2018 IECC Energy Cost Compliance

Property
Tony Brooks
11326 US-401
Fuquay Carina, NC 27526

Organization
Energy Modeling Agency
325 NC-42, Ahoskie, NC. 27910
Charlie Ashcom

Weather:Raleigh, NC
Brooks Bonus Room Spray Foam
Brooks Bonus Room Spray

Builder

Annual Energy Cost

$/yr

	2018 IECC	As Designed
Heating	74	56
Cooling	78	73
Water Heating	65	65
Mechanical Ventilation Fan	13	14
SubTotal - Used to Determine Compliance	**231**	**209**
Lights & Appliances (minus MechVent)	231	226
Photovoltaics	-0	-0
Service Charge	120	120
Total	**582**	**555**

Mandatory Requirements

Annual Energy Cost Check	PASSES
Duct Insulation R-Value Check (per Section 405.2)	PASSES
Window U-Value and SHGC Check (per Section 402.5)	PASSES
Home Infiltration (Section 402.4.1)	PASSES
Duct Testing (Section 403.3.3)	PASSES
Mechanical Ventilation (Section 403.6)	PASSES
Mechanical Ventilation Fan Efficacy (Section 403.6.1)	PASSES
Mandatory Requirements Check Box (2018 IECC)	PASSES

This home MEETS the annual energy cost requirements of Section 405 of the 2018 International Energy Conservation Code based on a climate zone of 4A. In fact, this home surpasses the requirements by 10.6%.

Name	Charlie Ashcom	Signature	
Organization	Energy Modeling Agency	Date	13 March 2025

In accordance with IECC, building inputs, such as setpoints, infiltration rates, and window shading may have been changed prior to calculating annual energy cost. Furthermore, the standard reference design HVAC system efficiencies are set equal to those in the design home as specified in the 2018 IECC. These standards are subject to change, and software updates should be obtained periodically to ensure the compliance calculations reflect current federal minimum standards.

HOME CERTIFIED TO MEET THE PROVISIONS OF THE 2018 INTERNATIONAL ENERGY CONSERVATION CODE

This home built at

11326 US-401, Fuquay Carina, NC

by

exceeds the minimum requirements

Building Features

Ceiling Flat	R-23.0
Sealed Attic:	NA
Vaulted Ceiling	R-23.0
Above Grade Walls	R-15.0
Foundation Walls	R-0.0
Exposed Floor	R-19.0
Slab	None

Duct	NA
Duct Leakage to Outside:	RESNET/HERS default
Total Duct Leakage:	Not Applicable
Infiltration:	Htg: 1.00 Clg: 1.00 ACH50
Window	U-Value: 0.330, SHGC: 0.450
Heating	Fuel-fired air distribution, Natural gas, 94.0 AFUE.
Cooling	Air conditioner, Electric, 15.0 SEER.
Water Heating	Instant water heater, Natural gas, 0.80 EF, 0.0 Gal.

The organization below certifies that the proposed building design described herein is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the 2018 IECC requirements in compliance with Chapter 4 based on Climate Zone 4A and with all mandatory requirements.

Name	Charlie Ashcom
Organization	Energy Modeling Agency

Signature	
Date	13 March 2025

REM/Design - Residential Energy Analysis Software v16.0.2

2018 IECC Certificate

11326 US-401, Fuquay Carina, NC 27526

Building Envelope Insulation		
Ceiling	R-23.0	
Above Grade Walls	R-15.0	
Foundation Walls	R-0.0	
Exposed Floor	R-19.0	
Slab	None	
Infiltration	Htg: 1.00 Clg: 1.00 ACH50	
Duct	NA	
Total Duct Leakage	Not Applicable	
Window Data	**U-Factor**	**SHGC**
Window	0.330	0.450

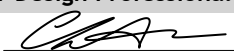
Mechanical Equipment

HEAT: Fuel-fired air distribution, Natural gas, 94.0 AFUE.

COOL: Air conditioner, Electric, 15.0 SEER.

DHW: Instant water heater, Natural gas, 0.80 EF, 0.0 Gal.

