October 1, 2008

TO: **PARTIES INTERESTED IN EVALUATION REPORTS ON FOAM PLASTIC INSULATION**

SUBJECT: Proposed Revisions to the Acceptance Criteria for Foam Plastic Insulation, Subject AC12-1008-R1 (MB/MO)

Dear Madam or Sir:

Revisions proposed to the subject acceptance criteria, as presented in the enclosed criteria draft, are being posted on the ICC-ES web site to allow for public comment. The revisions include:

1. Revise Sections 4.5.15.1.3 and 4.5.15.2.3 to delete requirements that extruded polystyrene (XPS) insulation be subject to flexural strength tests as part of the quality control program. See the attached letter, dated July 18, 2008, from the Extruded Polystyrene Foam Association.

2. Revise Sections 1.3.2.1.4 and 3.4.2 to permit compliance with the 2008 edition of ASTM C 578 as an alternative to compliance with the 2006 edition; and add a new Section 6.6 to require information related to permeability to be included in the evaluation report when data complying with ASTM C 578-08 is submitted. See the attached letter, dated July 18, 2008, from the Dow Chemical Company.

3. Add new Sections 1.3.2.1.5 and 3.4.2 to include requirements for unfaced preformed rigid cellular polyisocyanurate products complying with ASTM C 591.

You are cordially invited to submit written comments, within 30 days of the date of this letter. Please use the comment form on the web site attaching any letters to the form. An explanation of the alternate criteria process can be found on our web site at http://www.icc-es.org/Criteria_Development/alternative_criteria_process.shtml.

All comments received in the 30-day comment period will be considered. During this same 30-day period, however, the draft criteria will be balloted to the Evaluation Committee. If the public comments raise major issues, generate controversy, or require the criteria to be substantially rewritten, then ICC-ES staff may decide to reballot the criteria; or place a revised draft on the web site for further public comment; or put the criteria on the agenda for a future Evaluation Committee meeting.

Correspondence received and a memo outlining staff's resolution of the comments in the correspondence will be posted on the web site shortly after the close of the comment period.

Your cooperation is requested in forwarding to the Los Angeles business/regional office all material directed to the Evaluation Committee. Parties interested in the deliberations of the committee should refrain from communicating, whether in writing or verbally, with committee members. The committee reserves the right to refuse communications that do not comply with this request.

Newly approved acceptance criteria may involve test methods or test protocols that are not currently included in the scope of testing services offered by accredited testing laboratories. As noted in the ICC-ES Rules of Procedure for Evaluation Reports, the scope of the laboratory's accreditation must include the type of testing that is to be reported to ICC-ES. We encourage accredited laboratories to expand their scopes of accreditation to include testing under newly approved acceptance criteria. Please note that testing laboratories must be accredited by the International Accreditation Service (IAS) or by another accreditation body that is a signatory to the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement. For further information, please contact IAS at (562) 699-0541, extension 3309, or send an e-mail to pmccullen@iasonline.org.

Please submit all comments using the form on the web site. Attach any letters to the comment form. If you have any questions (not comments), please contact the undersigned at (800) 423-6587, extension 3289, or Michael O'Reardon, P.E., senior staff engineer, at extension 5685. You may also reach us by e-mail at es@icc-es.org.

Yours very truly,

Michael Beaton

Michael Beaton, P.E.
Vice President - Whittier Operations

MB/raf

Enclosure

cc: Evaluation Committee

200 LARKIN CENTER
July 18, 2008

The Dow Chemical Company
Midland, Michigan 48674

Michael Beaton
ICC Evaluation Services, Inc.
5360 Workman Mill Road
Whitter, CA 90601

REQUESTED CHANGE TO ICC ACCEPTANCE CRITERIA AC-12, "FOAM PLASTIC INSULATION"

Mr. Beaton,

I am writing to request an up-date to ICC-ES's Acceptance Criteria For Foam Plastic Insulation, AC-12. I request that the ASTM C 578 reference be up-dated from the 06 version to the 08 version:

1.3.2.1.4 ASTM C 578-**08**, Specification for Rigid Cellular Polystyrene Thermal Insulation

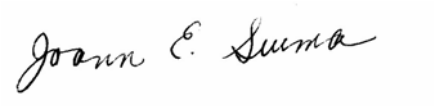
There have been several changes to the standard, they include:

- Deletion of the old Fed. Spec. footnote in Table 1, as a clean-up to the standard. The ASTM material standard replaced this outdated federal specification long ago.
- Addition of detailed definitions for the materials referenced in this standard: EPS, molded expanded polystyrene (3.2.1) and XPS, extruded expanded polystyrene (3.2.4)
- Addition of a new Type XV to Table 1, representing a new product available in the market.
- Up-date to the scope to clarify that SI unit are provided only for informational purposes (1.4)
- Up-date to Table 1; R-Values changing from 2 decimals to one decimal. The test methods used to assess R-Value are only capable of measuring to one decimal place. This R-Value requirement up-date does not impact how the foam sheathing performs.
- Up-date to Table 1; max perm of Type IV changed from 1.1 to 1.5. This gives manufacturers flexibility in production and the ability to tailor products to customer requests. This Type IV perm requirement up-date does not impact how the foam sheathing performs. (See Appendix 1 for further information.)

All of these changes enhance the ASTM C 578 material standard, while having no impact on how the foam sheathing will perform with respect to building codes. Also, the changes were completed via the ASTM consensus process.

I am requesting this up-date to occur during the next available date for revision of AC-12. I'd be happy to discuss this with you or others at ICC-ES, please feel free to give me a call.

Sincerely,



Joann Surma
The Dow Chemical Company
Building Materials Technical Support
Leader Codes and Standards
200 Larkin Center
Midland, MI 48674
(989) 636-8655

APPENDIX 1

To confirm that there are no moisture build-up concerns or an impact on building code requirements related to a change from 1.1 to 1.5 as the maximum allowable perm for a Type IV foam sheathing the following assessment is offered:

Background:

Water Vapor can condense into liquid water when it comes into contact with a cold object. Water Vapor can permeate into wall or roof areas and then condense to form water when a cold surface is reached. The point at which this condensation takes place is the called the Dew Point.

Given the proper information the theoretical location of a dewpoint in a wall or roof system can be calculated.

- The conditions (temperature and humidity) inside and outside the building must be known to determine how much water vapor is in the building and how cold it is outside to determine if condensation can occur.
- The R-Values of each components in the system is needed to determine the temperature at any point in the system (remember condensation occurs in cold locations)
- Each materials resistance to water vapor permeation (called "Rep Value" – note a rep value is the inverse of perm) is needed to determine the water vapor pressure at any point in the system (there must be enough water vapor present in order to condense)

When properly in-putted into a computer modeling program, this information can be used to determine the theoretical location of the dewpoint in the system.
Dewpoint analysis is a mathematical method used to better understand the condensation potential of a given building assembly. There are many kinds of dewpoint analyses. Some are very detailed and complicated, others are simpler. They all look at the temperature and humidity inside and outside the assembly and the physical properties of the assembly components themselves. This information is put together to determine whether or not there is the potential for water vapor condensation to occur in a given wall or roof assembly. The results of such an analysis are usually in the form of a graph. Most computer modeling tools are based on the movement of water by diffusion and they do not take into consideration movement of water vapor by air infiltration.

Assessment:
The Dow Chemical Company has developed computer modeling tool called the Dew Point Calculator. It is use to assess the potential for condensation to occur with a defined assembly. The calculations used in the Dow Dew Point Calculator are based upon the equations outlined in the ASHRAE Fundamentals Handbook, 1999.

An assessment was done using a 1.1 perm foam sheathing and a 1.5 perm foam sheathing in three different wall assemblies:

1. Concrete Block wall, foam sheathing on the interior side of the wall covered with dry wall.
2. Stud wall assembly with exterior vinyl siding, foam sheathing, R13 fiberglass batt, and interior dry wall.
3. Stud wall assembly with exterior Brick, air space, foam sheathing, R13 fiberglass batt, and interior dry wall.

Each assembly was assessed for a dewpoint in two different climactic conditions to represent worst case scenarios:

1. Florida summer conditions: Interior temp 72ºF, interior humidity 50%, exterior temp 92ºF exterior humidity 71.4%.
2. Minnesota winter conditions: Interior temp 70ºF, interior humidity 35%, exterior temp -21ºF exterior humidity 80%.

The assemblies assessed under the Minnesota winter conditions where evaluated with and without a vapor retarder.

Summary of Figures attached:

Figure Number	Wall Assembly with foam sheathing	Location	Foam Sheathing perm
1	Block wall	FL summer	1.1
2	Block wall	FL summer	1.5
3	Block wall no VR	MN winter	1.1
4	Block wall no VR	MN winter	1.5
5	Block wall with VR	MN winter	1.1
6	Block wall with VR	MN winter	1.5
7	stud wall, vinyl, R13	FL summer	1.1
8	stud wall, vinyl, R13	FL summer	1.5
9	stud wall, vinyl, R13 no VR	MN winter	1.1
10	stud wall, vinyl, R13 no VR	MN winter	1.5
11	stud wall, vinyl, R13 with VR	MN winter	1.1
12	stud wall, vinyl, R13 with VR	MN winter	1.5
13	stud wall, brick, R13	FL summer	1.1
14	stud wall, brick, R13	FL summer	1.5
15	stud wall, brick, R13 no VR	MN winter	1.1
16	stud wall, brick, R13 no VR	MN winter	1.5
17	stud wall, brick, R13 with VR	MN winter	1.1
18	stud wall, brick, R13 with VR	MN winter	1.5

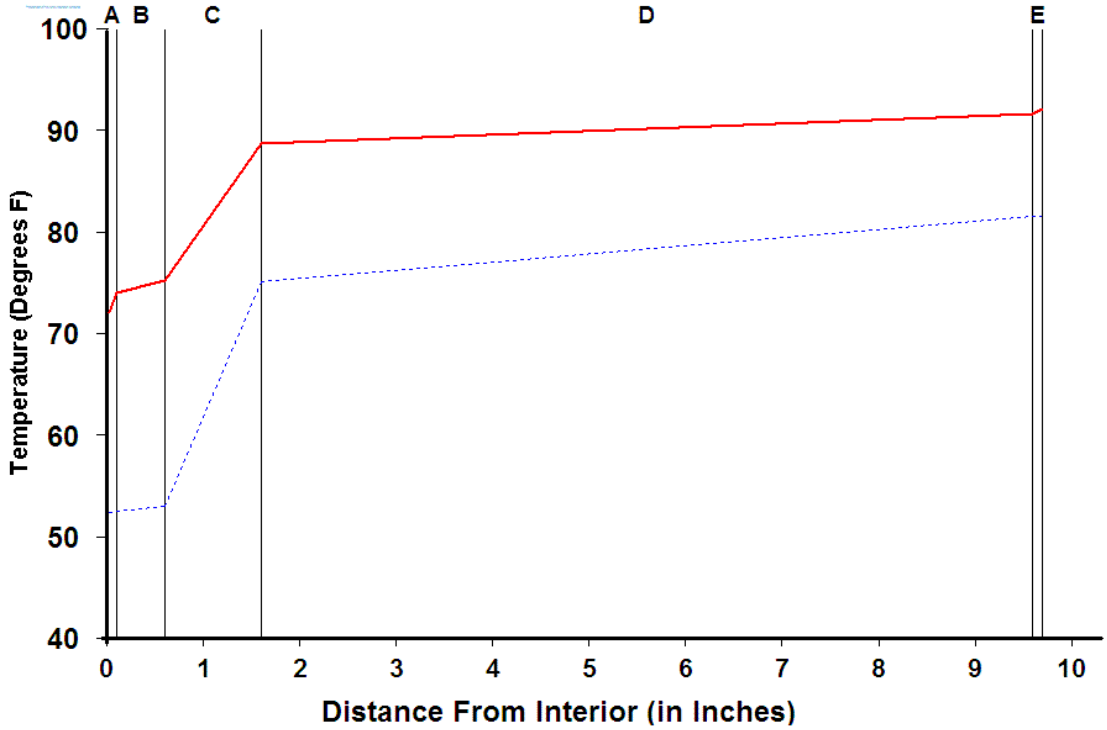
Conclusion:

The comparison between a 1.1 perm foam sheathing and a 1.5 perm foam sheathing, in all of these different wall assemblies, under all of these different conditions, shows no difference in performance due to the foam sheathing perm difference. The graphs do show the importance of a vapor retarder in the wall assemblies assessed. (per building code requirements – vapor retarder use on the warm in the winter side of a wall in a cold climate such as the Minnesota). The key is that the minor change in the foam sheathing perm from 1.1 to 1.5 had no impact on the dewpoint potential of any of the assemblies and, as such, has no impact on the building code requirements.

Figure 1

Dewpoint Analysis - Dow Chemical

Interior Block Wall - 1.1 perm foam FL Summer



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	72.0	92
Humidity	50.0	71.4

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	Foam Sheathing	1.000	5.00	0.910
D	Block Cinder & Gravel	8.000	1.10	0.400
E	Outside Air Film	0.100	0.17	0.001
F				
G				
H				
I				
J				
K				
L				
	TOTAL	9.700	7.40	1.326

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	72.00	52.32	0.000
AB	73.84	52.35	0.000
BC	75.05	52.84	0.000
CD	88.57	74.95	0.000
DE	91.54	81.42	0.000
EF	92.00	81.43	0.000
FG			
GH			
HI			
IJ			
JK			
KL			
L-			

NOTICE: This calculation is based on the theory of Water Vapor Migration presented in the ASHRAE 1993 Fundamentals Handbook. Actual performance may vary depending upon air infiltration. workmanship, and building materials. Since the information is provided without charge, The Dow Chemical Company assumes **no obligation or liability** for its use.

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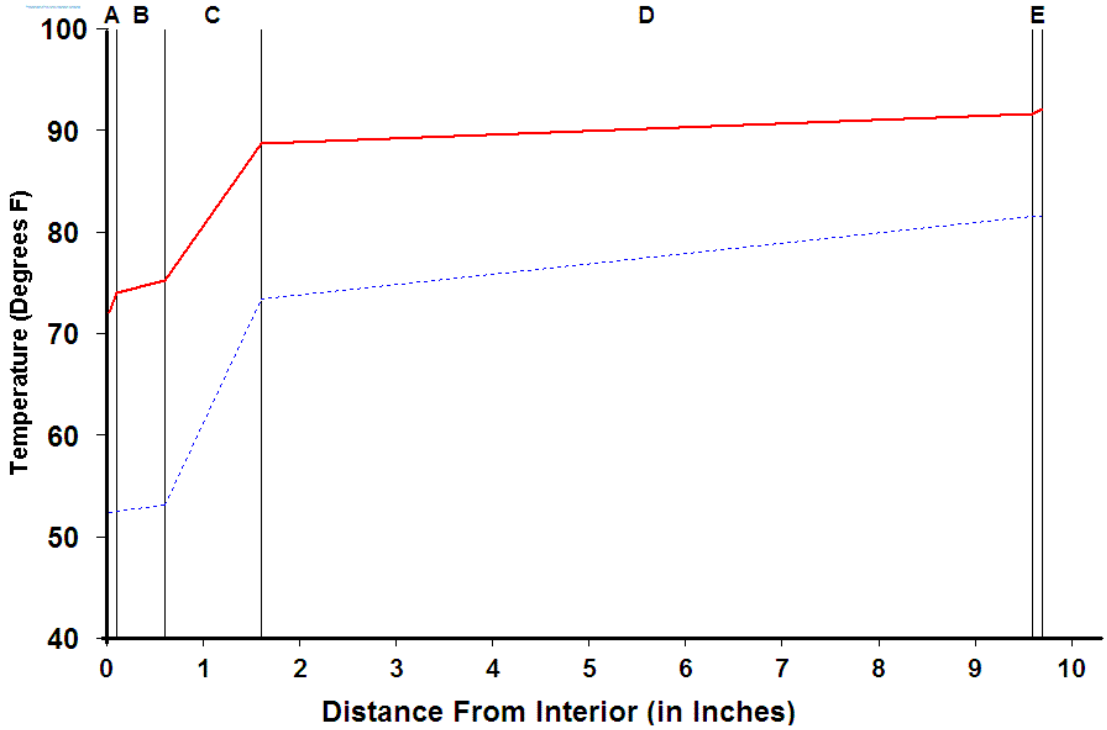
Figure 2

Dewpoint Analysis - Dow Chemical

Interior Block Wall - 1.5 perm foam FL Summer



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	72.0	92
Humidity	50.0	71.4

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	Foam Sheathing	1.000	5.00	0.670
D	Block Cinder & Gravel	8.000	1.10	0.400
E	Outside Air Film	0.100	0.17	0.001
F				
G				
H				
I				
J				
K				
L				
	TOTAL	9.700	7.40	1.086

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	72.00	52.32	0.000
AB	73.84	52.36	0.000
BC	75.05	52.96	0.000
CD	88.57	73.33	0.000
DE	91.54	81.41	0.000
EF	92.00	81.43	0.000
FG			
GH			
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IJ			
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KL			
L-			

