

Harnett County

INSPECTOR: IVR

DATE

1/16/14

 ADDRESS : 98 REGAL CREST DR
 CONTRACTOR : WEAVER DEVELOPMENT CO INC
 OWNER : MINTON JASON & MEGAN
 PARCEL : 05-0633- - -0013- -12-
 APPL NUMBER: 13-50032333 CP NEW RESIDENTIAL (SFD)

SUBDIV: REGAL CREST 13LOTS
 PHONE : (910) 433-0888
 PHONE :

 DIRECTIONS : T/S: 10/16/2013 10:30 AM JBROCK ----
 REGAL CREST LOT 13

STRUCTURE: 000 000 55X60 4BDR CRAWL W/ GARAGE & DECK

FLOOD ZONE : FLOOD ZONE X
 # BEDROOMS : 4000000.00
 SEPTIC - EXISTING? : NEW TANK
 PROPOSED USE : SFD
 WATER SUPPLY : COUNTY

PERMIT: CPSF 00 CP * SFD

TYP/SQ	REQUESTED COMPLETED	INSP RESULT	DESCRIPTION RESULTS/COMMENTS
B101 01	11/19/13	BS	R*BLDG FOOTING / TEMP SVC POLE TIME: 17:00 VRU #: 002466886
	11/19/13	DP	T/S: November 19, 2013 10:12 AM BSUTTON No footing done. No one at jobsite working. Inpsection not cancelled. \$50 re fee
B101 02	11/21/13	KS	R*BLDG FOOTING / TEMP SVC POLE TIME: 17:00 VRU #: 002468601
	11/21/13	AP	T/S: 11/20/2013 02:19 PM DJOHNSON T/S: 11/21/2013 02:15 PM KSLATTUM
B103 01	11/25/13	BS	R*BLDG FOUND & TEMP SVC POLE VRU #: 002469245
	11/25/13	AP	T/S: November 25, 2013 12:33 PM BSUTTON
A814 01	11/25/13	TW	ADDRESS CONFIRMATION TIME: 17:00 VRU #: 002469252
	12/13/13	AP	98 REGAL CREST DR FUQUAY VARINA 27526 T/S: 12/13/2013 02:11 PM TWARD
B105 01	11/27/13	TI	R*OPEN FLOOR VRU #: 002470664
	11/26/13	CA	
B105 02	12/02/13	BS	R*OPEN FLOOR VRU #: 002470748
	12/19/13	AP	T/S: December 19, 2013 02:56 PM BSUTTON
R425 01	12/27/13	KS	FOUR TRADE ROUGH IN VRU #: 002479376
	12/27/13	DA	Fairly complicated floor and roof system. Inspection may take longer than normal. T/S: 12/27/2013 12:22 PM KSLATTUM 1. Portal frame garage wall. 2. Need floor I joist repairs where top chords were drilled for plumbing and electrical.
I129 01	1/16/14	TI	R*INSULATION INSPECTION VRU #: 002484947
	<u>1-16-14</u>	<u>DAB</u>	
R425 02	1/16/14	TI	FOUR TRADE ROUGH IN TIME: 17:00 VRU #: 002485100
			T/S: 01/15/2014 02:18 PM DJOHNSON

----- COMMENTS AND NOTES -----

Trenco

818 Soundside Rd
Edenton, NC 27932

Re: J1013-6299
Minton Residence

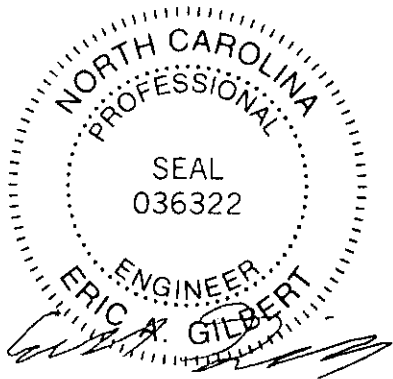
The truss drawing(s) referenced below have been prepared by Truss Engineering Co. under my direct supervision based on the parameters provided by Comtech, Inc - Fayetteville.

Pages or sheets covered by this seal: E7241404 thru E7241404

My license renewal date for the state of North Carolina is December 31, 2014.

North Carolina COA: C-0844

Lumber design values are in accordance with ANSI/TPI 1 section 6.3
These truss designs rely on lumber values established by others.



January 10, 2014

Gilbert, Eric

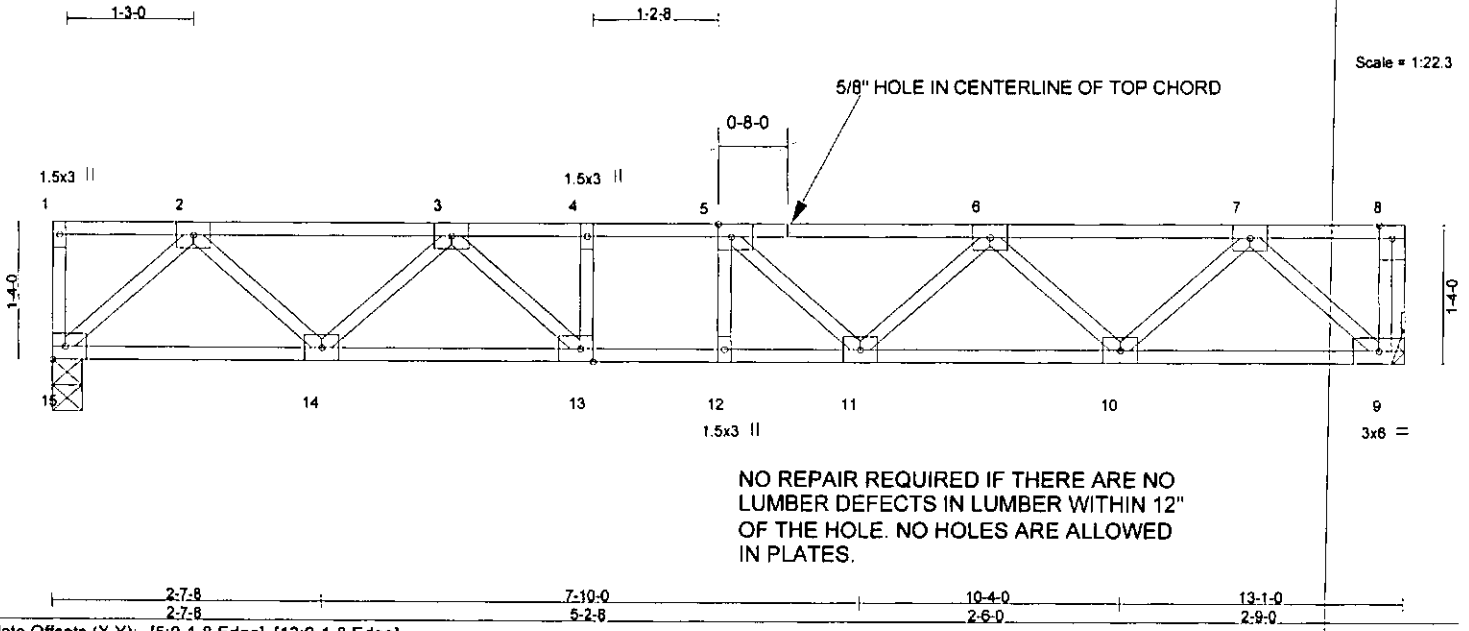
The seal on these drawings indicate acceptance of professional engineering responsibility solely for the truss components shown. The suitability and use of this component for any particular building is the responsibility of the building designer, per ANSI/TPI-1 Chapter 2.
Engineering services provided by Truss Engineering Company.



Job J1013-6298	Truss F06	Truss Type Floor	Qty 4	Ply 1	Minton Residence	0.5 UNIT(s) EAG	E7241404
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Comtech, Inc., Fayetteville, NC 28309

Job Reference (optional)
7.430 s Jul 26 2013 MITek Industries, Inc. Fri Jan 10 13 01:33 2014 Page 1
ID:LVhCxGvmEAdHFyHZLQgCaEyOeZh-8iSqaPhuUsQ2KLnbiBnU1GQUlwyFNLc5UF9jR6zwlPm



Scale = 1:22.3

Plate Offsets (X,Y): [5:0-1-8,Edge], [13:0-1-8,Edge]					
LOADING (psf)	SPACING 2-0-0	CSI	DEFL in (loc) l/defl L/d	PLATES	GRIP
TCLL 40.0	Plates Increase 1.00	TC 0.31	Vert(LL) -0.08 11-12 >999 480	MT20	244/190
TCDL 10.0	Lumber Increase 1.00	BC 0.56	Vert(TL) -0.13 11-12 >999 360		
BCLL 0.0	Rep Stress Incr YES	WB 0.31	Horz(TL) 0.03 9 n/a n/a		
BCDL 5.0	Code IRC2009/TPI2007	(Matrix)		Weight: 69 lb	FT = 20%F, 11%E

LUMBER	BRACING
TOP CHORD 2x4 SP No.1(flat)	TOP CHORD Structural wood sheathing directly applied or 6-0-0 oc purlins, except end verticals.
BOT CHORD 2x4 SP No.1(flat)	BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.
WEBS 2x4 SP No.3(flat)	

REACTIONS (lb/size) 9=709/Mechanical, 15=709/0-3-8 (min. 0-1-8)

FORCES (lb) - Maximum Compression/Maximum Tension

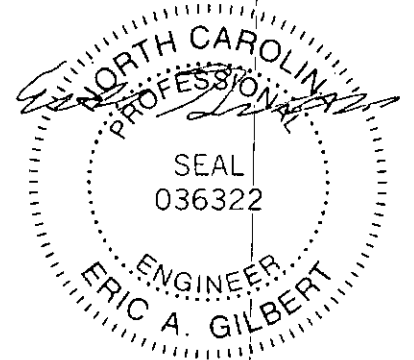
TOP CHORD 1-15=-34/0, 8-9=-45/0, 1-2=0/0, 2-3=-1170/0, 3-4=-1864/0, 4-5=-1864/0, 5-6=-1780/0, 6-7=-1205/0, 7-8=0/0

BOT CHORD 14-15=0/720, 13-14=0/1607, 12-13=0/1864, 11-12=0/1864, 10-11=0/1641, 9-10=0/743

WEBS 7-9=-990/0, 2-15=-979/0, 7-10=0/642, 2-14=0/625, 6-10=-606/0, 3-14=-808/0, 6-11=0/267, 3-13=0/489, 5-11=-274/64, 4-13=-195/0, 5-12=-145/53

- NOTES**
- 1) Unbalanced floor live loads have been considered for this design.
 - 2) All plates are 3x4 MT20 unless otherwise indicated.
 - 3) Plates checked for a plus or minus 1 degree rotation about its center.
 - 4) Refer to girder(s) for truss to truss connections.
 - 5) "Semi-rigid pitchbreaks including heels" Member end fixity model was used in the analysis and design of this truss.
 - 6) Recommend 2x6 strongbacks, on edge, spaced at 10-0-0 oc and fastened to each truss with 3-10d (0.131" X 3") nails. Strongbacks to be attached to walls at their outer ends or restrained by other means.

