SPRAY POLYURETHANE FOAM ALLIANCE
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Mr. Dave Ware
California Energy Commission
High Performance Buildings and Standards Development Office
1516 Ninth Street, Mail Stop 37
Sacramento, CA 95814

March 9, 2012

Subject: **Docket No. 12-BSTD-1:** Commentary from SPFA on the 2013 Building Energy Efficiency Draft 45-day Language

Dear Mr. Ware,

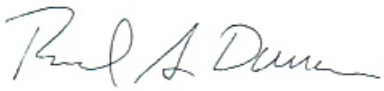
The Spray Polyurethane Foam Alliance (SPFA) Title 24 Task Force is sending this letter to provide public comment on proposed changes contained in the 45-day Language version of 2013 Building Energy Efficiency (Title 24) as posted under Express Terms - 2013 Building Energy Efficiency Standards Rulemaking.

SPFA was formed in 1987 to provide unified and consistent voice for contractors, consultants, formulators and suppliers of spray polyurethane foam (SPF) insulation and roofing systems. SPF systems provide a high value insulation and air sealing solution for improving energy efficiency for all buildings in California. In addition, the skilled labor required to install it means high-paying, sustainable jobs in the state.

The comments contained in this letter address specific proposed changes and were developed by SPFA's Title 24 Task Force on a consensus basis. The comments provided below were sent to CEC Staff in prior correspondence, and have not been addressed in the current 45-day version.

Should you have any questions about this letter or the comments provided, please contact me so we can meet with your staff to discuss these comments.

Best Regards,



Richard S. Duncan, P.E., Ph.D.
Technical Director

On behalf of the Title 24 Task Group:

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Comments on 2013 Title 24: 45-Day Language

RA3

1. RA3.5.1 Terminology: Voids & Air Spaces: The last sentence in this section is confusing.: "Voids occur when insulation depth is too shallow to provide the expected R-value and for the insulation to maintain contact with the assembly's air barrier." We recommend deleting this sentence.

2. RA3.5.5.0.1a (also RA3.5.5.0.1b and JA4.1.7 [in two locations]): Current language reads:

   "R-value: The total R-value shall be calculated based on the nominal required thickness of the insulation multiplied by a thermal resistivity of 5.8 per inch. Alternatively, the total R-value may be calculated based on the thickness of insulation multiplied by the "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*.

   "Based on this calculation, the overall assembly U-factor shall be determined by selecting the assembly type, framing configuration, and cavity insulation from the appropriate Reference Joint Appendix JA4 table. The R-value of ccSPF insulation shall meet or exceed the installed thickness specified in Table 1 below."

   For clarity, we recommend that these two paragraphs be rearranged as follows:

   "R-value: The total R-value shall be calculated based on the nominal required thickness of the insulation multiplied by a thermal resistivity of 5.8 per inch. The R-value of ccSPF insulation shall meet or exceed the installed thickness specified in Table 1 below.

   "Alternatively, the total R-value may be calculated based on the thickness of insulation multiplied by the 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*. Based on this calculation, the overall assembly U-factor shall be determined by selecting

the assembly type, framing configuration, and cavity insulation from the appropriate Reference Joint Appendix JA4 table."

3. RA3.5.5.0.1a; 6th Paragraph: Change "ocSPF" to "ccSPF" (typographical error)

4. RA3.5.5.0.1b: Same change as Item 2.

5. RA3.5.5.0.2; 11th bullet point: "In unvented attics where SPF insulation…" We believe that this places a burden on the HERS rater beyond the scope of RA3. Therefore, we request the deletion of this bullet point.

6. RA3.5.5.0.4 and RA3.5.5.0.5: The verbiage "All provisions of Residential Appendix RA2 shall be met" is provided for SPF insulations only. As this is inconsistent verbiage within RA3 (i.e., no other insulation systems have this language), we request that these sentences be deleted.