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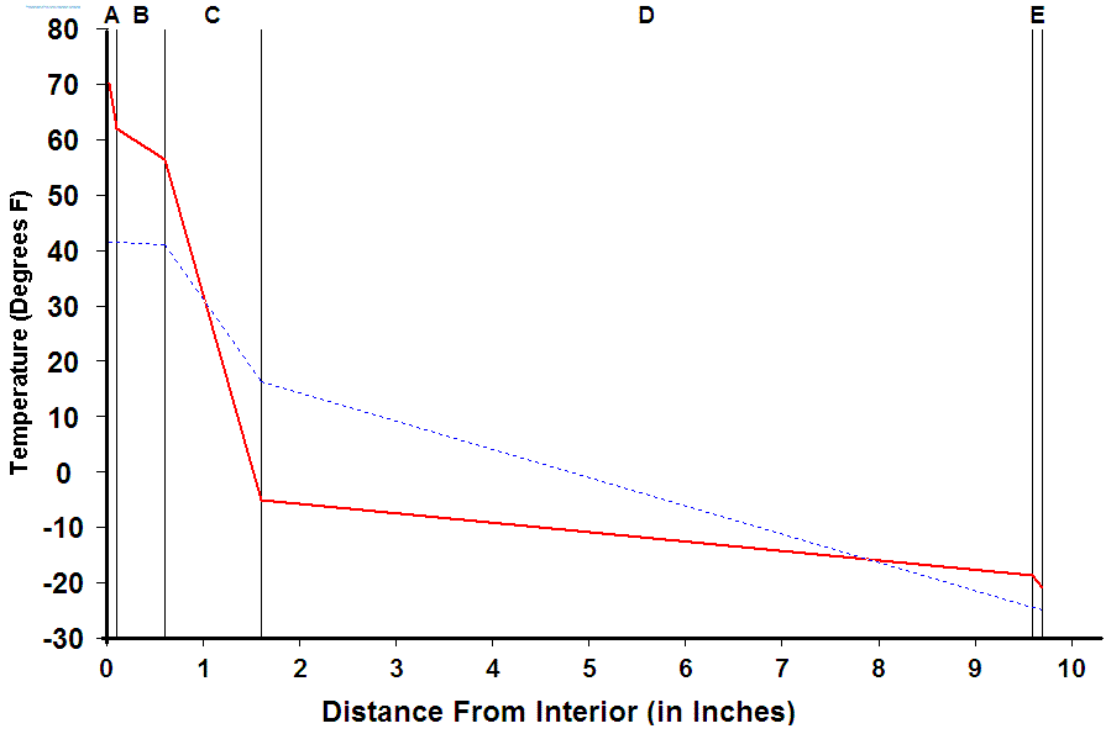
Figure 3

Dewpoint Analysis - Dow Chemical

Interior Block Wall - 1.1 perm foam MN Winter no VR



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	70.0	-21.0
Humidity	35.0	80.0

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	Foam Sheathing	1.000	5.00	0.910
D	Block Cinder & Gravel	8.000	1.10	0.400
E	Outside Air Film	0.100	0.17	0.001
F				
G				
H				
I				
J				
K				
L				
	TOTAL	9.700	7.40	1.326

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	70.00	41.16	0.000
AB	61.64	41.14	0.000
BC	56.10	40.88	0.000
CD	-5.38	16.07	* 0.011
DE	-18.91	-24.75	0.000
EF	-21.00	-25.03	0.000
FG			
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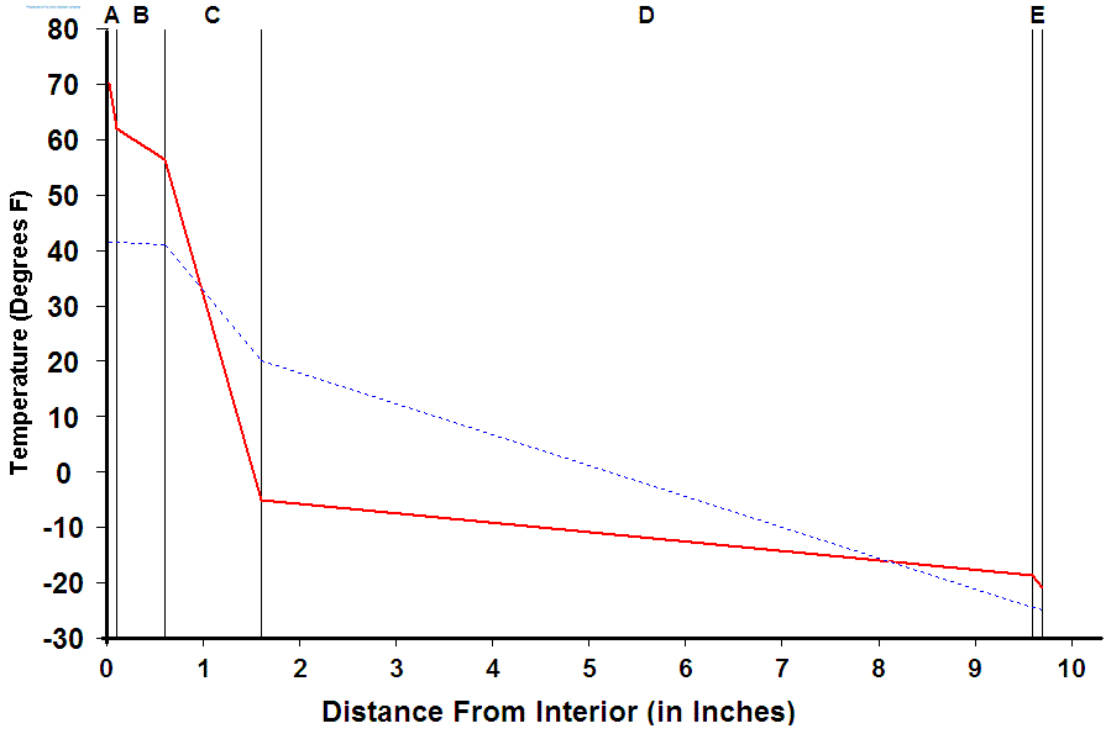
Figure 4

Dewpoint Analysis - Dow Chemical

Interior Block Wall - 1.5 perm foam MN Winter no VR



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	70.0	-21.0
Humidity	35.0	80.0

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	Foam Sheathing	1.000	5.00	0.670
D	Block Cinder & Gravel	8.000	1.10	0.400
E	Outside Air Film	0.100	0.17	0.001
F				
G				
H				
I				
J				
K				
L				
	TOTAL	9.700	7.40	1.086

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	70.00	41.16	0.000
AB	61.64	41.14	0.000
BC	56.10	40.82	0.000
CD	-5.38	19.76	* 0.016
DE	-18.91	-24.68	0.000
EF	-21.00	-25.03	0.000
FG			
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L-			

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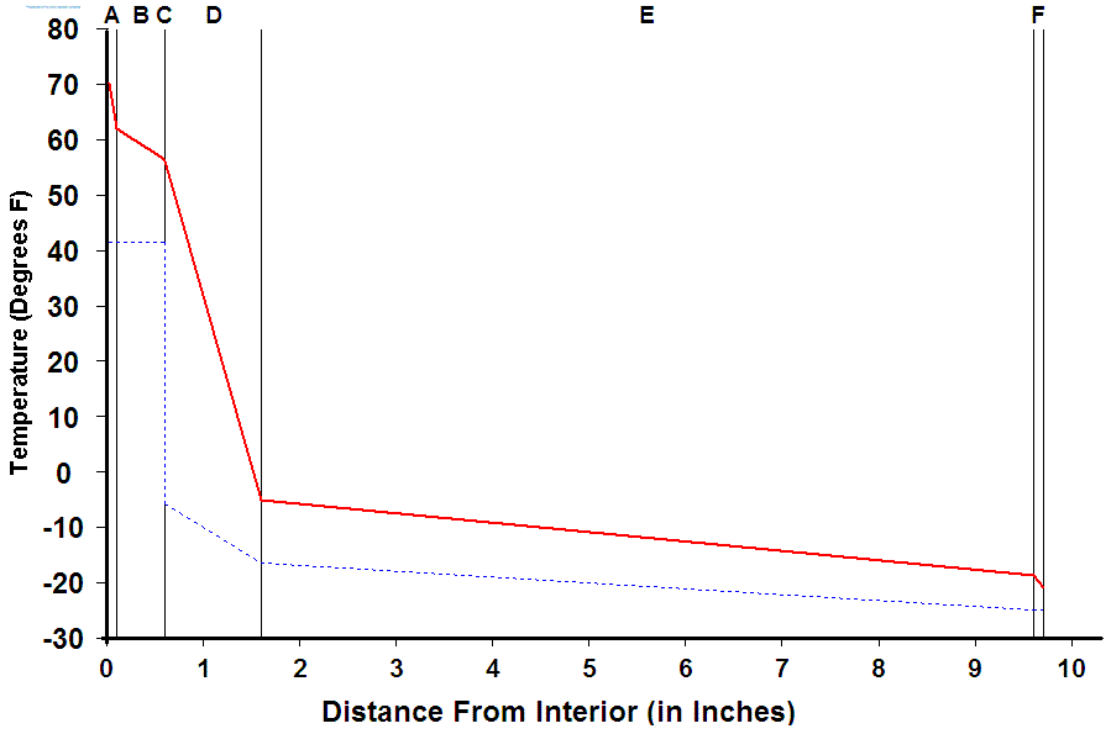
Figure 5

Dewpoint Analysis - Dow Chemical

Interior Block Wall - 1.1 perm foam MN Winter with VR



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	70.0	-21.0
Humidity	35.0	80.0

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	Polyethylene 6 mil	0.006	0.01	17.000
D	Foam Sheathing	1.000	5.00	0.910
E	Block Cinder & Gravel	8.000	1.10	0.400
F	Outside Air Film	0.100	0.17	0.001
G				
H				
I				
J				
K				
L				
	TOTAL	9.706	7.41	18.326

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	70.00	41.16	0.000
AB	61.65	41.16	0.000
BC	56.12	41.14	0.000
CD	56.00	-5.96	0.000
DE	-5.40	-16.74	0.000
EF	-18.91	-25.01	0.000
FG	-21.00	-25.03	0.000
GH			
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JK			
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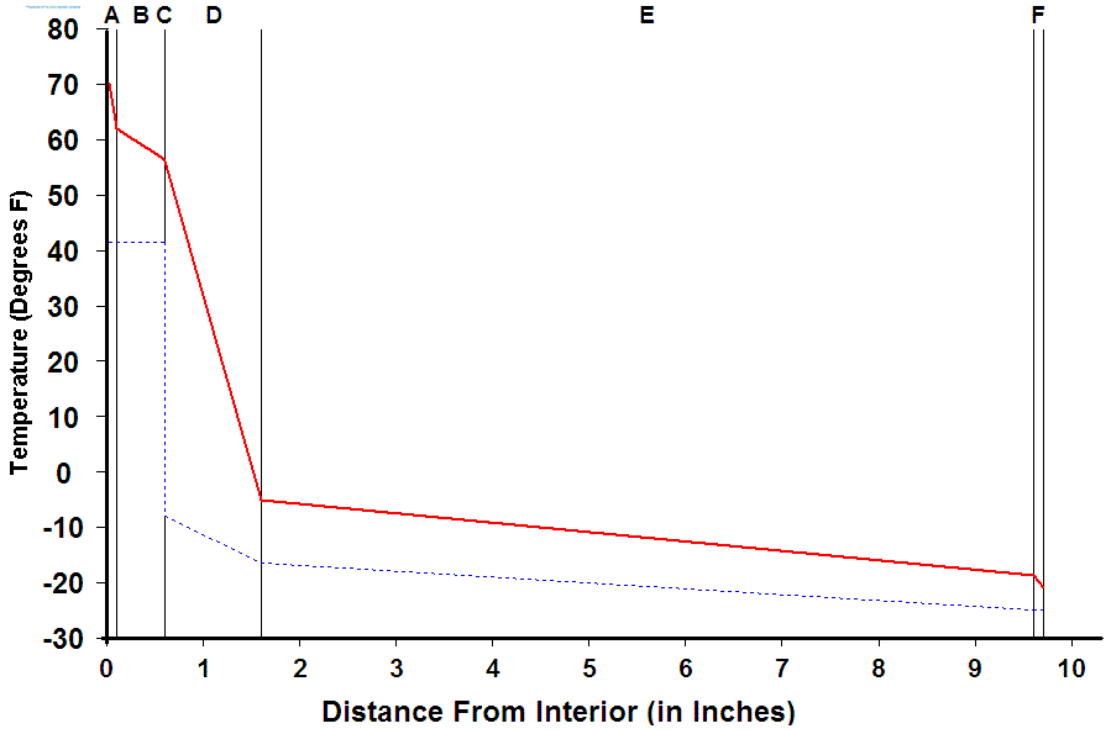
Figure 6

Dewpoint Analysis - Dow Chemical

Interior Block Wall - 1.5 perm foam MN Winter with VR



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	70.0	-21.0
Humidity	35.0	80.0

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	Polyethylene 6 mil	0.006	0.01	17.000
D	Foam Sheathing	1.000	5.00	0.670
E	Block Cinder & Gravel	8.000	1.10	0.400
F	Outside Air Film	0.100	0.17	0.001
G				
H				
I				
J				
K				
L				
	TOTAL	9.706	7.41	18.086

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	70.00	41.16	0.000
AB	61.65	41.16	0.000
BC	56.12	41.14	0.000
CD	56.00	-8.15	0.000
DE	-5.40	-16.66	0.000
EF	-18.91	-25.01	0.000
FG	-21.00	-25.03	0.000
GH			
HI			
IJ			
JK			
KL			
L-			

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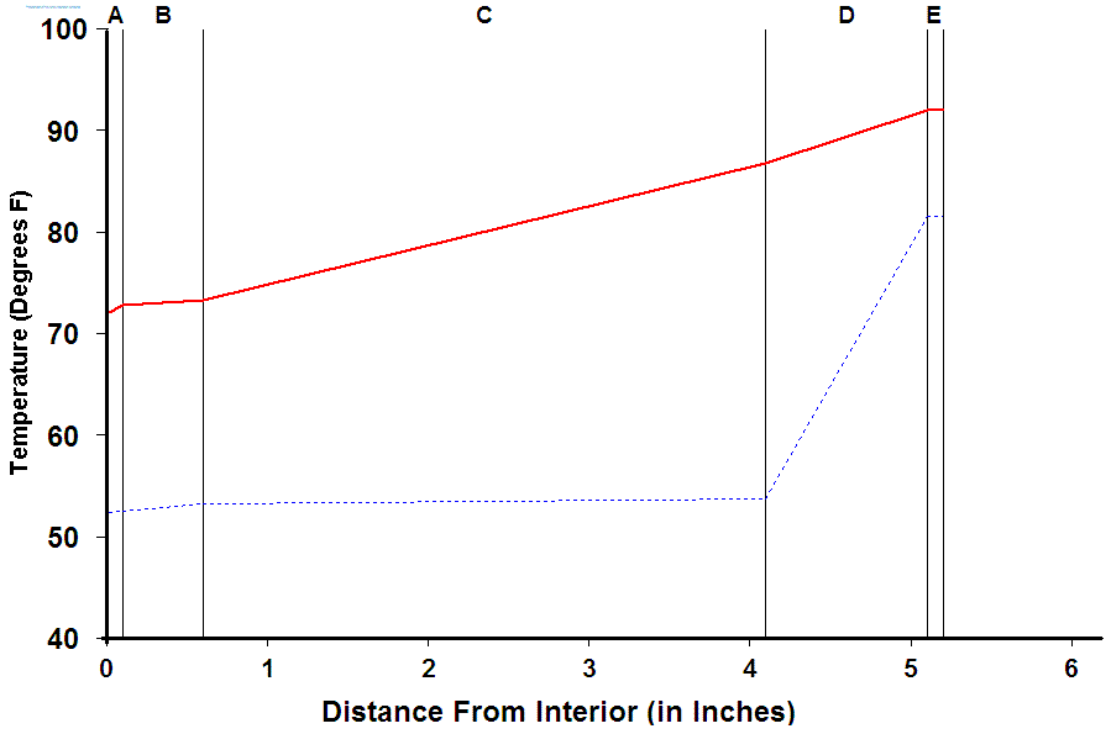
Figure 7

Dewpoint Analysis - Dow Chemical

2 x 4 wall 1.1 perm FL summer



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	72.0	92.0
Humidity	50.0	71.4

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	R-13 Fiberglass Batt	3.500	13.00	0.010
D	Foam Sheathing	1.000	5.00	0.910
E	Vinyl Siding	0.100	0.17	0.001
F				
G				
H				
I				
J				
K				
L				
	TOTAL	5.200	19.30	0.936

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	72.00	52.32	0.000
AB	72.70	52.37	0.000
BC	73.17	53.06	0.000
CD	86.64	53.54	0.000
DE	91.82	81.41	0.000
EF	92.00	81.43	0.000
FG			
GH			
HI			
IJ			
JK			
KL			
L-			

