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Owens Corning Comments on 2019 Energy Code Compliance Manuals

Additional submitted attachment is included below.

July 27, 2018

California Energy Commission
Attention: Docket No. 18-BSTD-02
1516 Ninth Street
Sacramento CA 95814-5512
Attn: Payam Bozorgchami
Filed electronically at: https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=18-BSTD-02

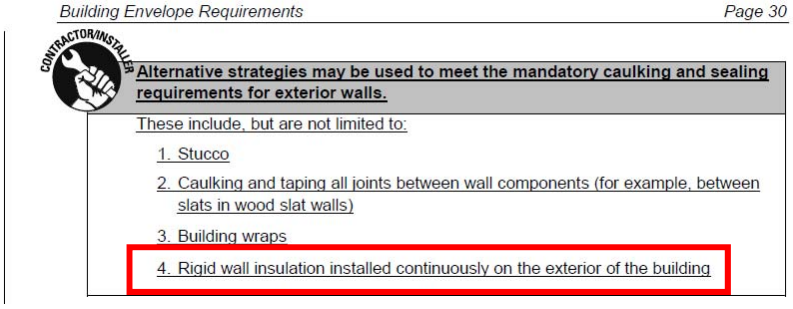
RE: 2019 Energy Code Compliance Manuals Comments

Dear Mr. Bozorgchami and Staff:

Owens Corning, through our numerous businesses has the privilege of touching numerous markets and building categories across the globe. Our portfolio of products and solutions is not restricted to one particular industry or segment. Accordingly, our approach to building codes and standards is wholistic and broad-based. We have previously stated our belief in strong building envelopes, enclosures and energy efficient assemblies as being critical to sustainable building practices and policy. We appreciate the inclusive efforts of the California Energy Commission and view these compliance manuals as the means by which previously adopted energy code policy is to be executed in the marketplace. We trust our comments will help clarify the CEC's expectations and intent as the new code is put into practice across the state.

Our comments for your consideration are as follows:

Item 1: 3.4.2.1 Joints and Other Openings §110.7



Concern: When rigid wall or continuous insulation is used as the primary air barrier, it is necessary for such to be taped, gasketed, otherwise sealed or used in conjunction with an appropriate house wrap to limit air infiltration. It is recommended that a reference to these air sealing requirements be included.

Item 2: **3.5.1.2 Loose-Fill Insulation**

3.5.1.2 Loose-Fill Insulation

Loose-fill is insulation that has a pneumatic or blown installation process, including cellulose, fiberglass, and natural wool (animal or cotton-based products). Blown wall insulation can be an effective way to deal with the irregularities of wall cavities; especially the spaces around pipes, electric cables, junction boxes, and other equipment embedded in wall cavities (see Figure 3-18). The R-value of blown wall insulation material installed in closed cavities is determined by the installed thickness. This differs from manufactured products such as fiberglass or mineral wool batts for which the R-value has been tested and arrives at the construction site in preformed lengths and thicknesses with set R-value thicknesses.

When installed in floors, walls, and other assemblies, these fibrous insulations are held in place in one of three ways:

1. Pre-installed netting or fabric
2. Use of existing cavity walls
3. Use of integral adhesives

Figure 3-18: Cellulose-Insulated Wall

Source: California Energy Commission

Blown wall insulation must be thoroughly checked to ensure the R-value is achieved. R-value depends on the installed density of the material at the building site, and the building official should ensure that the installed density meets manufacturer specifications. See Section 3.5.

Concern: The language in this section referencing blown and sprayed-in wall insulation R-value as being determined by the thickness of the material is only marginally correct. As noted in other sections of the Manuals, it is the density at time of installation coupled with the installed thickness that determines the delivered R-value. We recommend staying consistent throughout the Manual with installed density and the appropriate verification language.

Item 3: **3.5.1.3 Spray Polyurethane Foam (SPF)**

Building Envelope Requirements *Page 41*

SPF must be separated from the interior of the building, including attic spaces, by an approved thermal barrier consisting of ½-inch (12.7 mm) gypsum wallboard or equivalent thermal barrier material (Section 316.4, CBC)

There are two types of SPF insulation:

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 surface 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.

Figure 3-20: Open-Cell SPF Installed in Wall Cavity

Source: SPFA

Concern: This text does not address filling the cavity in 2x6 walls as required to meet the new mandatory requirements. Recommend adding clarification language.