7. RA3.5.5.1.4; Second Bullet Point: Delete the words "…or voids" from this sentence.

8. RA3.5.5.1.5; Bullet Points 3, 4 and 5: We request these bullet point items be revised as follows:
   • For steel-framed kneewalls, skylight shafts, and gable ends, external surfaces of steel studs shall be covered with batts or blankets, ~~or~~ rigid board insulation or SPF unless otherwise specified on the Certificate of Compliance using correct U-factors from Joint Appendix JA4, Table 4.3.4 (or U-factors approved by the Commission Executive Director).
   • The backside of air impermeable insulation exposed to the unconditioned attic space is not required to be covered ~~shall be completely covered~~ with rigid board insulation or an air barrier.
   • ~~The house side of the insulation shall be in contact with the drywall or other wall finish.~~

9. RA3.5.4.1.9: This section is not numbered correctly (it should be RA3.5.5.1.9).\

10. RA3.5.5.2.3 and following sections: Not numbered correctly.

11. RA3.5.5.2.3; 1st bullet point: "Prior to installation verify that the building official…" As the California Residential Code, Section R806.4 permits the installation of unvented attics, we request that this verification be deleted as it places an unnecessary burden on

the HERS rater to participate in design consultations out of sequence with and beyond the scope of RA3.

12. RA3.5.5.2.3; 2nd bullet point: "In vented and unvented attics…" For clarity and consistency with the building code, we request this bullet point be reworded as follows: "In attics where entry is made for the service of utilities, SPF must be protected from ignition in accordance with CBC, Part 2, Section 2603 or Part 2.5, Section R316 or the SPF assembly must have been tested in accordance with AC 377."

13. Document 10 101 to 10 114 Energy Building Regulations, Table 150.1 A.

Current 45-Day Language for Table 150.1 A

The current table proposes increasing the prescriptive requirement for wood frame cavity wall insulation from R13 to R15+4ci in California Climate Zones (CCZ) 2-10 and from R19 to R21+4ci in CCZ 1 and 11-16.

SPFA Concerns

While SPFA endorses the use of continuous insulation, this proposal would eliminate many types of cost-effective cavity insulations such as standard density fiberglass, cellulose and other fibrous insulations as well as open-cell SPF in wood-framed walls for 2x4 walls in CCZ 2-10 and for 2x6 walls in CCZ 1 and 11-16. To achieve these modest increases in cavity R-value, density of fibrous and open-cell SPF insulations must significantly increase, or closed-cell SPF products must be used. Limited cavity insulation choices increase cost to the homeowner or building owner, and increases the environmental impact of manufacturing and shipping these higher density insulations.

SPFA Analysis

While increasing cavity R-values as proposed will decrease the U-value of an opaque wall (no windows and doors) by about 5%, these cavity R-value increases have negligible effect on the overall energy usage of a building.

For example, the effect of these cavity wall R-value increases was modeled using REM/Rate v12.97 for a 1,979 square foot wood-frame home located in both Los Angeles, CA (IECC Climate Zone 3) and Mt. Shasta, Siskiyou County, CA (IECC Climate

Zone 5). This analysis shows the wall U-value, predicted energy use and energy costs based on local energy rates built into REM/Rate.

Six wall constructions were modeled. The first is a wood-frame wall built to 2008 Title 24 standards, as shown in Column 1a using RESENT Grade I cavity insulation. Column 1b shows results with RESNET Grade III cavity insulation is assumed. The next two walls, Columns 2a and 2b, are built to the standards proposed for 2013, using RESNET Grade I and Grade II cavity insulation quality levels. The last two walls, in Columns 3a and 3b, use the 2008 cavity wall R-values with two levels of continuous insulation, R4 and R5.

The baseline construction of the walls in this analysis consisted of:

Interior Air Film	R0.68
½" gypsum	R0.45
25% Framing 2x6 @ 16"oc2x6	R6.875
Cavity Insulation	(varied from R13, R15, R19, R21)
Continuous Ins	(varied from 0, R4, R5)
Exterior Finish	R0.24
Exterior Air Film	R0.17

		Wood-Frame Wall Construction					
		2008		2013		2013 Alternatives	
		1a	1b	2a	2b	3a	3c
Los Angeles	**Units**	**R13 (I)**	**R13 (III)**	**R15+4ci (I)**	**R15+4ci (II)**	**R13+4ci**	**R13+5ci**
U-value	Btu/hr-sq ft °F	0.081	0.090	0.057	0.059	0.061	0.057
Energy Use	MMBTU/year	70.2	70.8	68.3	68.5	68.6	68.4
Energy Cost	$	908	911	899	900	901	899
Energy Savings	$		-3	9	8	8	9
Additional Cost	$			865	865	631	793
Mount Shasta	**Units**	**R19* (I)**	**R19*(III)**	**R21+4ci (I)**	**R21+4ci (II)**	**R19+4ci**	**R19+5ci**
U-value	Btu/hr-sq ft °F	0.066	0.072	0.048	0.050	0.050	0.045
Energy Use	MMBTU/year	152.6	153.6	148	148.3	148.6	147/9
Energy Cost	$	1312	1317	1288	1290	1291	1288
Energy Savings	$		-5	24	22	21	24
Additional Cost	$			865	865	523	685

