B. Certain Exceptions to Fenestration Requirements Are Unnecessary and Can Be Eliminated

In creating the Multifamily chapter, the following exceptions appear to have been carried over that are unnecessary, reduce energy efficiency, and/or undermine compliance and enforcement and should be eliminated:

(1) EXCEPTION 3 to Section 170.2(a)3Aii (page 456 in the pdf): this exception for site-built fenestration in dwelling units permits use of default values from Appendix NA6 instead of requiring NFRC-certified actual performance values or the standard code default values. This exception is an open-ended invitation for site-built fenestration products in multifamily building dwelling units to avoid requirements for NFRC rating and labeling of performance values (or limited default values) by permitting use of values from the Nonresidential Reference Appendix NA6 instead. It should be noted that the draft Express Terms already

completely eliminate the more limited site-built exception in the nonresidential requirements that currently allows using Appendix NA6 for vertical fenestration for up to 200 square feet of glazing. By contrast, this exception as proposed for multifamily is currently unlimited – it should at least be limited consistent with current nonresidential fenestration requirements (if not eliminated, the exception should at least be limited to no more than 200 square feet of glazing in any building and be limited to buildings above 3 stories).

(2) **EXCEPTION 1 to Section 170.2(a)3Aiiib (page 456 in the pdf): this exception permits up to an excessive 0.56 RSHGC value, more than double the standard prescriptive level, in certain situations.** The basis for this exception is unclear. This provision appears to predate current widespread, cost-effective availability of low solar gain glass. We are not aware of any good reason why the standard RSHGC requirements should not apply in the cases set forth in this exception. There is no apparent need for such an RSHGC exception for multifamily buildings, regardless of overhang restrictions or first story display perimeters.

(3) **EXCEPTION 1 to Section 180.2(b)1Ci (page 515 in the pdf): this exception from RSHGC and/or VT requirements applies when 150 sq. ft. or less of existing fenestration is replaced.** This exception would unnecessarily exempt many replacement window projects from the requirements for efficient windows. There is no good reason for this exception, which can be expected to result in substantially higher energy use, higher peak demand, larger HVAC systems and less comfortable homes. Since windows last for many years, it is important to fully capture improved efficiency when windows are replaced. The square footage limits may also provide an unintended incentive to replace fewer windows at one time. This exception should be eliminated or at least substantially reduced in terms of square feet (maybe down to 50 square feet or less like Exception 1 to Section 180.2(b)1Cii on page 515 in the pdf).

C. SHGC Instead of RSHGC Should Be Specified for Multifamily Fenestration

The draft code proposes to adopt RSHGC for multifamily prescriptive compliance. I recommend specifying SHGC instead. The use of RSHGC as the compliance metric for all multifamily buildings allows use of a weaker SHGC in the prescriptive compliance path by taking into account certain shading effects in the RSHGC calculation. This approach does not seem to benefit energy efficiency and runs counter to ease of compliance and enforcement. The straightforward approach of simply reading the SHGC values from the NFRC or default label to determine compliance would be a better option. Permitting the use of RSHGC of each fenestration product for compliance could result in numerous measurements and calculations for, at best, no additional efficiency or energy savings (since the benefit of the overhang is offset by a higher SHGC) and at worst, less efficiency (where the overhang would have been installed anyway along with the lower SHGC or where the RSGHC is calculated inaccurately).

Use of an RSHGC may be particularly problematic for builders of low-rise multifamily housing who may never have had to deal with the complication of RSHGC calculations in the past. Those who specifically want to design the building for such shading and to take credit for such a design should be directed to a more accurate option -- performance-based compliance where shading can be properly incorporated. (Note that a similar argument can be made to use SHGC for nonresidential too, but at least in that case, there is experience with RSHGC.)

II. Fenestration in Nonresidential Buildings

My recommendations on nonresidential buildings center on simplifying code requirements and maintaining relatively uniform efficient values, while seeking to be consistent to the degree possible with the approach in the national model nonresidential building energy codes (the IECC and ASHRAE Standard 90.1). For example, the current energy code establishes the same set of prescriptive nonresidential fenestration requirements statewide without regard to climate zone. This is an important and valuable innovation and feature in the current energy code. I strongly favor continuing uniform U-factors and SHGCs to the degree possible just as in the current energy code. This approach will reduce costs through economies of scale, save energy and improve compliance and enforcement.

Beyond the general concept of retaining and enhancing uniform statewide requirements, the following specific refinements would improve the prescriptive fenestration values for nonresidential buildings in the draft code (see Table 140.3-B on pages 234-235 in the pdf).

A. Combine the Categories of "Curtainwall or Storefront" and "Fixed Window" into a Single "Fixed Window" Category

A reasonable approach to significantly improve the performance of fenestration in nonresidential buildings would be to treat "Curtainwall or Storefront" fenestration the same as other Fixed Window products (the proposed Fixed Window values are more stringent than Curtainwall or Storefront). In both ASHRAE 90.1 and the IECC, curtainwall/storefront glazing is not a separate category but is instead required to meet the same U-factor and SHGC as other fixed fenestration. By combining the products into one category, the choice of the type of vertical fixed fenestration product would no longer impact the overall energy usage permitted under the code.

B. Establish 0.23 Maximum RSHGC/SHGC Prescriptive Value for All Vertical Fenestration

The proposed RSHGC/SHGC values would be improved by setting one RSHGC /SHGC area weighted average prescriptive value for all vertical fenestration types used in a building. Given how close the values are among the categories, there is simply no good reason for different RSHGCs/SHGCs by product type (the values are typically all met by the same types of glazing). A reasonable approach would be to adopt the same 0.23 SHGC approved last cycle for

residential fenestration for all vertical non-residential fenestration, including fixed and operable fenestration and curtainwall. This simplification will also reduce confusion and improve enforcement.

C. Establish 0.32 Minimum VT Prescriptive Value for All Vertical Fenestration

The proposed minimum VT values can be improved and simplified by setting one weighted average VT value of 0.32 (the current Operable value) for all vertical fenestration (Fixed, Operable, and Curtain wall/Storefront). While tightening RSHGC/SHGC requirements can produce significant energy and peak savings, it is important to realistically adjust minimum VT downward concurrently with SHGC reductions or reasonable products to achieve lower SHGC will be blocked by the minimum VT requirement.

Minimum VT and maximum SHGC are connected. Lower SHGC products block more transmittance of light, which also reduces VT (yet there is no proposal to adjust the maximum VT in the draft along with the proposed SGHC reductions). In other words, any significant reduction to SHGC should be accompanied by an appropriate reduction to VT. It should also be recognized that the SHGC levels currently specified in the energy code already maximize control of solar gain for the most part from the non-visible light portion of the spectrum; as a result, any further reductions in SHGC will have to come mostly from the visible light part of the spectrum resulting in a disproportionate reduction in VT.

The need for a corresponding reduction in VT to go along with a lower SHGC for Fixed windows is illustrated by current prescriptive Operable Window requirements. Such windows must meet a maximum 0.22 SHGC and a minimum 0.32 VT. Note that the Operable SHGC is only 0.03 lower than the current 0.25 SHGC for Fixed windows, but the VT is 0.10 lower than the current 0.42 VT for Fixed windows. Given the proposal to lower current Fixed window SHGC requirements in certain climate zones to 0.22 (the same as Operable), it is reasonable to lower the minimum VT for Fixed windows to 0.32.

Thank you again for the opportunity to offer these views.

Respectfully submitted,

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