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February 19, 2013

California Energy Commission  
Dockets Office  
1516 Ninth Street  
Sacramento, CA 95814-5512

Re: **Docket No. 12-BSTD-05**

To Whom It May Concern:

This Association represents union roofing contractors in fourteen Metropolitan San Francisco Bay Area counties. We were pleased to work closely with California Energy Commission Staff in developing the 2013 Building Energy Efficiency Standards. We welcome the opportunity to continue that collaboration by offering our comments on the second draft of the Nonresidential Compliance Manual.

The second draft is much improved over the first draft, but there remain a number of areas where additional explanation is needed to clarify new provisions of the Standards. Examples illustrating these provisions are also needed to help roofing contractors and building officials better understand their application in the field.

In at least two sections of the Manual, the narrative needs to be revised to increase clarity and to avoid confusion. There are also a number of instances where editing is needed to delete the discussion of superseded Code provisions, remove outdated examples, update cross-references and correct typographical errors.

Our specific comments and recommendations are as follows:

**1. New Table 141.0-B Requires Further Discussion and Explanation**

One of the most significant changes to the “cool roofing” provisions of the 2013 Building Energy Efficiency Standards is the introduction Table 141.0-B, which provides contractors who are performing reroofing work with a new tool for making trade-offs between roof/ceiling insulation and aged solar reflectance.

The second draft of the Nonresidential Compliance Manual mentions the opportunity to make trade-offs and reproduces Table 141.0-B in its entirety, but provides roofing contractors with no guidance on how to actually use the table. There is also no discussion of how Table

141.0-B interacts with other provisions of the 2013 Standards. These omissions must be rectified because:

- (a) Many roofing contractors are not familiar with U-factors. They need to understand what they are, where to find them and how to utilize them to make trade-offs;
- (b) The U-factors presented in Table 141.0-B not do not merely reflect the amount of roof/ceiling insulation that is necessary to compensate for a roofing material with an aged reflectance that is less than 0.63. The U-factors in Table 141.0-B also take account of the minimum insulation requirements for roof alterations that are set forth in Table 141.0-C. Building officials especially need to understand that a roofing contractor who makes a trade-off pursuant to Table 141.0-B simultaneously satisfies the requirements of Table 141.0-C. Explaining this fact now will avoid needless confusion later; and
- (c) It should also be explained that when a trade-off is made pursuant to Table 141.0-B, the various Exceptions to Section 141.0(b)2Biii of the Standards do not apply. Allowing the Exceptions to be used in conjunction with Table 141.0-B would undermine the integrity of the trade-off process.

New Table 141.0-B is discussed under the heading “Roofing Products (Cool Roofs)” on pages 3-88 and 3-89 of the second draft of the Nonresidential Compliance Manual. This section of the Manual needs to be expanded to further discuss and explain the new table. We suggest that this Section be revised along the following lines. For ease of identification, all of the original language is presented in *italics*. Material suggested for deletion is indicated in ~~strikeout~~ format, while new material is indicated in **bold, underlined** text.

#### *Roofing Products (Cool Roofs)*

##### *§141.0(b)2B*

*When more than 2,000 ft<sup>2</sup> or more than 50 percent of a roof (whichever is less) is being replaced on a conditioned building, energy code requirements for roof surface radiative (cool roof) properties and roof insulation levels are triggered. Thus when a small repair is made, these requirements don't apply. The requirements of the Standards regarding roof insulation would not be “triggered” if the existing roof surface were overlaid instead of replaced.*

*These envelope requirements only apply to conditioned spaces and do not apply to unconditioned and process spaces. However, these requirements do apply to roofs over conditioned non-process spaces even if the building has a portion that is process space. These roof areas can be delineated by the fire separation walls between process areas and conditioned, non-process areas.*

*For nonresidential buildings, **the** prescriptive requirements for roofing products are based on roof slope; **and** climate zone. Low-sloped roofs in climate zones 1 through 16 have a required minimum aged reflectance of 0.63 and a minimum thermal emittance of 0.75, or a minimum SRI of 75.*



Steep-sloped roofs in climate zones 1 through 16 have a required minimum aged solar reflectance of 0.20 and a minimum thermal emittance of 0.75, or a minimum SRI of 16.