Builder or Design Professional

Signature 

REM/Design - Residential Energy Analysis Software v16.0.2

Energy Cost and Features

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Brooks Bonus Room Spray Foam.blg

Builder

Annual Energy Costs ($/yr)

	Brooks Bonus Room Fiberglass	Brooks Bonus Room Spray Foam	Savings	%Saved
Heating	134	65	70	52.0%
Cooling	121	58	63	51.7%
Water Heating	32	32		
Lights & Appliances	226	226		
Photovoltaics	-0	-0		
Service Charges	120	120		
Total	633	501	132	20.9%
Average Monthly($/Month)	53	42	11	20.9%

Energy Features

	Brooks Bonus Room Fiberglass	Brooks Bonus Room Spray Foam
Ceiling w/Attic	R-49 fiberglassAttic U=0.065	R-23 SprayFoam Attic U=0.040
Sealed Attic	None	
Vaulted Ceiling	R-49, Vaulted U=0.043	R-23, Spray Foam U=0.038
Above Grade Wall	R-19 fiberglass U=0.072	R-15 Spray Foam U=0.053
Foundation Walls (Cond)	None	
Foundation Walls (Uncond)	Uninsulated	
Doors	Steel-urth w/brk U=0.187	
Windows	Dbl/LoE/Arg - Vinyl U=0.330	
Floors	R-19 Fiberglass U=0.062	
Slab Floors	None	
Infiltration	Htg: 0.67 Clg: 0.67 ACHnat	Htg: 1.00 Clg: 1.00 ACH50
Infiltration Measure	User estimate	Blower door
Mechanical Ventilation	None	
Interior Mass	None	
Mechanical Equipment 1	Heating: Fuel-fired air distribution, 24.0 kBtuh, 94.0 AFUE.	Heating: Fuel-fired air distribution, 12.0 kBtuh, 94.0 AFUE.
Mechanical Equipment 2	Cooling: Air conditioner, 12.0 kBtuh, 15.0 SEER.	Cooling: Air conditioner, 12.0 kBtuh, 15.0 SEER.
Mechanical Equipment 3	Water Heating: Instant water heater, Gas, 0.80 EF.	Water Heating: Instant water heater, Gas, 0.80 EF.
Programmable Thermostat	Heat=No; Cool=No	
Ducts	UninsulatedConditioned space	
Duct Leakage to Outside	RESNET/HERS default	

Note: Where feature level varies in home, the dominate value is shown. Only changed features are shown for second building.

Equipment Sizing

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Builder

	Brooks Bonus Room Fiberglass	Brooks Bonus Room Spray Foam
Heating		
Calculated Peak Load (kBtu/hr)	14.4	8.2
Infiltration	4.3	0.2
Envelope	10.1	7.9
Sizing Factor (%)	100.0	100.0
Heating Equipment Capacity(kBtu/hr)		
Required	14.4	8.2
Specified	24.0	12.0
Cooling		
Calculated Peak Load (kBtu/hr)	12.0	6.5
Sensible	9.1	5.9
Latent	2.8	0.5
SHF	0.8	0.9
Sizing Factor(%)	100.0	100.0
Cooling Equipment Capacity (kBtu/hr)		
Required Total	12.0	6.5
Specified Total	12.0	12.0
Specified SHF	0.7	0.7
Required Sensible	9.14	5.94
Specified Sensible	8.40	8.40
Required Latent	2.82	0.54
Specified Latent	3.60	3.60

INSULSTARLIGHT
HIGH PERFORMANCE OPEN-CELL SPF

12-008 Insulation Certification Form

Open Cell Spray-in-Place Polyurethane Foam Insulation System

Date Installation completed: March 14, 2025

Application Project Building Address: 11326 US-401

City/State/Zip Fuquay Varina, NC 27526

Application Contractor: Energy Saving Insulation, LLC
(Company Name)
Address: 1220 Cotten Farm Dr

City/State/Zip Fuquay Varina, NC 27526 Phone # (919) 798-9906

List Values in the areas insulated -

Exterior Stud Wall: Average thickness 4” R-Value R15

Ceiling insulation: Average thickness _____ R-Value _____

Roof Deck insulation: Average thickness 6” R-Value R23

Crawl Space/Basement: Average thickness _____ R-Value _____

Special Areas insulated: _____

_____

I (print name) Energy Saving Insulation, LLC as an Independent contractor, certify that the 12-008 Insulation installed on this project was applied in accordance with the NCFI recommendations and specifications as stated on the product data sheet and the 12-008 Application Specifications in the amount as indicated on this certification.