*Actual R19 assumed, not R17 for R19 batts compressed to 5.5"

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SPFA Assessment of Results

The transition from the 2008 to the proposed 2013 wall construction can be evaluated by comparing the results in Columns 1 and 2a. There is a 25-30% decrease in wall U-value. These U-value decreases result in an annual energy cost savings of only $9 per year in Los Angeles, and about $24 per year in Mt. Shasta. According to a ConSol report submitted to CEC, the U-value increase will cost about $865-999 per house.
Consol Report: :
http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/current/Reports/General/Consols%20Cost%20Table%20for%20CEC%201-18-12.pdf

This translates to a 36 to 96 year payback to the homeowner based on modeling results above.

The majority of the energy savings from the improved frame wall insulation levels in the 2013 proposal is a result of using continuous insulated sheathing, not from increased cavity R-values. Continuous insulation prevents heat loss through framing members (thermal bridging). This effect can be seen by comparing the increased energy savings in Columns 3a and 3b versus Column 1. The difference in energy savings from increasing cavity R-values by R2 is only about $1 to $3 per year (compare Columns 3a to 2a) when the same R4 continuous insulation is used.

Instead of increasing cavity R-values by R2, SPFA believes that more attention should be given to cavity insulation quality. The current 2013 proposal allows inset stapling of fiberglass batts, for example. According to RESNET insulation grading criteria, inset stapling reduces the grade from Grade I to Grade II, which in turn, reduces the R-value performance of the cavity insulation. Note that a Grade II installation (Column 2b) using 2013 cavity R-values performs essentially the same as a Grade I installation at 2008 cavity R-values (Column 3a) when R4 continuous insulation is included.

More importantly, there is a significant construction cost savings using 2008 cavity insulation levels. According to installed cost data from RS Means, the installed cost of R13 batt insulation is $0.13/SF less than R15. Similarly, RS Means shows a cost increase of $0.19/SF using R21 versus R19 batts. In the home modeled, there is 1,885 SF of wall area. Going from R13 to R15 will increase construction cost by $245, which will take 245 years to recover based on the $1 per year energy savings in Los Angeles. Increasing

cavity R-values from R19 to R21 will cost an additional $358, and will take about 120 years to recover based on an annual energy savings of $3 per year in Mount Shasta.

Column 3b shows results for 2008 cavity insulation levels with R5 continuous insulation. These assemblies provide the same results as the 2013 cavity insulation levels with R4 continuous insulation, as shown in Column 2a.

SPFA Proposal

The SPFA analysis above provides a representative assessment, but it does not cover all California climate zones and local energy costs. It is similar to the Increased Wall Insulation CASE Study of October 2011: http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/current/Reports/Residential/Envelope/2013_CASE_R_Increased_Wall_Insulation_Oct_2011.pdf

The main difference is that this short SPFA study evaluates the effect of increasing cavity R-values by R2 when R4 or R5 of continuous insulation is in place. The results show that increasing cavity R-values has an insignificant or zero effect on energy savings. For example, R15+4ci provides the same energy consumption as R13+5ci and negligibly less energy consumption than R13+4ci. Increasing cavity R-value by R2 reduces consumer choice, discriminates against many existing and proven insulation materials, and results in increased first cost that is not recovered by energy savings. In addition the environmental impact of increasing cavity insulation density to achieve the R-value increase versus the net energy savings has not been considered.

Based on our preliminary assessment, SPFA proposes one of the two following changes to Table 150.1 A:

(1) Change the proposed requirement to R13+4ci in CCZ 2-10 and R19+4ci in CCZ 1 and 11-16 for wood-framed walls, based on a complete cost-benefit analysis

- OR -

(2) Add to the proposed requirement R13+5ci in CCZ 2-10 and R19+5ci in CCZ 1 and 11-16 for wood framed walls, based on equivalent U-values to the currently proposed R15+4ci and R21+4ci.