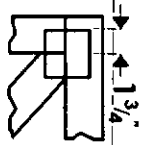
LOAD CASE(S) Standard



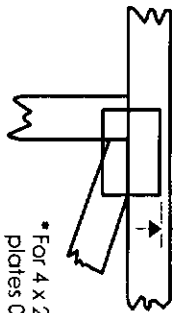
January 10, 2014

Symbols

PLATE LOCATION AND ORIENTATION



Center plate on joint unless X, Y offsets are indicated. Dimensions are in ft-in-sixteenths. Apply plates to both sides of truss and fully embed teeth.



* For 4 x 2 orientation, locate plates 0-¹/₈" from outside edge of truss.



* This symbol indicates the required direction of slots in connector plates.

* Plate location details available in MITEK 20/20 software or upon request.

PLATE SIZE

4 X 4

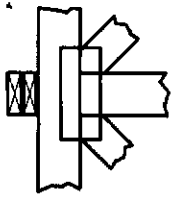
The first dimension is the plate width measured perpendicular to slots. Second dimension is the length parallel to slots.

LATERAL BRACING LOCATION



Indicated by symbol shown and/or by text in the bracing section of the output. Use T or I bracing if indicated.

BEARING

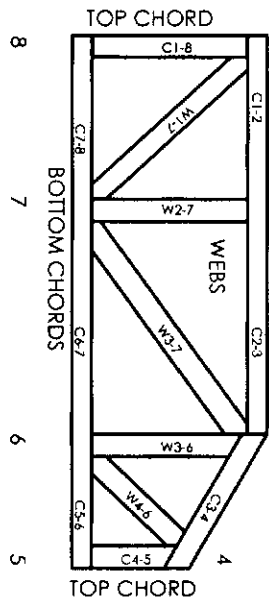
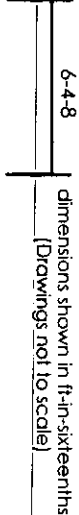


Indicates location where bearings (support) occur. Icons vary but reaction section indicates joint number where bearings occur.

Industry Standards:

ANSI/TP11: National Design Specification for Metal Plate Connected Wood Truss Construction.
DSB-89: Building Standard for Bracing.
BCSI: Building Component Safety Information, Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses.

Numbering System



JOINTS ARE GENERALLY NUMBERED/CLOCKWISE AROUND THE TRUSS STARTING AT THE JOINT FARTHEST TO THE LEFT.

CHORDS AND WEBS ARE IDENTIFIED BY END JOINT NUMBERS/LETTERS.

PRODUCT CODE APPROVALS

ICC-ES Reports:

ESR-1311, ESR-1352, ESR1988
ER-3907, ESR-2362, ESR-1397, ESR-3282

Southern Pine lumber designations are as follows:

SYP represents values as published by AWC in the 2005/2012 NDS
SP represents ALSC approved/new values with effective date of June 1, 2013

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Mitek Engineering Reference Sheet: Mill-7473 rev. 02/26/2013

General Safety Notes

Failure to Follow Could Cause Property Damage or Personal Injury

1. Additional stability bracing for truss system, e.g. diagonal or X-bracing, is always required. See BCSI.
2. Truss bracing must be designed by an engineer. For wide truss spacing, individual lateral braces themselves may require bracing, or alternative T or I bracing should be considered.
3. Never exceed the design loading shown and never stock materials on inadequately braced trusses.
4. Provide copies of this truss design to the building designer, erection supervisor, property owner and all other interested parties.
5. Cut members to bear tightly against each other.
6. Place plates on each face of truss or each joint and embed fully. Knots and warps at joint locations are regulated by ANSI/TP 11.
7. Design assumes trusses will be suitably protected from the environment in accord with ANSI/TP 11.
8. Unless otherwise noted, moisture content of lumber shall not exceed 19% at time of fabrication.
9. Unless expressly noted, this design is not applicable for use with fire retardant, preservative treated, or green lumber.
10. Carrier is a non-structural consideration and is the responsibility of truss fabricator. General practice is to camber for dead load deflection.
11. Plate type, size, orientation and location dimensions indicated are minimum plating requirements.
12. Lumber used shall be of the species and size, and in all respects, equal to or better than that specified.
13. Top chords must be sheathed or purlins provided at spacing indicated on design.
14. Bottom chords require lateral bracing of 10 ft. spacing, or less, if no ceiling is installed, unless otherwise noted.
15. Connections not shown are the responsibility of others.
16. Do not cut or alter truss member or plate without prior approval of an engineer.
17. Install end load vertically unless indicated otherwise.
18. Use of green or treated lumber may pose unacceptable environmental, health or performance risks. Consult with project engineer before use.
19. Review all portions of this design (front, back, words and pictures) before use. Reviewing pictures alone is not sufficient.
20. Design assumes manufacture in accordance with ANSI/TP 11 Quality Criteria.

The Icynene Insulation System®

Insulation and Air Barrier System

The Icynene Insulation System® provides this structure with an insulation that controls both conductive heat loss/gain and convection (air leakage) heat loss/gain. Icynene® is an environmentally friendly low density foam that contains no CFC's, no HCFC's nor any formaldehyde. Due to the air sealing and insulating characteristics of The Icynene Insulation System®, this structure can enjoy the benefits of:

- enhanced energy efficiency
- improved indoor air quality
- enhanced soundproofing

The manufacturer recommends that the insulation be installed at these overall thickness to provide the levels of insulation conductive heat flow resistance (R-value). The air sealing properties of The Icynene Insulation System® will provide insulation benefits over and above those measured by R-value.

	Icynene® Spray Foam	Icynene® Pour Foam
R-13	3 1/2"	3 1/4"
R-15	4	3 3/4
R-19	5 1/2	4 3/4
R-21	6	5 1/4
R-30	8 1/2	7 1/2

In lieu of purely R-value based thicknesses, the Icynene Certified Installation Contractor may utilize performance values to determine the correct thickness to be sprayed on each location. Documentation on performance values should be attached to this Site Card.

Performance Values: 6" > R-38 ; 5" = R-30 ; 3" > R-19 (See back of card for engineer's letter)

The Icynene Insulation System® has been installed in accordance with the manufacturer's instructions in the amount of:

	Thickness
Ceilings	_____
Walls	_____
kneewalls	3" Nominal
Floors	3" Nominal

Foam Works Insulators, LLC
5902 Fayetteville Road
Raleigh, N.C. 27603
(919) 256-9600

98 Regal Crest Dr.
Address

Foam Works Insulators, LLC
Company (Icynene Licensed Dealer)

Wade Jiner
Authorized Signature

1-6-14
Date

This building is insulated with The Icynene Insulation System®



ICYNENE INC.

6747 Campobello Rd., Mississauga, Ontario, L5N 2L7, Canada
Tel: 905-363-4040 • Toll Free: 800-758-7325 • Fax: 905-363-0102

March 3, 2009

Foam Worx Insulators, LLC.
1212 Home Court
Raleigh, NC, 27603

Attn: Mr. Rich Brown, Sales Team Leader

Re: Thermal Performance of Icynene®

The International Energy Conservation Code, (IECC, Chapter 4), allows for the use of the performance approach in approving insulation thickness. Compliance with this chapter requires an analysis of the annual energy usage.

The Icynene Engineering department has performed numerous energy performance analyses for new construction and retrofit projects. Icynene uses REM/Design software developed by Architectural Energy Corporation from Boulder, CO. Attached is their letter regarding the code compliance capability of the software. Our findings are included in the Icynene Design Note "The Economic Thickness of Thermal Insulation".

Icynene® is a thermal insulation and an air barrier material. It provides improved energy performance as a result of convective heat flow control. The air seal advantage of Icynene® provides improved energy performance over much higher R-value insulations that are air permeable. The blower door testing of air tightness of the houses insulated with Icynene indicates an average air infiltration rate 5.5 times lower than a house insulated with mineral fiber insulation. Based on measured air infiltration and the number of energy analyses performed we have found that Icynene®, installed in accordance with the manufacturer's installation instructions to a nominal thickness of 3" in the walls and floors and 6" in roof/ceiling applications, will perform better thermally than R-19 and R-38, air-permeable mineral fiber insulation.

If you require further information please do not hesitate to contact the writer.

Foam Worx Insulators, LLC.
1212 Home Court
Raleigh, NC, 27603
Victor M. Ginic, P. Eng.
Building Science Engineer
vginic@icynene.com



The Icynene Insulation System®

FOAM WORKS

INSULATORS LLC

Building Inspections

RE: Harnett Co. - 98 Regal Crest Dr

Foam Work Insulators, LLC sprays The Icynene Insulation System® to nominal depths of 5 or 6 inches in ceilings, roof decks, cathedrals, slopes and overhangs, as well as 3 inches nominal in floors and exterior walls, per the attached letter from Icynene Engineering. (Five inches exceeds an R-30 of fiberglass and six inches exceeds an R-38). I have included both the mentioned letter from Icynene, as well as the supporting document, titled "The Economic Thickness of Insulation" with this letter. I have also included in this package: Product Specifications for Icynene, ICC-ES report number ESR-1826, the engineering detail for the roof insulation, the document titled "Goldseal: Residential Occupancy Time" (which assures your safety in entering the dwelling and inspecting the Icynene one day after spraying) and a copy of the lifetime warranty. This house has CertainTeed or GAF/Elk shingles on it, so I have included the letters from both companies which affirm the full warranty on the shingles and the engineered drawing on the unvented attic assembly. In the attic and in the small areas behind kneewalls and the crawl space, we are adhering to Assembly #2 in the ESR report which allows for Icynene to be spray to the roof deck, ceilings and vertical walls without Thermal Barrier or Ignition Barrier covering. (See attached ESR and Drawings).

This letter also certifies that for 98 Regal Crest Dr, Foam Work Insulators, LLC has sprayed The Icynene Insulation System® in accordance with North Carolina codes, which require R-13, R-19 and R-30 (Zone 3b) or R-38 (Zone 4) insulation values in walls, floors and ceilings/roofs, respectively. Based on information published by Icynene, we provided 3 inches of Icynene in the exterior walls and floors and 5 inches (Zone 3b) or 6 inches (Zone 4) of foam in floors, ceilings, slopes, cathedrals and overhangs.

Please call me if you have any other questions, or requests for information.

Sincerely,



Wade Liner
Manager
Foam Works Insulators, LLC
5902 Fayetteville Road
Raleigh, NC 27603
Phone: 919-256-9600
Fax: 919-256-9601



6747 Campobello Rd., Mississauga, Ontario, L5N 2L7, Canada
Tel: 905-363-4040 • Toll Free: 800-758-7325 • Fax: 905-363-0102

March 3, 2009

Foam Worx Insulators, LLC.
1212 Home Court
Raleigh, NC, 27603

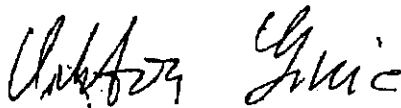
Re: Thermal Performance of Icyne®

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The Icyne Engineering department has performed numerous energy performance analyses for new construction and retrofit projects. Icyne uses REM/Design software developed by Architectural Energy Corporation from Boulder, CO. Attached is their letter regarding the code compliance capability of the software. Our findings are included in the Icyne Design Note "The Economic Thickness of Thermal Insulation".