Oscar Contreras (signed) Date March 14, 2025

12-008 Spray Polyurethane Foam Insulation System R-Value Chart

Thickness	R-value		Thickness	R-Value
1”	3.7		8”	31
3.5”	13		11”	42
5.5”	21		14”	54

NCFI POLYURETHANES

12-008 is a product of Barnhardt MFG Co d/b/a NCFI Polyurethanes - Mount Airy, NC 27030

092019

INSULSTAR® LIGHT
HIGH PERFORMANCE OPEN-CELL SPF

Barnhardt Manufacturing Company
dba NCFI Polyurethanes
Mount Airy, NC 27030
800.346.8229 www.NCFI.com

12-008 SPRAY FOAM SYSTEM TECHNICAL DATA SHEET

DESCRIPTION:

InsulStar®Light 12-008 is a two component, one-to-one by volume, no-mix, self-adhering, seamless spray applied open-cell polyurethane insulation system. InsulStar®Light has been formulated with water as the blowing agent and does not contain CFC, HCFC, HFC or formaldehyde. InsulStar®Light is suitable for use in Type I, II, III, IV & V construction.

DISTINGUISHING CHARACTERISTICS:

- Eliminates Convective Air Movement in Building Assemblies
- Good Sound Barrier
- High Yields
- Good Dimensional Stability
- Meets ASTM E84 Class A
- Air Impermeable Insulation
- Low VOC per CDPH Standard version 1.2 2017
- Fungal Resistant—ASTM C1338

R-Value* Chart ASTM C518	
Foam Thickness	R-value (°F·hr·ft^2 / Btu)
1.0”	**3.7**
3.5”	**13**
5.5”	**21**
8”	**31**
10”	**38**
11”	**42**
14”	**54**
16”	**61**

Note: As with all insulating materials, the R-value will vary with age and use conditions.

*Based on 90 day aged testing of R-values at 1” and 3.5”

TYPICAL PHYSICAL PROPERTIES:

Core Density ASTM C1622	0.4 - 0.5 pcf
Moisture Vapor Perm ASTM E96 Desiccant Method	28 @ 1”
Air Permeance @ 75Pa ASTM E2178	<0.02 L/s-m^2 @ 4”
Flammability - ASTM E84	@ 4 inches Flame Spread ≤ 25 Smoke Dev ≤ 450
Potential Heat—NFPA 259	506 Btu/ft^2 @ 1”
UL 94	HF-1
Sound Transmission - ASTM E90	STC - 41*
Noise Reduction - ASTM C423	NRC - 0.75
Sound Absorption - ASTM C423	SAA - 0.71
Max Service Temperature	180°F

Note: The above values are average values obtained from laboratory experiments and should serve only as guidelines. Free rise core density should not be confused with overall density. Overall densities are always higher than free rise core densities and take into account skin formation, thickness of application, environmental conditions, etc.

*In a 2”x 6” wall assembly

For proper use of this NCFI insulating material refer to the NCFI Product Stewardship Manual and the following codes or guides:

- CCRR-0323 Code Compliance Research Report
- 2018 or 2021 International Building Code Chapter 26 or Residential Code Section R316 & R806
- Products, Resources, and Documents Library at polyurethane.americanchemistry.com

12-008 Application Information

PREPARATION OF SURFACE TO BE SPRAYED:
To ensure proper adhesion, all substrate surfaces should be dry, clean of dust or flaking surface, loose scale, ice or frost. All metal surfaces must be free of oil, grease, etc. Uncoated metals may require a primer coat.

STORAGE AND USE OF CHEMICALS:
The 12-008 system consists of the A2-000 component and the 12-008 B component. NCFI recommends the chemicals not be allowed to freeze. If suspected, refer to NCFI Technical Bulletin "Spray Foam Chemicals Temperature Control & Storage". For proper processing through the spray foam proportioning pumps, the chemicals should be between 60°F and 85°F. Chemicals shipped during winter or summer months may need extra time to reach the proper processing temperature range. Cold chemicals can cause poor mixing, pump cavitation or other processing problems. Keep drums tightly closed when not in use and under dry air or nitrogen pressure of 2-3 psi after they have been opened. When stored between 40°F and 90°F, the shelf life of unopened A2-000 is 24 months and 12-008 B component is 6 months.

SAFE HANDLING OF LIQUID COMPONENTS:
Use caution in removing bungs from the container. Partially loosen the small bung first allowing any built up gas pressure to escape before completely removing it. Avoid prolonged breathing of vapors. In case of chemical contact with eyes, flush with water for at least 15 minutes and get medical attention. For further information go to www.spraypolyurethane.org and click on the Resources tab in the Professional Contractors section.