For high-rise residential buildings and hotels and motels, ~~the~~ prescriptive requirements for roofing products are based on roof slope and climate zone ~~and roof mass~~. Low-sloped roofs in climate zones 10, 11, 13, 14 and 15 ~~shall~~ have a **required** minimum aged solar reflectance of 0.55 and a minimum thermal emittance of 0.75, or a minimum SRI of 64. Steep-sloped roofs **in** climate zones 2 through 15 ~~shall~~ have a **required** minimum aged solar reflectance of 0.20 and a minimum thermal emittance of 0.75, or a minimum SRI of 16.

~~1. For all~~ **There are two exceptions to the prescriptive requirements for all nonresidential, high-rise residential and hotel/motel buildings:**

**1.** For roof area covered by building integrated photovoltaic panels and building integrated solar thermal panels, roofing products are not required to meet the minimum requirements for solar reflectance, thermal emittance, or SRI.

**2.** For roof constructions that have thermal mass over the roof membrane with a weight of at least 25 lb/ft<sup>2</sup> roofing products are not required to meet the minimum requirements for solar reflectance, thermal emittance, or SRI.

**A new Exception has been added to the 2013 Standards. It applies only to low-sloped nonresidential buildings. An aged solar reflectance less than 0.63 is allowed, provided that additional insulation is installed.**

**Table 141.0-B has been added to the Standards to simplify the process of making insulation/aged solar reflectance trade-offs. The table expresses the trade-off requirements in terms of overall roof U-factors, rather than in terms of continuous insulation R-values.**

**U-factors measure the thermal performance of the entire roof assembly, both above and below the roof deck. Utilizing U-factors provides flexibility. Trade-offs can be made by installing additional insulation continuously above the roof deck, between the joists below the roof deck or a combination of both approaches.**

**The new, simplified trade-off process begins by locating in Table 141.0-B the maximum roof/ceiling U-factor that applies to the aged reflectance of the roofing product to be installed and the climate zone of the building. By consulting the U-factor tables in Reference Joint Appendix JA4, one can then determine what configurations of above- and/or below-deck insulation satisfy the trade-off. Reference Joint Appendix JA4 contains U-factor tables for many common roof constructions (wood framed, metal framed, span deck and concrete roofs, etc). See the examples at the end of this Section for illustrations of insulation/reflectance trade-offs.**

**To make the new trade-off process as simple as possible, Table 141.0-B not only takes account of the amount of insulation necessary to compensate for using a non-compliant roofing product, it also accounts for the minimum insulation requirements that apply to roof alterations generally. Accordingly, contractors who make trade-offs**



pursuant to Table 141.0-B also satisfy the minimum insulation requirements set forth in Table 141.0-C.

It is also important to note that while the Code provides a number of Exceptions to the minimum insulation requirements for roof alterations, these Exceptions do not apply when Table 141.0-B is used to make an insulation/reflectance trade-off. The U-factors in that table are based on full and complete compliance with the minimum insulation requirements. The Exceptions to Section 141.0(b)2Biii of the Standards reduce those requirements. Applying the Exceptions in this context would undermine the integrity of the trade-off process and reduce building energy efficiency.

## **2. Examples That Illustrate the Simplified Trade-Off Process Are Needed**

The simplified trade-off procedure contemplated by Table 141.0-B is entirely new to the 2013 Standards. The procedure involves both a term (U-factor) and a publication (Reference Joint Appendix JA4) with which many roofing contractors are unfamiliar. Under these circumstances, it is absolutely crucial that the Nonresidential Compliance Manual include illustrative examples of how to make insulation/aged reflectance trade-offs and links to web-based software tools and reference appendices. We respectfully recommend that examples like the following be added to the Manual:

### **Example 3-32**

#### **Question**

A low-sloped nonresidential building located in Santa Rosa needs to be reroofed. It has a wood-framed rafter roof. The rafters are 2 x 4's spaced 16 inches on center. The owner wants to install a roofing product with an aged reflectance of 0.60, which is less than the prescriptive standard of 0.63. Can I install additional insulation to make up for the shortfall in reflectance?

#### **Answer**

Yes. There are two ways to make an insulation/reflectance trade-off when re-roofing a low-sloped nonresidential building.