Icyne® is a thermal insulation and an air barrier material. It provides improved energy performance as a result of convective heat flow control. The air seal advantage of Icyne® provides improved energy performance over much higher R-value insulations that are air permeable. The blower door testing of air tightness of the houses insulated with Icyne indicates an average air infiltration rate 5.5 times lower than a house insulated with mineral fiber insulation. Based on measured air infiltration and the number of energy analyses performed we have found that Icyne®, installed in accordance with the manufacturer's installation instructions to a nominal thickness of 3" in the walls and floors and 6" in roof/ceiling applications, will perform better thermally than R-19 and R-38, air-permeable mineral fiber insulation.

If you require further information please do not hesitate to contact the writer.


Yours truly,

Viktor M. Ginic, P. Eng.
Building Science Engineer
vginic@icyne.com



The Icyne Insulation System®

The Economic Thickness of Thermal Insulation

The conventional method of evaluating the performance of insulation is to measure the R-value, the conductive heat flow resistance of the material.

The measurement of conductive heat flow resistance is made using the heat flow meter apparatus. This test procedure (ASTM C-518) measures the thermal conductivity of insulation material. In this test, one side of the specimen is heated to a specific temperature and after steady state heat flow has been reached, the temperature on the opposite side is measured. Through this temperature measurement the R-value is calculated. The outside surface of the test apparatus and the specimen is sealed and insulated to minimize the heat loss through the edge and eliminate the effects of any convection or radiant heat flow. This measurement solely defines the conductive heat flow resistance of the insulation material, the R-value.

Once the R-value of an insulation material is determined, the heat flow through it can be calculated using Fourier's steady-state heat flow equation.

$$Q = \frac{A \times \Delta T}{R}$$

Where:

Q = Rate of heat flow, BTU/hr

A = Area, ft²

ΔT = Temperature differential, °F

R = Resistance to heat flow, hr.ft² °F/BTU

This equation is used to calculate the benefit of increasing the thickness of any type of insulation as long as there is no air movement (convective heat transfer) through the insulation.

As an example, consider 1000 ft² of insulated area with a temperature differential of 40°F. Let us include the outside air film at R-0.2 and the inside air film at R-0.7. The total R-value before the application of any insulation is 0.9. Increasing the insulation thickness by 1" increments at R-3.6/inch provides the following heat flow rates as shown in Figure 1.1 & 1.2.

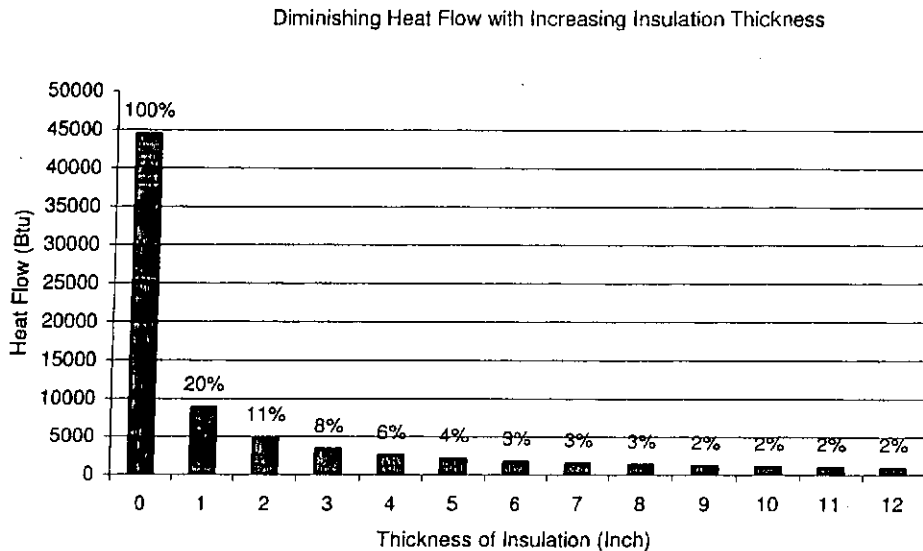


Figure 1.1: Percentage of total heat flow

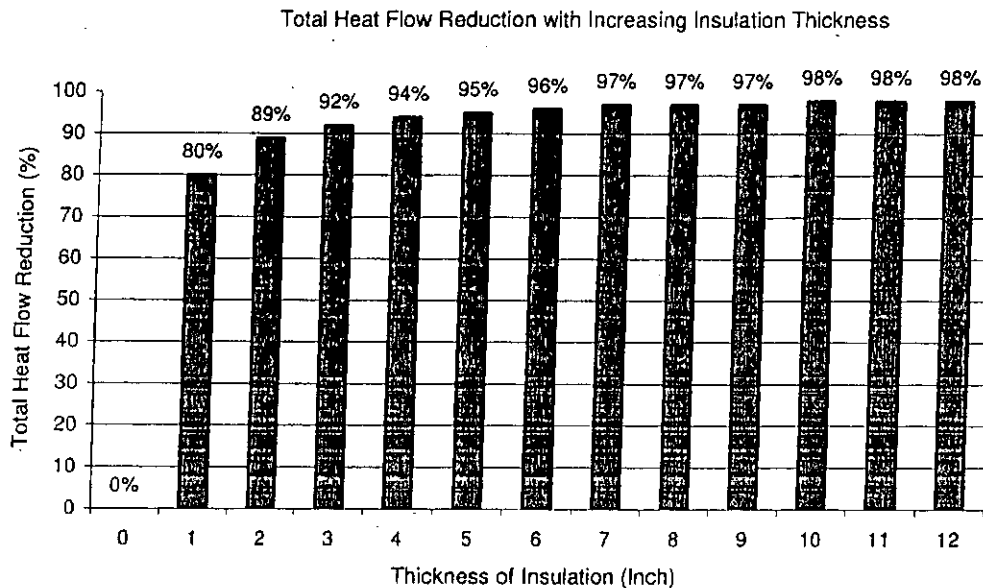


Figure 1.2: Percentage of total heat flow reduction

In Figure 1.1, we can see that the first 1" of insulation reduces the heat flow to 20% of the total and at 5" of thickness, the heat flow is reduced further, down to 5% of the total. In looking at Figure 1.2, we see that increasing the insulation thickness from 6" to 12" only provides an additional heat flow reduction of 2%. Doubling the insulation thickness (R-value); doubling the cost; only provides a modest 2% increase in heat flow reduction. Based on this observation, it is very difficult to justify the additional cost of adding insulation thickness beyond 5".

The Icynene Insulation System[®] fills any shaped cavity and adheres to almost all materials, thereby, forming an insulation layer with very low air permeance. Air flow is eliminated and for this reason, conductive heat loss can be used as a sole criterion for establishing insulation thickness with Icynene.

As shown in Figure 1.2, insulation material with R-value of 3.6 per inch blocks out 95% of conductive heat flow within the first 5 inches of the material. Thickness beyond this point would bring more reduction in heat flow but it would not be economically justified since the returns on additional R-value have greatly diminished.

REDUCE AIR INFILTRATION - REDUCE ENERGY USE REDUCE EQUIPMENT SIZE

In the case of insulation material with significant air permeance, conductive heat loss should not be the only criterion used for establishing insulation thickness. Convective heat loss must be considered as well, particularly when a substantial latent load is involved.

Oak Ridge National Laboratory (ORNL) conducted an experiment¹ to determine the efficiency of a roof assembly insulated with low density, loose-fill fiberglass insulation and discovered that up to 50% of the heat loss occurred as a result of convection; air circulation through the insulation. This result showed that the air-permeable insulation had lost its anticipated thermal performance level by half and that convective heat transfer had a significant negative impact on insulation performance.

¹ ORNL's Building Envelope Center: Fighting the Other Cold War
URL: <http://www.ornl.gov/ORNLReview/rev26-2/text/usemain.html>

The importance of reducing air infiltration can be easily demonstrated by analyzing the energy consumption for heating and cooling houses that have different R-values and air infiltration rates. The following evaluation was generated using the REM/Design energy analysis software. This evaluation deals with three identical houses, located in different North American cities with three different levels of insulation and air-infiltration. The house design is fully detached, has approximately 3,500 sq.ft. conditioned area with two stories and a fully conditioned basement.

The first is a **Typical** house with an air permeable insulation installed at R-19 in the walls & R-30 in the ceiling according to the general building code requirements and an air infiltration rate of 0.6 ACH at natural pressure.

The second house has the same insulation material with a **Higher R-value**, R-43 in the ceiling & R-19 in the walls and an air infiltration rate is kept at 0.6 ACH at natural pressure.

The third is an **lcynene** house with R-11 in the walls, R- 18 in the ceiling and an air infiltration of 0.1ACH at natural pressure.

Heating and cooling costs and the required heating and cooling equipment capacities for each house are plotted on the following graphs. The utility rates are set at \$0.08 per kWh for electricity and \$0.50 per Therm for natural gas.

Figure 2.1 shows the energy costs for heating in several different cities throughout North America. The heating costs are compared for the three different insulation systems. It can be seen that savings on heating cost reached up to 40%~50% with lcynene[®] when compared to the "Typical" and "Higher R-Value" insulation system. Also, the graph indicates that the colder the climate, the greater the heating cost savings are with lcynene.