EQUIPMENT AND COMPONENT RATIOS:
The 12-008 system, consisting of the 12-008 B Side drum and the A2-000 A Side drum, is formulated for spraying with a two component pump specifically designed for spray foam systems. The B component is connected to the resin pump and the A drum is connected to the isocyanate pump. The proportioning pump ratio is 1:1.
DO NOT mix the B-side chemical while spraying.
If the drum has been sitting for a number of weeks, the chemical may be stirred with a drum mixer up to 10 minutes prior to spraying.

Recommended proportioner settings are:

Pre-heater Temperatures	130-140°F
Hose Temperature	130-140°F
Pressure Static	1200 psi
Pressure Dynamic	1000 psi

Note: These are only recommended starting points, and may need to be adjusted according to the specific mixing chamber, proportioner, hose lengths, ambient and substrate temperatures, and conditions. Adjust the settings to achieve a good spray pattern. For additional assistance contact NCFI Polyurethanes.

CHANGING OVER FROM DIFFERENT SYSTEMS:
Closed cell and other foams are incompatible with the B side of 12-008. Therefore care should be taken to avoid the introduction of any other chemical system into the B side drum of 12-008. It is recommended to dedicate a stainless steel transfer pump to the B side of 12-008 to avoid the possibility of cross contamination. Before applying the 12-008 in a building assembly, spray out all of the changeover material, under pressure, onto cardboard or plastic film to flush out the hoses and pump. Under no circumstances should the user bleed out the spray lines containing incompatible foam back into the B-side 12-008 drum.

OPTIMUM SUBSTRATE TEMPERATURE:
For general work, the surface to be sprayed should be between 50°F and 120°F. Within this range, the warmer the surface. the better the adhesion. For surfaces below 50°F, the spray applicator should spray a test area approximately 25 square feet and check for proper adhesion and cell structure. If both are satisfactory, then the spray application may continue.

APPLICATION PASS THICKNESS:
Spraying foam will generate heat. The thicker the pass, the more heat will be generated. Heat will build up if the user does not wait for the foam to cool after each pass. Too much heat will degrade the foam's cell structure and the foam won't have optimum properties. The minimum pass thickness for proper chemical reaction is 3 inches. The maximum pass thickness is 10 inches**.** When spraying more than 6 inches in a single pass, the applicator must closely monitor the foam's adhesion and cell structure. Then wait 10 minutes or until the foam surface has cooled to ambient temperature before spraying on top of it. The number of passes to achieve the total insulation value is not limited.

ATTIC AND CRAWLSPACE APPLICATION:
Building codes require an ignition barrier material over foam plastic insulations installed in attics and crawlspaces. The 12-008 system is approved for use with DC315 intumescent coating in lieu of the code-prescribed ignition barrier in attics and crawlspaces. The foam can be installed up to 8 inches thick on vertical surfaces and up to 14 inches thick on horizontal and overhead surfaces when covered with 7 wet mils of DC315.

UNVENTED ATTIC APPLICATION:
The 12-008 system was tested per IBC Section 2603.9 and IRC Section R316.6 to qualify for application in an unvented attic with no ignition barrier covering. The attic space must be constructed in a specific manner with the attic access designed and installed in the attic floor. The 12-008 must be applied within the limitations of the approval. Refer to Intertek CCRR - 0323 or contact NCFI for specific details of the construction requirements.

INSULSTAR LIGHT
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12-008 Application Information

APPLICATION AND SAFETY CONSIDERATIONS:
Before 12-008 is to be applied, there are many safety and application situations to consider. All spray foam applicators must evaluate the job prior to beginning the spray foam application. It is impossible to anticipate every issue and provide explicit guidance in this product application guideline. If there is a question regarding an aspect of the planned application, contact NCFI for more guidance. The NCFI Product Stewardship Manual contains additional information and should be reviewed often enough by all spray foam applicators to remain familiar with the contents. The American Chemistry Council (ACC), the Center for Polyurethanes Industry (CPI) and the Spray Polyurethane Foam Alliance (SPFA) also publish information regarding the safe handling and application of spray foam chemicals. If there are any questions regarding the application of the 12-008 system, contact NCFI.

APPLICATION GUIDELINES:
12-008 is suitable for application to most construction materials including wood, masonry, concrete, and metal. 12-008 should not be applied to surfaces that will be in contact with soil or intermittent contact with water. To ensure proper adhesion, all substrate surfaces should be dry, clean of dust or flaking surface rust, ice or frost, oil, grease, etc. Uncoated metals may require a primer coat. 24 hours before spraying the foam, no flammable chemicals, such as wasp and hornet sprays, should be sprayed in the area where the foam will be applied. After the foam has been applied, no flammable chemical can be sprayed until the foam has cooled to ambient temperature.

