**From:** "DNG Phil Dregger" <pdregger@DNG-Group.com
**To:** Payam Bozorgchami
**Date:** 1/8/2008 6:05 PM
**Subject:** Fwd: Draft ARMA Comments - Section 149(b)1Biv

This letter is a follow up to testimony given by Mr. Reed Hitchcock and Mr. Phil Dregger, on behalf of the Asphalt Roofing Manufacturers Association (ARMA) at the December 17, 2007 hearing regarding proposed revisions to the California Building Energy Efficiency Standards.

The following comments and recommendations pertain to the proposed 45-day language contained in Section 149(b)1Biv and related documents. The 45-day language is in *italics.*

*iv When roofs are exposed to the roof deck or recover boards are exposed in nonresidential and high-rise residential buildings and hotels and motels with low-sloped roofs shall be insulated to the levels specified in Table 149-A.*

- Information provided to ARMA by CEC consultants indicates the analysis showing the cost effectiveness of adding R8 or R14, including a recover board, is based on assumed installed costs of $1.75 and $2.19 per square foot, respectively. In our opinion, these installed cost estimations are low and do not reflect the range of "degrees of difficulty" associated with roof replacement projects. Using October 2007 R.S. Means cost information, published Long Term Thermal Resistance (LTTR) insulation values, and “degrees of difficulty” factors recommended in the “2007 Remodeling/Repair Construction Costs” publication by Saylor Publications, estimated incremental costs associated with adding insulation as part of a roof replacements projects range as follows. See Pacific Building Consultants, Inc. email dated 12-28-07 for more information.
    - R8 - $2.11 (larger and/or less difficult projects) to $3.45 (smaller and/or more difficult projects).
    - R14 - $2.67 (larger and/or less difficult projects) to $5.10 (smaller and/or more difficult projects).

- Information provided to ARMA by CEC consultants indicates that life-cycle cost analysis showing the cost effectiveness of adding certain amounts of insulation as part of low-sloped roof replacement projects uses a 30 year life for the insulation. In our opinion, the anticipated average life of insulation installed above the roof deck is less than 30 years. Low-sloped roof coverings are typically reroofed at least once in 30 years, and more often than not, the above deck insulation is replaced at that time. The anticipated average life of low-sloped membrane roofing varies by membrane type and other factors. According to Carl Cash in his 2005 paper "2005 Roofing Industry Durability and Cost Survey" the average life of low-sloped roofing ranges from 14 years (e.g., spray urethane foam - coated) to 40 years (e.g., metal panels - copper, stainless steel). The average life of common low-sloped membrane roofs ranged from 14 years (e.g., TPO reinforced, Hyaplon (CSPE), APP modified asphalt - unsurfaced) to 18 years (e.g, BUR - gravel surfaced asphalt glass plies, SBS modified asphalt - multi ply).

- The March 20, 2007 PG&E report Final Report, Insulation Requirements , page 21, states that since the current recommendation is to remove the prescriptive requirement for cool roofs for climate zones [1,3, 5 and 16,] the recommended U-Factors for climate zones 1,3, 5 and 16 for daytime occupancies assume no cool roofs”. Since this assumption varies from our understanding of the 45-day proposed language, the March 20, 2007 PG&E report may over estimate energy savings related to the proposed insulation levels in climate zones 3 and 5.

- **In light of the above, ARMA recommends the CEC revisit and adjust, as needed, the proposed language so that adding insulation as part of low-slope roof replacement projects is only required in amounts and in climate zones where it is shown to be cost effective, at least on a time-dependant valuation basis.**

***EXCEPTIONS to Section 149(b)1Biv:***

1. *The existing roof is insulated with at least R-11 insulation or it has a U-factor lower than 0.075.*

- Information provided to ARMA by CEC consultants indicates that adding R8 or R14 to a roof that already has R11 insulation is not cost effective. ARMA concurs. In fact, the daytime occupancy data shows a large gap between the anticipated costs and the anticipated savings.

- We understand the R11 threshold was selected based on the assumption that if an existing roof is insulated, it would be insulated to at least R11 (e.g., 3.5 inches of below deck fiberglass insulation). ARMA respectively takes exception to this assumption. In ARMA's experience, many roofs may have no insulation below the roof deck but have minimal amounts of insulation above the roof deck (e.g., ½", ¾", 1.0", 1.5", 2.0" of wood fiber or perlite) with R values ranging from about 1.4 to 5.6 or more.

- As currently worded, owners of buildings with existing roof R values or R value equivalents less than R11, may be required to add insulation during roof replacement projects when in fact this may not be cost effective.

- **ARMA recommends the CEC perform additional analyses using a series of base insulation levels to more closely approximate the "breakeven" point, by climate zone, for adding roof insulation in a cost effective manner.** Please note projections of the incremental costs associated with adding insulation to roofs that previously had above deck insulation, need to consider costs associated with re-installing the pre-existing minimal amounts of roof insulation which is required by the current energy code.

- In addition, many low-sloped roofs in California do not have conventional roof insulations but do have energy saving radiant barriers or reflective foil type insulations installed below the roof deck. Since the thermal performance of radiant barriers varies in terms of the direction of heat flow, it is not clear how the proposed threshold values would be interpreted. The equivalent air-to-air thermal resistance values for many radiant barriers are less than 11 in the heat flow up case, while they are greater than 11 in the heat flow down case.

- **ARMA recommends clarifying requirements for existing roofs with radiant barriers.**

***EXCEPTIONS to Section 149(b)1Biv:***

*2. If the thickness of the insulation required in Table 149-A reduces the height of curbs to less than 4 in., the insulation thickness may be reduced to maintain a curb height above the finish roof of at least 4 in.*

- ARMA concurs with the apparent intent of this exception, namely, to avoid requiring building owners to incur costs associated with raising roof mounted equipment as part of roof replacement projects to comply with certain insulation levels. **However, ARMA recommends the reference to a minimum curb height of 4 inches be changed to 8 inches to be consistent with minimum roof base flashing heights recommended for low-sloped roofs by contractor, manufacturing, and consulting groups**

**throughout the roofing industry.** See also comments in our letter to the CEC dated November 30, 2007.

- Regarding subsequent draft language provided to ARMA via email on 12-11-07:
  - Rephrase references to removing roof top mechanical equipment to phrasing that does not imply the equipment must be actually removed from off the roof surface (e.g., "temporarily disconnected and lifted").
  - Assuming a piece of equipment is not intended to be temporarily disconnected and lifted, the height of its curb does not necessarily represent the height available to extend roof membrane base flashings. This is due to access limitations associated with overhanging side rails and metal flashings integral to many pieces of curb mounted mechanical equipment.
  - **Accordingly, ARMA recommends changing references to the "height of the curb" to "effective curb height or better yet to available base flashing height or some similar phrase.**

- If insulation is added above the roof deck as part of a roof replacement project, and this additional thickness reduces available base flashing heights to less than 8 inches at parapets walls or at walls of penthouse structures, considerable expense would be incurred to remove walls coverings (e.g., wood siding, cement plaster, etc.) to reposition and raise metal flashings along the bottom edges of the wall coverings (e.g., z-shaped metal flashings). This is required because it is not appropriate to install roof membrane flashings to the front surfaces of cement plaster, wood siding, or other wall covering systems that include provision for drainage behind the front surface (e.g., a water resistive barrier). It is also not appropriate to completely cover existing parapet walls required to have "non-combustible" coverings, with "combustible" roof membranes. **Accordingly, ARMA recommends the language of this exception include roof replacement projects where wall coverings would need to be removed to comply with minimum 8 inch base flashing heights.**