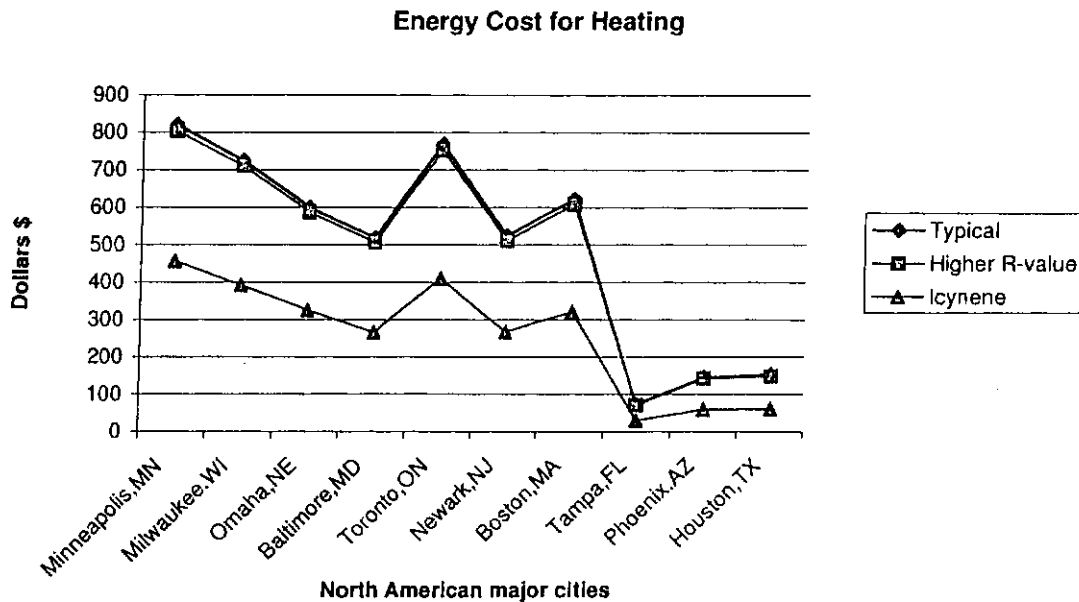
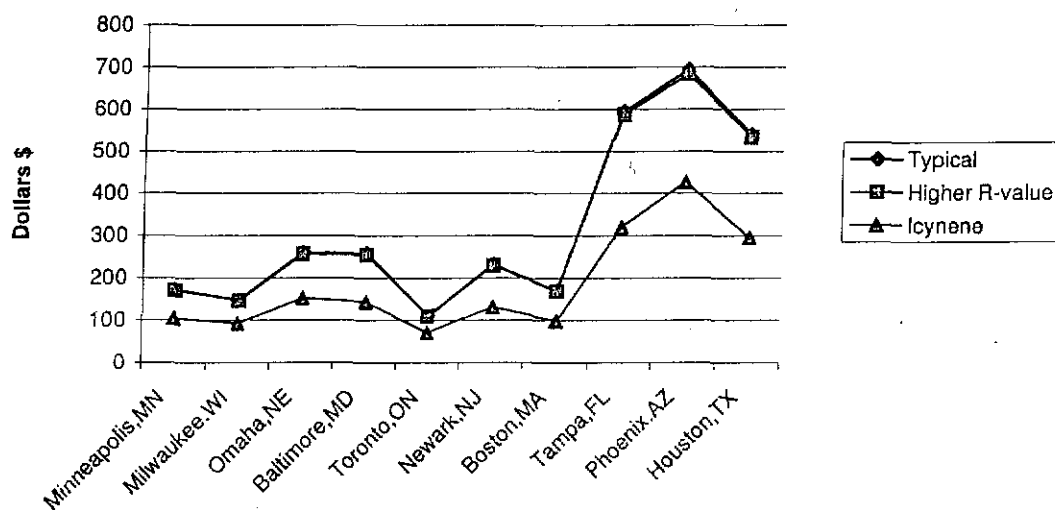


Figure 2.1

Figure 2.2 shows savings on cooling costs with lcynene. They provide savings of 25%~40% over the "Typical" and "Higher R-Value" insulation system. The cities in a hot & humid climate show greater savings due to the higher cooling demand and latent load.

Energy Cost for Cooling

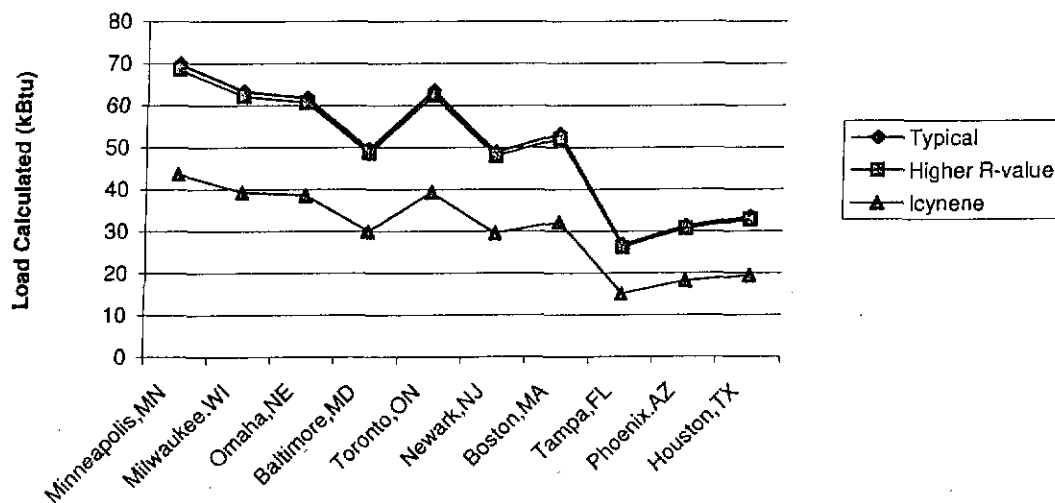


North American major cities

Figure 2.2

As far as sizing heating and cooling equipment is concerned, Icynene provides a significant reduction in both heating & cooling load due to its air sealing property. Figures 2.3 & 2.4 show the equipment size required in these houses for heating and cooling. The graphs show that there is a significant reduction in required capacity for both heating and cooling relative to "Typical" and "Higher R-Value" systems. Often with Icynene, size reduction for heating equipment can reach up to 50% and for cooling, it can be up to 40%.

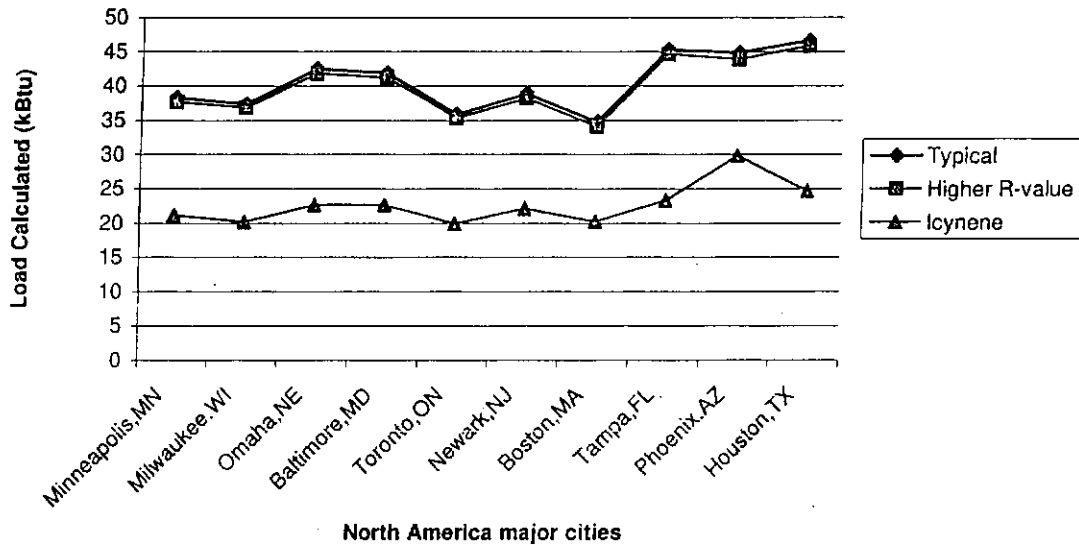
Calculated Load for Heating



North American major cities

Figure 2.3

Calculated Load for Cooling



North America major cities
Figure 2.4

Icynene's air seal capability virtually eliminates convective heat transfer within the insulation and reduces unwanted air leakage through the building envelope. This feature improves the efficiency of the building envelope thereby reducing the heating and cooling costs and reducing the size of HVAC equipment as outlined in figures 2.1 through 2.4. As a result lower operating costs are realized and the cost of the operating equipment is reduced.

Often, air permeable insulation at twice the R-value gets used and still comes short of the desired energy savings as shown in Figures 2.1 and 2.2.

The on-site spray applied application of Icynene provides an excellent air seal that ensures a low air infiltration rate for the building envelope. This quality improves energy efficiency of the building as demonstrated through the graphs above and in addition, the overall performance of the building resulting in better sound attenuation, healthier indoor environment and enhanced thermal comfort.

ICC-ES Evaluation Report

ESR-1826
Reissued February 1, 2013
This report is subject to renewal February 1, 2015.
www.icc-es.org | (800) 423-6587 | (562) 699-0543

A Subsidiary of the International Code Council®
**DIVISION: 07 00 00—THERMAL AND MOISTURE
PROTECTION**
Section: 07 21 00—Thermal insulation
REPORT HOLDER:

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EVALUATION SUBJECT:
ICYNENE LD-C-50™ AND LD-C-50 VERSION 2 (v2)

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2012 and 2009 *International Building Code*® (2009 IBC)
- 2012 and 2009 *International Residential Code*® (2009 IRC)
- 2012 and 2009 *International Energy Conservation Code*® (2009 IECC)
- Other Codes (see Section 8.0)

Properties evaluated:

- Surface burning characteristics
- Physical properties
- Thermal performance (R-values)
- Attic and crawl space installation
- Fire resistance
- Air permeability
- Noncombustible construction

2.0 USES

ICynene LD-C-50™ and LD-C-50 v2 are used to provide thermal insulation in buildings and to seal areas such as plumbing and wiring penetrations against air infiltration, in Types I, II, III, IV and Type V construction (IBC) and dwellings under the IRC. The insulations may be used in fire-resistance-rated construction when installed in accordance with Section 4.5 and in Types I through IV construction when installed in accordance with Section 4.6.

3.0 DESCRIPTION

3.1 General:

ICynene LD-C-50™ and LD-C-50 v2 are low-density, open-cell, polyurethane foam plastic insulations and air barrier systems that are 100 percent water-blown with an installed nominal density of 0.5 pcf (8 kg/m³). The insulations are two-component, spray-applied products. The two components of the insulation are polymeric isocyanate (A-Component, also known as Base Seal®) and proprietary resin (B-Component, LD-C-50 or LD-C-50 v2 Resin, also known as, Gold Seal®). The A-Component must be stored at a temperature of 50°F (10°C) or greater, and has a shelf life of six months. The B-Component must be stored at temperatures below 100°F (37.8°C), and has a shelf life of six months.

3.2 Surface Burning Characteristics:

When tested in accordance with ASTM E84/UL 723, at a thickness of 6 inches (152 mm) and a nominal density of 0.5 pcf (8 kg/m³), ICynene LD-C-50 and LD-C-50 v2 have a flame spread index of 25 or less and a smoke-developed index of 450 or less. Thicknesses of up to 7½ inches (190.5 mm) for wall cavities and 11½ inches (292 mm) for ceiling cavities are recognized based on room corner fire testing in accordance with NFPA 286, when covered with minimum ½-inch-thick (13 mm) gypsum board or an equivalent thermal barrier complying with the applicable code.

3.3 Thermal Resistance:

ICynene LD-C-50 and LD-C-50 v2 have thermal resistance (R-values) at a mean temperature of 75°F (24°C) as shown in Table 1.

3.4 Air Permeability:

ICynene LD-C-50™ and LD-C-50 v2 spray-applied foam plastic insulations, at a minimum thickness of 3½ inches (89 mm), are considered air-impermeable insulation in accordance with IRC Section R202, based on testing in accordance with ASTM E283.

3.5 Intumescent Coatings:

3.5.1 No Burn Plus XD: No Burn Plus XD intumescent coating is a latex-based coating supplied in 1-gallon (4L) and 5-gallon (19L) pails and 55-gallon (208 L) drums. The coating material has a shelf life of 12 months when stored in factory-sealed containers at temperatures between 40°F (4.4°C) and 90°F (32.2°C).

3.5.2 DC 315: DC 315 intumescent coating is a water-based coating supplied in 5-gallon (19L) pails and 55-gallon (208L) drums. The coating material has a shelf life of 24 months when stored in factory-sealed containers at temperatures between 41°F (5°C) and 95°F (35°C).

