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DOCKET
12-BSTD-1
DATE MAY 04 2012
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May 4, 2012

Commissioner Karen Douglas
Lead Commissioner for Energy Efficiency
California Energy Commission
1516 9th St., MS-31
Sacramento, CA 95814

Re: ARMA Comments and Supporting Data on Proposed 2013 Building Energy Efficiency Standards California Energy Commission Docket No. 12-BSTD-01

Dear Commissioner Douglas:

On behalf of the members of the Asphalt Roofing Manufacturers Association (ARMA), I appreciate the opportunity to comment on the proposed modifications to Title 24, Part 6 for residential and non-residential roofing presented at the March 12-13, 2013 workshop along with the California Energy Commission's response to concerns raised at the hearings. ARMA is the North American trade association representing the manufacturers of asphaltic roofing materials for steep-slope and low-slope applications as well as the suppliers to the asphalt roofing industry.

The response of the Commission staff to the comments made on the record at the March hearings addressed three key areas. Our comments to those responses are addressed under the subheadings below and in the attached documentation:

Market Consistency

We applaud the Commission's acknowledgement of the need for consistency in the codes regarding prescriptive levels for solar reflectance for new construction and retrofit applications. As we stated on the record, variations in those requirements lead to confusion in the marketplace among consumers, contractors, specifiers, distributors, manufacturers, and even code enforcement officials. We consider the acknowledgement of this issue a huge step on the part of the Commission to better understanding both our industry and the impact of building codes.

Insulation and Solar Reflectance Trade-off

At the hearings, roofing industry representatives recommended tradeoffs for insulation when lower values of solar reflectance are used, both above and below deck. Commission staff responded that they agreed with these recommendations, and we appreciate that direction. However, in review of the trade-off values for U-factors for solar reflectance using widely accepted Department of Energy modeling tools, our experts have identified that there is a substantial penalty for the use of insulation in place of the cool roof. This penalty is

explained in detail in Appendix A attached. It is our recommendation that until this information is reviewed in its entirety and corrective action is taken, that 15-day language for approval is grossly premature.

Cost Assumptions

Representatives of our organization and other industry stakeholders testified at the March hearings that they had grave concerns about the quality and extent of the cost analysis conducted by Commission consultants Architectural Energy Corporation (AEC) to support the aged solar reflectance for low-sloped roofs. In response, Commission staff disagreed with those assessments based on their assertion that "every effort was made by staff to ensure the data collection was representative of industry costs and while it may have been desirable for the inclusion of more data sources, the data gathered is representative of industry's products and installation costs." ARMA respectfully refutes these claims.

In response to the CEC's position, ARMA has engaged GnarusAdvisors, California-based experts in surveys and statistical analysis to conduct a thorough review of the AEC report and to provide an unbiased report to us on the adequacy of the surveys performed by CEC, the level and sufficiency of the data obtained, the breadth of the conclusions drawn from the data, and the use of that data as a basis for the proposed increase in solar reflectance. That report is attached (Appendix B) for your reference in its entirety. In summary, Gnarus found that from a statistical analysis, the report had insufficient data on which to reach its conclusions. They also concluded that the scope of information, from the responses to the surveys and the follow up phone calling performed, created an insufficient data base from which one could draw any conclusion which would be considered statistically valid. Last, the consultants were also critical of the general methodology followed in obtaining the information and drawing any conclusions from it.

In light of this report and its findings, combined with all of the testimony presented by ARMA and others at the hearing and in written testimony, we strongly oppose any increase in solar reflectance until such time that an appropriate, thoughtful, complete, and statistically sound analysis can be completed. Considering the severity of the flaws in the report, and the potential impacts to the entire roofing industry, continued failure of CEC staff to appropriately and thoroughly consider and address these concerns will force us to take whatever actions available through the Commission, the judicial process, and the laws of the State of California.

Summary

While we appreciate that the CEC staff has considered comments received from our industry organizations, individual manufacturers, and other stakeholders and has worked to address some of the concerns that have been raised, we remain deeply concerned that many of the issues previously raised have not been addressed which have direct impact on the standards proposed. Because of this, we continue to have grave reservations with the overall process.