CODE-COMPLIANT FIRE RESISTANCE:
Building codes require the spray foam to be separated from the interior of buildings with an approved thermal barrier of ½ inch minimum thickness gypsum board or other approved thermal barrier. There is no thickness limitation when the foam is covered with a thermal barrier. In lieu of the Thermal Barrier, the 12-008 can be coated with DC315 or No-Burn Plus ThB intumescent coating. The foam thickness is limited to 8 inches in walls/14 inches in roof/ceiling assemblies with DC315. The foam thickness is limited to 8½ inches in walls and 14 inches in roof/ceiling assemblies when coated with ThB. Contact NCFI for additional information.

APPLICATION IN TYPE I, II, III, IV CONSTRUCTION:
InsulStar®Light 12-008 is approved for use in all types of construction. Specific requirements for applications in Type I, II, III, and IV construction are provided in Intertek CCRR-0323. Contact NCFI for additional details.

VENTILATION OF SPRAY AREA:
Spraying foam will generate a mist and fumes with a distinct odor. For interior applications, the building area must be vented with fresh air prior to reentry. The amount of air flow and time needed for venting will vary based on each situation. A closed attic area may require fans to force air into and out of the space. An open building that does not have the doors and windows installed may have sufficient air flow to vent the area fairly quickly. Refer to the NCFI Technical Bulletin “Ventilation Requirements for Reentry of Spaces After Spraying Open Cell Spray Foams.” for detailed guidance.

APPLICATION AROUND PLASTIC PIPES:
The 12-008 foam can be applied in contact with PVC, CPVC, ABS, PP-R and PEX plastic pipes. Refer to the NCFI Applicator Bulletin “Spraying Polyurethane Foam to CPVC and Other Types of Plastic Pipes” for the required application technique. The pipes must not be pressurized during the foam application.

APPLICATION AROUND ELECTRICAL WIRES:
The 12-008 system can be applied in contact with electrical wires. Refer to the NCFI Applicator Bulletin “Spray foam Application Around Electrical Wires” for the required application technique. Applicators must spray the foam in such a manner that the expanding foam does not stretch or distort the wires. When encapsulating light gauge wires in the foam, a foam layer should be installed behind the wires, then allow time for the foam to cool before applying the foam that covers the wires.

MOISTURE VAPOR RETARDER USE:
For applications in colder climates, building codes may require a vapor retarder on the warm side of the open cell foam. Consult the local building codes for information or contact NCFI Polyurethanes for further guidance.

Thank you for taking your time to learn how Spray Polyurethane foam is not only the most efficient insulating product on the market but it will also comply with local building codes without the need to install the foam to meet the typical prescriptive IRC/IBC R-value requirements.

Spray foam is a superior insulation product and it works differently than traditional fibrous insulation product. First, we need to look at the way spray foam naturally air seals a building. Air infiltration equates to 40-50% of the energy loss in an average building and spray foam addresses this issue. Plus, Spray foam has superior thermal resistance. We measure it in a heatflow reduction scale (see attached). Here it shows that there is a diminishing rate of return of efficiency. 5 1/2" of our Open Cell Spray Foam or 3" Closed Cell Foam gives us a 96% heatflow reduction which is roughly an R-20…. If we double that thickness to reach over an R-38, we only gain 2% in efficiency. That 2% may equal as much as $5 to $10 per year in energy savings. So, this is why we generally only recommend installing 3 ½" of open cell or 2" Closed Cell foam in the walls and 5 ½" Open Cell or 3" Closed Cell Foam under the roof or attic areas. Also attached is an engineering report that supports these principles and states that 5 ½" of open cell or 3" closed cell spray polyurethane foam will outperform an R-60 of a fiberglass insulation.

Spray foam has been around since the 1950's and we've been involved in thousands of building insulation projects and literally hundreds of projects in the tri-state area. We will not meet the prescriptive IRC/IBC codes by spraying to our recommended thicknesses but fortunately, the Energy Codes (IECC) does make the necessary provision to allow a performance approach to insulating the Building Envelope. The attached "Meeting the Energy Code" document further illustrates code compliance through chapter 405 of the 2018 IECC energy codes.