4.0 INSTALLATION

4.1 General:

The manufacturer's published installation instructions and this report must be strictly adhered to and a copy of these instructions and this evaluation report must be available on the jobsite at all times during installation.

4.2 Application:

Icynene LD-C-50™ and LD-C-50 v2 foam plastic insulations must be applied using spray equipment specified by Icynene, Inc. The insulation must not be used in areas which have a maximum service temperature greater than 180°F (82°C). The foam plastic insulation must not be used in electrical outlet or junction boxes or in contact with rain or water, and must be protected from the weather during and after application. Where the insulation is used as air-impermeable insulation, such as in unventilated attic spaces regulated by IRC Section R806, the insulation must be installed at a minimum thickness of 3.5 inches (89 mm). The insulation can be installed in one pass to the maximum thickness. Where multiple passes are required, the cure time between passes is negligible.

4.3 Thermal Barrier:

4.3.1 Application with a Prescriptive Thermal Barrier:

Icynene LD-C-50™ and LD-C-50 v2 foam plastic insulations must be separated from the interior of the building by an approved thermal barrier, such as 1/2-inch (12.7 mm) gypsum wallboard installed using mechanical fasteners in accordance with the applicable code, or an equivalent 15-minute thermal barrier complying with the applicable code. When installation is within an attic or crawl space as described in Section 4.4, a thermal barrier is not required between the foam plastic and the attic or crawl space, but is required between the foam and the interior of the building. Thicknesses of up to 7 1/2 inches (190.5 mm) for wall cavities and 11 1/2 inches (292 mm) for ceiling cavities are recognized based on room corner fire testing in accordance with NFPA 286, when covered with minimum 1/2-inch-thick (13 mm) gypsum board or equivalent thermal barrier complying with, the applicable code.

4.3.2 Application without a Prescriptive Thermal Barrier or Ignition Barrier: The prescriptive 15-minute thermal barrier or ignition barrier may be omitted when installation is in accordance with this section. The insulation and coating may be spray-applied to the interior facing of walls, the underside or roof sheathing of roof rafters, and in crawl spaces, and may be left exposed as an interior finish without a prescribed 15-minute thermal barrier or ignition barrier. The thickness of the foam plastic applied to the underside of the roof sheathing must not exceed 14 inches (356 mm). The thickness of the spray foam insulation applied to vertical wall surfaces must not exceed 6 inches (152 mm). The foam plastic must be covered on all surfaces with DC 315 coating at a minimum thickness of 13 dry mils, 20 wet mils, 80 ft² per gallon. The coating must be applied over the insulation in accordance with the coating manufacturer's instructions and this report. Surfaces to be coated must be dry, clean, and free of dirt, loose debris and other substances that could interfere with adhesion of the coating. The coating is applied in one coat with low-pressure airless spray equipment.

4.4 Attics and Crawl Spaces:

4.4.1 Application with a Prescriptive Ignition Barrier:

When Icynene LD-C-50™ and LD-C-50 v2 foam plastic insulations are installed within attics where entry is made only for service of utilities, an ignition barrier must be installed in accordance with IBC Section 2603.4.1.6 and IRC Sections R316.5.3 and R316.5.4, as applicable. The ignition barrier must be consistent with the requirements for the type of construction required by the applicable code and must be installed in a manner so that the foam plastic insulation is not exposed. The insulation may be installed in unvented attics in accordance with the 2009 IRC Section R806.4 or 2012 IRC Section R806.5, as applicable.

4.4.2 Application without a Prescriptive Ignition Barrier:

Where Icynene LD-C-50 and LD-C-50 v2 foam plastic insulation is installed in an attic or crawl space without a prescriptive ignition barrier, in accordance with Sections 4.4.2.1, 4.4.2.2, 4.4.2.3 and 4.4.3, the following conditions apply:

1. Entry to the attic or crawl space is only for service of utilities and no storage is permitted.
2. There are no interconnected attic, crawl space or basement areas.
3. Air in the attic or crawl space is not circulated to other parts of the building.
4. Combustion air is provided in accordance with IMC Section 701.
5. Attic ventilation is provided when required by IBC Section 1203.2 or IRC Section R806, except when air-impermeable insulation is permitted in unvented attics in accordance with Section R806.4 of the 2009 IRC or Section R806.5 of the 2012 IRC.
6. Under-floor (crawl space) ventilation is provided when required by IBC Section 1203.3 or IRC Section R408.1, as applicable.

4.4.2.1 Attics – LD-C-50 and LD-C-50 v2: In attics Icynene LD-C-50™ LD-C-50 v2, foam plastic insulation may be spray-applied to the underside of the roof sheathing and/or rafters, as described in this section. The thickness of the foam plastic applied to the underside of the roof sheathing must not exceed 14 inches (356 mm). The thickness of the spray foam insulation applied to vertical wall surfaces must not exceed 5.5 inches (140 mm). The insulation must be covered on all surfaces with one of the coatings described in Section 3.5. The coating must be applied over the insulation in accordance with the coating manufacturer's instructions and this report. Surfaces to be coated must be dry, clean, and free of dirt, loose debris and other substances that could interfere with adhesion of the coating. The coating is applied in one coat with low-pressure airless spray equipment. The coating must be applied to a thickness as follows:

- No Burn Plus XD at a minimum dry film thickness of 4 mils (6 wet mils) at 270 ft² per gallon.
- DC 315 at a minimum dry film thickness of 3 mils (4 wet mils) at 400 ft² per gallon.

The coatings must be applied when ambient and substrate temperature is at least 60°F (16°C) and no more than 95°F (35°C). All other surfaces (including glass) must be protected against damage from the coating. The insulation may be installed in unvented attics when the foam plastic is applied at a minimum thickness of 3.5 inches (89 mm) as described in this section in accordance

with the 2009 IRC Section R806.4 or Section R806.5 of the 2012 IRC.

4.4.2.2 Attics – LD-C-50 v2: When LD-C-50 v2 is applied in unvented attics conforming to 2012 IRC Section R806.5 or 2009 IRC Section R806.4, the insulation may be applied to the underside of roof sheathing and/or rafters to a minimum thickness of 5½ inches (140 mm) and a minimum thickness of 1½ inches (38 mm) over the rafters; and may be applied to vertical wall surfaces to a minimum thickness of 5½ inches (140 mm) and a minimum thickness of 1½ inches (38 mm) over the studs. Maximum thickness on the underside of roof sheathing or on vertical wall surfaces is 20 inches (508 mm). The insulation may be left exposed to the attic without a prescriptive ignition barrier or an intumescent coating.

The attic must have attic access complying with IRC Section R807, horizontally placed in the floor, and opening outward toward the living space. Items penetrating the roof deck or walls, such as skylight wells and vents, must be covered with a minimum of 5½ inches (140 mm) of the LD-C-50 v2 insulation.

4.4.2.3 Crawl Spaces: In crawl spaces, Icynene LD-C-50 and LD-C-50 v2 insulation may be spray-applied to vertical walls and the underside of floors, as described in this section. The thickness of the foam plastic applied to the underside of the floors must not exceed 14 inches (356 mm). The thickness of the spray foam insulation applied to vertical wall surfaces must not exceed 3½ inches (88.9 mm). The foam plastic does not require an ignition barrier or a coating.

4.4.3 Use on Attic Floors: When used on attic floors, Icynene LD-C-50™ and LD-C-50 v2 foam plastic insulation may be installed at a maximum thickness of 11½ inches (292 mm) between joists in attic floors. The insulation must be separated from the interior of the building by an approved thermal barrier. The coatings specified in Section 4.4.2.1 and the ignition barrier in accordance with IBC Section 2603.4.1.6 and IRC Section R316.5.3, may be omitted.

4.5 One-hour Fire-resistance-rated Assemblies:

4.5.1 Assembly 1 (Limited Load-bearing Wood Stud Wall): Minimum nominally 2-by-4 [1½ by 3½ inches (38 mm by 89 mm)] southern pine (G = 0.55), No. 2 grade studs spaced 16 inches (406 mm) on center with a base layer of ½-inch-thick (12.7 mm) wood fiber sound board installed horizontally on each face with vertical joints located over the studs, attached with 6d box nails, 2 inches (51 mm) long and spaced 24 inches (610 mm) on center along the studs, and a second layer of ⅝-inch-thick (15.9 mm) Type X gypsum wallboard installed vertically on each face, attached with 8d box nails, 2½ inches (64 mm) long and spaced 7 inches (178 mm) on center along the studs. The stud cavity contains Icynene insulation nominally 2 inches (51 mm) thick.

Axial loads applied to the wall assembly must be limited to the least of the following:

- 1,805 pounds (8029 N) per stud.
- Design stress of 0.78 F'c.
- Design stress of 0.78 F'c at a maximum l_w/d of 33.

4.5.2 Assembly 2 (Limited Load-bearing Wood Stud Wall): Minimum nominally 2-by-4 [1½ by 3½ inches (38 mm by 89 mm)] southern pine (G = 0.55), No. 2 grade studs spaced 16 inches (406 mm) on center with two layers of ½-inch-thick (12.7 mm) Type X gypsum wallboard installed vertically with joints staggered on each

face, attached with 8d box nails, 2½ inches (64 mm) long and spaced 7 inches (178 mm) on center along the studs for the face layer and 6d cement coated box nails, 2 inches (51 mm) long and spaced 24 inches (610 mm) on center along the studs. The stud cavity contains Icynene insulation nominally 2 inches (51 mm) thick.

Axial loads applied to the wall assembly must be limited to the least of the following:

- 1,805 pounds (8029 N) per stud.
- Design stress of 0.78 F'c.
- Design stress of 0.78 F'c at a maximum l_w/d of 33.

4.5.3 Assembly 3 (Floor/Ceiling): Minimum nominally 2-by-10 [1½ by 9¼ inches (38 mm by 235 mm)] Douglas fir, No. 2 grade wood joists spaced 24 inches (610 mm) on center, with minimum 1-by-3 [¾ by 2½ inches (19.1 by 64 mm)] spruce bridging at mid-span. Floor decking must be minimum ½-inch-thick (12.7 mm) exterior grade plywood installed perpendicular to joists and fastened with 2-inch-long (51 mm) ring shank nails 6 inches (152 mm) on center at the joints and 12 inches (305 mm) on center at the intermediate joists. Plywood joints must occur over joists. Icynene insulation must be applied to the underside of the plywood deck between the joists to a depth of 5 inches (127 mm). Two layers of minimum ⅝-inch-thick (15.9 mm), Type X gypsum wallboard must be attached perpendicular to the joists on the ceiling side of the assembly. The first layer must be attached with 1¼-inch-long (32 mm), Type W drywall screws, spaced 24 inches (610 mm) on center. The second layer must be applied perpendicular to the joists, offset 24 inches (610 mm) from the base layer. The second layer must be attached with 2-inch-long (51 mm), Type S drywall screws spaced 12 inches (305 mm) on center. Additional fasteners must be installed along the butt joints of the second layer, securing the two layers together. These fasteners must be 1½-inch-long (38 mm), Type G drywall screws placed 2 inches (51 mm) back from each end of the butt joint and spaced 12 inches (305 mm) on center. The wallboard joints on the exposed side must be treated with paper tape embedded in joint compound and topped with an added coat of compound, and the fastener heads must be coated with joint compound in accordance with ASTM C840 or GA-216.