Your attention and response to our comments and attached supporting documentation is appreciated. As an industry, we all want to ensure that the results of the 2013 Title 24, Part 6 process are energy efficiency standards that make practical sense for the consumer and ensure that they continue to have choice in their roofing selection that fits the needs of their

homes or buildings. The 2013 standards should likewise continue to support the goals of the California Energy Commission and the State of California, and should be based in sound scientific, technical and economic facts and data.

As an industry, we remain ready, willing, and able to assist CEC staff to work through the science, technology, and economics related to roofing materials and systems. We urge you to accept this offer and to work with industry to come up with sound requirements for roofing. Please do not hesitate to contact me if you have any questions about this letter, the supporting documentation, and ARMA's position.

Sincerely,

Reed B. Hitchcock
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CC: Roofing Industry Coalition Members
Peter Hart, LeClair Ryan
Jim Mattesich, Greenberg Traurig
Bill Pennington, CEC
Maziar Shirakh, CEC
Martha Brook, CEC
Payam Bozorgchami, CEC

Appendix A

	San Diego
R-Value Required by T24	14.9
Thermal Emittance	85
Climate Zone	7

Assumption Set #1:

Summertime cost of electricity - HI
Air Conditioner Efficiency - AVG
Energy Source for Heating - Natural gas - HI cost
Heating System Efficiency - AVG

Increase R-Value to this amount from amount listed above to use black membrane vs. membrane with 65% reflectivity:	29.3
Increase R-Value to this amount from amount listed above to use black membrane vs. membrane with 25% reflectivity:	16.6

Net R-Value Increase to use 25% reflective membrane vs. 65% reflective membrane	
PER DOE Calculator	12.7
PER Title 24	16.4
Title 24 R-Value Trade-off Penalty:	3.7

Assumption Set #2:

Summertime cost of electricity - HI
Air Conditioner Efficiency - HI
Energy Source for Heating - Natural gas - HI cost
Heating System Efficiency - HI

Increase R-Value to this amount from amount listed above to use black membrane vs. membrane with 65% reflectivity:	28.7
Increase R-Value to this amount from amount listed above to use black membrane vs. membrane with 25% reflectivity:	16.6

Net R-Value Increase to use 25% reflective membrane vs. 65% reflective membrane	
PER DOE Calculator	12.1
PER Title 24	16.4
Title 24 R-Value Trade-off Penalty:	4.3

Appendix A

INPUT SCREEN FROM DOE Cool Roof Calculator:

My State	California
My City	San Diego

Click to see Data for All 243 Locations

My Proposed Roof:

R-value (HIGH=20; AVG=10; LOW=5) [h·ft²·°F/Btu]	14.9
Solar reflectance, SR (HIGH=80; AVG=50; LOW=10) [%]	25
Infrared emittance, IE (HIGH=90; AVG=60; LOW=10) [%]	85

My Energy Costs and Equipment Efficiencies

Summertime cost of electricity (HIGH=0.20; AVG=0.10; LOW=0.05) [$/KWh]	.2
Air conditioner efficiency (Coefficient of Performance) (HIGH=2.5; AVG=2.0; LOW=1.5)	2.5
Energy source for heating (choose one)	○ Electricity ◉ Fuel
If electricity, wintertime cost (HIGH=0.20; AVG=0.10; LOW=0.05) [$/KWh]	
If fuel, cost (Natural gas: HIGH=1.00; AVG=0.70; LOW=0.50) [$/Therm] (Fuel oil: 2002 East coast=0.85; 2002 Midwest=0.70) [$/Therm]	1.0
Heating system efficiency (Furnace or boiler: HIGH=0.8; AVG=0.7; LOW=0.5) (Electric heat pump: HIGH=2.0; AVG=1.5) (Electric resistance: 1.0)	0.8

Calculate My Annual Savings Relative to a Black Roof

Net Savings [$/ft² per year]	0.016
Cooling savings [$/ft² per year]	0.017
Heating savings (heating penalty if negative) [$/ft² per year]	-0.001

Insulation in Black Roof to Yield Same Annual Energy Savings:

Upgrade from R-14.9 to R-16.6 [h·ft²·°F/Btu]

Details of Comparison:

Heating degree days for location chosen [Annual °F-day]	1075.5
Cooling degree days for location chosen [Annual °F-day]	766
Solar load for location chosen [Annual Average Btu/ft² per day]	1621.1
Cooling load for black roof (SR=5%;IE=90%) [Btu/ft² per year]	4177
Heating load for black roof (SR=5%;IE=90%) [Btu/ft² per year]	2887
Cooling load for proposed roof [Btu/ft² per year]	3443
Heating load for proposed roof [Btu/ft² per year]	2950

Appendix B

GNARUS
ADVISORS LLC
WWW.GNARUSLLC.COM

Commissioner Karen Douglas
Lead Commissioner for Energy Efficiency
California Energy Commission
1516 9th St., MS-31
Sacramento, CA 95814

May 4, 2012

Re: Gnarus LLC Comments on Proposed 2013 Building Energy Efficiency Standards California Energy Commission Docket No. 10-BSTD-01

Dear Commissioner Douglas:

I have been asked by the Asphalt Roofing Manufacturers Association (ARMA) to review and comment on the results of a survey which purportedly "identifies the potential cost increases associated with installing a cool roof with a higher aged solar reflectance on low-sloped roofs of nonresidential buildings than is currently required by the 2008 Building Energy Efficiency Standards (Standards)"and then compares them to existing estimates of the associated energy savings. [1]

The results of the survey and the comparison of incremental costs and benefits for various roof types are shown in Table 2. As can be seen there, estimated incremental benefits range from $0.33/ft2 to $0.83/ft2, depending on climate zone, and incremental costs range from $0.03/ft2 to $0.31/ft2, depending on roof type. Thus, The Report concludes that: "For low-sloped roofing types energy savings far outweigh the measure cost [sic], resulting in large statewide energy savings."

There are a number of problems with The Report that, in my opinion, make it unreliable as a basis for public policy.

1. I have not had an opportunity to review the September 2011 CASE report. It is thus impossible to ascertain if the respondents to the e-mail and phone surveys discussed in The Report provided cost estimates that are directly comparable to the estimates of benefits adopted from the September 2011 CASE report.

2. Initially a relatively complex e-mail survey was sent to 70 roofing contractors throughout California. No information is provided regarding how that sample was selected so it is impossible to ascertain if it was truly random.

[1] Architectural Energy Corporation, "Non-Residential Cool Roof Cost Summary," February 8, 2012 ("The Report"). I have also reviewed what appears to be a preliminary version dated January 5, 2012. My comments are focused on the former.

3. In any event, only three responses to the e-mail survey were received, and one of those was by phone. This is an unacceptably low response rate.

4. Because of the low response rate to the e-mail survey, a follow-up phone survey was conducted, seemingly using a much simpler format than the e-mail survey. Information was obtained from nine respondents. Again, no information is provided regarding sample selection for the phone survey or, in this case, the response rate.

5. The purpose of the surveys described in The Report was to estimate average incremental costs of increasing the aged solar reflectance standard from 0.55 to 0.65. Presumably, there are hundreds or even thousands of roofing contractors in California. Even if one treated the samples in The Report as random, and even if one counted the sample size as 12 (three e-mail responses and nine phone responses), that is too low to provide statistically meaningful results. A common rule of thumb, which is well-founded in statistical theory, is that such estimates require a minimum of 30 observations for levels of precision and confidence typically encountered in judicial and public policy undertakings.[2]

6. Perhaps because the sample sizes are so low, The Report does not include any formal statistics beyond the regression model discussed below in Comment 10.

7. The sample size problem is compounded by the fact that not all contractor respondents provided cost data for all roofing types. In fact, for example, Table 3 indicates that the source for the incremental cost estimate for Single Ply PVC was 4 contractors (not 12 contractors). Yet Table 7, which details the individual responses to the contractor phone survey shows only three responses for Single Ply PVC at the 0.55 standard and none for Single Ply PVC at the 0.65 standard.