1. The Simplified Performance Tradeoff Approach has been modified for the 2013 Standards. It is a software tool that allows users to make roof insulation/reflectance trade-offs through a simplified process. The user enters a limited number of inputs, such as building type, building vintage, roof insulation and reflectance details. The software analyzes the inputs and generates for the user a range of compliant design options. The software does all the work. There is no need for the user to consult reference appendices or make manual calculations. The software tool can be accessed on the Energy Commission's website at <http://www.energy.ca.gov/title24/2013standards/trade-offtool>.

2. Another way to make an insulation/reflectance trade-off is to utilize Table 141.0-B. First, look up in the table the maximum roof/ceiling insulation U-factor for the aged

solar reflectance of the roofing product and the climate zone in which the building is located. In this case, the roofing product has an aged reflectance of 0.60 and Santa Rosa is located in climate zone 2, so the appropriate U-factor is found in row 1, column 2 of the table. It is 0.052.

Next, consult Section 4.2 (Roofs and Ceilings) of Reference Joint Appendix JA4 to find the U-factor table for the type of roof in question. Reference Joint Appendix JA4 can be accessed on the Commission's website at: [http://www.energy.ca.gov/title24/2013standards/approved\\_alternatives/Appendix JA4 U C factor and thermal mass data.pdf](http://www.energy.ca.gov/title24/2013standards/approved_alternatives/Appendix_JA4_U_C_factor_and_thermal_mass_data.pdf).

The appropriate table in this case is Table 4.2.2, U-factors of Wood Framed Rafter Roofs. Locate the section of the table that pertains to 2 x 4 rafters spaced 16 inches on center. There are a number of U-factors in this area of the table that are equal to or less than 0.052. A combination of R-11 cavity insulation and R-8 continuous insulation, for example, has a U-factor of 0.050. Similarly, a combination of R-13 cavity insulation and R-6 continuous insulation has a U-factor of 0.052. Any U-factor that is equal to or less than 0.052 represents a combination of above-and below-deck insulation that complies with the requirements for the proposed trade-off.

### Example 3-33

#### Question

According to Table 141.0-C, when a nonresidential building in climate zone 2 is reroofed, there is a minimum insulation requirement of R-14 of continuous insulation or a U-factor of 0.055. Is this in addition to the insulation required to make a trade-off pursuant to Table 141.0-B?

#### Answer

No. The U-factors in Table 141.0-B already take account of the minimum insulation requirements for roof alterations. The insulation R-values and U-factors in Table 141.0-C only apply when a compliant roofing product is being installed and no trade-off is involved.

### Example 3-34

#### Question

There are a number of Exceptions to the minimum insulation requirements for roof alterations. Can these be used to limit the insulation required to make a trade-off pursuant to Table 141.0-B?

#### Answer

No. The Exceptions to Section 141.0(b)2Biii of the Standards do not apply to trade-off situations. They only apply when a compliant roofing product is being installed and no trade-off is involved.



### 3. The Discussion of the Exceptions to the Prescriptive Requirements for Cool Roofs Needs to be Revised for Greater Clarity

The discussion of the exceptions to the minimum prescriptive requirements for solar reflectance and thermal emittance of roofing products on page 3-62 of the second draft of the Nonresidential Compliance Manual does not align well with the actual provisions of Section 140.3(a)1Ai of the 2013 Standards. In addition, some key terms from the Standards are missing from the narrative, which may promote confusion.

**We also believe that whenever a Table from the Standards is reproduced verbatim in the Manual, it should be identified as such by using the same number.** The roof/ceiling insulation table discussed below, for example, should be identified as Table 140.3, not as Table 3-16. Using different numbers for the same table promotes confusion and should be avoided at all costs. The only tables in the Manual that should be numbered according to a different system are those that do not actually appear in the body of the 2013 Standards. A good example is Table 3-11, which is unique to the Nonresidential Compliance Manual. There is no corresponding table in the Standards.

We respectfully suggest that the discussion of prescriptive requirements for cool roofs in the Manual be revised along the following lines. As previously, all of the original language is presented in *italics*. Material suggested for deletion is indicated in ~~strikeout~~ format, while new material is indicated in **bold, underlined** text.