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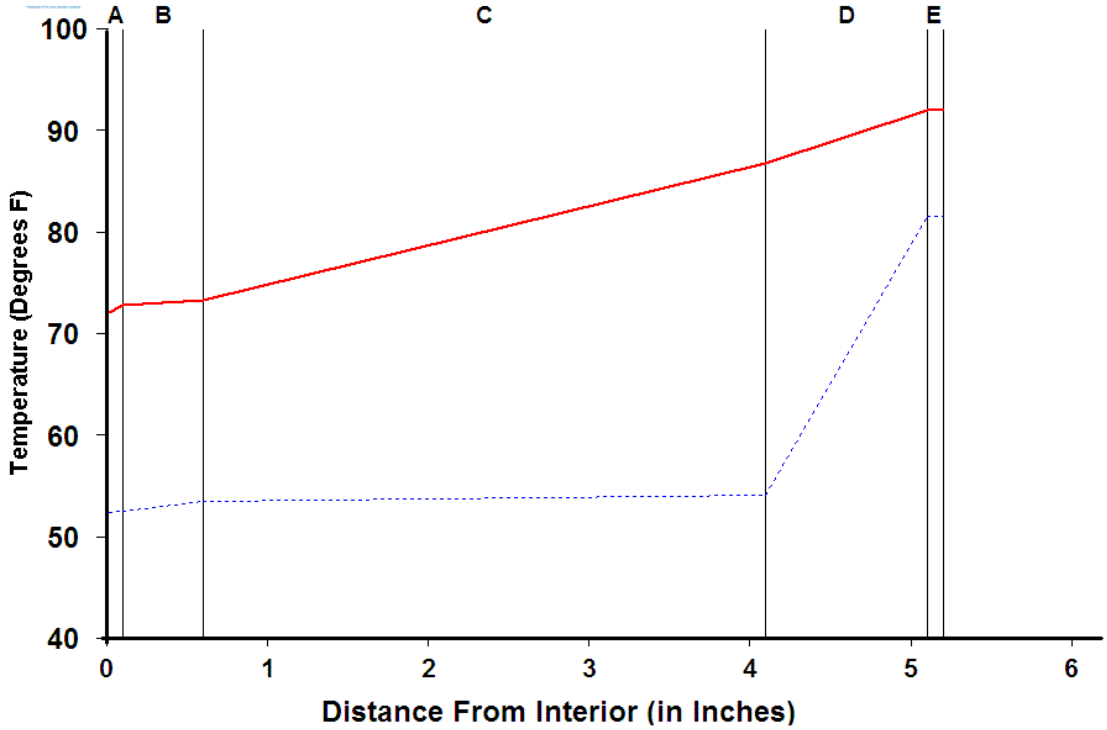
Figure 8

Dewpoint Analysis - Dow Chemical

2 x 4 wall 1.5 perm FL summer



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	72.0	92.0
Humidity	50.0	71.4

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	R-13 Fiberglass Batt	3.500	13.00	0.010
D	Foam Sheathing	1.000	5.00	0.670
E	Vinyl Siding	0.100	0.17	0.001
F				
G				
H				
I				
J				
K				
L				
	TOTAL	5.200	19.30	0.696

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	72.00	52.32	0.000
AB	72.70	52.38	0.000
BC	73.17	53.31	0.000
CD	86.64	53.96	0.000
DE	91.82	81.40	0.000
EF	92.00	81.43	0.000
FG			
GH			
HI			
IJ			
JK			
KL			
L-			

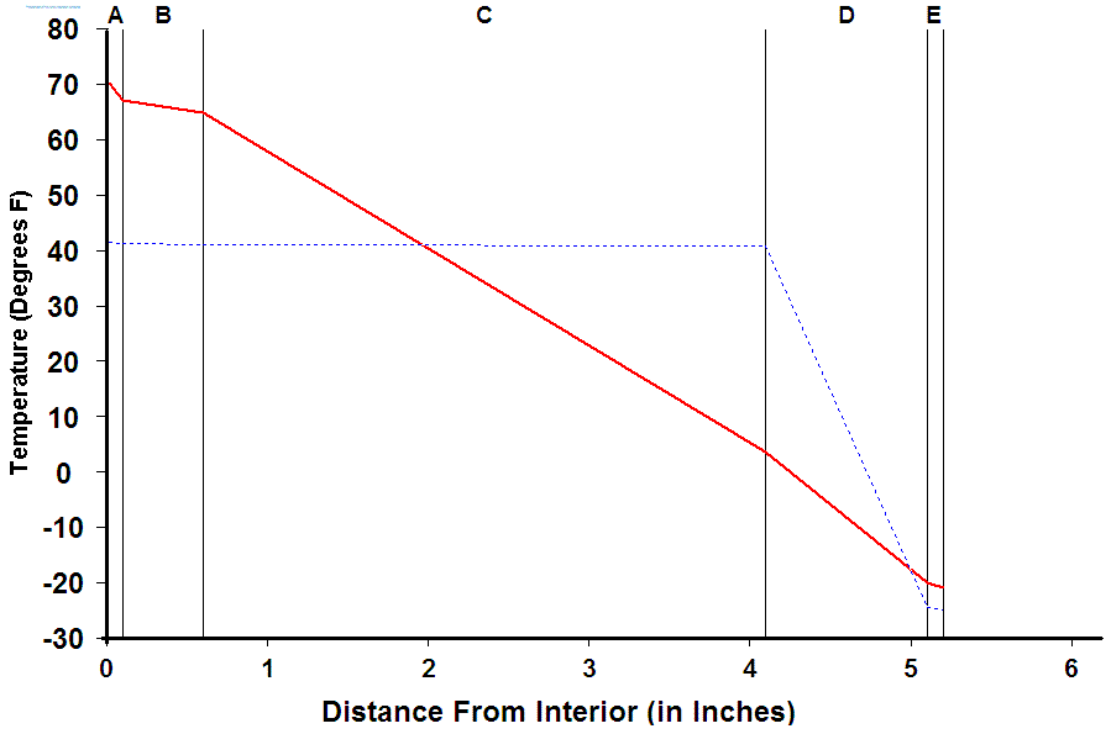
NOTICE: This calculation is based on the theory of Water Vapor Migration presented in the ASHRAE 1993 Fundamentals Handbook. Actual performance may vary depending upon air infiltration. workmanship, and building materials. Since the information is provided without charge, The Dow Chemical Company assumes **no obligation or liability** for its use.

July 17 2008 8:56:49 AM

Figure 9

Dewpoint Analysis - Dow Chemical

2 x 4 wall 1.1 perm MN winter no VR



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	70.0	-21
Humidity	35.0	80

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	R-13 Fiberglass Batt	3.500	13.00	0.010
D	Foam Sheathing	1.000	5.00	0.910
E	Vinyl Siding	0.100	0.17	0.001
F				
G				
H				
I				
J				
K				
L				
	TOTAL	5.200	19.30	0.936

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	70.00	41.16	0.000
AB	66.79	41.13	0.000
BC	64.67	40.76	0.000
CD	3.38	40.50	* 0.466
DE	-20.20	-24.63	0.000
EF	-21.00	-25.03	0.000
FG			
GH			
HI			
IJ			
JK			
KL			
L-			

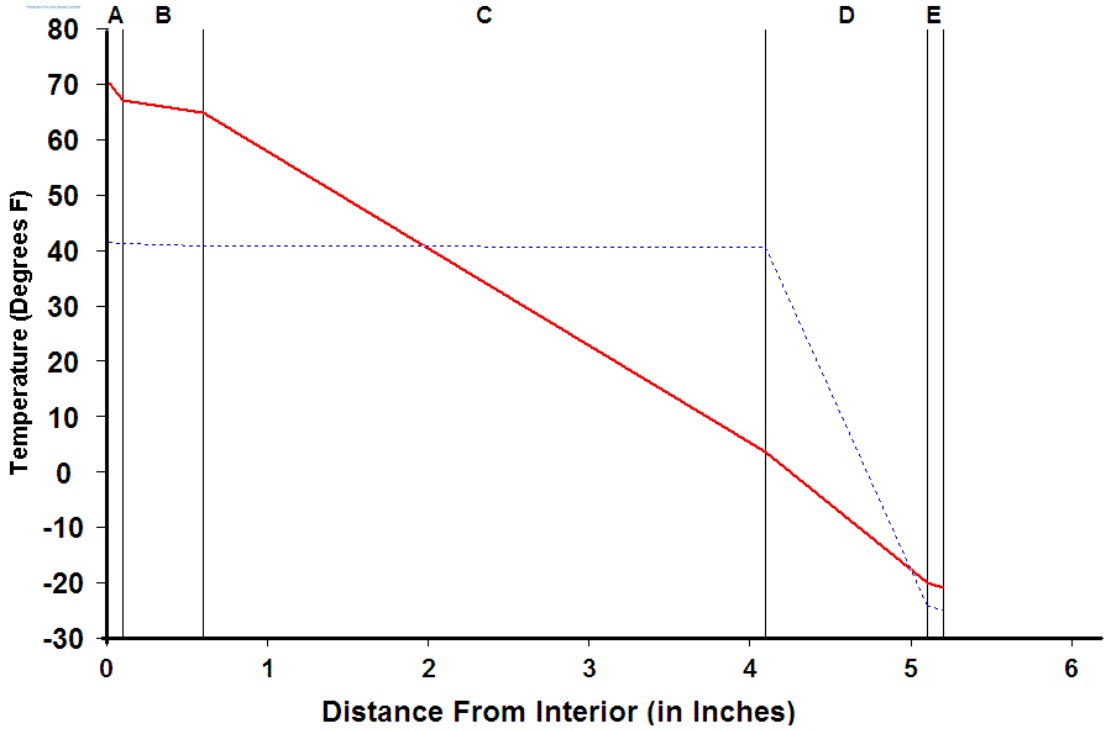
NOTICE: This calculation is based on the theory of Water Vapor Migration presented in the ASHRAE 1993 Fundamentals Handbook. Actual performance may vary depending upon air infiltration. workmanship, and building materials. Since the information is provided without charge, The Dow Chemical Company assumes **no obligation or liability** for its use.

July 17 2008 9:08:12 AM

Figure 10

Dewpoint Analysis - Dow Chemical

2 x 4 wall 1.5 perm MN winter no VR



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	70.0	-21
Humidity	35.0	80

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	R-13 Fiberglass Batt	3.500	13.00	0.010
D	Foam Sheathing	1.000	5.00	0.670
E	Vinyl Siding	0.100	0.17	0.001
F				
G				
H				
I				
J				
K				
L				
	TOTAL	5.200	19.30	0.696

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	70.00	41.16	0.000
AB	66.79	41.12	0.000
BC	64.67	40.63	0.000
CD	3.38	40.26	* 0.465
DE	-20.20	-24.49	0.000
EF	-21.00	-25.03	0.000
FG			
GH			
HI			
IJ			
JK			
KL			
L-			

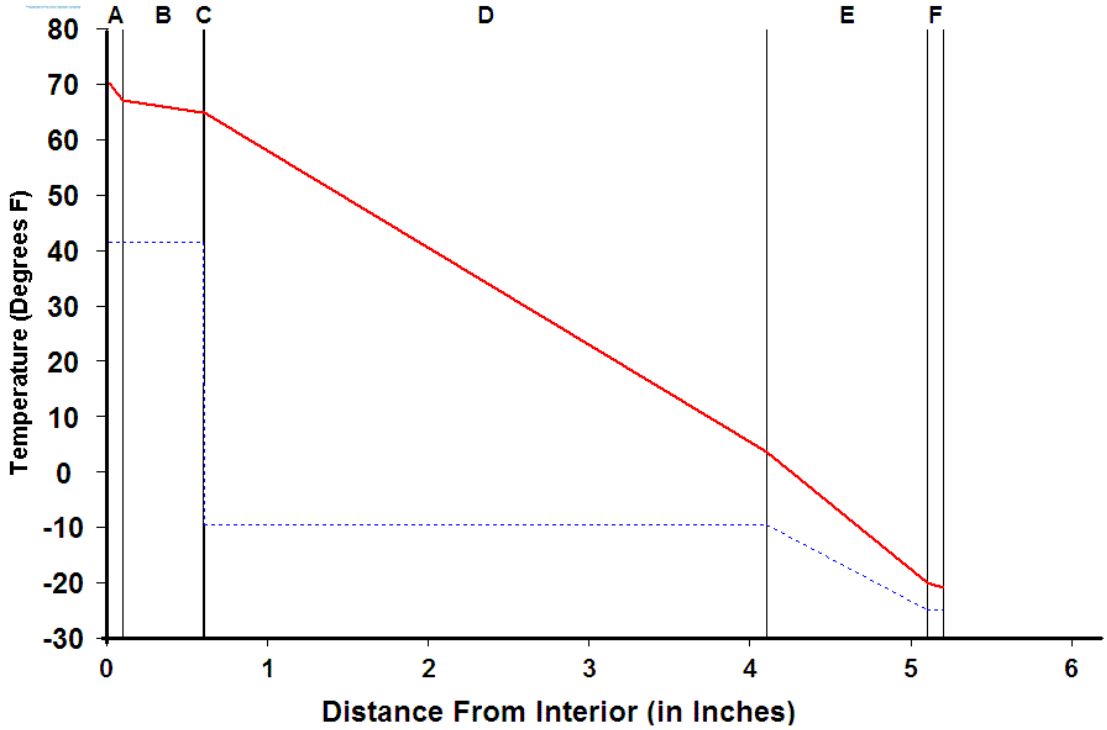
NOTICE: This calculation is based on the theory of Water Vapor Migration presented in the ASHRAE 1993 Fundamentals Handbook. Actual performance may vary depending upon air infiltration. workmanship, and building materials. Since the information is provided without charge, The Dow Chemical Company assumes **no obligation or liability** for its use.

July 17 2008 9:04:01 AM

Figure 11

Dewpoint Analysis - Dow Chemical

2 x 4 wall 1.1 perm MN winter with VR



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	70.0	-21
Humidity	35.0	80

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	Polyethylene 6 mil	0.006	0.01	17.000
D	R-13 Fiberglass Batt	3.500	13.00	0.010
E	Foam Sheathing	1.000	5.00	0.910
F	Vinyl Siding	0.100	0.17	0.001
G				
H				
I				
J				
K				
L				
	TOTAL	5.206	19.31	17.936

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	70.00	41.16	0.000
AB	66.80	41.16	0.000
BC	64.67	41.14	0.000
CD	64.63	-9.67	0.000
DE	3.36	-9.79	0.000
EF	-20.20	-25.01	0.000
FG	-21.00	-25.03	0.000
GH			
HI			
IJ			
JK			
KL			
L-			

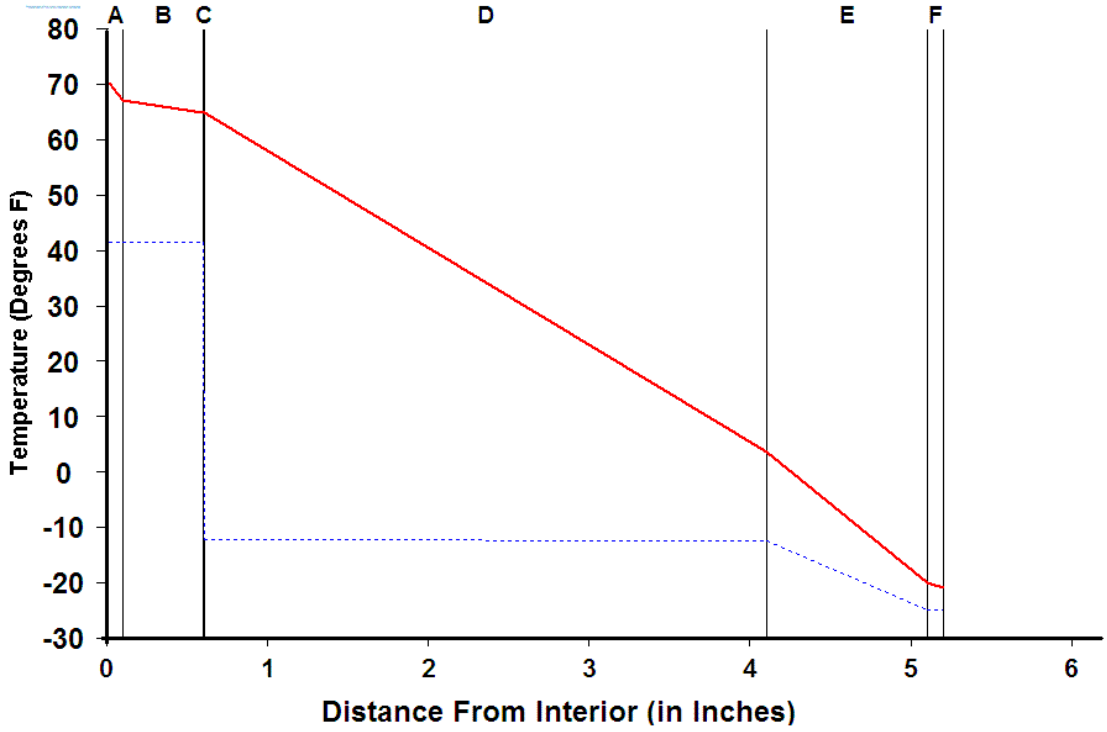
NOTICE: This calculation is based on the theory of Water Vapor Migration presented in the ASHRAE 1993 Fundamentals Handbook. Actual performance may vary depending upon air infiltration. workmanship, and building materials. Since the information is provided without charge, The Dow Chemical Company assumes **no obligation or liability** for its use.