4.5.4 Assembly 4 (Non-loadbearing Steel Stud Wall): Nominally 6-inch-deep (152.4 mm), No. 18 gage, galvanized steel studs spaced 16 inches (406.4 mm) on center, are friction-fit into No. 18 gage galvanized steel floor and ceiling track with a layer of ⅝-inch-thick (15.9 mm), Type X gypsum board applied to the interior side with the long edge parallel to steel studs and secured using No. 6, 1¼-inch-long (31.7 mm), self-drilling drywall screws spaced 8 inches (203 mm) on center around the perimeter and 12 inches (305 mm) on center in the field. The gypsum board joints must be treated with vinyl or casein, dry or premixed joint compound applied in two coats to cover all exposed screw heads and gypsum board butt joints, and a minimum 2-inch-wide (51 mm) paper, plastic, or fiberglass tape embedded in the first layer of compound over butt joints of the gypsum board. The stud cavity is filled with Icynene insulation up to 6 inches (152 mm) thick. DensGlass® Gold Exterior Sheathing, ½ inch (12.7 mm) thick, is installed parallel to steel studs with vertical joints offset a minimum of 16 inches (406 mm) from the vertical joints of the gypsum board and the horizontal joints offset a minimum of 24 inches (610 mm) from the horizontal joints of the gypsum board. The sheathing is attached using No. 6, 1¼-inch-long

(31.7 mm), self-drilling drywall screws spaced 8 inches (203 mm) on center around the perimeter and in the field. Hohmann & Barnard DW-10 brick ties, 6 inches (152 mm) long by 1½-inches (38 mm) wide, are spaced 16 inches (406.4 mm) on center vertically on each steel stud, and secured, using two 1½-inch-long (41.3 mm) self-drilling screws, through 4-inch (102 mm) red clay brick [3½ inches (88.9 mm) by 2¼ inches (57.1 mm) by 7¾ inches (197 mm)] laid in a running bond pattern with Type S mortar, leaving a nominally 1-inch (25.4 mm) air gap between the brick and the exterior sheathing.

Optional: It is permitted to add code-complying, expanded polystyrene (EPS), extruded polystyrene (XPS), foil-faced, rigid polyurethane board stock or polyurethane spray foam on the exterior of the wall (between the DensGlass® Gold sheathed wall and the brick), while maintaining the 1-inch (25.4 mm) air space. The length of the brick ties must be increased to account for the thickness of the insulation.

4.6 Exterior Walls in Type I, II, III and IV Construction:

4.6.1 General: When used on exterior walls of Types I, II, III or IV construction, the assembly must comply with IBC Section 2603.5 and this section, and the LD-C-50 and LD-C-50 v2 insulation must be installed at a maximum thickness of 6 inches (152 mm). The potential heat of Icynene LD-C-50 and LD-C-50 v2 insulation is 494 Btu/ft² (5.6 MJ/m²) per inch of thickness, when testing is in accordance with NFPA 259.

4.6.2 Exterior Face: Nominally 6-inch-deep (152 mm), No. 18 gage, galvanized steel studs spaced 16 inches (406 mm) on center, are fastened to No. 18 gage, galvanized steel floor and ceiling track using No. 8, 7⁄8-inch-long (22.2 mm), self-tapping pan head framing screws. GP DensGlass® Gold Exterior Sheathing, ½ inch (12.7 mm) thick, is installed over the exterior side of steel studs with the long end perpendicular to the steel studs, using No. 6, Type S, 1¼-inch (31.7 mm), self-tapping bugle head screws spaced 8 inches (203 mm) on center around the perimeter and in the field. The stud cavity is filled with Icynene insulation to a nominal thickness of 6 inches (152 mm).

4.6.3 Interior Face: Type X gypsum board, 5⁄8 inches (15.9 mm) thick, is installed with the long dimension perpendicular to steel studs with No. 6, Type S, 1¼ inch-long (31.7 mm), self-tapping, bugle head screws spaced 8 inches (203 mm) on center around the perimeter and in the field. The gypsum board joints must be treated with vinyl or casein, dry or premixed joint compound applied in two coats to cover all exposed screw heads and gypsum board butt joints, and a minimum 2-inch-wide (51 mm) paper, plastic, or fiberglass tape embedded in the first layer of compound over butt joints of the gypsum board.

4.6.4 Exterior Wall Covering: Details of the exterior wall covering must be provided to the code official by the report holder, designer or specifier, with an engineering analysis demonstrating that (1) the exterior wall covering conforms to ASTM E136 and (2) the addition of the wall covering to the assembly described in this section does not negatively affect conformance of the assembly with the requirements of IBC Section 2603.5.

5.0 CONDITIONS OF USE

The Icynene LD-C-50™ and LD-C-50 v2 spray-applied polyurethane foam plastic insulations described in this report comply with, or are suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 This evaluation report and the manufacturer's published installation instructions, when required by the code official, must be submitted at the time of permit application.
 - 5.2 The insulation must be installed in accordance with the manufacturer's published installation instructions, this evaluation report and the applicable code. If there is a conflict between the installation instructions and this report, this report governs.
 - 5.3 The insulation must be separated from the interior of the building by an approved 15-minute thermal barrier, except when installation is as described in Section 4.3.2 or in attics and crawl spaces as described in Section 4.4.2 and 4.4.3.
 - 5.4 Since the performance of LD-C-50 v2, when installed in unvented attics without a code-prescribed ignition barrier or an intumescent coating, is based on fire performance of an unvented attic, the installation must be approved by the code official as conforming with the provisions of Section 4.4.2.2 and Conditions 1 to 5 of Section 4.4.2.
 - 5.5 The insulation must not exceed the thickness and density noted in Sections 3.2, 4.3, 4.4, 4.5 and 4.6.
 - 5.6 The insulation must be protected from the weather during and after application.
 - 5.7 The insulation must be applied by licensed dealers and installers certified by Icynene, Inc.
 - 5.8 Use of the insulation in areas where the probability of termite infestation is "very heavy" must be in accordance with IRC Section R318.4 or IBC Section 2603.8, as applicable.
 - 5.9 Jobsite certification and labeling of the insulation must comply with IRC Sections N1101.4 and N1101.4.1 and IECC Sections 303.1.1 and 303.1.2, as applicable.
 - 5.10 When LD-C-50 v2 insulation is installed under Section 4.4.2.2 of this report, a certificate must be placed in the attic stating that the foam plastic insulation has been installed in accordance with Conditions 1 to 5 of Section 4.4.2 and the terms of Section 4.4.2.2 of ESR-1826; any alterations to the attic or insulation must be consistent with those requirements.
 - 5.11 A vapor retarder must be installed in accordance with the applicable code.
 - 5.12 Icynene LD-C-50 and LD-C-50 v2, foam plastic insulation are manufactured in Mississauga, Ontario, Canada, under a quality control program with inspections by Intertek Testing Services (AA-691).
- #### 6.0 EVIDENCE SUBMITTED
- 6.1 Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC377), dated June 2012, including reports of tests in accordance with Appendix X (Section 4.4.2.1) and Appendix C (Section 4.4.2.2).
 - 6.2 Test report on air leakage rate in accordance with ASTM E283.
 - 6.3 Reports of room corner fire testing in accordance with NFPA 286.
 - 6.4 Test reports in accordance with ASTM E119.
 - 6.5 Test report in accordance with NFPA 285, and related engineering analysis.

- 6.6 Reports of tests in accordance with NFPA 259.
- 6.7 Reports of fire tests in accordance with ASTM E970.
- 6.8 For LD-C-50 v2, an engineering evaluation, including full-scale fire testing, small-scale testing and fire modeling.

7.0 IDENTIFICATION

All packages and containers of Icynene LD-C-50™ and LD-C-50 v2 must be labeled with the Icynene, Inc., name and address; the product name; the flame spread index and the smoke-developed index; the shelf life expiration date; the label of the inspection agency (Intertek Testing Services); and the evaluation report number (ESR-1826).

Intumescent coatings are identified with the manufacturer's name and address, the product trade name and use instructions.

8.0 OTHER CODES

8.1 Scope:

In addition to the codes referenced in Section 1.0, the products recognized in this report were evaluated for compliance with the requirements of the following codes:

- 2006 *International Building Code*® (2006 IBC)
- 2006 *International Residential Code*® (2006 IRC)
- 2006 *International Energy Conservation Code*® (2006 IECC)

8.2 Uses:

The products comply with the above-mentioned codes as described in Sections 2.0 to 7.0 of this report, with the revisions noted below.

- **Application with a Prescriptive Ignition Barrier:** See Section 4.4.1, except attics must be vented in accordance with 2006 IBC Section 1203.2, and crawl space ventilation must be in accordance with 2006 IBC Section 1203.3, as applicable. Additionally, an ignition barrier must be installed in accordance with 2006 IRC Section R314.5.3 or R314.5.4, as applicable.
- **Application without a Prescriptive Ignition Barrier:** See Section 4.4.2, except attics must be vented in accordance with Section 1203.2 of the 2006 IBC or Section R806 of the 2006 IRC, and crawl space ventilation must be in accordance with Section 1203.3 of the 2006 IBC or Section R408 of the 2006 IRC, as applicable.
- **Jobsite Certification and Labeling:** See Section 5.8, except jobsite certification and labeling must comply with Sections 102.1.1 and 102.1.11, as applicable, of the 2006 IECC.
- **Protection Against Termites:** See Section 5.7, except use of the insulation in areas where the probability of termite infestation is "very heavy" must be in accordance with Section R320.5 of the 2006 IRC.

TABLE 1—THERMAL RESISTANCE (R-VALUES) FOR LD-C-50 and LD-C-50 v2

THICKNESS (Inches)	R-VALUE (°F·ft ² ·h/Btu)
1	3.7
2	7
3	11
3.5	13
4	14
5	18
5.5	20
6	22
7	25
7.5	27
8	29
9	32
9.5	34
10	36
11.5	41
14	50
20	74

For SI: 1 inch = 25.4 mm, 1°F·ft²·h/Btu = 0.176 110°K·m²/W.

¹R-values are calculated based on tested K values at 1- and 3.5-inch thicknesses.

²R-values greater than 10 are rounded to the nearest whole number.

PRODUCT SPECIFICATION

1. PRODUCT NAME

Classic Max™

LD-C-50-v2

ICYNENE Classic Max™ is a trademark for light density, open celled, flexible, 100% water-blown polyurethane foam insulation manufactured by Icynene Inc. ICYNENE Classic Max™ spray formula is a nominal 0.5 lbs/ft³ density, free rise material.

2. MANUFACTURER

ICYNENE Classic Max™ (LD-C-50-v2) is made on-site from liquid components manufactured by Icynene Inc. Installation and on-site manufacturing is supplied by independent Icynene Licensed Dealers.