#### *Roofing Products (Cool Roof)*

*There are ~~five~~ **four** exceptions to the minimum prescribed requirements for solar reflectance and thermal emittance or the SRI.*

***1. Wood-framed assemblies roofs** in climate zones 3 and 5 are exempt if the roof assembly has a U-factor of 0.039 or lower.*

***2. Metal framed building** roofs in climate zones 3 and 5 are also exempted if the roof assembly has a U-factor of 0.048 or lower.*

***3. If the roof construction has a thermal mass like gravel, concrete pavers, stone or other materials with a weight of at least 25 lb/ft<sup>2</sup> over the roof membrane, then it is exempt from** ~~does not need to meet the above requirements~~ **for solar reflectance and emittance or SRI.***

***4. Roof area covered by building-integrated photovoltaic panels and building-integrated thermal panels is not required to meet the cool roof requirements.***

***In addition,** where a **low-sloped nonresidential** roof's aged reflectance is less than the prescribed requirement, insulation trade-offs are available. By increasing a roof's insulation level a roofing product with a lower reflectance than the prescriptive requirements can be used to meet ~~prescriptive~~ **the** Cool Roof requirements. The appropriate U-factor for nonresidential buildings based on roof type, climate zone and aged reflectance of less than 0.63 can be determined from Table ~~3-16~~ **140.3, below.***

#### **4. A Number of Editorial Corrections are Needed**

There are a number of instances where editing is needed to delete the discussion of superseded Code provisions, remove outdated examples, update cross-references and correct typographical errors. These include the following:

**a.** There are two errors in the discussion of Solar Reflectance Index on page 3-52 of second draft Nonresidential Compliance Manual.

First, it is stated that “Solar Reflectance Index (SRI) is a new concept in the Standards.” This statement was true for the last iteration of the Energy Code, but it is no longer the case. **The words “is a new concept in the Standards” should therefore be deleted.**

Second, the link that is provided for the SRI calculator developed by the staff at Lawrence Berkeley National Laboratory (<http://www.energy.ca.gov/title24/2013standards>) does not actually point there. Rather, it points to the general portal for the 2013 Building Energy Efficiency Standards. **This link needs to be updated to point directly to the SRI calculator.**

**b.** Table 3-11 (Roof/Ceiling U-factor Requirements) on page 3-57 of the Manual cites cross-references that have been superseded. Because the Standards have been reorganized, Table 3-11 is no longer a “Summary from Standards Tables 143-A, 143-B and 143-C.” **The cross-references need to be updated to reflect the fact that Table 3-11 is now a “Summary from Standards Tables 140.3-B, 140.3-C and 140.3-D.”**

**c.** It would be helpful to add a link to the new insulation/reflectance trade-off software in the discussion of the Simplified Performance Tradeoff Approach on page 3-81. The end of the first paragraph under Section 3.4 should be revised to read as follows:

*This compliance approach allows the user to enter inputs such as building type, building vintage, roof insulation and roof reflectance details and compliance software analyzes the energy effects of design choices without the need for elaborate lookup tables and other detailed information. **The software can be accessed on the Energy Commission’s web site at <http://www.energy.ca.gov/title24/2013standards/trade-offtool>.***

**d.** There is a typographical error in the first sentence at the top of page 3-87. It should be revised to read as follows:

*Tradeoffs between envelope components are performed using either the **compliance software developed for the Simplified Performance Tradeoff Approach or the simplified roof insulation and reflectance tradeoff tables in §140.3.***

**e.** Example 3-30 on page 3-100 is based on superseded provisions of the Energy Code that differentiated between steep-sloped residential roofing materials on the basis of product density. There were different standards for roofing products weighing 5 pounds or more per square foot



than for roofing products weighing less than 5 pounds per square foot. The 2013 Standards no longer differentiate between roofing materials according to product density. **Example 3-30 should therefore be deleted from the Nonresidential Compliance Manual.**

Thank you for the opportunity to offer the above comments and suggestions on the second draft of the Nonresidential Compliance Manual. This Association stands ready to work with California Energy Commission Staff to refine and clarify these recommendations as may be necessary to produce a final document that helps roofing contractors, building owners and building officials alike to better understand, apply and enforce the provisions of the 2013 Building Energy Efficiency Standards.

If you have any questions or need additional information, please do not hesitate to call on us. In the meantime, thank you once again for your attention and consideration.

Sincerely,



William D. Callahan, Ph.D.  
Executive Director