July 17 2008 9:11:08 AM

Figure 12

Dewpoint Analysis - Dow Chemical

2 x 4 wall 1.5 perm MN winter with VR



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	70.0	-21
Humidity	35.0	80

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	Polyethylene 6 mil	0.006	0.01	17.000
D	R-13 Fiberglass Batt	3.500	13.00	0.010
E	Foam Sheathing	1.000	5.00	0.670
F	Vinyl Siding	0.100	0.17	0.001
G				
H				
I				
J				
K				
L				
	TOTAL	5.206	19.31	17.696

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	70.00	41.16	0.000
AB	66.80	41.16	0.000
BC	64.67	41.14	0.000
CD	64.63	-12.45	0.000
DE	3.36	-12.59	0.000
EF	-20.20	-25.01	0.000
FG	-21.00	-25.03	0.000
GH			
HI			
IJ			
JK			
KL			
L-			

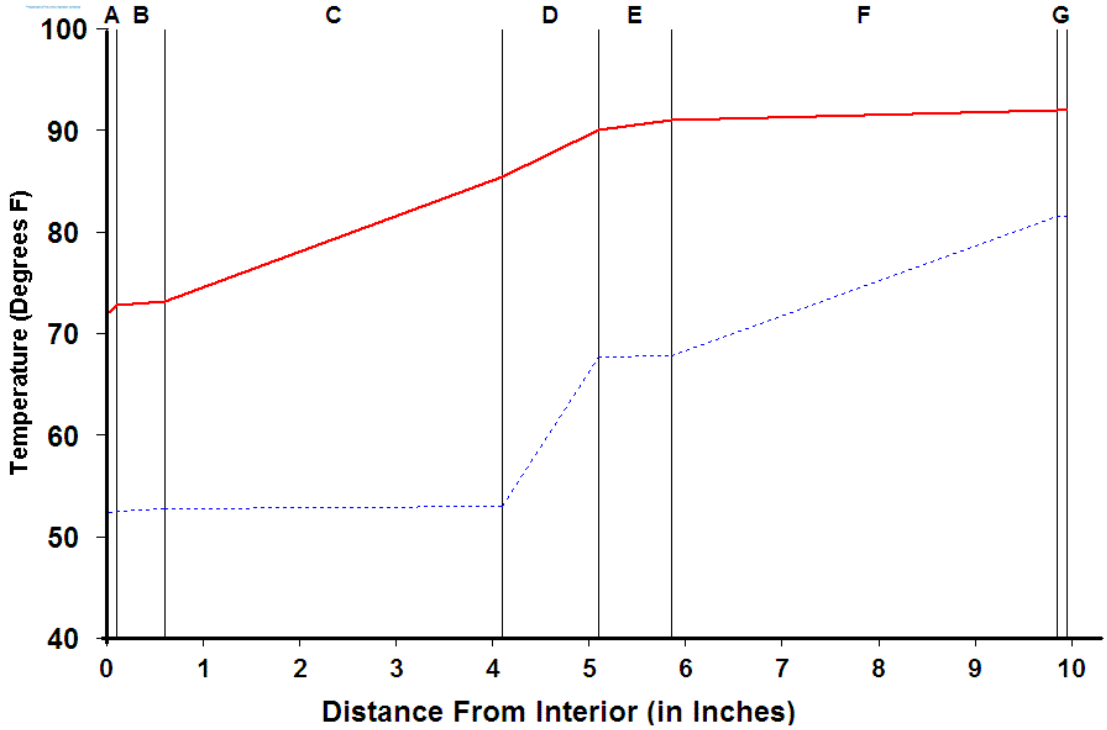
NOTICE: This calculation is based on the theory of Water Vapor Migration presented in the ASHRAE 1993 Fundamentals Handbook. Actual performance may vary depending upon air infiltration. workmanship, and building materials. Since the information is provided without charge, The Dow Chemical Company assumes **no obligation or liability** for its use.

July 17 2008 9:06:14 AM

Figure 13

Dewpoint Analysis - Dow Chemical

exterior brick 1.1 perm foam FL sum



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	72.0	92.0
Humidity	50.0	71.4

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	R-13 Fiberglass Batt	3.500	13.00	0.010
D	foam sheathing	1.000	5.00	0.910
E	Wall Air Space NonRefl	0.750	1.01	0.006
F	Brick Common 4in	4.000	1.00	1.300
G	Outside Air Film Winter	0.100	0.17	0.001
H				
I				
J				
K				
L				
	TOTAL	9.950	21.31	2.242

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	72.00	52.32	0.000
AB	72.64	52.34	0.000
BC	73.06	52.63	0.000
CD	85.26	52.83	0.000
DE	89.95	67.59	0.000
EF	90.90	67.67	0.000
FG	91.84	81.42	0.000
GH	92.00	81.43	0.000
HI			
IJ			
JK			
KL			
L-			

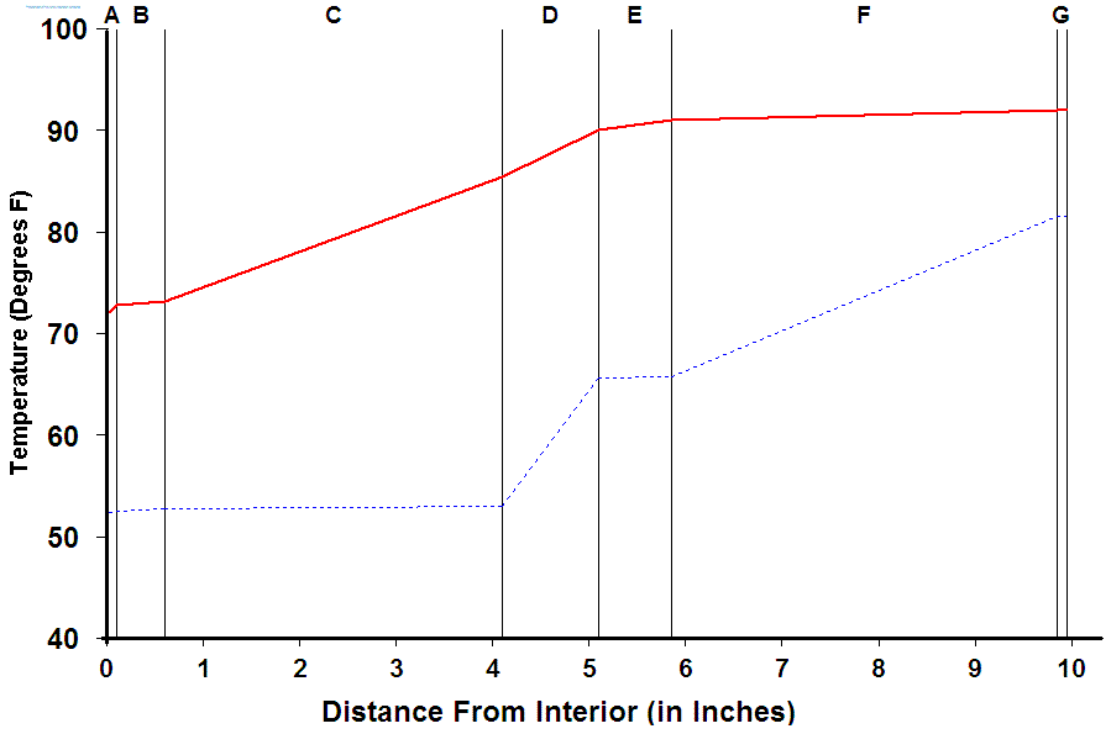
NOTICE: This calculation is based on the theory of Water Vapor Migration presented in the ASHRAE 1993 Fundamentals Handbook. Actual performance may vary depending upon air infiltration. workmanship, and building materials. Since the information is provided without charge, The Dow Chemical Company assumes **no obligation or liability** for its use.

July 17 2008 9:18:53 AM

Figure 14

Dewpoint Analysis - Dow Chemical

exterior brick 1.5 perm foam FL sum



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	72.0	92.0
Humidity	50.0	71.4

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	R-13 Fiberglass Batt	3.500	13.00	0.010
D	foam sheathing	1.000	5.00	0.670
E	Wall Air Space NonRefl	0.750	1.01	0.006
F	Brick Common 4in	4.000	1.00	1.300
G	Outside Air Film Winter	0.100	0.17	0.001
H				
I				
J				
K				
L				
	TOTAL	9.950	21.31	2.002

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	72.00	52.32	0.000
AB	72.64	52.34	0.000
BC	73.06	52.67	0.000
CD	85.26	52.90	0.000
DE	89.95	65.48	0.000
EF	90.90	65.57	0.000
FG	91.84	81.42	0.000
GH	92.00	81.43	0.000
HI			
IJ			
JK			
KL			
L-			

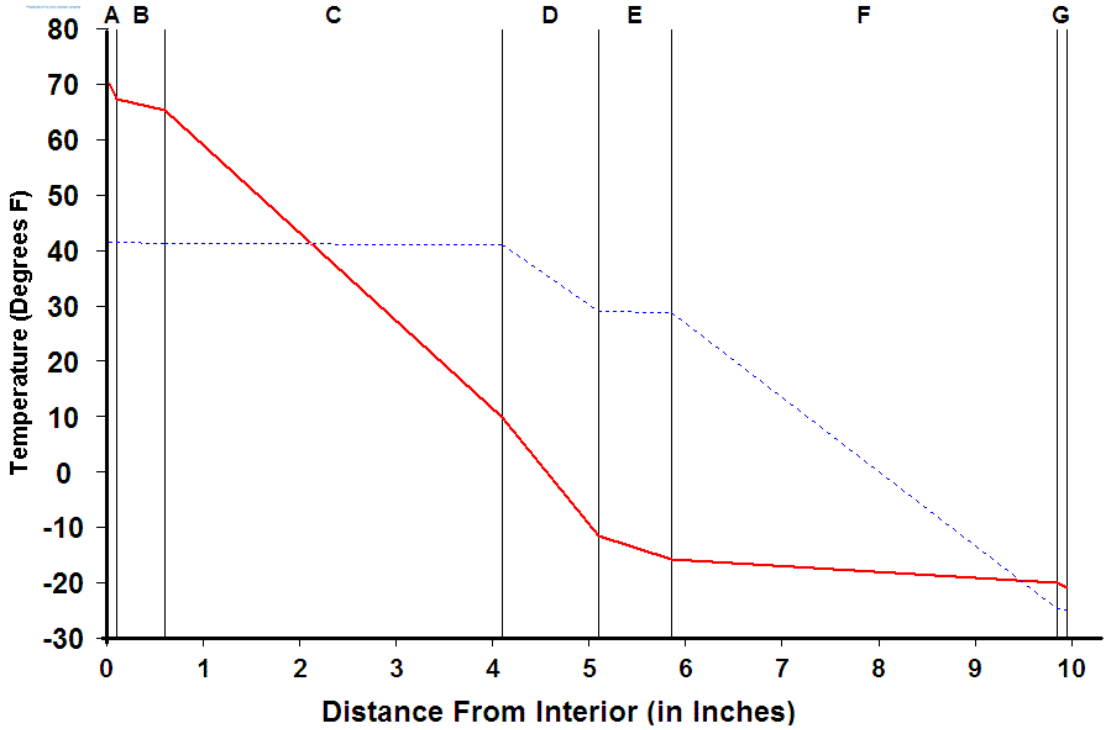
NOTICE: This calculation is based on the theory of Water Vapor Migration presented in the ASHRAE 1993 Fundamentals Handbook. Actual performance may vary depending upon air infiltration. workmanship, and building materials. Since the information is provided without charge, The Dow Chemical Company assumes **no obligation or liability** for its use.

July 17 2008 9:17:25 AM

Figure 15

Dewpoint Analysis - Dow Chemical

exterior brick 1.1 perm foam MN wim no VR



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	70.0	-21
Humidity	35.0	80

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	R-13 Fiberglass Batt	3.500	13.00	0.010
D	foam sheathing	1.000	5.00	0.910
E	Wall Air Space NonRefl	0.750	1.01	0.006
F	Brick Common 4in	4.000	1.00	1.300
G	Outside Air Film Winter	0.100	0.17	0.001
H				
I				
J				
K				
L				
	TOTAL	9.950	21.31	2.242

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	70.00	41.16	0.000
AB	67.10	41.15	0.000
BC	65.17	40.99	0.000
CD	9.66	40.88	* 0.431
DE	-11.69	28.69	* 0.014
EF	-16.00	28.59	* 0.014
FG	-20.27	-24.86	0.000
GH	-21.00	-25.03	0.000
HI			
IJ			
JK			
KL			
L-			

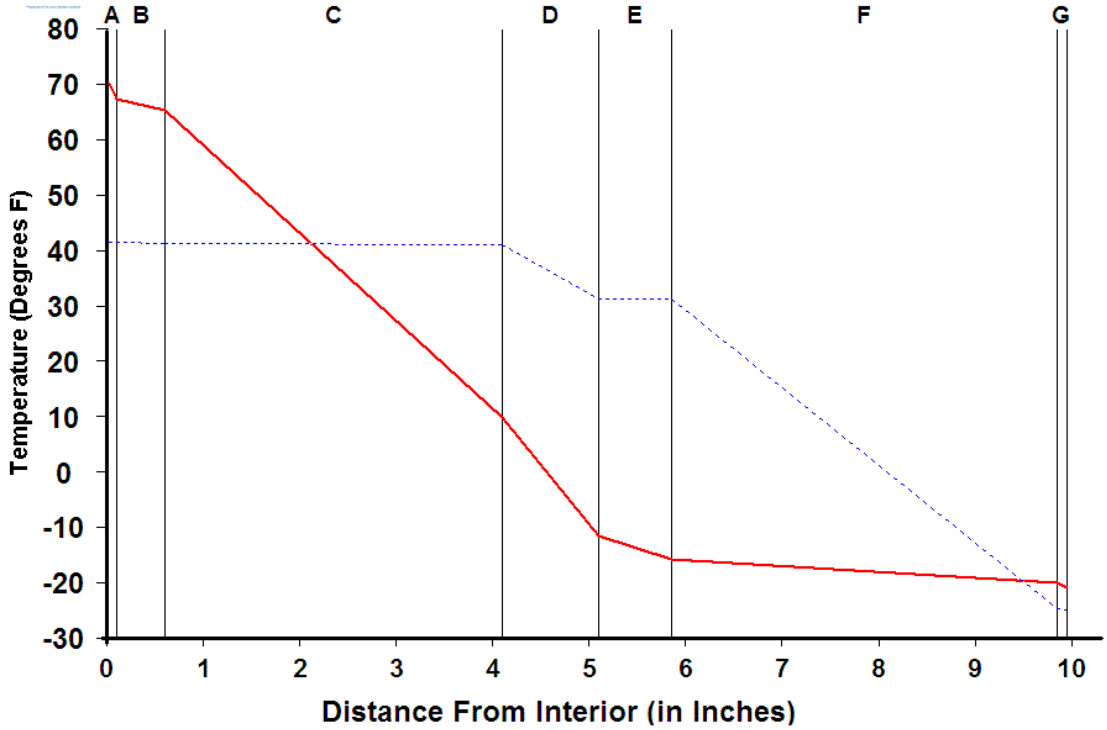
NOTICE: This calculation is based on the theory of Water Vapor Migration presented in the ASHRAE 1993 Fundamentals Handbook. Actual performance may vary depending upon air infiltration. workmanship, and building materials. Since the information is provided without charge, The Dow Chemical Company assumes **no obligation or liability** for its use.