3. PRODUCT DESCRIPTION

ICYNENE Classic Max™ is a light density formulation of spray foam insulation. Icynene is the pioneer of high yield, 100% water-blown polyurethane foam technology for air sealing and insulating buildings.

ICYNENE Classic Max™ insulates and air-seals in one step for maximum energy conservation while minimizing the environmental impact during manufacturing and construction. Significantly reducing air leakage means ICYNENE Classic Max™ contributes to a healthier, quieter and more comfortable indoor environment, while reducing energy consumption and related greenhouse gas emissions by as much as 50%.

ICYNENE Classic Max™ is an effective vapor permeable air barrier material that can move with the building to maintain the air barrier characteristic against energy-robbing air leakage for the life of the building. Convective air movement inside wall cavities is virtually eliminated, providing more uniform temperatures throughout the building.

The result is superior quality construction, with higher comfort levels and lower heating and/or cooling costs. Energy savings will vary depending on building design, location, etc.

ICYNENE Classic Max™ is applied by spraying liquid components onto an open wall, crawl space, ceiling surface or cathedral ceiling. There it expands approximately 100:1 in seconds to provide a

flexible foam blanket of millions of tiny air cells, filling building cavities, cracks and crevices in the process. It adheres to most construction materials, sealing out air infiltration. Excess material is easily trimmed off, leaving a surface ready for drywall or other code-compliant finish.

4. TECHNICAL DATA

(Based on Core Samples)

Thermal Performance

Thermal resistance (ASTM C518)

- R/in = R3.7 hr. ft² °F/BTU

Average insulation contribution in a full fill stud wall:

- 2" x 4" = R13

- 2" x 6" = R20

ICYNENE Classic Max™ provides more effective performance than the equivalent R-value of air permeable insulation materials. ICYNENE Classic Max™ is not subject to loss of R-value due to aging, windy conditions, settling, convection or air infiltration; nor will it be prone to traditional moisture intrusion via air leakage.

Air Permeance/Air Barrier /Air-Seal

ICYNENE Classic Max™ fills any shaped cavity, and adheres to most construction materials, creating assemblies with very low air permeance. Additional interior or exterior air infiltration protection is subject to applicable codes.

Air permeability of core foam:

ASTM E283

- 0.009 L/s·m² @ 75 Pa for 3.5"

Air permeability of a 2" x 6" wood framed wall assembly:

ASTM E2178

- 0.01 L/ s·m² @ 75 Pa for 5.5"

All buildings insulated and air-sealed with ICYNENE Classic Max™ must be designed to include adequate mechanical ventilation/ outdoor air supply. See ASHRAE Standard 62 - Ventilation for Acceptable Indoor Air Quality.

Water Vapor Permeance

ICYNENE Classic Max™ is water vapor permeable and allows moisture to diffuse through the insulation and dissipate from the building envelope.

Water vapor transmission properties:

(ASTM E96 Desiccant Method)

- 11 perms @ 5.5"

In those situations that warrant a vapor retarder, a supplemental layer of polyethylene may be used. Alternately, low vapor permeance paint either directly on the foam or as a primer for the interior drywall may be used.

Water Absorption Properties

Water can be forced into the foam under pressure because it is open celled. Water will drain by gravity, given favorable drying potential, and upon drying all chemical and physical properties are fully restored.

Acoustical Properties

Performance in a 2" x 4" wood stud wall:

STC Sound Transmission Class - 37
 Hz. Freq. 125 250 500 1000 2000 4000
 ASTM E90 19 30 31 42 38 46

NRC Noise Reduction Coefficient - 70
 Hz. Freq. 125 250 500 1000 2000 4000
 ASTM C423 .11 .43 .89 .72 .71 .67

Burn Characteristics

ICYNENE Classic Max™ is a combustible product and is therefore, consumed by flame, but will not sustain flame upon removal of the flame source. It leaves a charred foam residue. It will not melt or drip. ICYNENE Classic Max™ is subject to all applicable National/State and County building codes regarding fire prevention. Requirements for Thermal Barrier and Ignition Barrier coverings must be met as per the applicable building code having jurisdiction.

<u>U.S. Fire Testing</u>	
Surface Burning Characteristics (ASTM E84) @ 5" thickness	
Flame Spread	≤25
Smoke Development	≤450
*flame spread rating not intended to reflect hazards under actual fire conditions.	

Unvented Attic

ICYNENE Classic Max™ can be applied to the underside of the roof deck and be left bare if its thickness is a minimum of 5½ inches at roof

decking and 1½ inches at roof framing to a maximum of 20". Refer to evaluation report for details.

Electrical Wiring

ICYNENE Classic Max™ has been evaluated with energized 14/3 and 12/2 residential wiring (max. 122 ° F). It is chemically compatible with typical electrical wiring coverings.

Note: For any insulation of older knob and tube wiring, please reference local electrical code.

Corrosion

ICYNENE Classic Max™ did not cause corrosion when evaluated in contact with steel at 120°F and 85% relative humidity conditions.

Plastic Piping

ICYNENE Classic Max™ is compatible in direct contact with CPVC piping systems, as per Paschal Engineering Study for the Spray Polyurethane Foam Alliance (SPFA).

Bacterial or Fungal Growth and Food Value

Independent testing conducted by Texas Tech University has confirmed that ICYNENE Classic Max™ is not a source of food for mold; and as an air barrier material, it resists the airborne introduction of moisture, nutrients, and mold spores into the building envelope.

Environmental / Health / Safety

ICYNENE Classic Max™ is 100% water-blown and therefore contains no ozone-depleting blowing agents. It is also PBDE-free. It has been thoroughly evaluated for in-situ emissions by industry and government experts. VOC emissions are below 1/100th of the safe concentration level (TLV) within hours following the application of ICYNENE Classic Max™.



ICYNENE®

Telephone: 905.363.4040
Toll Free: 800.758.7325
Facsimile: 905.363.0102
Website: www.icynene.com
Email: inquiry@icynene.com

Proper handling and use is required to avoid exposure to reactive chemicals in their unreacted state. For more information, contact the Spray Polyurethane Foam Alliance or the American Chemistry Council. Newly insulated areas have been shown to be safe for occupancy 24 hours after installation is complete.

ICYNENE Classic Max™ is CHPS E.Q. 2.2/Section 01350 Compliant and listed as such in the Collaborative for High Performance Schools (CHPS) Low Emitting Materials (LEM) Table.

The reaction used to create ICYNENE Classic Max™ generates carbon dioxide to expand the foam. Carbon dioxide has a very low Global Warming Potential (GWP of 1).

Not intended for exterior use. Not to be installed within 3" of heat emitting devices or where the temperature is in excess of 200°F, as per ASTM C411 or in accordance with applicable codes.

5. INSTALLATION

ICYNENE Classic Max™ is installed by a network of Licensed Dealers, trained in the installation of ICYNENE Classic Max™.

Installation is generally independent of environmental conditions. It can be installed in hot, humid or freezing conditions. Surface preparation is generally not necessary. Within seconds, the foaming process is complete.

For information on Health and Safety, refer to the Spray Polyurethane Foam Alliance Health and Safety guidance documents at www.spraypolyurethane.com

6. AVAILABILITY

Contact Icynene Inc. at 800-758-7325 or visit our website at www.icynene.com to find a local Icynene Licensed Dealer/Contractor.

7. WARRANTY

WHEN INSTALLED PROPERLY IN ACCORDANCE WITH INSTRUCTIONS, THE COMPANY WARRANTS THAT THE PROPERTIES OF THE PRODUCT MEET PRODUCT SPECIFICATIONS AS OUTLINED IN THIS PRODUCT SPECIFICATION SHEET. SAVE AND EXCEPT ANY EXCLUSIONS REFERENCED IN THE WARRANTY.

8. TECHNICAL

Icynene Licensed Dealers and Icynene Inc. provide support on both technical and regulatory issues. Architectural specifications in CSI 3-Part format and design details are available at our website at www.icynene.com.

9. REGULATORY

ICYNENE Classic Max™ (LD-C-50-v2) has been tested as per the requirements of the International Code Council – Evaluation Service's AC377 Acceptance Criteria (June 2011). A thorough engineering evaluation has been conducted for unvented attic fire performance requirements.

The following evaluation reports apply to this product

- ICC ESR-1826 (LD-C-50-v2)

Based on the 3rd party test evidence submitted, this product was found to comply with:

- IRC – 2006 – 2009
- IBC – 2006 – 2009
- IECC – 2006 – 2009

10. RELATED REFERENCES

All physical properties were determined through testing by accredited third-party agencies. Icynene Inc. reserves the right to change specifications in its effort of continuous improvement. Please confirm that technical data literature is current.

11. PACKAGING AND STORAGE

Packaging	55 U.S. gallon steel drums
Component 'A'	550 lb. per drum Base Seal [®] MDI
Component 'B'	500 lb. per drum ICYNENE LD-C-50-v2 B-Side Resin

Storage

Component A, Base Seal[®] MDI and Component B, ICYNENE LD-C-50-v2 Resin ideally should be stored between 60°F and 90°F.

Component A, Base Seal[®], should be protected from freezing.

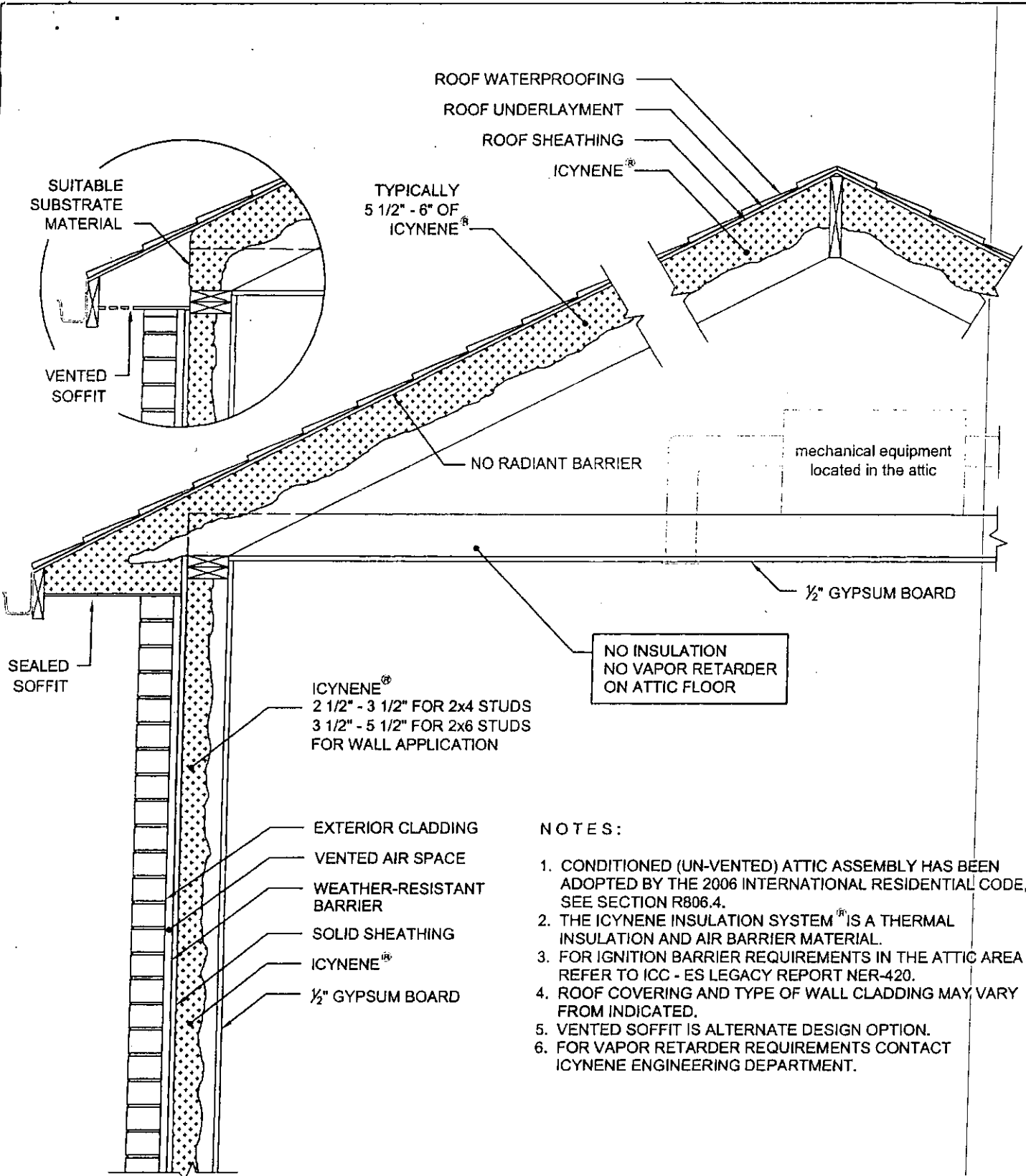
Component B, ICYNENE LD-C-50v2™ Resin, can be frozen but must be protected from overheating 120°F and prolonged storage above 100°F.