Item 4: **3.5.1.4 Rigid Insulation**

3.5.1.4 Rigid Insulation

Rigid board insulation sheathing is made from fiberglass, expanded polystyrene (EPS), extruded polystyrene (XPS), polyisocyanurate (ISO), or polyurethane (PUR). It varies in thickness, and some products can provide up to R-6 per inch of thickness.

This type of insulation is used for above-roof decks, exterior walls, cathedral ceilings, basement walls, as perimeter insulation at concrete slab edges, and to insulate special framing situations such as window and door headers, and around metal seismic bracing. 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.

Figure 3-22: Properly Installed Rigid Insulation with Sealant Tape

Source: U.S. Environmental Protection Agency

CONTRACTOR/INSTALLER

...er installation of continuous rigid insulation may include button cap nails, furring strips, flashing, ...lant tape and design of the drainage plane. See Figure 3-22.

Concern: The language used in the last sentence of this section is coupling rigid insulation used for thermal performance as well as rigid insulation used for air-infiltration mitigation. If rigid insulation is only being installed for thermal performance, sealing of the joints is not necessary. Recommend revising the language to clarify the different applications and installation requirements.

Item 5: **3.6.1 Unvented Attics**

efficiency features used in compliance calculations is realized as an energy benefit to the occupants.

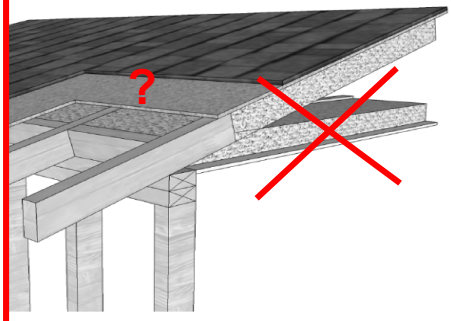
3.6.1 Unvented Attics

Attic ventilation is the traditional way of controlling temperature and moisture in an attic. In an unvented attic assembly, insulation is applied directly at the roofline of the building, either above or below the structural roof rafter. The roof system becomes part of the insulated building enclosure. For this case, the thermal boundary of the building results in an unvented attic space between the ceiling gypboard and the insulated roof above, see Figure 3-43.

The provisions of CBC, Title 24, Part 2, Vol. 2.5, Section R806.5 describes conditions for insulation placed at the roof of the building as opposed to on top of the horizontal ceiling. Unvented attic assemblies are allowed provided that:

1. ***Air-permeable** insulation is used below and in direct contact with the underside of the roof sheathing and rigid board, or sheet insulation of at least R-5 is used above the roof sheathing.*
2. ***Air-impermeable** insulation is used below and in direct contact with the underside of the roof sheathing, and an additional layer of air-permeable insulation is installed directly under the air-impermeable insulation.*

Figure 3-43: Unvented Attic Assembly with Insulation at the Ceiling and Between the Roof Rafters



Source: California Energy Commission

Concern: The requirements listed in this section for unvented attics conflict with the 2016 California Residential Code (CRC). The CRC was appropriately revised to be more consistent with the International Residential Code language. See partial excerpts of section 806.5 in the 2016 CRC below. We recommend revising the language and associated diagrams in 3.6.1 to be consistent with the 2016 CRC. We also recommend the Commission NOT adopt any language that would be introducing new

requirements not already enshrined in the building codes, and instead, rely on system evaluation reports for addressing any specific manufacturer system related requirements.

2016 California Residential Code, Part 2.5 - Includes September 2017

Errata

(Errata Printing: Sep 2017)

CHAPTER 8 - ROOF-CEILING CONSTRUCTION

est point of the space, measured vertically, with the balance of the required ventilation provided by eave or cornice vents. Where the location of wall or roof framing members conflicts with the installation of upper ventilators, installation more than 3 feet (914 mm) below the ridge or highest point of the space shall be permitted.

R806.3 Vent and insulation clearance. Where eave or cornice vents are installed, insulation shall not block the free flow of air. Not less than a 1-inch (25 mm) space shall be provided between the insulation and the roof sheathing and at the location of the vent.

R806.4 Installation and weather protection. Ventilators shall be installed in accordance with manufacturer's instructions. Installation of ventilators in roof systems shall be in accordance with the requirements of Section R903. Installation of ventilators in wall systems shall be in accordance with the requirements of Section R703.1.