July 17 2008 9:23:48 AM

Figure 16

Dewpoint Analysis - Dow Chemical

exterior brick 1.5 perm foam MN win no VR



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	70.0	-21
Humidity	35.0	80

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	R-13 Fiberglass Batt	3.500	13.00	0.010
D	foam sheathing	1.000	5.00	0.670
E	Wall Air Space NonRefl	0.750	1.01	0.006
F	Brick Common 4in	4.000	1.00	1.300
G	Outside Air Film Winter	0.100	0.17	0.001
H				
I				
J				
K				
L				
	TOTAL	9.950	21.31	2.002

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	70.00	41.16	0.000
AB	67.10	41.15	0.000
BC	65.17	40.97	0.000
CD	9.66	40.85	* 0.431
DE	-11.69	30.99	* 0.018
EF	-16.00	30.90	* 0.019
FG	-20.27	-24.84	0.000
GH	-21.00	-25.03	0.000
HI			
IJ			
JK			
KL			
L-			

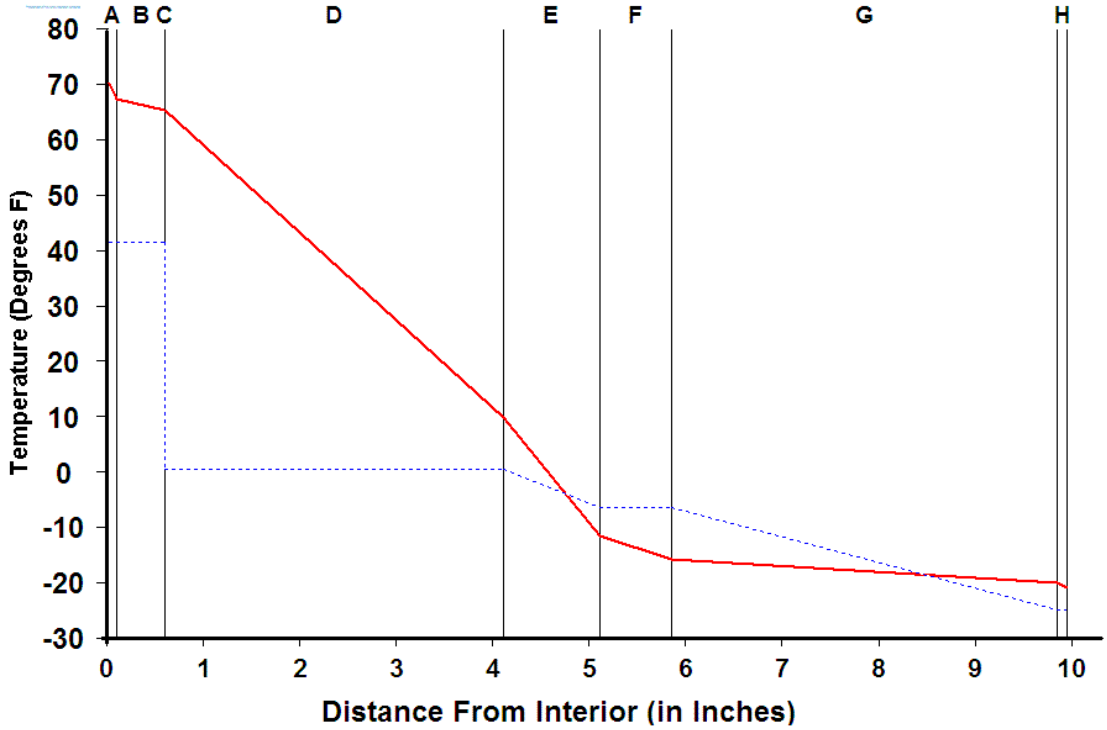
NOTICE: This calculation is based on the theory of Water Vapor Migration presented in the ASHRAE 1993 Fundamentals Handbook. Actual performance may vary depending upon air infiltration. workmanship, and building materials. Since the information is provided without charge, The Dow Chemical Company assumes **no obligation or liability** for its use.

July 17 2008 9:25:35 AM

Figure 17

Dewpoint Analysis - Dow Chemical

exterior brick 1.1 perm foam MN win with VR



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	70.0	-21
Humidity	35.0	80

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	Polyethylene 6 mil	0.006	0.01	17.000
D	R-13 Fiberglass Batt	3.500	13.00	0.010
E	foam sheathing	1.000	5.00	0.910
F	Wall Air Space NonRefl	0.750	1.01	0.006
G	Brick Common 4in	4.000	1.00	1.300
H	Outside Air Film Winter	0.100	0.17	0.001
I				
J				
K				
L				
	TOTAL	9.956	21.32	19.242

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	70.00	41.16	0.000
AB	67.10	41.16	0.000
BC	65.18	41.14	0.000
CD	65.13	0.38	0.000
DE	9.65	0.31	0.000
EF	-11.70	-6.58	* 0.000
FG	-16.01	-6.63	* 0.000
GH	-20.27	-25.01	0.000
HI	-21.00	-25.03	0.000
IJ			
JK			
KL			
L-			

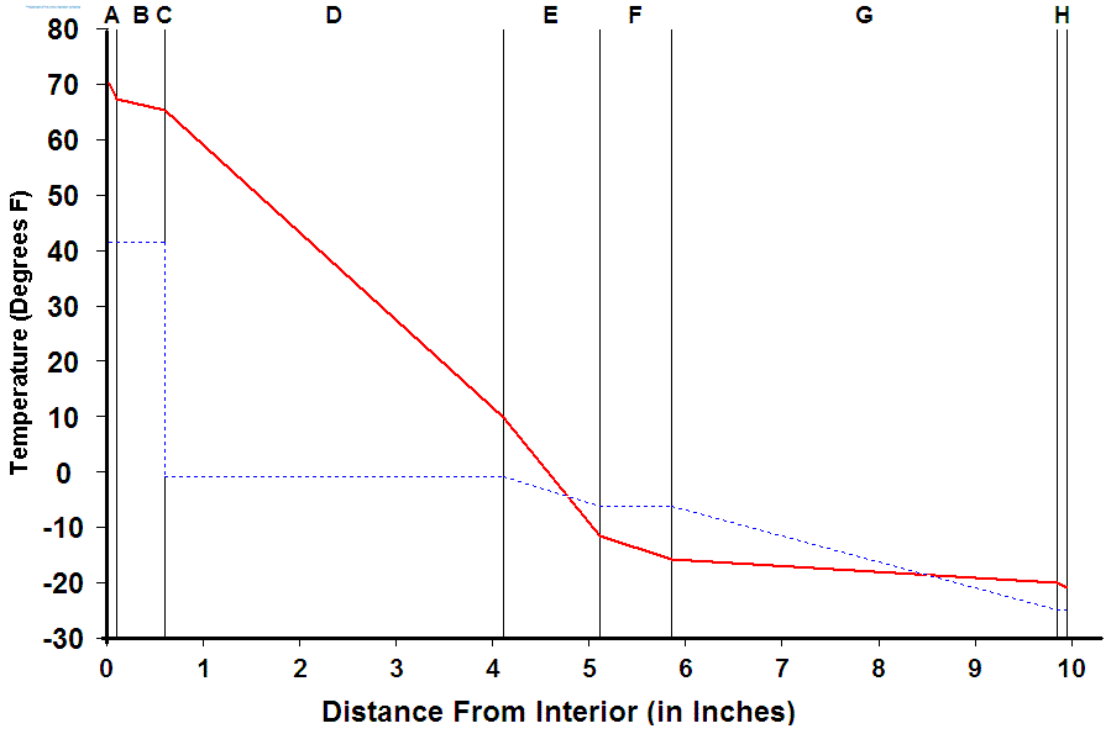
NOTICE: This calculation is based on the theory of Water Vapor Migration presented in the ASHRAE 1993 Fundamentals Handbook. Actual performance may vary depending upon air infiltration. workmanship, and building materials. Since the information is provided without charge, The Dow Chemical Company assumes **no obligation or liability** for its use.

July 17 2008 9:28:43 AM

Figure 18

Dewpoint Analysis - Dow Chemical

exterior brick 1.5 perm foam MN win with VR



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	70.0	-21
Humidity	35.0	80

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .5in	0.500	0.45	0.014
C	Polyethylene 6 mil	0.006	0.01	17.000
D	R-13 Fiberglass Batt	3.500	13.00	0.010
E	foam sheathing	1.000	5.00	0.670
F	Wall Air Space NonRefl	0.750	1.01	0.006
G	Brick Common 4in	4.000	1.00	1.300
H	Outside Air Film Winter	0.100	0.17	0.001
I				
J				
K				
L				
	TOTAL	9.956	21.32	19.002

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	70.00	41.16	0.000
AB	67.10	41.16	0.000
BC	65.18	41.14	0.000
CD	65.13	-1.05	0.000
DE	9.65	-1.12	0.000
EF	-11.70	-6.43	* 0.000
FG	-16.01	-6.49	* 0.000
GH	-20.27	-25.01	0.000
HI	-21.00	-25.03	0.000
IJ			
JK			
KL			
L-			

NOTICE: This calculation is based on the theory of Water Vapor Migration presented in the ASHRAE 1993 Fundamentals Handbook. Actual performance may vary depending upon air infiltration. workmanship, and building materials. Since the information is provided without charge, The Dow Chemical Company assumes **no obligation or liability** for its use.

July 17 2008 9:27:10 AM

EXTRUDED POLYSTYRENE FOAM ASSOCIATION

4223 Dale Boulevard ♦ Woodbridge, VA 22193
Tel 703.730.1601 ♦ fax 703.583.5860
www.xpsa.com

July 18, 2008

Mr. Michael Beaton
ICC Evaluation Services, Inc.
5360 Workman Mill Road
Whittier, CA 90601-2298

ICC-ES AC 12 Quality Control Program Requirements for Extruded Polystyrene (XPS) Foam Insulation

Dear Mike:

This letter is in regards to the requirements for ongoing quality control of XPS as referenced currently in ICC-ES AC 12 (Acceptance Criteria for Foam Plastic Insulation) sections 4.5.15.1.3 and 4.5.15.2.3. Please accept the following request submitted on behalf of the Extruded Polystyrene Foam Association. [1]:

It is proposed to revise ICC-ES AC 12 sections 4.5.15.1.3 and 4.5.15.2.3 to remove the requirement within the quality control program for monitoring the Flexural Strength for extruded polystyrene (XPS) thermal insulation. The justification for removal of the requirement to monitor flexural strength is that the compressive resistance of the XPS thermal insulation boards is directly proportional to the flexural strength of the XPS (See Graph 1). Therefore by closely monitoring the compressive resistance to ensure compliance to the C578, the flexural strength will be attained. It is XPSA position that compressive resistance and density testing (which is already included for all ASTM C 578 materials) are the most representative quality assurance tests for use with XPS thermal insulation. Flexural strength testing is redundant, adding unnecessary time and cost to the quality assurance program.

Also the last sentence that refers to "all types and resins grades" in these two sections was meant for use with EPS only, as XPS production does not use pre-formulated polystyrene beads as part of the manufacturing process.

The following is proposed rewording for ICC-ES AC 12 sections 4.5.15.1.3 and 4.5.15.2.3.:

[1] The Extruded Polystyrene Foam Association (XPSA) is a trade association representing manufacturers of extruded polystyrene foam (XPS) insulation products and the industry's raw material suppliers. XPSA members include The Dow Chemical Company, Owens Corning, and Pactiv Corporation, which collectively manufacture more than 95 percent of all XPS insulation products sold in the North American market. XPSA conducts industry-wide research; addresses regulatory and legislative challenges; and serves as the industry spokesperson to promote the benefits that accrue to society from appropriate use of XPS foam insulation applications.

4.5.15.1.3 In addition to the information required in Sections 5.1, 5.2 and 5.5 of this criteria, the quality control program shall assure continued compliance with ASTM C 578. The quality control program shall verify flexural strength (required for expanded polystyrene only), compressive strength (required for extruded polystyrene only), density and the presence of fire-retardant modified resins at each inspection by the inspection agency. Over time, the testing shall incorporate tests to address all types and resin grades (required for expanded polystyrene only).

4.5.15.2.3 In addition to the information required in Sections 5.1, 5.2 and 5.5 of this criteria, the quality control program shall assure continued compliance with ASTM C 578. The quality control program shall verify flexural strength (required for expanded polystyrene only), compressive strength (required for extruded polystyrene only), density and the presence of fire-retardant modified resins at each inspection by the inspection agency. Over time, the testing shall incorporate tests to address all types and resin grades (required for expanded polystyrene only).

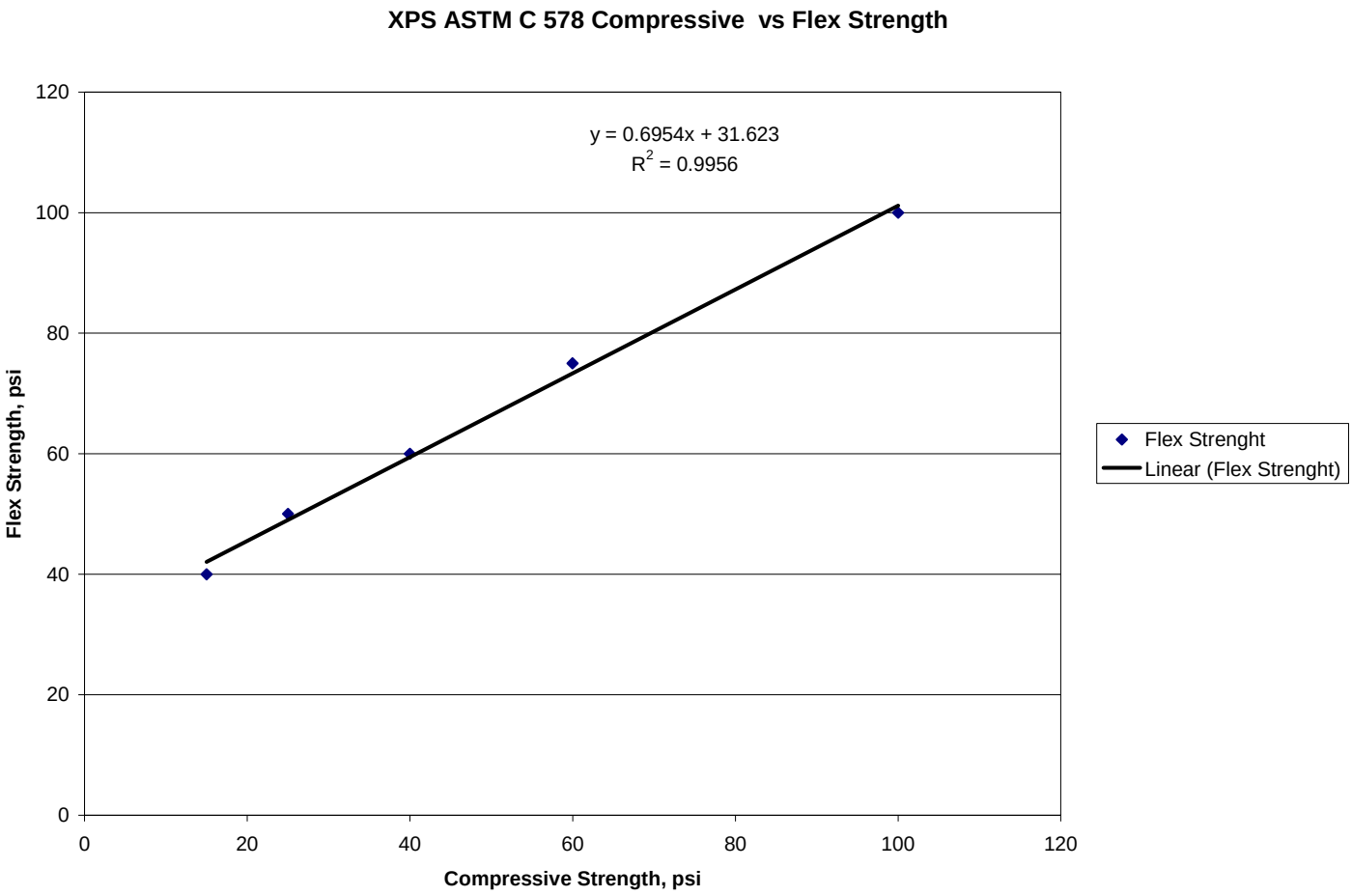
We urge the ICC ES evaluation service to accept this proposal and move forward to up-date ICC-ES AC 12, Acceptance Criteria for Foam Plastic Insulation.

Respectfully submitted,

S. Susan Strong

S. Susan Strong (previously Herrenbruck)
Executive Director

Graph 1


XPS ASTM C 578 Compressive vs Flex Strength
y = 0.6954x + 31.623
R2 = 0.9956
Flex Strength, psi
Compressive Strength, psi
0
20
40
60
80
100
120
Flex Strenght
Linear (Flex Strenght)

PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR FOAM PLASTIC INSULATION

AC12

Proposed October 2008

Previously approved May 2008, February 2007, June 2006, February 2005, October 2004, June 2004, July 2002, January 2002, July 2001, September 2000, July 2000, September 1999, June 1998, January 1996, January 1995, April 1992, October 1982, April 1980

PREFACE

Evaluation reports issued by ICC Evaluation Service, Inc. (ICC-ES), are based upon performance features of the International family of codes and other widely adopted code families, including the Uniform Codes, the BOCA National Codes, and the SBCCI Standard Codes. Section 104.11 of the *International Building Code*® reads as follows:

> **The provisions of this code are not intended to prevent the installation of any materials or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.**

Similar provisions are contained in the Uniform Codes, the National Codes, and the Standard Codes.

ICC-ES may consider alternate criteria, provided the report applicant submits valid data demonstrating that the alternate criteria are at least equivalent to the criteria proposed in this document, and otherwise meet the applicable performance requirements of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria proposed in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise meet the applicable performance requirements of the codes, ICC-ES retains the right to refuse to issue or renew an evaluation report, if the product, material, or type or method of construction is such that either unusual care with its installation or use must be exercised for satisfactory performance, or malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use of the product, material, or type or method of construction.

Acceptance criteria are developed for use solely for purposes of issuing ICC-ES evaluation reports.

PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR FOAM PLASTIC INSULATION

1.0 INTRODUCTION

1.1 Purpose: The purpose of this acceptance criteria is to establish requirements for foam plastic insulation to be recognized in an ICC Evaluation Service, Inc. (ICC-ES), evaluation report under the 2006 *International Building Code*® (IBC), the 2006 *International Fire Code*® (IFC), the 2006 *International Residential Code*® (IRC), the 2006 *International Energy Conservation Code* (IECC), the 1997 *Uniform Building Code*™ (UBC) and the 1997 *Uniform Fire Code*™ (UFC). The bases of recognition are IBC Section 104.11, IRC Section 104.11, and UBC Section 104.2.8.