Component B, ICYNENE LD-C-50v2™ Resin, may separate during storage and should be mixed thoroughly prior to use.

12. INSTALLATION SPECIFICATIONS

Must be installed by Icynene Licensed Dealers. Refer to the Icynene Installer's Manual for expanded information.





NOTES:

1. CONDITIONED (UN-VENTED) ATTIC ASSEMBLY HAS BEEN ADOPTED BY THE 2006 INTERNATIONAL RESIDENTIAL CODE, SEE SECTION R806.4.
2. THE ICYNENE INSULATION SYSTEM® IS A THERMAL INSULATION AND AIR BARRIER MATERIAL.
3. FOR IGNITION BARRIER REQUIREMENTS IN THE ATTIC AREA REFER TO ICC - ES LEGACY REPORT NER-420.
4. ROOF COVERING AND TYPE OF WALL CLADDING MAY VARY FROM INDICATED.
5. VENTED SOFFIT IS ALTERNATE DESIGN OPTION.
6. FOR VAPOR RETARDER REQUIREMENTS CONTACT ICYNENE ENGINEERING DEPARTMENT.


ICYNENE
 1-800-758-7325
 www.icynene.com

**CONDITIONED (UNVENTED)
 ATTIC ASSEMBLY**

DETAIL - 1

NOV 2006

ICY_ENG_01



**FIBER GLASS SHINGLES APPLIED OVER
UNVENTILATED/INSULATED ROOF DECKS**

No. R-201B

Date Issued: 10/8/2004

Supersedes: R-201A, 2/15/2001

CertainTeed's Limited Asphalt Shingle Warranty, including SureStart™ coverage, will remain in force when its fiber glass asphalt shingles manufactured to meet ASTM D3462 are applied to roof deck assemblies (slopes \geq 2:12) where foam insulation is prefabricated into the roof deck system (often called "nailboard insulation"), where insulation is installed beneath an acceptable roof deck system, or where radiant barriers are installed, with or without ventilation directly below the deck. *See important restrictions below.*

- Acceptable roof deck surfaces must consist of either minimum 3/8" thick plywood or minimum 7/16" thick OSB. If an alternate deck surface material is being considered, then please contact CertainTeed at the number below.
- The design professional is responsible for ensuring 1) proper quality and application of the insulation and/or radiant barrier, 2) provision of adequate structural ventilation and/or vapor retarders as determined to be necessary, and 3) that all local codes are met (particularly taking into account local climate conditions). Special attention must be taken if cellular foam, fiber-glass, or cellulose insulations, or other highly-permeable insulation will be used in an unventilated system, or if the insulation/rafter or insulation/joist planes may create an air leak that could lead to moisture transmission and condensation problems. *All these important factors and decisions, while not the responsibility of CertainTeed Corporation, are critical to assure proper deck system performance.*
- CertainTeed shall not have any liability or responsibility under its warranty for
 - a) Damage to or defects in its shingles caused by settlement, movement, distortion, deterioration, cracking, or other failure of the roof deck or of the materials used as a roofing base over which its shingles are applied,
 - b) Damage caused by the growth of mold or mildew, or
 - c) Defects, damage, or failure caused by application of its shingles not in strict adherence with CertainTeed's written instructions.

Roofing Systems Technical Service

CertainTeed Corporation
Roofing Products Group
1400 Union Meeting Road; P.O. Box 1100
Blue Bell, PA 19422
800-345-1145



Steep Slope Technical Point

No: 135-08

TO: Steep Slope Sales
Team, GAF-Elk
Contractors, GAF-Elk
Distributors.

FROM: Contractor
Services

DATE: 12/02/08

SUBJECT: *Under Deck Sprayed-In-Place Foam Insulation*

<i>What Is Sprayed-In-Place Foam Insulation?</i>	<p>Sprayed-in-place insulation is...</p> <ul style="list-style-type: none"> Usually a two-part spray on foam insulation, commonly applied to wall cavities and the bottom of roof decks as a part of the building envelope's insulation assembly.
<i>Additional Information About Sprayed-In-Place Foam Insulation You Should Know</i>	<p>Using sprayed-in-place insulation</p> <ul style="list-style-type: none"> Is installed to assist in the energy performance of a home. When installed in accordance with the 2006 International Residential Code (the IRC) and the 2007 IRC Supplement, is an accepted method of insulating a roof assembly. May lead to condensation problems, mold growth, deck deterioration, damage of fiberglass asphalt shingles, and structural damage when not installed according to the manufacturer's instructions and building code requirements.
<i>Will Sprayed-In-Place Foam Insulation Damage My Roof?</i>	<p>Sprayed-in-place insulation</p> <ul style="list-style-type: none"> Applied directly to bottom side of roof decks, the insulation does not allow for airflow on the bottom of the deck like in a traditional vented attic assembly. It is the responsibility of the design professional to examine the need for structural ventilation and to insure interior air quality. For any building, construction must be in compliance with local codes.
<i>What Does GAF-Elk Recommend?</i>	<p>GAF-Elk recommends....</p> <ul style="list-style-type: none"> Proper attic ventilation following the FHA/HUD 1/300 rule, which calls for 1 sq.ft. of net free (open) soffit to ridge ventilation of per 300 sq.ft. of attic floor space. GAF-Elk does, however, recognize the emergence of unvented attic assemblies and recommends that all code requirements be met and the manufacturer's recommendations followed when installing an unvented attic assembly. There are retrofit applications of sprayed-in-place foam insulation that allow for ventilated attic assemblies. Where this type of application is installed, GAF-Elk's recommendation of proper attic ventilation amounts should be followed.
<i>Will Sprayed-In-Place Foam Insulation Void My Warranty?</i>	<p>No, the GAF-Elk Shingle Limited Warranty against manufacturing defects will remain in effect.</p> <ul style="list-style-type: none"> However, any damage to the shingles attributable to using sprayed-in-place insulation directly applied to the roof deck or lack of ventilation is excluded from GAF-Elk's responsibility under the terms of our Limited Warranty.
<i>Where Can I Get More Information?</i>	<p>GAF-Elk Technical Services can assist you... with these and other questions you may have regarding your new roof installation. GAF-Elk Technical Services can be contacted at 800-ROOF-411 (800-766-3411). Also, <i>the GAF-Elk website is a great resource</i> for just about any question you may have or for additional information you may require. Please visit: www.gaf.com</p>



January 17, 2003


Ed Reeves
Icynene, Inc.
5805 Whittle Road
Suite 100
Mississauga, Ontario
L4Z 2J1

RE: *GOLDSEAL™: Residential Occupancy Time*

Dear Mr. Ed Reeves,

As outlined in my report entitled "Human Health Risk Assessment of Volatile Organic Compound Emissions from GOLDSEAL™", GOLDSEAL™ emission products should not pose a significant health risk to individuals residing in homes insulated with this building material. Based on the decay patterns of GOLDSEAL™ emission products and the conclusions drawn from the risk assessment process, *a residential occupancy time of 1 day has been recommended for your product.* With a planned assessment of all construction materials, the use of GOLDSEAL™ as a polyurethane foam insulation product, should not pose an additional health risk to the general population.

Sincerely,



Lalita Bharadwaj, Ph.D.
Toxicologist

The Icynene Insulation System®

LIFETIME LIMITED WARRANTY

Icynene Inc. ("Icynene"), subject to the conditions and limitations listed herein, warrants that The Icynene Insulation System® (the "Product"), when installed according to its installation instructions by an Icynene Licensed Dealer, will perform as indicated in the product specification sheet published at the time of the installation. This Lifetime Limited Warranty is in effect throughout the life of the building, provided the original purchaser registers with the Icynene Warranty Dept. within 30 days of occupancy. Icynene's sole responsibility under this Warranty shall be to repair or replace any defective Product at the cost of the material only. Icynene shall not be responsible for labour costs or any other costs whatsoever in connection with the removal or installation of either the original or replacement insulation.

Icynene shall have no liability under this Lifetime Limited Warranty for defects or failure caused by improper storage, or an installation not in strict adherence with its written instructions, or any damage due to fire, storms, other Acts of God, abuse, neglect, or accident, or defects, failure, or damage caused by materials adjacent to the Product, or damage caused by alteration after completion of the installation of the Product. Statements about the performance qualities of the Product by Licensed Dealers or contained in advertising literature do not constitute an express warranty.

THE WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES, WHETHER ARISING UNDER STATUTE, OR IN TORT, OR BY IMPLICATION OF LAW OR OTHERWISE. ALL IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE LENGTH OF THIS WARRANTY. ICYNENE SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, ARISING FROM A BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OR FOR THE COST OF REMOVING, INSTALLING, OR REINSTATING ANY REPAIR OF REPLACEMENT.

Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This Lifetime Limited Warranty gives you specific legal rights, and you may also have other rights which vary from jurisdiction to jurisdiction.

To obtain performances under this Lifetime Limited Warranty, the customer must notify Icynene in writing of the defect promptly following its discovery and must submit with this notice proof of the date of purchase and the date, location and description of the circumstances under which the defect occurred or was first noticed. Notice shall be given in writing to:

WARRANTY DEPARTMENT

Icynene Inc.
6747 Campobello Road
Mississauga, Ontario
L5N 2L7
Canada



SL-306-01



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