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California Energy Commission
Dockets Office, MS-4
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Via email: [docket@energy.ca.gov]

Attn: Mazi Shirakh

SUBJECT: Docket number: 14-BTSD-01 Spray Polyurethane Foam Alliance (SPFA) Comments to the 2016 Standards Pre-Rulemaking

To Whom It May Concern,

The SPFA Title 24 Task Force is sending this letter to provide public comment for the Staff Workshop on Proposed Energy Efficiency Measures for Residential Buildings (2016).

SPFA was formed in 1987 to provide unified and consistent voice for contractors, consultants, formulators and suppliers of spray polyurethane foam (SPF) insulation and roofing systems. SPF systems provide a high value insulation and air sealing solution for improving energy efficiency for all buildings in California. In addition, the skilled labor required to install it means high-paying, sustainable jobs in the state.

SPFA appreciates the opportunity to contribute to the development of new and updated Title 24 Building Energy Standards for 2016, and we believe that SPF can play a significant role in helping California's residential buildings meet the State's energy efficiency goals. Our primary concerns are in regard to the way that SPF is modeled within the approved building energy simulation software, when using the Alternative Calculation Method (ACM). The following are four areas of concern:

1. MODELED SAVINGS FOR UNVENTED HIGH PERFORMANCE ATTICS VS. VENTED HIGH PERFORMANCE ATTICS

The authors of the Draft 2016 High Performance Attics (HPA)/Ducts in Conditioned Space (DCS) Codes and Standards Enhancement (CASE) Initiative analyzed several different approaches to HPAs. The CBECC-res software team made it possible to model an unvented attic by providing a "research version" of CBECC-res to the CASE team. It should be noted that while it is possible to construct an unvented, insulated attic without the use of Spray Polyurethane Foam (SPF), SPF attics are by far the most common type of unvented attics constructed today, and the two terms are used almost interchangeably.

The results of the CASE analysis show unvented attics offering lower savings potential than either vented attics with below-deck or vented attics with above-deck insulation—a statewide average of 8.6% to 9.9% to 10.6%, respectively. This is counter to the experience of the SPFA in real-world settings, and appears to be largely due to the modeling assumptions used in CBECC-res. Failure to correct the way that unvented attics modeled in CA compliance software will put SPF at an undeserved market disadvantage as builders use compliance runs to choose materials and techniques to meet the proposed standards.

According to the report (page 93), "….utilizing unvented attics to house ducts and equipment in conditioned space did not perform as well as choosing DCS strategies with vented attics. Even with R-38 at the roof line of an unvented attic, the weighted statewide savings (at 8.6%) performs inferior *[sic]* to the case of 'ducts entirely in conditioned space' for the vented attic (with no verification)." The CBECC-res team identified several key reasons for this, including that "The software assumes the overall leakage from the house is the same regardless of whether the attic is vented or unvented."

The report explains this assumption by claiming; "Since most attic leaks occur at the junction of the roof deck and ceiling, there is no net difference in overall leakage from the attic, assuming that the junction is not sealed, which is standard practice even in unvented attics due to the difficultly of sealing that junction."

It is the experience of SPFA and our members that the energy performance of unvented attics sealed and insulated with SPF generally surpasses any vented attic design. One of the key reasons for this performance is that unvented SPF attics generate substantially lower air infiltration rates than unvented, *unsealed* attics, and the air infiltrations rate is lower when compared to a vented attic. Protocols for attic sealing with SPF specifically address and target the junction of the roof deck and the ceiling, and it is the manufacturer's specification to seal that junction.

We therefore disagree with the assessment that there is "no net difference in overall leakage from the attic", or that "the overall leakage of the house is the same", in the case of an unvented attic. There may be unvented attic design scenarios that use air-permeable insulation and therefore have little effect on the infiltration rate of a home, however SPF is by far the most common material used for unvented attic designs. There should be a lower attic air leakage rate assigned to SPF installations within CBECC-res software. There have been many field studies documenting the efficacy of SPF in reducing both attic and whole-home infiltration rates, which could be used as the basis for establishing realistic air leakage defaults.

