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ACC Comments on 2019 Energy Code Compliance Manuals

Additional submitted attachment is included below.

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California Energy Commission
Dockets Office, MS-4
1516 Ninth Street
Sacramento CA 95814-5512
Attn: Payam Bozorgchami

RE: Docket No 18-BSTD-02 - 2019 Energy Code Compliance Manuals

Dear Mr. Bozorgchami,

The American Chemistry Council's Center for the Polyurethanes Industry[1] (CPI) and Foam Sheathing Committee[2] (FSC), commenting collectively as "ACC," are pleased to provide the following comments regarding the California Energy Commission's (Commission) 2019 Energy Code Compliance Manuals. ACC supports the advancement of building energy efficiency through the code and standards development process and looks forward to working with the Commission to ensure that the compliance manual is technically accurate and representative of the 2019 Title 24 standard.

ACC requests that the following changes:

1. **Thermal Barrier vs Thermal Break**

   The guidance makes several references to thermal barriers in the context of a material that provides R-value or blocks the flow of heat. For example, a "15 minute thermal barrier" is referenced in the guidance despite the fact such barriers do not provide insulation properties or block heat flow. Instead, the thermal barrier has a specific fire safety function defined in IRC R316 and IBC 2603 as a protective layer over foam plastics. Any references to "thermal barrier" that deal with heat transmission should use the phrase "thermal break".

   Those sections include: 3.3.6.2 Item 1, Figure 3-25 "Below Roof Deck Option B, and Section 3.5.8 item 2.

[1] CPI serves as the voice of the polyurethanes industry in North America, promoting its development and coordinating with polyurethane trade associations across the globe. The polyurethane industry supports research and initiatives that serve its communities and customers. The business of polyurethane is a $26.5 billion enterprise and a key element of the U.S. economy.

[2] FSC is a subgroup of the Plastics Division of the American Chemistry Council and represents the following member companies: Atlas Roofing, Dow, GAF, Hunter Panels, Johns Manville, Kingspan Insulation, Owens Corning, and RMAX.

2. P. 37 Section 3.4.5.1 – Product Requirements

Change: Closed-cell spray polyurethane foam (ccSPF) products can provide ~~Class I or~~ Class II vapor retarder performance, depending on thickness.

Reason: Closed-cell SPF is rated as a Class II vapor retarder at approximately 2 inches of depth. It would take at least 20 inches of closed-cell SPF to provide a Class I vapor retarder performance.

3. P. 41 Contractor / Installer Box

Change: SPF must be separated from the interior of the building, including attic spaces by an approved thermal barrier complying with Section 316.4 of the CRC. ~~Thermal barrier consisting of ½ inch (12.7 mm) gypsum wallboard, or equivalent thermal barrier material (Section 316.4, CBC).~~

Reason: Multiple products meet the thermal barrier requirements in Section 316.4 of the CBC. The guidance should not specify individual products.

4. P. 41 – Open-Cell Spray Polyurethane Foam

A. Low-Density Open-Cell SPF (ocSPF) Insulation: A spray-applied polyurethane foam insulation having an open cellular structure resulting in an installed nominal density of 0.4 to 1.5 pounds per cubic foot (pcf), ocSPF has been assigned a default R-value of 3.6 per inch for compliance purposes, but some products can achieve higher R-values. The ocSPF insulation is sprayed then expands to fill the framed cavity (see Figure 3-20). Excess insulation may be trimmed by a special tool to facilitate interior cladding installation. The average thickness of the foam insulation must meet or exceed the required R-value. Depressions in the foam insulation shall not be greater than ½-inch of the required thickness, provided these depressions do not exceed 10 percent of the surface area being insulated. The ocSPF must fill the cavity of 2x4 framing to achieve R-13. When using a combination of cavity insulation and exterior continuous insulation, ocSPF may not need to fill the entire wall cavity.

Reason: Title 24 Part 6 no longer includes prescriptive minimum R-value requirements. The 2019 standard includes prescriptive minimum U-factor requirements, which allow for more flexibility when developing wall assemblies. Including the new statement for ocSPF clarifies that ocSPF does not always need to fill the entire wall cavity when using a combination of cavity insulation and exterior continuous insulation to meet a desired U-factor.

5. P. 42 Box: "Equation 3-2: Alternative Calculation for Total R-Value:"

Change: "Tested R-value per inch" ~~as listed in the Table of R-values or R-value Chart from the manufacturer's current ICC Evaluation Service Report (ESR) that shows compliance with Acceptance Criteria for Spray-Applied Foam Plastic Insulation - AC377~~ per Section 301.2 of ICC 1100, Standard for Spray-applied Foam Plastic Insulation, wherein thermal resistance shall be determined in accordance with ASTM C177, ASTM C518 or ASTM C1363. Test specimen density shall be within ±10 percent of the nominal density intended for use."