1.2 Scope: This criteria applies to foam plastic insulation for use in accordance with the applicable code. This criteria also provides acceptable diversified test procedures. Requirements for spray-applied foam plastic insulation are covered in the ICC-ES Acceptance Criteria for Spray-applied Polyurethane Foam Plastic Insulation (AC377).

1.3 Codes and Reference Standards: Where standards are referenced in this criteria, these standards shall be applied consistently with the code upon which compliance is based.

1.3.1 Codes:

1.3.1.1 2006 *International Building Code*® (IBC), International Code Council.

1.3.1.2 2006 *International Fire Code*® (IFC), International Code Council.

1.3.1.3 2006 *International Residential Code*® (IRC), International Code Council.

1.3.1.4 2006 *International Energy Conservation Code*® (IECC), International Code Council.

1.3.1.5 1997 *Uniform Building Code*™ (UBC).

1.3.1.6 1997 *Uniform Fire Code*™ (UFC).

1.3.2 Reference Standards:

1.3.2.1 ASTM International (ASTM):

1.3.2.1.1 ASTM C 177-99, Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.

1.3.2.1.2 ASTM C 236-89 1993^{el}, Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box.

1.3.2.1.3 ASTM C 518-91, Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

1.3.2.1.4 ASTM C 578-06 or -08, Specification for Rigid Cellular Polystyrene Thermal Insulation.

1.3.2.1.5 ASTM C 591-07, Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation

~~**1.3.2.1.5**~~ **1.3.2.1.6** ASTM C 840-04, Specification for Application and Finishing of Gypsum Board.

~~**1.3.2.1.6**~~ **1.3.2.1.7** ASTM C 976-90 (1996)^{el}, Test Method for Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box.

~~**1.3.2.1.7**~~ **1.3.2.1.8** ASTM C 1289-06, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

~~**1.3.2.1.8**~~ **1.3.2.1.9** ASTM D 1621-00, Test Method for Compressive Properties of Rigid Cellular Plastics.

~~**1.3.2.1.9**~~ **1.3.2.1.10** ASTM D 1622-98, Test Method for Determining Apparent Density of Rigid Cellular Plastics.

~~**1.3.2.1.10**~~ **1.3.2.1.11** ASTM D 1623-78 (1995), Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics (Type B Specimen).

~~**1.3.2.1.11**~~ **1.3.2.1.12** ASTM D 2126-98, Test Method for Response of Rigid Cellular Plastics to Thermal and Rigid Aging.

~~**1.3.2.1.12**~~ **1.3.2.1.13** ASTM D 2856-94 (1998), Standard Test Method for Open-Cell Content of Rigid Cellular Plastics by the Air Pycnometer.

~~**1.3.2.1.13**~~ **1.3.2.1.14** ASTM E 84-04, Test Methods for Surface Burning Characteristics of Building Materials.

~~**1.3.2.1.14**~~ **1.3.2.1.15** ASTM E 119-00, Test Methods for Fire Tests of Building Construction and Materials.

~~**1.3.2.1.15**~~ **1.3.2.1.16** ASTM E 283-04, Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.

1.3.2.2 Factory Mutual (FM):

1.3.2.2.1 FM 4450-(1989), Approval Standard for Class 1 Insulated Steel Deck Roofs—with Supplements through July 1992.

1.3.2.2.2 FM 4880-(2001), American National Standard for Evaluating Insulated Wall or Wall and Roof/Ceiling Assemblies, Plastic Interior Finish Materials, Plastic Exterior Building Panels Wall/Ceiling Coating Systems, Interior or Exterior Finish Systems.

1.3.2.3 National Fire Protection Association (NFPA):

1.3.2.3.1 NFPA 13-02, Installation of Sprinkler Systems.

1.3.2.3.2 NFPA 259-04, Test Method for Potential Heat of Building Materials.

1.3.2.3.3 NFPA 268-01, Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source.

1.3.2.3.4 NFPA 286-00, Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.3.2.4 Underwriters Laboratories (UL):

1.3.2.4.1 UL 723-03, Test for Surface Burning Characteristics of Building Materials, with revisions through May 2005.

1.3.2.4.2 UL 790-98, Tests for Fire Resistance for

Roof Covering Materials, with revisions through July 198.

1.3.2.4.3 UL 1256-02, Fire Tests of Roof Deck Construction.

1.3.2.4.4 UL 1040-96, Fire Test of Insulated Wall Construction, with revisions through April 2001 (IBC) and June 2001 (IRC).

1.3.2.4.5 UL 1715-97, Fire Tests of Interior Finish Material, with revisions through October 2002 (IBC and March 2004 (IRC).

2.0 BASIC INFORMATION

The following information shall be submitted:

2.1 Product Description: Complete information concerning material specifications, thickness, size and the manufacturing process.

2.2 Installation Instructions: Installation details and limitations, fastening methods, joint treatments and face treatments.

2.3 Packaging and Identification: A description of the method of packaging and field identification of the foam plastic insulation. Identification provisions shall include the evaluation report number.

2.4 Field Preparation: A description of the methods of field-cutting, application and finishing.

2.5 Testing Laboratories: Testing laboratories shall comply with Section 2.0 of the ICC-ES Acceptance Criteria for Test Reports (AC85) and Section 4.2 of the ICC-ES Rules of Procedures for Evaluation Reports.

2.6 Test Reports: Test reports shall comply with AC85.

2.7 Product Sampling: Sampling for foam plastic insulation under this criteria shall comply with Section 3.1 of AC85.

3.0 TEST AND PERFORMANCE REQUIREMENTS

3.1 Flame-spread Index: The insulation shall exhibit a maximum flame-spread index of 75 when tested in accordance with ASTM E 84 or UBC Standard 8-1.

3.1.1 Other sections in the codes and this acceptance criteria may alter the maximum allowable flame-spread index.

3.1.2 Except as specifically permitted in IBC Section 2603, IRC Section R314 or UBC Section 2602, foam plastic recognition shall be limited to the maximum thickness and density of the test specimen.

3.2 Smoke-developed Index: The insulation shall exhibit a maximum smoke-developed index of 450 when tested in accordance with ASTM E 84, UL 723 or UBC Standard 8-1. Recognition is limited to the maximum thickness and density of the tested specimen. Testing required to determine the smoke-developed index is waived for roofing insulation under IBC Section 2603.3 (Exception 3), IRC Section R314.5.2 or UBC Section 2602.5.3.

3.3 Noncombustible Construction:

For purposes of this acceptance criteria, foam plastic is a combustible material. In certain instances, foam plastic is permitted where noncombustible materials are required under IBC Section 2603.5, UBC Section 2602.4 (Exception 3), or UBC Section 2602.5.2. For EPS insulating concrete forms used in noncombustible construction, see the ICC-ES Acceptance Criteria for Stay-in-place, Foam Plastic Insulating Concrete Form Systems for Solid Concrete Walls (AC353).

3.4 Physical Properties:

3.4.1 Faced, Preformed, Rigid Cellular Polyisocyanurate: These materials, including products into which recycled material is introduced, shall comply with requirements in ASTM C 1289.

Exception: Thermal resistance test results may be less than the minimum values stated in ASTM C 1289, but shall be greater than 90 percent of the minimum values. When the thermal resistance values fall below the minimum value stated in ASTM C 1289, the evaluation report shall report the actual value, and products shall not be labeled as complying with ASTM C 1289 or shall be labeled as complying with ASTM C 1289 except for thermal resistance.

3.4.2 Unfaced, Preformed, Rigid Cellular Polyisocyanurate: These materials, including products into which recycled material is introduced, shall comply with requirements in ASTM C 591. Where the number of test specimens is not specified in the applicable test methods, a minimum of five specimens shall be used.

~~**3.4.2**~~ **3.4.3 Rigid Cellular Polystyrene:** These materials, including products into which recycled material is introduced, shall comply with requirements in ASTM C 578.

Exception 1: Products less than 1 inch (25.4 mm) thick or manufactured with facing material are not required to comply with ASTM C 578, provided the products are limited to nonstructural applications.

Exception 2: Products limited to use as filler on concrete roof decks as described in Section 4.5.15.

~~**3.4.3**~~ **3.4.4 Recycled or Recovered Material Qualification:** The introduction of recycled or recovered material into ICC-ES recognized foam plastic materials shall be qualified to establish that finished foam plastic insulation with recycled or recovered content meets the requirements of this acceptance criteria. The definitions in Sections 3.4.4.1 through 3.4.4.3 apply.

~~**3.4.3.1**~~ **3.4.4.1** Recovered material means waste material and by-products which have been recovered or diverted from solid waste, but the term does not include those materials and by-products generated from, and commonly reused within, an original manufacturing process.

~~**3.4.3.2**~~ **3.4.4.2** Post-consumer waste means material or product that has served its intended use and has been discarded after passing through the hands of a final user. Post-consumer waste is a part of the broader category “recycled material.”

~~**3.4.3.3**~~ **3.4.4.3** Recycled material means material that is utilized in place of a raw or virgin material in manufacturing a product, and consists of materials derived from post-consumer waste, industrial scrap, material derived from agricultural waste and other items.

~~3.4.4~~ 3.4.5 **Vapor Retarder:** Foam plastic insulation intended to be qualified as vapor retarders shall be tested in accordance with ASTM E 96-00 and shall have a permeance rating of 1 perm (5.7×10^{-11} kg/Pa-s-m^2) or less at the intended thickness.

3.5 Compliance without Testing:

3.5.1 Building Components Containing Foam Plastic Insulation: A building component containing an approved foam plastic that can be analytically justified for structural compliance with the applicable code, utilizing allowable stresses and loads specified therein, can be recognized without testing under the following conditions:

3.5.1.1 A thermal barrier complying with IBC Section 2603.4, IRC Section R314.4 or UBC Section 2602.4, is provided.

3.5.1.2 Attachment of the thermal barrier is presently justified by tests, or the barrier is permitted to be installed in compliance with specific sections of the applicable code, based on the material involved. One-half-inch-thick (12.7 mm) gypsum wallboard installed in compliance with IRC Table R702.3, UBC Table 25-G, or ASTM C 840 is a specific example of a complying thermal barrier.

3.5.1.3 Sections 3.5.1.1 and 3.5.1.2 do not apply to masonry or concrete elements with cavities containing foam plastic. See IBC Section 2603.4.1.1, IRC Section R314.5.1 or UBC Section 2602.4 (Exception 3).

3.5.1.4 The foam plastic is used where combustible, nonfire-resistive construction is permitted.

3.5.1.5 Durability of facings is not in question.

3.5.2 Patio Covers: Foam plastic insulation used in patio covers, as defined in IBC Section I102.1 of Appendix I, IRC Section AH102 of Appendix H or UBC Section 3116 of Division III of the Appendix to Chapter 31, is permitted to have the thermal barrier and specific approved tests waived under the following conditions:

3.5.2.1 Roof Panels: Roof panels with foam plastic cores are acceptable under IBC Section 2603.6, IRC Section 314.6 or UBC Section 2602.6, without fire sprinklers, under the following conditions:

3.5.2.1.1 The structure is always an appendage to an existing building.

3.5.2.1.2 At least two adjacent exterior elevations shall have openings of at least 65 percent of the area below a 6-foot 8-inch (2032 mm) height.

3.5.2.1.3 A thermosetting foam plastic is used.

3.5.2.1.4 The foam plastic panels have metal skins. Minimum thicknesses of aluminum and steel skins are 0.032 inch and 0.016 inch (0.8 mm and 0.4 mm), respectively.

3.5.2.1.5 The foam plastic core complies with IRC Section 314.3, UBC Sections 2602.1 through 2602.3, or UBC Sections 2603.1 through 2603.3.

3.5.2.1.6 The metal facings encapsulate the foam plastic core.

3.5.2.2 Wall Panels: Wall panels with foam plastic cores are acceptable under IRC Section R314.6 or UBC Section 2602.6, with the following conditions:

3.5.2.2.1 At least two adjacent exterior elevations have openings of at least 65 percent of the area below a 6-foot 8-inch (2032 mm) height.

3.5.2.2.2 Panels are limited to the following exterior wall locations:

3.5.2.2.2.1 Kick plates and knee walls up to 30 inches (762 mm) in height.

3.5.2.2.2.2 Full-height corner panels with a maximum horizontal dimension of 16 inches (406 mm) at each end of an elevation.

3.5.2.2.2.3 Filler panels up to 16 inches (406 mm) deep above openings.

3.5.2.2.3 Wall panels are nonbearing.

3.5.2.2.4 The foam core is encapsulated in metal skins, including vertical edges. No horizontal joints are permitted between the floor and the roof line. Minimum metal skin thicknesses are 0.032 inch (0.8 mm) for aluminum or 0.016 inch (0.4 mm) for steel.

3.6 Patio Cover Sandwich Panels:

3.6.1 General: For patio covers as defined in IBC Appendix I, IRC Appendix H and Division III of UBC Appendix Chapter 31, sandwich panels with foam plastic cores that are used as roof or wall panels of patio covers shall also comply with this section of this criteria.

3.6.2 Thermal Barriers: Except as permitted under Section 3.5.2 of this criteria, the sandwich panels shall be installed with a thermal barrier complying with this criteria and the applicable code, or the panels shall be subjected to a room corner fire test complying with Sections 4.5.2, 4.5.4.2, and 4.5 of this criteria.

The panels used in the room corner fire tests shall have the maximum foam plastic thickness for which recognition is sought. Test assemblies of roof panels shall include a longitudinal seam between adjacent roof panels located as close to the centerline of the wood crib as permitted by the evaluation report applicant's published installation instructions. If the roof panel longitudinal seam in the test assembly is not directly over the centerline of the wood crib, the distance from the seam to the interior face of the wall parallel to the seam shall be specified in the evaluation report as a minimum distance. Superimposed design loads do not need to be exerted on the room corner fire test assembly, provided the panels' use is limited Type V construction, and the panels are not required to be fire-resistance rated. Sealants shall not be applied to the interior face of the panel joints fire test assembly, unless the durability of the sealants is demonstrated with submitted independent data.

3.6.3 Roof Classification: For recognition under the IBC, compliance with IBC Section 2603.6 needs to be demonstrated by testing in accordance with ASTM E 108 or UL790. For recognition under the IRC, roof classification tests are not required, provided recognition is limited to installations permitting a nonclassified roof covering under IRC Section R902. For recognition under the UBC, reports

of tests in accordance with UBC Standard 15-2 are needed only if the roof panels are to be recognized with a roof classification.

4.0 TESTS METHODS

4.1 Thermal Barrier Index Requirements: An approved thermal barrier shall have an index of 15 or greater and shall be qualified to remain in place for the time of its index classification.

4.1.1 UBC: The index classification shall be determined in accordance with UBC Standard 26-2. The small-scale furnace specified therein shall be recognized by ICC-ES. Recognition involves evaluating small-scale test results on a specimen that has previously been tested as a component of a full-scale fire-resistive assembly. The intent is to compare temperatures between the unexposed surface of the small-scale assembly and the full-scale assembly tested in accordance with UBC Standard 7-1. A complete report of test, including temperature readings, is required for each test. At least three additional thermocouples are necessary between the interface of gypsum wallboard and wood studs, if this type of assembly is used for calibration.

4.1.2 IBC and IRC: The index classification shall be determined by exposing the thermal barrier to testing in accordance with ASTM E 119 for a minimum of 15 minutes. The condition of acceptance is that the average rise from ambient temperature at the beginning of the test is not more than 250°F (120°C).

4.2 Foam Plastics in Structural Elements: Thermal barriers for structural elements utilizing foam plastic in supporting superimposed loads shall be qualified in accordance with one of the following:

4.2.1 ASTM E 119 or UBC Standard 7-1 for the required 15-minute time period. The structural element is tested with superimposed loads applied as set forth in ASTM E 119 or Section 7.111 or 7.125 of UBC Standard 7-1. The hose stream test shall be waived.

4.2.2 Section 4.5.3 of this criteria as an alternate to ASTM E 119 or UBC Standard 7-1 for nonfire-resistive construction.

4.3 Foam Plastics in Nonbearing Walls and Ceilings: Thermal barriers for foam plastics in nonbearing walls and ceilings shall be qualified with one of the following:

4.3.1 Section 4.5.2 for room test.

4.3.2 Section 4.2.1, except for superimposed loads.

4.3.3 Thermal barriers referenced and installed as set forth in Chapter 8 or 7 of the IBC or UBC.

4.3.4 Testing in accordance with ASTM E 119 or UBC Standard 26-2, horizontally when installed over foam plastic in a manner representative of actual field installation. Thermal barriers shall be adhesively applied and have an index of at least 30. The following exceptions apply to the prescribed test method:

4.3.4.1 The thermal barrier is to be tested over the specific foam plastic substrate for which recognition is sought. This is in lieu of the $^1/_2$-inch-thick (12.7 mm) calcium silicate board that would otherwise be required.