2. CONDITIONING AND VENTILATION OF UNVENTED ATTICS

According to the 2013 ACM Manual (page 57, 2.6.4 Attic Conditioning), "When spray foam insulation is applied to a roof that will not be vented, it is modeled as a 'conditioned' attic and the volume of the attic is included in the conditioned space. A conventional attic is assumed to be 'ventilated.'" However, the ACM manual does not designate that a sealed, SPF attic is 'unventilated', which is by far the predominant design for SPF installations. Instead, the manual goes on to say that "Attic ventilation is not a compliance variable and is the same for both proposed and standard design," and that "The attic conditioning (ventilated, conditioned) is reported on the CF1R."

In other words, unvented SPF attics, which are in reality very tightly sealed spaces, are modeled as not just leaky, but ventilated spaces in the 2013 compliance software. Additionally, the software assumes that the attic is directly conditioned space and includes the space conditioning load for the volume of the attic in the same calculation used for *inhabited* spaces within the home.

As such, if the description from the ACM manual is accurate, the 2013 software is doubly punitive in terms of the energy credit for using an unvented attic. In reality the space is neither conditioned (at least not directly), nor is it ventilated, yet it is modeled as if it were both.

According to those familiar with the beta version of the 2016 CBECC-res software, it will no longer model an unvented attic as ventilated, but it will instead assume there is leakage to the outside at the same rate as the conditioned (habitable) space of a home with a vented attic. However, the leaks in home with a vented attic will be assigned to the ceiling, while the unvented attic home will leak at the roof deck. Since the roof deck covers a larger area than the ceiling, we can assume that the home with the unvented attic will be modeled as having a higher air leakage than the vented-attic home. This is again counter to the experience of the SPFA having observed some of the lowest leakage rates in the homebuilding industry in homes constructed with SPF.

Since HPAs are proposed to be part of the prescriptive code in 2016, it is critical that the issues with how compliance software represents unvented SPF attic designs be resolved. SPFA looks forward to working with staff to improve the ACMs and align the modeling assumptions with field data.

3. EMISSIVITY/COMPARISON TO RADIANT BARRIER

Emissivity is treated by the compliance software as a factor of roofing material, roof angle, and the presence or absence of a radiant barrier. As SPF applied directly below the roof deck has an effect on emissivity—above and beyond the thermal resistance represented through R-value—the ACMs should also assume a lower thermal emittance when SPF is used. Anecdotal evidence from energy consultants indicates that when using California compliance software, modeled TDV energy impacts from SPF applied below the roof deck are similar to that of radiant barrier, while field data indicates that the impact are far greater for SPF.

SPFA would like further clarification on how the compliance software models the radiant properties of SPF and other below deck materials, including radiant barriers, in order to understand where improvements may be necessary.

4. NEW FIELD VERIFICATION REQUIREMENT "IN THE CASE OF UNVENTED ATTIC"

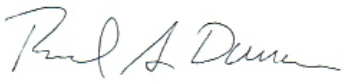
The Draft CASE Initiative (page xvi) says that the HPA proposal "will required field verification for some measures, some of which are already in the current standards" (including the 'House pressurization test') and that "new field verification and diagnostic tests needed or to be modified (will) include: 'Leakage to the outside in the case of an Unvented Attic'." There is no additional information on the nature of this proposed new test, although there is a placeholder later in the report (page 63) where it is noted that the compliance manuals section will be updated in the Final CASE report.

However, at this time it is unclear:

- How the diagnostic tests for leakage to the outside would be different from the house pressurization test already in the standards, if at all (e.g. would the attic be tested in isolation if that was the only part of the home treated with spray foam?)?
- If the plan for this new test assumes that default leakage values for all unvented attics (or just those using spray foam) will be established, and whether those would be based on the definitions of spray foam as an air barrier in the Residential Appendices (RA3).
- Whether the test would be mandatory for all homes using the unvented attic strategy, or mandatory only if the builder claims credit for leakage lower than default, similar to what is required if the builder claims higher-than-default R-values for SPF insulation.

SPFA looks forward to working with CEC staff to better understand the proposed code changes, especially how the software will determine the compliance credit for use of SPF, and how that will relate to mandatory or optional field diagnostic testing. Based on our initial review of the HPA code change proposal and the compliance software, it appears that there are several areas for improvement. We are happy to provide field data and technical expertise necessary to ensure that building energy simulations more closely approximate the real-world performance achievable with SPF.

Best regards,



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