Reason: It is not appropriate to rely on or reference a single an evaluation service, such as ICC-ES, in this document. Other qualified services may exist now or in the future. ACC recommends citing the appropriate standard, in this case Section 301.2 of ICC 1100 (Standard for Spray Foam). This section applies to low and medium density as well as roofing products: "301.2

Thermal Resistance. Thermal resistance shall be determined in accordance with ASTM C177, ASTM C518 or ASTM C1363. Test specimen density shall be within ±10 percent of the nominal density intended for use."

6. P. 43 Section 3.5.1.4 Rigid Insulation

Change: Rigid ~~board~~ insulation in the form of sheathing or spray applied insulation is made from fiberglass, expanded polystyrene (EPS), extruded polystyrene (XPS), polyisocyanurate (ISO), or polyurethane (PUR) – including closed-cell spray polyurethane foam. It varies in thickness, and some products can provide up to R-6.8 per inch of thickness.

Reason: These changes clarify that closed-cell SPF can be used as exterior continuous insulation. Additionally, closed-cell SPF can meet R-6.8 per inch.

Change: Rigid board insulation may also be integral to exterior siding materials. ~~Properly sealed rigid insulation can be used continuously across an envelope surface to reduce air infiltration and exfiltration, and thermal bridging at framing.~~ When installed as continuous insulation, rigid board insulation reduces thermal bridging at framing. When properly sealed, rigid continuous insulation may be used as an air barrier. When installed with sealed joints and adhered flashing (as shown in Fig 3-22) some types of rigid board insulation can also be used as the water-resistive barrier.

Change: The 2019 California Building Code (CBC) provides guidance on fastener penetration depth, diameter, and spacing for exterior foam sheathing in Section R703.11.2. CRC Table 703.15.1, reproduced below in Figure 3-23, shows the fastener spacing for cladding attachment over foam sheathing to wood framing. Up to 2" of foam sheathing may be fastened directly to the structural sheathing in accordance with CRC Table R703.3.3.

Reason: Continuous insulation does not need to be "sealed" to provide thermal bridging or air barrier benefits. This text does not recognize that with the installation with sealed joints and adhered flashing (as shown in Fig 3-22) some types of rigid board insulation can be used as the water-resistive barrier. The last paragraph on the page should also reference the ability to fasten through up to 2" foam sheathing directly to structural sheathing (rather than framing as required in Figure 3-23 below). This provision is found in a different part of the 2018 IRC or 2019 CRC. See Table R703.3.3 of the 2018 IRC / 2015 IRC.

7. P. 49 Figure 3-25: Prescriptive Insulation Options for Climate Zones 4 and 8-16

Change: Update table 3-25 as detailed below.

High Performance ~~Ventilated~~ Attics		
Ventilated Attics		Unvented (Sealed Attics)
Option A ~~Option B~~ Single Family	Option B Multifamily	Option C
□ Vented attic □ R19 below roof deck batt, spray in cellulose/fiberglass secured with netting, or spray foam □ R38 ceiling insulation □ Air space between roofing and the roof deck □ R8 duct insulation □ 5% total duct leakage	□ Vented attic □ R19 (CZ 4, 8-9, 11-15) or R13 (CZ 10, 16) below roof deck batt, spray in cellulose/fiberglass secured with netting, or spray foam □ R38 ceiling insulation □ Air space between roofing and the roof deck □ R8 duct insulation □ 5% total duct leakage	~~□ Vented attic~~ □ Unvented attic ~~□ R30 or R38 ceiling insulation (climate zone specific)~~ □ R22 air impermeable insulation applied to the underside of the roof deck □ R6 or R8 ducts (climate zone specific) ~~□ Radiant Barrier~~ □ HERS verified ducts in Conditioned space

Reason: The guidance for high performance attics provides prescriptive examples of options to construct *vented* High Performance Attics. Unvented attics are increasingly used in California, therefore the guidance for high performance attics should include an example of building an unvented attic sealed with SPF. Additionally, CEC should be encouraging the use of ducts in conditioned space to make homes more efficient.

Change: Include footnote or other text referencing Option A, the unvented roof method in Section 3.6.1 and the above roof deck method in Section 3.6.4.

Reason: For this edition of the manual, there should be reference to Option A in that it is permitted through performance path per footnote added to Table 150.1-A. The footnote addition is significant and a reference in the manual is appropriate.

The unvented roof method presented in Section 3.6.1 provides another insulation option appropriate for mention in this table. The "above roof deck" method in Section 3.6.4 should be cross-referenced here even though recently removed from the prescriptive path.

8. P. 53 Box: Architect/Designer

Change: Add the following sentence to the end of the box: Refer to Section 3.6.1 for unvented attic design.