4.3.4.2 The test sample shall always be tested in the horizontal, inverted position with attachment of the thermal barrier as intended for recognition in the evaluation report. The thermal barrier shall be clear of the shelf that supports the test specimen. This shall be specifically described in the report of tests. The test shall be conducted for a minimum 30-minute period, with the furnace temperature following the time-temperature curve in ASTM E 119 or UBC Standard 7-1. The furnace temperature at 30 minutes shall be 1550°F (843°C).

4.4 Foam Plastic Drop-out Ceiling Panels and Tiles: The interior finish materials are used in metal ceiling suspension systems complying with the IBC or UBC. The following requirements are the bases of recognition in ICC-ES evaluation reports for the panels and tiles:

4.4.1 Flame-spread and smoke-density indices shall not exceed 25 and 450, respectively, when tested in conformance with ASTM E 84, UL 723 or UBC Standard 8-1.

4.4.2 Recognition under IBC Section 2606.7 or UBC Section 2603.8 shall be permitted.

4.4.3 Installation is prohibited in exits such as corridors, stairways, horizontal exits, pressurized enclosures and exit passageways as defined in Chapter 10, and malls as defined in Chapter 4, of the UBC.

4.4.4 Room fire tests shall be conducted in accordance with Sections 4.5.2 and 4.5.4 of this criteria, and shall comply with the conditions of acceptance specified therein.

4.4.5 Labels on packages and containers of panels and tiles shall comply with IBC Section 2603.2 or UBC Section 2602.2. In addition, the evaluation report number shall be on the edge of each panel and tile.

4.4.6 Prescriptive Requirements:

4.4.6.1 Panels and tiles shall be used only in a horizontal arrangement.

4.4.6.2 Panels and tiles shall remain unpainted or otherwise uncoated, unless approved otherwise.

4.4.6.3 Restraining clips shall not be used to hold the panels or tiles in their suspension frame unless the tests required under Section 4.4 of this criteria are conducted on installations with the clips.

4.4.6.4 The space above the panels and tiles shall not be used as an air circulation plenum.

4.4.7 When automatic sprinklers are installed, panels and tiles recognized under IBC Section 2606.7 or UBC Section 2603.8, as specified in Section 4.4.2 of this criteria, may be installed as drop-out ceiling tiles and panels in light hazard and Group 1 ordinary hazard occupancies, as defined in NFPA 13 or Section 1-4.7 of UBC Standard 9-1. The ceiling tiles and panels are installed beneath the sprinklers without sprinklers below the ceiling under the following conditions that are in addition to those in Section 4.4.6 of this criteria:

4.4.7.1 The ceiling tiles and panels shall be listed as drop-out ceilings and shall be installed in accordance with the listing.

4.4.7.2 Drop-out panels and tiles shall not be used in

conjunction with dry-pipe sprinkler system deflectors.

4.4.7.3 Panels and tiles shall be located no more than 5 feet (1524mm) below the sprinklers.

4.4.7.4 The sprinklers are installed above the ceiling in accordance with NFPA 13 or UBC Standard 9-1, including separation from obstructions.

4.4.7.5 Tests shall be conducted to demonstrate that the panels and tiles fall from their mounting at or below 425°F (218°C) when tested as follows: One 2-foot-by-4-foot (610 mm by 1219 mm) ceiling panel or two 2-foot-by-2-foot (610 mm by 610 mm) ceiling panels shall be installed in a typical suspension frame located at the top of a 4-foot-by-4-foot-by-2-foot-high (1219 mm by 1219 mm by 610 mm) enclosure. The ceiling panel(s) make up one half of the ceiling of the enclosure; the remaining half consists of either a mineral composition board or additional ceiling panel(s). The enclosure shall be located 12 inches (305 mm) above the floor. A radiant heat source shall be placed centrally under the mineral composition board and ignited. The temperature profile shall be per Table 1. However, when the panels begin to melt or distort, the heat will vent and it may not be possible to maintain the specific profile. If this is the case, the temperature shall be maintained as close as possible to the specific profile. A thermocouple located in the center of the enclosure and located 1 inch (25 mm) below the ceiling shall be used to monitor the temperature at the ceiling.

4.4.7.6 Ceiling tiles and panels are installed in metal suspension systems that provide the same amount of support for the tiles and panels as the suspension members used in the tests.

4.4.7.7 Insulation shall not be placed in the area above the drop out ceiling panels and tiles, or beneath the automatic sprinklers.

4.5 Special Comments on Testing:

4.5.1 Full-scale Corner Fire Tests: Full-scale corner tests for nonbearing wall panels, based on Factory Mutual's building corner fire test procedure 4880 or the Underwriters Laboratories test procedure described in UL Standard 1040. These tests involve walls up to 30 feet (9144 mm) high and 50 feet (15 240 mm) long with 750- to 800-pound (340 to 365 kg) wood cribs. Recognition by these tests is limited by Section 4.5.10.2 of this criteria.

4.5.2 Room Tests: Room test for nonbearing walls and ceilings:

4.5.2.1 Testing shall comply with UL 1715 or UBC Standard 26-3, except for the following:

4.5.2.1.1 The $^1/_2$-inch-thick (12.7 mm) asbestos cement board room liner is permitted to be replaced with other materials with equivalent or superior thermal insulation characteristics.

4.5.2.1.2 Where the foam plastic material, in its tested thickness, has an *R* value of 25 or more, the asbestos cement substrate is permitted to be deleted under the following conditions:

4.5.2.1.2.1 There is no burning completely through the foam during the test.

4.5.2.1.2.2 Absence of the substrate does not affect the installation of thermal barriers or other coverings over the foam plastic.

4.5.2.1.3 Foam plastic products shall be tested at the maximum thickness and density anticipated for use. Variations in facing materials from that tested can be considered, provided they are equivalent to the facing tested. Justifying data shall include comparative testing of the facings on foam plastic in accordance with ASTM E 84, UL 723 or UBC Standard 8-1.

4.5.2.2 Conditions of acceptance shall comply with UL 1715 or UBC Standard 26-3, except for the following:

4.5.2.2.1 When it can be determined that discoloration is not due to charring, the $^1/_4$-inch (6.4 mm) limit in Item 1 of UBC Section 26.304 is not applicable.

4.5.2.2.2 Determination of excessive smoke levels shall be as set forth in Section 4.5.4 of this acceptance criteria.

4.5.2.3 Testing conducted in accordance with NFPA 286 shall have conditions of acceptance as stated in IBC Section 803.2.

4.5.3 Options for Nonfire-resistive Construction: As an option in nonfire-resistive construction where loading is feasible, the room test is permitted to be used to justify bearing walls, floors, roofs and ceilings, subject to prior approval. The manner of loading shall be described in detail and shall result in maximum allowable design stress conditions under dead, live and snow loads. Under this proposal, the condition for acceptance is that the system sustain the applied load during the test. UL 1715 or Section 26.302 of UBC Standard 26-3 permits this type of testing and exempts loading for Type V-N construction.

4.5.4 Smoke Determination:

4.5.4.1 General: Smoke determination shall consider the following:

4.5.4.1.1 Smoke-density measurements of the foam plastic system under ASTM E 84 or UBC Standard 8-1 in the most critical manner of installation.

4.5.4.1.2 Visual documentation (movies, videotapes) of the smoke generated during the room test. Where an obviously high level of smoke is generated during the test, the product will be considered unacceptable. Any questionable level, as determined by ICC-ES, will be deemed unacceptable, since the present state of the art does not submit to a precise pass-fail criteria. ICC-ES reserves the right to reject visual documentation, if of poor quality. One copy of visual documentation will be retained by ICC-ES for reference purposes.

4.5.4.2 Video Recording: Test Protocol for Video Recording of UL 1715 or UBC Standard 26-3 tests:

4.5.4.2.1 A 300-watt flood-type, quartz halogen lamp shall be positioned in the corner diametrically opposite the crib, near the floor level. The lamp shall be aimed at the wall corner/ceiling intersection above the crib or burner.

4.5.4.2.2 A video camera with a mechanically adjustable iris, adjusted to prevent automatic closing of the iris opening due to brightness of the fire (at least 50 percent open), shall be used. A video monitor shall be used to determine when adjustments and compensation for the

brightness of the ignition flames are needed.

The camera mount shall be adjusted so that the camera lens is approximately 3 feet (914 mm) from the floor.

The camera angle and magnification shall be adjusted until the top of the doorway and the top of the crib or burner are visible and the ceiling area directly above the fire is in full view.

4.5.4.2.3 For each test, when the test is for wall systems only, a new section of uncoated and unpainted $^5/_8$-inch (15.9 mm) gypsum wallboard, 2 feet by 2 feet (610 mm by 610 mm), shall be installed in the ceiling at the wall corner intersection directly above the crib.

4.5.4.2.4 A clock or timer depicting "real time" shall be included in all videos. The timer may be integral to the video camera, or a clock/timer is permitted to be used, providing it can be clearly viewed throughout the test period. For the UL 1715 or UBC Standard 26-3 test, the start of the test shall be when the alcohol-soaked excelsior is ignited.

4.5.4.2.5 Immediately prior to ignition of the crib or burner, the date and laboratory test report identification number shall be filmed.

4.5.4.2.6 The test report shall be in sufficient detail to provide:

4.5.4.2.6.1 Description of the room test setup, with details.

4.5.4.2.6.2 Test observations, commencing with crib ignition and ending with a final description of panels after all combustion ceases.

4.5.4.2.6.3 Thermocouple readings.

4.5.4.2.6.4 Statement of passing or failing.

4.5.4.2.6.5 Photographic record of tests.

4.5.4.2.6.6 Small sample of the protective covering or panel.

4.5.5 Potential Heat Content: Where the potential heat content of foam plastic is required, values shall be determined in accordance with NFPA 259 or UBC Standard 26-1.

4.5.6 Ignition: Where ignition properties for foam plastic are required, values shall be determined in accordance with NFPA 268 or UBC Standard 26-4 or 26-9.

4.5.7 Determination of Thermal Resistance: Thermal resistance shall be determined in accordance with the applicable specification for the product. When a specification for the product does not exist, or when the specification does not address testing and conditioning of samples for thermal resistance testing, thermal resistance shall be determined in accordance with Sections 4.5.7.1 through 4.5.7.5.

4.5.7.1 Thermal resistance of foam plastic insulation shall be determined by tests conducted in accordance with ASTM C 177, C 236 or C 976. ASTM C 236 and ASTM C 976 are guarded hot plate or guarded hot box methods, intended for assemblies or nonhomogeneous insulations. Determination by heat-flow meters under ASTM C 518 is permitted with evidence of calibration in accordance with the standard, properly documented and certified by the testing agency. This includes a description of the control samples used and the last date of calibration prior to testing of the foam plastic insulation.

4.5.7.2 The reporting of thermal resistance shall be based on a mean-test temperature of 75°F± 5°F (23.8°C ± 2.8°C). Supplemental thermal-resistance values at other mean temperatures are permitted to be included.

4.5.7.3 Recognition of thermal-resistance values for a range of thicknesses shall be established at the thinnest, thickest and mid-thicknesses, to establish a representative curve for interpolation purposes.

4.5.7.4 Tests for thermal resistance of foam plastics utilizing expanding agents, other than air or pentane, shall be performed on samples aged or conditioned in one of the following manners:

4.5.7.4.1 Conditioning at 140°F (60°C) dry heat, ± 2°F (1°C), for 90 days.

4.5.7.4.2 Aging at 70°F ± 10°F (21.1°C ± 5.5°C) in free air for a two-year period.

4.5.7.5 Description of test samples shall include details of facings, if so tested. Thermal-resistance values will be related to test specimens. Test results on unfaced specimens are permitted to be used for insulation with facings.

4.5.8 Mechanical Fasteners in Foam Plastic Insulation: Appropriate tests shall be conducted to determine the allowable shear of mechanical fasteners, such as nails, through the foam plastic insulation to attach exterior wall coverings to framing members or structural sheathing. Nails and staples in wood are limited to a 0.015-inch (0.38 mm) movement.

Exception: Attachment of conventional wood, metal or plastic siding through insulation not exceeding a $1^1/_2$-inch (38 mm) thickness, with sufficient penetration of fasteners into structural framing or structural sheathing beneath.

4.5.9 Foam Plastic Insulation Protection: Thermal barriers and other protective components shall be protected, in an approved manner, for foam plastics exposed to damage from moving vehicles, the handling of merchandise, or similar activities.

4.5.10 Specific Conditions of Acceptance: ICC-ES Evaluation Committee consideration of foam plastic assemblies has resulted in the following conditions of acceptance:

4.5.10.1 Recognition of specific assemblies by approved testing under IBC Section 2603.9, IRC Section R314.6 or UBC Section 2602.6 without fire-extinguishing systems.

4.5.10.2 Assemblies justified only by full-scale corner tests are permitted to be located only in areas with a minimum clear ceiling height of 20 feet (6096 mm). See Section 4.5.1.

4.5.10.3 Under the UBC only, foam plastic insulation is permitted to be placed over combustible, fire-resistive walls without negating the fire-resistive rating.

4.5.10.4 Specific assemblies under other ICC-ES acceptance criteria.

4.5.11 Special Conditions:

4.5.11.1 Foam plastic roofing insulation or components shall be separated from the interior of the building as set forth in IBC Section 2603.4.1.5, IRC Section R314.5.2, UBC Section 2602.5.3 or the equivalent. For metal roof decks, acceptable separation from the building interior is permitted to be determined by testing in accordance with FM 4450, UL 1256, Items 3.2 and 3.3 of UBC Section 601.3 or the Acceptance Criteria for Foam Plastic Insulation Applied Directly to Steel Decks (AC142).

4.5.11.2 Foam plastic cores for doors shall comply with IBC Sections 2603.4.1.7 and 2603.4.1.8, IRC Section R314.5.5 or R314.5.6, and UBC Section 2602.5.4.

4.5.11.3 Foam plastic trim shall comply with IBC Section 2604, IRC Section R314.5.9 or UBC Section 601.5.5.

4.5.11.4 Recognition of specific products or systems is permitted to be based on end use, quantity, location and similar considerations, where testing described in Section 3 of this criteria is not applicable or practical.

4.5.11.5 Foam Plastic Used in Attic and Crawl Spaces:

4.5.11.5.1 Attics:

4.5.11.5.1.1 Foam plastic insulation installed in attics where entry is made only for service of utilities shall be protected by an ignition barrier as set forth in IBC Section 2603.4.1.6, IRC Section R314.5.3 or Exception 4 of UBC Section 2602.4, except as noted in Section 4.5.11.5.1.2. Utilities include, but are not limited to, mechanical equipment, electrical wiring, fans, plumbing, gas or electric hot water heaters, and gas or electric furnaces.

4.5.11.5.1.2 Between June 1, 2008, and June 1, 2009, variations from the conditions specified in Section 4.5.11.5.1.1 are permitted to be considered based upon diversified testing approved by ICC-ES prior to testing. As an alternative, the ignition barrier shall not be required when satisfactory testing is conducted in accordance with either Section 4.5.11.5.1.2.1 or 4.5.11.5.1.2.2.

4.5.11.5.1.2.1 For Use on Walls or Floors of Attics or the Underside of Roof Decks in Attics with Limitations Noted in Section 4.5.11.5.1.2.3.1: Tests shall be conducted in accordance with NFPA 286 with the conditions of acceptance specified in IBC Section 803.2; or in accordance with UL 1715 or UBC Standard 26-3 with conditions of acceptance as specified in Section 4.5.2 of AC12. The tests shall be conducted with the foam plastic installed at the maximum thickness and maximum density for which recognition is sought, over the gypsum wallboard or glass-reinforced cement board as described in the standard.

4.5.11.5.1.2.2 For Use on Walls or Floors of Attics or the Underside of Roof Decks in Attics with Limitations Noted in Section 4.5.11.5.1.2.3.2: Comparative room corner fire tests shall be conducted in accordance with the test procedures of NFPA 286, UL 1715 or UBC Standard 26-3. The foam plastic insulation shall be applied in the manner for which recognition is sought. The interior face of the control assembly shall consist of nominally $^1/_4$-inch-thick A-C or B-C plywood applied to the interior face of wood wall framing. (Plywood is permitted by IBC Section 2603.4.1.6, IRC Section R314.5.3 and UBC Section 2602.4, Exception 4, as a protective material for foam plastic located in attics.) The exterior face shall be covered with $^3/_8$-inch-thick exterior plywood. The second test assembly shall be identical, but without plywood on the interior face of the wall. Conditions of acceptance shall consider the time-to-failure of the control test assembly, as evidenced by flashover, which is flame exiting the door opening. The second assembly with exposed foam plastic shall be tested for at least the same duration of time. A successful comparison is based on no flashover of the second assembly within the time-to-failure of the control test assembly.

4.5.11.5.1.2.3 Limitations on Attic Installations:

4.5.11.5.1.2.3.1 When testing is in accordance with Section 4.5.11.5.1.2.1, the evaluation report shall include the following limitations:

a. Attic ventilation is provided in accordance with IBC Section 1203.2 or IRC Section R806, as applicable.

b. Combustion air is provided in accordance with IMC Sections 701 and 703.

c. The foam plastic insulation is limited to the maximum thickness and density tested.