R806.5 Unvented attic and unvented enclosed rafter assemblies. Unvented attics and unvented enclosed roof framing assemblies created by ceilings that are applied directly to the underside of the roof framing members and structural roof sheathing applied directly to the top of the roof framing members/rafters, shall be permitted where all the following conditions are met:

1. The unvented attic space is completely within the building thermal envelope.
2. No interior Class I vapor retarders are installed on the ceiling side (attic floor) of the unvented attic assembly or on the ceiling side of the unvented enclosed roof framing assembly.
3. Where wood shingles or shakes are used, a minimum $^1/_4$-inch (6.4 mm) vented airspace separates the shingles or shakes and the roofing underlayment above the structural sheathing.
4. In *California Climate Zones 14 and 16,* any air-impermeable insulation shall be a Class II vapor retarder, or shall have a Class II vapor retarder coating or covering

wood shingles or wood shakes, or any other roofing system using battens and no continuous underlayment is installed. A continuous underlayment shall be considered to exist if sheathing, roofing paper or any continuous layer having a perm rate of no more than one perm under the dry cup method is present.

5.1.1. Where only air-impermeable insulation is provided, it shall be applied in direct contact with the underside of the structural roof sheathing.

5.1.2. Where air-permeable insulation is provided inside the building thermal envelope, it shall be installed in accordance with Section 5.1.1. In addition to the air-permeable insulation installed directly below the structural sheathing, rigid board or sheet insulation shall be installed directly above the structural roof sheathing in accordance with the *R*-values in Table R806.5 for condensation control.

5.1.3. Where both air-impermeable and air-permeable insulation are provided, the air-impermeable insulation shall be applied in direct contact with the underside of the structural roof sheathing and shall be in accordance with the *R*-values in Table R806.5 for condensation control. The air-permeable insulation shall be installed directly under the air-impermeable insulation.

5.1.4. Alternatively, sufficient rigid board or sheet insulation shall be installed directly above the structural roof sheathing to maintain the monthly average temperature of the underside of the structural roof sheathing above 45°F (7°C). For calculation purposes, air-flute

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2016 CRC language already addresses how to deal with unvented attic assemblies and various insulation types.

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ture is assumed to be the monthly average outside air temperature of the three coldest months.

5.2. Where preformed insulation board is used as the air-impermeable insulation layer, it shall be sealed at the perimeter of each individual sheet interior surface to form a continuous layer.

TABLE R806.5
INSULATION FOR CONDENSATION CONTROL

CLIMATE ZONE	MINIMUM RIGID BOARD *OR* AIR-IMPERMEABLE INSULATION *R*-VALUE
6-15 tile roof only	0 (none required)
3-15	R-5
1 & 2	R-10
16	R-15

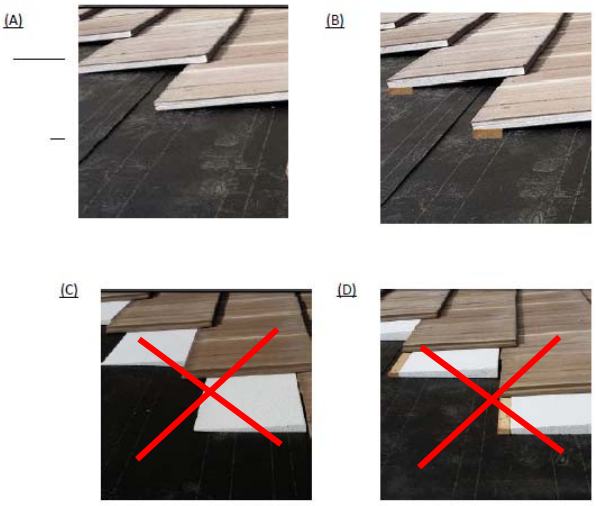
The referenced table includes criteria for condensation control in all 16 California climate zones.

Item 6: 3.6.2 and Figure 3-47, Option C & D – Wedged Foam

All four configurations (A-D) in Figure 3-47 can be installed without any significant changes to conventional roof or attic design (such as changes to fascia dimensions). IRT can be used in both vented and unvented attic configurations.

Some IRT Products are ASTM rated for Class A fire rating (ASTM E108) and have CRRC certification for cool roof tiles in multiple colors. Depending on the configuration selected from the four options (A-D) in Figure 3-47, a U-factor between 0.18 and 0.10 can be achieved, with option D performing the best. It is best practice to check with manufacturers about the ratings and certifications for each tile. Product manufacturers cite several advantages of the product due to its lightweight construction and increased insulation properties – ease of installation, ability to install similar to traditional roof tiles but at a much faster pace, less weight on the roof structure, increased thermal resistance, and improved thermal performance.