Reason: This statement is incomplete. If an unvented attic is created by way of performance design and it is shown to be at least equivalent to the prescriptive options, it should be permitted as a substitute approach in the prescriptive path. At a minimum this statement should mention the unvented attic alternative as later addressed in Section 3.6.1.

9. **P. 53 3.5.4.1 Mandatory Requirements §150.0(c) 2X4 inch wood-framed walls above grade and 3.5.4.1 Mandatory Requirements §150.0(c) All other wall types**

Change: Update U-factor and R-value references for "2X4 wood framed walls" and for "All other wall types"

Reason: Section 3.2 (new changes to T24) states: "Mandatory minimum wall insulation level increased to R-20 for 2x6 or larger framing (or an area-weighted average maximum U-factor of 0.071)." This mandatory requirements for 2x4 walls / R13 seems to be in conflict with the U-factor. It also conflicts with Example 3.23 below on p.55. §150.0(c) has single family U-factors of 0.048 for cz 1-5 and 8-16 and 0.065 for cz 6-7 and multifamily U-factors of 0.051 for cz 1-5 and 8-16 and 0.065 for cz 6-7.

10. **P. 55 Table 3-10**

Change: Update Table 3-10 to include a 2X4 wall assembly with R13 of open-cell SPF and R5 of exterior continuous insulation.

Reason: Table 3-10 provides examples of Wood-Framed Wall Assemblies and the corresponding U-factor. The chart includes closed-cell SPF, but does not include open-cell SPF. Open-cell and closed-cell SPF have different R-values, thus both should be included. Additionally, R13+5 is one of three prescriptive option in the IECC.

Change: Update Table 3-10 to include examples of 2x4 construction using open and closed cell SPF.

Reason: Open-cell and closed-cell SPF can be used to meet the prescriptive requirements of Chapter 6 in 2X4 construction. Only including examples of 2X4 assemblies with fibrous insulation implies that only these forms of insulation can be used to meet the prescriptive requirements in 2X4 construction.

Change: Review the calculated U-factor for a 2X6 wall assembly with R31 of ccSPF and R2 of exterior insulation.

Reason: Using a 25% framing factor ACC calculated the U-factor as 0.049.

11. **P. 56 2. Mass Walls**

Change: When the prescriptive compliance approach is used, the <u>continuous</u> insulation must be installed integral with or on the exterior or interior of the mass wall.

Reason: The text in the last sentence might be confused with "integral insulation" which is discontinuous cavity insulation in cores of concrete block. Suggest inserting the word "continuous" in front of "insulation" to help avoid this possible confusion. This would make it clearer that the intention is for continuous integral insulation.

12. **P. 61 Table 3-10: Slab Insulation Requirements for Heated Slab Floors**

Change: Add footnote: <u>In addition to the requirements of the table, minimum R-5 insulation shall extend under the entire slab.</u>

Reason: This is otherwise in conflict with the requirements in the California Mechanical Code Section 1217.6.2 Insulation that requires minimum R-5 full sub-slab insulation for heated slabs.

13. **P. 70-71 Section 3.6.1 – Unvented Attics**

Change: Air-impermeable insulation is used below and in direct contact with the underside of the roof sheathing. Air permeable insulation can be installed directly below the air-impermeable insulation, if needed.~~, and an additional layer of air-permeable insulation is installed directly under the air-impermeable insulation~~.

Reason: The deleted language is unclear and implies that unvented attics built with air-impermeable insulation also need to use air-permeable insulation.

Change: Update section 3.6.1 to provide guidance on sealing UVA constructed with air-permeable insulation.

Reason: The guidance provides instruction on netted insulation in an unvented attic constructed with air-permeable insulation. Unvented attics must be sealed properly, the guidance should include instruction on how to properly seal an unvented attic constructed with air-permeable insulation. Additionally, the use of air-permeable insulation for unvented attics is now approved in the International Residential Code, based on research performed by the Building America program. Based on this research, this application of air-permeable insulation is limited to warmer climates (IECC climate zones 1-3) and also requires a moisture ventilation system at the ridge vent. These specific requirements are based on moderating the accumulation of attic moisture, and should be included in this manual.

The 2018 IRC contains specific detailed provisions for vapor diffusion ports; those requirements are under review for the 2021 IBC. There is a strong likelihood that the provisions will be revised this year, and subsequently revised for the 2021 IRC. Assemblies using only air-permeable insulation must meet the vapor diffusion port requirements as currently approved by the ICC Code Committee.

Please feel free to contact me at Lindsay_Stovall@americanchemisty.com or (916) 448-2581 with any questions.

Regards,

Lindsay Stovall
Director, Regulatory and State Affairs
American Chemistry Council