4.5.11.5.1.2.3.2 When testing is in accordance with Section 4.5.11.5.1.2.2, the evaluation report shall include the following limitations:

a. Entry to the attic is only to service utilities and no storage is permitted.

b. There are no interconnected attic areas.

c. Air in the attic is not circulated to other parts of the building.

d. Attic ventilation is provided in accordance with IBC Section 1203.2 or IRC Section R806, as applicable.

e. The foam plastic insulation is limited to the maximum thickness and density tested.

f. Combustion air is provided in accordance with IMC Sections 701 and 703.

4.5.11.5.2 Crawl Spaces:

4.5.11.5.2.1 Foam plastic insulation installed in a crawl space where entry is made only for service of utilities shall be protected by an ignition barrier as set forth in IBC Section 2603.4.1.6, IRC Section R314.5.4 or Exception 4 of UBC Section 2602.4, except as noted in Section 4.5.11.5.2.2. Utilities include, but are not limited to, mechanical equipment, electrical wiring, fans, plumbing, gas or electric hot water heaters, and gas or electric furnaces.

4.5.11.5.2.2 Between June 1, 2008, and June 1, 2009, variations from the conditions specified in Section 4.5.11.5.1.1 are permitted to be considered based upon diversified testing approved by ICC-ES prior to testing. As an alternative, the ignition barrier shall not be required when satisfactory tests are conducted in accordance with either Section 4.5.11.5.2.2.1 or Section 4.5.11.5.2.2.2.

4.5.11.5.2.2.1 For Use on Walls of Crawl Spaces or the Underside of Floors in a Crawl Space with Limitations as Noted in Section 4.5.11.2.2.3.1: Tests shall be conducted in accordance with NFPA 286 with the conditions of acceptance specified in IBC Section 803.2; or in accordance with UL 1715 or UBC Standard 26-3 with

conditions of acceptance as specified in Section 4.5.2 of AC12. The tests must be conducted with the foam plastic installed, at the maximum density and maximum thickness for which recognition is sought, over the gypsum wallboard or glass-reinforced cement board as described in the standard.

4.5.11.5.2.2.2 For Use on Walls of Crawl Spaces or the Underside of Floors in a Crawl Space with Limitations Noted in Section 4.5.11.5.2.2.3.2: Comparative crawl space fire tests shall be conducted where the performance of the exposed foam plastic insulation is compared under identical test conditions to that of the foam plastic insulation covered with a code-approved ignition barrier. The interior face of the control assembly shall consist of nominally $^1/_4$-inch-thick A-C or B-C plywood applied to the interior face of wood wall framing. (Plywood is permitted by UBC Section 2602.4, Exception 4, IBC Section 2603.4.1.6 and IRC Section R314.5.3 as a protective material for foam plastic located in attics.) The time to flashover and the time to burn through the wood-framed floor/ceiling must be equal or greater for the exposed foam plastic insulation versus the foam plastic insulation covered with the $^1/_4$-inch-thick plywood. The tests shall be conducted in accordance with Appendix A.

4.5.11.5.2.2.3 Limitations on Crawl Space Applications:

4.5.11.5.2.2.3.1 When testing is in accordance with Section 4.5.11.5.2.2.1, the evaluation report shall include the following limitations:

a. Under-floor (crawl space) ventilation is provided in accordance with IBC Section 1203.3 or IRC Section R408.1, as applicable.

b. Combustion air is provided in accordance with IMC Sections 701 and 703.

c. The foam plastic insulation is limited to the maximum thickness and density tested.

4.5.11.5.2.2.3.2 When testing is in accordance with Section 4.5.11.5.2.2.2, the evaluation report shall include the following limitations:

a. Entry to the crawl space is only to service utilities and no storage is permitted.

b. There are no interconnected crawl space areas.

c. Air in the crawl space is not circulated to other parts of the building.

d. Under-floor (crawl space) ventilation is provided in accordance with IBC Section 1203.3 or IRC Section R408.1, as applicable.

e. The foam plastic insulation is limited to the maximum thickness and density tested.

f. Combustion air is provided in accordance with IMC Sections 701 and 703.

4.5.11.5.3 Ventilation Requirements under the IRC: Unvented, conditioned attic assemblies are permitted under the conditions prescribed in IRC Section 806.4, provided reports of tests in accordance with ASTM E 283 are submitted, with the test procedure modified as follows:

1. The test frame shall be a minimum of 24 inches square, and a $^1/_2$-inch-thick low-density fiberboard substrate fastened and sealed on one side. The fiberboard shall have a minimum air permeance of 1.0 L/s-m^2.

2. The foam plastic insulation shall be applied in the minimum thickness for which recognition is sought.

3. The test pressure difference shall be 75 Pa (1.57 lb/ft^2).

4. Air flow shall be by both infiltration and exfiltration.

5. Total air leakage shall be reported as the larger result from the infiltration and exfiltration tests.

6. Air impermeable is defined as a maximum total air leakage rate of 0.02 L/s-m^2.

Unvented crawl spaces are permitted under the conditions prescribed in IRC Section R408.3.

4.5.11.6 Foam plastic roofing insulation shall be part of a tested Class A, B or C assembly under UL 790 or UBC Standard 15-2.

4.5.12 Exterior Wall-covering Systems: Exterior wall covering systems with foam plastic components shall comply with this criteria. Special requirements for cementitious exterior wall coatings over foam plastic are set forth in a companion document.

4.5.13 Foam Plastic Insulation Used as Decorative Material: Use of foam plastic as a decorative material attached to the building can be considered under IFC Section 807 or UFC Section 1103.3.3.

4.5.14 Foam Plastic Insulation Used over Concrete Roof Decks: Polystyrene foam plastic insulation used as filler on concrete roof deck surfaces shall be evaluated in accordance with ASTM C 578 and comply with the physical property requirements in Table 1 of ASTM C 578 for compressive strength. Other physical property requirements in Table 1 of ASTM C 578 shall be determined by the test results. All minimum physical property requirements shall be specified in the quality control manual. The flat-surfaced product shall be limited to placement over solid, flat concrete roof decks and be labeled to restrict the product to this application.

4.5.15 Qualification to ASTM C 578: Data required by Section 3.4.3 of this criteria shall be submitted in accordance with either Section 4.5.15.1 or 4.5.15.2. The number of test specimens shall be as specified in the applicable test standard.

4.5.15.1 Option 1: The resin supplier qualifies each resin grade and the evaluation report applicant (proponent) demonstrates an equivalent product can be manufactured at each manufacturing location.

4.5.15.1.1 The resin supplier shall submit reports of testing showing compliance with all requirements of ASTM C 578 for each resin grade requested, and for each Type requested.

Exception: Oxygen index testing is only required on one type per resin grade.

4.5.15.1.2 For boards manufactured with any one of the resin grades already qualified by the resin supplier under Section 4.5.15.1.1, the proponent shall submit reports of

testing demonstrating compliance with the flexural strength, compressive strength and density requirements of ASTM C 578 for each type and each manufacturing plant to be recognized in the evaluation report.

4.5.15.1.3 In addition to the information required in Sections 5.1, 5.2 and 5.5 of this criteria, the quality control program shall assure continued compliance with ASTM C 578. ~~The quality control program shall verify flexural strength, compressive strength (required for extruded polystyrene only), density and the presence of fire-retardant-modified resins at each inspection by the inspection agency. Over time, the testing shall incorporate tests to address all types and resin grades.~~ At each inspection, the inspection agency shall verify the following:

- For expanded polystyrene, flexural strength, density and the presence of fire-retardant-modified resins. Over time, the testing shall incorporate tests to address all types and resin grades.

- For extruded polystyrene, compressive strength, density and the presence of fire-retardant-modified resins.

4.5.15.2 Option 2: No data is submitted by the resin supplier; therefore, the proponent shall demonstrate full compliance with ASTM C 578.

4.5.15.2.1 Reports of testing shall be submitted demonstrating compliance with all requirements of ASTM C 578 for each type and each resin grade, from product produced at one manufacturing location.

> **Exception:** Oxygen index testing is only required on one density per resin grade.

4.5.15.2.2 For boards manufactured with any one of the resin grades already qualified under Section 4.5.15.2.1, the proponent shall submit reports of testing demonstrating compliance with the flexural strength, compressive strength and density requirements of ASTM C 578 for each type and each manufacturing plant to be recognized in the evaluation report.

4.5.15.2.3 In addition to the information required in Sections 5.1, 5.2 and 5.5 of this criteria, the quality control program shall assure continued compliance with ASTM C 578. ~~The quality control program shall verify flexural strength, compressive strength (required for extruded polystyrene only), density and the presence of fire-retardant-modified resins at each inspection by the inspection agency. Over time, the testing shall incorporate tests to address all types and resin grades.~~ At each inspection, the inspection agency shall verify the following:

- For expanded polystyrene, flexural strength, density and the presence of fire-retardant-modified resins. Over time, the testing shall incorporate tests to address all types and resin grades.

- For extruded polystyrene, compressive strength, density and the presence of fire-retardant-modified resins.

4.5.16 Qualification to ASTM C 1289: Data required by Section 3.4.2 of this criteria shall be submitted in accordance with Sections 4.5.16.1 through 4.5.16.2. The number of test specimens shall be as specified in the applicable test standard.

4.5.16.1 Reports of testing of product made at one manufacturing location shall be submitted showing compliance with all requirements of ASTM C 1289, for each type and class, except as permitted in Section 3.4.2.

4.5.16.2 For products manufactured at more than one location, the manufacturer shall submit reports of testing demonstrating compliance with the flexural strength (modulus of rupture and break load) and tensile strength requirements of ASTM C 1289 for each type and class at each manufacturing plant to be recognized in the evaluation report. These products shall be manufactured under a common quality control program and shall be made from the same base materials.

4.5.16.3 In addition to the information required in Sections 5.1, 5.2 and 5.5 of this criteria, the quality control program shall assure continued compliance with ASTM C 1289.

5.0 QUALITY CONTROL

5.1 Quality Control Program: The products shall be manufactured under an approved quality control program with inspections by an inspection agency accredited by the International Accreditation Service (IAS) or as otherwise acceptable to ICC-ES.

5.2 Quality Documentation: Quality documentation complying with the ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted.

5.3 Identification: Identification shall comply with IBC Section 2603.2, IRC Section R314.2 or UBC Section 2602.2. For foam plastic insulation used with exterior wall coatings on walls required to be of noncombustible construction, the following identification methods are permitted in lieu of IBC Section 2603.5.6 or Item 6 of UBC Section 2602.5.2.2: Each insulation board shall be identified along one edge, and one board from each insulation package shall be identified on both faces, with the following information:

5.3.1 Exterior coating company name and the evaluation report number.

5.3.2 Identification required by the evaluation report covering the block molder of the insulation board.

5.3.3 In lieu of the exterior coating company name and evaluation report number mentioned in Section 5.3.1, special identification for board specifications acceptable to a group of exterior coating companies is permitted to be used, provided the specifications and identification are addressed in the exterior coating evaluation report or the report covering the block molder.

5.4 Foam Plastic Insulation in EIFS: Block molders shall be covered by a specific ICC-ES evaluation report, or have quality control and listing information submitted and recognized under exterior insulation and finish system (EIFS) reports. Under the latter arrangement, recognition of the block molder's product is confined to those specific evaluation reports on EIFS for which the data has been submitted.

5.5 Quality Control Details: The inspection agency shall provide satisfactory evidence on the foam plastic formulation, the method of manufacturing the foam core, and the specifications for facings and adhesives for samples used in determining flame-spread and smoke-developed indices. In the absence of information released by the

manufacturer, the inspection agency must conduct necessary tests to make this determination. The inspection agency shall provide reasonable assurance through quality control procedures and inspections that a manufactured product is the same as samples used in qualifying flame-spread tests.

5.6 Recycled and Recovered Materials: The quality control manual shall describe the process of introducing recycled or recovered material, including cleanliness and proportioning controls. The inspection agency shall provide reasonable assurance, through quality control procedures outlined in the manual and through inspections, that a manufactured product is the same as samples used in qualifying tests. Use of recovered or recycled material in finished foam plastic insulation shall be addressed in the quality control procedures.

6.0 EVALUATION REPORT RECOGNITION

6.1 The evaluation report shall include, at a minimum, the IBC, IRC and IECC within the evaluation scope, except when the report is limited to recognition under the IRC.

6.2 The evaluation report shall state all of the following *R*-values at a mean test temperature of 75˚F ± 5˚F for the insulation:

a. at the maximum thickness recognized in the evaluation report

b. at a 1-inch thickness

c. and at intermediate thicknesses when the *R*-value is not linear with respect to thickness.

6.3 The evaluation report shall state the construction types for which the insulation has been evaluated.

6.4 The evaluation report shall state whether the insulation is a vapor retarder. When the insulation has not been tested, or does not meet the requirements for a vapor retarder, the evaluation report shall state that a vapor retarder shall be installed as required in the applicable code.

6.5 When recognition includes installation in attics and crawl spaces, the evaluation report shall state the requirements for ventilation.

6.6 When foam plastic insulation is qualified using ASTM C 578-08, the evaluation report shall include the vapor permeance rating for the product. ■

TABLE 1—TEMPERATURE PROFILE FOR TESTS

TIME (minutes)	TEMPERATURE (˚F)
0:00	Ambient
1:00	Ambient
2:00	80
3:00	160
4:00	270
5:00	310
6:00	330
7:00	360
8:00	400
9:00	425
≥10:00	425

For **SI:** 1˚C = (˚F – 32) $^{5}/_{9}$.

Appendix A - Test Method for Crawl Space Evaluation

A1.0 SCOPE

The objective of this test is to evaluate the fire performance of foam plastic insulation materials when tested in a simulated crawl space module to determine if the insulation is acceptable for use in attic or crawl space areas without a thermal barrier. The test provides a comparison of fire performance characteristics between insulated wood sub-floor assemblies.

A2.0 TEST CONFIGURATION

A sub-floor assembly is mounted on top of a three-sided wall module. The simulated crawl space module consists of three 8-ft square (outside dimensions ± 2 in.) walls, each 48 ± 2 in. high, and built of nominal 4-in. wide x 8 in. high x 16-in. long concrete blocks with a full open space on one side of the structure. Masonry walls or module walls constructed of wood or metal studs with two layers of $^1/_2$ in. gypsum board are permitted provided the interior dimensions are the same as for a concrete block module, i.e., 88 ± 2 in. wide and 92 ± 2 in. deep. If wood or metal stud construction is used, the studs shall be located inside the module, i.e., the width of the module is equal to the distance between the interior faces of the gypsum board attached to the side walls and the depth is equal to the distance between the front opening and the interior face of the gypsum board attached to the back wall.

The floor/ceiling above the crawl space is built using nominal 2 x 8-in. x 8-ft floor joists on 16 in. centers, with 2 x 8-in. joist headers, all bearing on 2 x 4-in. sill plates and surfaced with $^{15}/_{32}$-in. thick, 4-ply, APA graded A-C plywood sub-flooring. The use of joists and headers with a larger depth, e.g., 2 x 10 in., 2 x 12 in., etc. is permitted at the client's request.

Note 1: The use of CDX grade plywood is considered too variable in quality for comparison purposes required for this evaluation.

Note 2: All construction lumber (joists and studs, if used) shall be of the same species and grade for all tests conducted to qualify a foam plastic insulation.

The joists are perpendicular to the camera's line-of-sight, so that they tend to dam the flame front and hold it inside the test area. The floor of the test chamber is covered with approximately 1 in. of sand. To provide additional protection, it is acceptable to cover the floor with $^1/_2$ in. gypsum board before installing the 1 in. layer of sand.

A3.0 IGNITION SOURCE

The fire source is a 22-lb wood crib constructed of nominal 2 x 2-in. No. 1 select grade white pine (no knots), 15-in. square in plan, spaced approximately $1^1/_2$ in. apart and fastened at right angles with a single nail at each end. The crib shall be conditioned to an average moisture content of 7.5 ± 0.5%. The crib is placed in a rear corner of the crawl space 1 in. from each wall surface and supported approximately 4-in. above the floor on small sections of refractory brick. The crib sticks of the bottom layer shall be parallel to the side walls. Approximately 150 ml of ethyl alcohol in a circular or square metal pan with a surface area of 36 to 40 in^2 placed under the crib is used for ignition.

A4.0 TEST DURATION AND END POINT COMPARISON CRITERIA

One or both of the following two criteria are established for test duration and relative comparison to between tests:

1. Time to flames emerging from the front of the crawl space.
2. Time to burn-through of the floor/deck system.

A5.0 DOCUMENTATION

The test is recorded with photographs and video documentation positioned to view the entire front of the open side of the module. A timing reference, mechanical or electronic, is included in all photographic and video records.

A6.0 REPORT

The report shall include:

- Name and location of facility where test is conducted.
- Date of specimen construction and date tested.
- A description of the tested assembly with emphasis on the insulation type (including facings), thickness, density, and attachment details.
- Photographic and video documentation: pre-test, during (including timing), and post-test.
- A summary of visual observations including time to flames exiting the module and/or burn through of the sub-floor assembly.
- Conclusions in the form of a statement of findings summarizing the fire performance of the assembly; and, as appropriate, compared to a baseline test.
- Signature of a representative engineer or officer of the test facility.