Figure 3-47: Insulated Roof Tile (IRT) (A) attached directly to roof deck, (B) attached to batten, (C) attached directly to roof deck with wedged foam filling air space, and (D) attached to battens with wedged foam filling air space



Source: Green Hybrid Roofing

Concern: The “wedged insulation” below roofing tiles is an approach that has not been proven to be commercially viable. The manufacturer introduced this concept with market claims which later became very suspect. Delivered R-values are in question as are some of the standards the manufacturer references to claim compliance or equivalency in the code. At this time there does not appear to be any other manufacturers promoting this type of product or application. It is therefore misleading to the larger market and inappropriate for the California Energy Commission to be advocating this particular assembly. Recommend striking these images and the referencing language from this section. Should a better design find its way to the market post publication of these manuals, the performance path would continue to allow for such product(s) to demonstrate code compliance. Leave in the reference to Insulated Roof Tiles as per their proven contribution and commercial viability to applicable sections of the energy code.

Item 7: **4.4.3.5 Buried and Deeply Buried Ducts**

Page 4-56HVAC Requirements - Air Distribution System Ducts, Plenums, and Fans, and Filters

~~4.5.3.3~~4.4.3.3 **Duct Insulation**

Performance credit is also available if all of the ducts are insulated to a level higher than required by the prescriptive package. If ducts with multiple R-values are installed, the lowest duct R-value must be used for the entire duct system. However, the air handler, plenum, connectors, and boots can be insulated to the mandatory minimum R-value.

As an alternative when there is a mix of duct insulation R-values, credit is available through the method described in the next section.

~~4.5.3.4~~4.4.3.4 **Diagnostic Duct Location, Surface Area, and R-value**

This compliance option allows the designer to take credit for a high-efficiency duct design that incorporates duct system features that may not meet the criteria for the duct location and/or insulation compliance options described above. This method requires that the designer must enter the design characteristics of all ducts that are not located within the conditioned space. The information required for the input to the compliance software includes the length, diameter, insulation R-value, and location of all ducts. This method will result in a credit if the proposed duct system is better than the standard design.

To claim this credit, the duct system design must be documented on plans that are submitted to the enforcement agency and posted at the construction site for use by the installers, the enforcement agency field inspector, and the HERS rater. The duct system must be installed in accordance with the approved duct system plans, and the duct system installation must be certified by the installer on the CF2R form and verified by a HERS rater on the CF3R form. Details of this compliance option are described in the *Residential ACM Reference Manual*, and verification procedures are described in RA3.1 of the Reference Residential Appendix.

~~4.5.3.5~~4.4.3.5 **Buried and Deeply Buried Ducts**

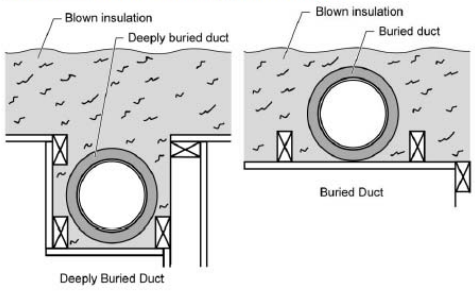


Figure 4-16: Buried Ducts on Ceiling and Deeply Buried Ducts

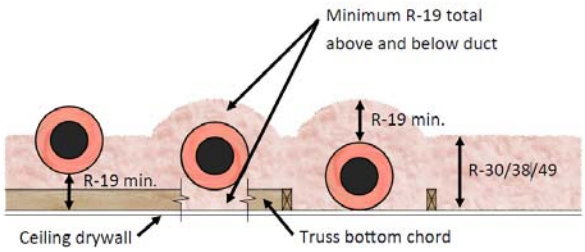


Figure 2. *Example partially buried duct (left), buried duct across the truss bottom truss chord (middle), and buried duct on the ceiling (right).*

NEW OPTIONS

(insulation PINK for clarity)

https://www.homeinnovation.com/~/media/Files/Reports/TechSpec-Buried-Ducts-2017.pdf

Concern: The existing requirements for improving the energy performance of HVAC distribution ducts via burying ducts is antiquated and does not allow for more recent studies showing enhanced performance without having to build soffits to encase the ducts. We recommend consideration be given for deeply buried ducts above the ceiling plane wherein it can be demonstrated that insulation mounds around and on top of the duct can be sufficiently contained so as to deliver sustainable thermal performance. Specifically, we advocate for such systems (where low leakage ducts are also installed) to be given compliance credit equal to, or as close to equal to as can be demonstrated, to ducts in conditioned space. This is similar to the 2018 IRC methodology and modified Home Innovation Research Labs illustration shown above.

Regards,

Shawn P. Mullins
Market Development Leader/Regulatory Affairs – West
shawn.mullins@owenscorning.com