8. In fact, the incremental cost estimate for Single Ply PVC actually seems to have been based on yet a third survey, this one of eleven distributors (see Tables 1 and 4). No information is provided on how distributors were selected, response rates, or what were their individual responses (Table 7 only reports on the contractor phone survey).

9. Another example of the sample size problem is Modified Bitumen SBS. Table 1 indicates that the source for the incremental cost estimate of $0.25/ft2 was "Contractors – Phone Survey." Yet Table 3 shows that the estimate was based on a single respondent. Table 7 shows that the respondent is based in Livermore, and provided no useful cost data for any other roof type category.

[2]See http://www.itl.nist.gov/div898/handbook/prc/section2/prc222.htm or Van Hooris, C. and Morgan, B. (2007), "Understanding Power and Rules of Thumb for Determining Sample Sizes," Tutorials in Quantitative Methods for Psychology, 3(2), p 43-50.

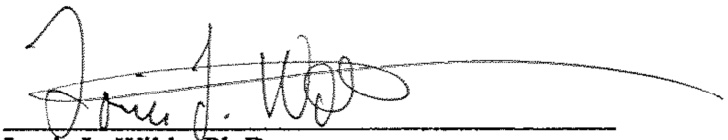
10. Yet another example of the sample size problem is Roof Coatings. Table 1 indicates that the incremental cost estimate of $0.31/ft2 is based on "Manufacturer Data." Table 3 indicates that the source was "4 contractors." However, it is not clear that the data reported in Table 7 supports that estimate. Rather, it seems to have come from a regression model based on data provided by a single manufacturer. The data is shown in Table 5 and the regression is shown in Figure 1. Even if the regression model is meaningful and scientifically reliable (which it may not be), this still amounts to using a single observation from a manufacturer to project incremental costs for all roofing contractors in California. This fails to comport with accepted standards for survey research.

11. As noted above, the contractor phone survey seems to have been much simpler than the e-mail survey. Of the three respondents to the e-mail survey, only two seem to have provided useful information, as shown in Tables 8 and 9. Interestingly, the incremental cost estimates shown there are generally much higher than those shown in Table 1.

12. This raises a final point: The Report fails to show the actual calculations that underlie the incremental cost estimates in Table 2 with the exceptions of Modified Bitumen and Roof Coatings, discussed above.

In summary, it is my opinion that The Report fails to provide the necessary information to assess fully the scientific reliability of its incremental cost estimates and contains various internal inconsistencies. Nevertheless, in my opinion, it is clear that the methodology employed is neither statistically sound nor sufficiently reliable to serve as a basis for rule-making by the CEC concerning proposed reflectance standards for commercial roofing materials.

Sincerely,



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Education

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- M.A., Economics, University of Rochester
- B.A., Mathematics, University of Iowa

Academic Appointments

- California Institute of Technology
- Indian Statistical Institute
- Yale University
- University of Chicago
- University of Rochester

Non-Academic Employment

- LECG, LLP
- Charles River Associates, Inc.
- Arthur Andersen LLP
- Arthur Andersen Economic Consulting
- Putnam, Hayes & Bartlett, Inc.

Editorial and Policy Boards

- Policy Board, Journal of Consumer Research (1983-1994)
- Editorial Board, Journal of Consumer Research (1982-1986)

SUMMARY

Dr. Wilde holds a Ph.D. in Economics from the University of Rochester, where his areas of concentration were Labor Economics and General Equilibrium Theory. Dr. Wilde has been a full time consultant since 1992. From 1976 to 1992, he was on the faculty of the California Institute of Technology, where his research focused on consumer behavior, industrial organization, and law and economics. He currently is a Visiting Associate in Economics at the California Institute of Technology. He has numerous academic publications and has been awarded a variety of research grants and fellowships including 11 National Science Foundation Grants, a Fellowship in Civil Liability from the Yale Law School, and a Guggenheim Memorial Foundation Fellowship.

Dr. Wilde has consulted and testified in a wide range of areas such as antitrust, intellectual property, labor, toxic tort, entertainment, contract, and environmental economics. The latter has included cost allocation, natural resource damage assessment, and property value diminution.

PUBLICATIONS

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