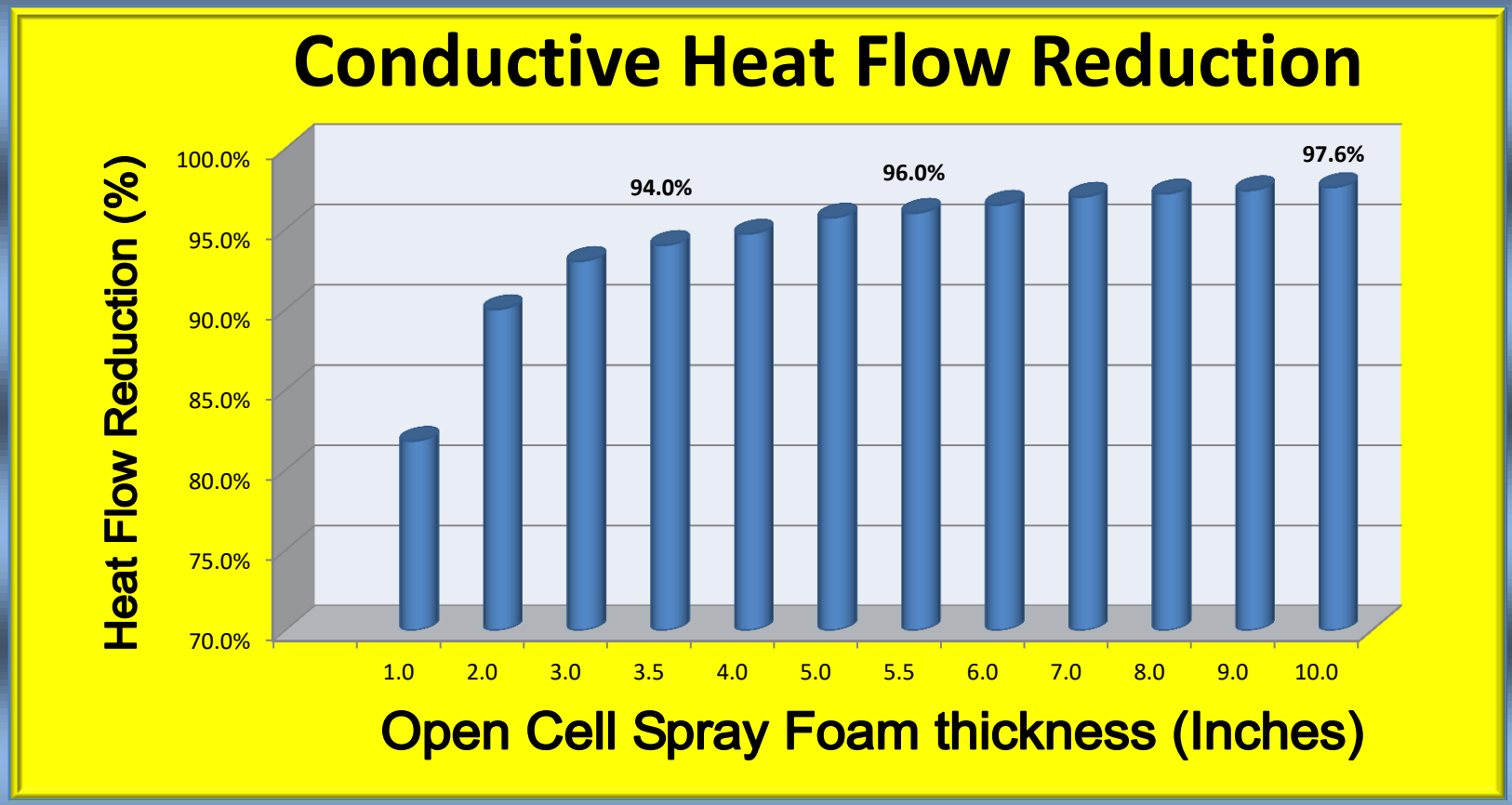
Please review the attached documents and feel free to call me to discuss the compliance methods for spray foam insulation.

Thank you for your time,

Energy Modeling Agency

Energy Modeling Agency
A Division of GreenBroker, LLC
www.EnergyModelingAgency.com
info@EnergyModelingAgency.com
1-800-524-2145

Open Cell Spray Foam Insulation



Energy Modeling Agency

Deer Ridge Consulting, Inc.

505 Deer Ridge Lane
Ararat, VA 24053
Office: 276-755-9162
Fax: 866-441-1054
www.deer-ridge-consulting.com

Code Compliance Research Report

Subject: NCFI 12-008 Spray Polyurethane Foam System
Open-cell, Low-density Spray Polyurethane Insulation

Date: December 3, 2018
Revised December 20, 2018

Materials: NCFI 12-008 SPF
DC315 Fireproof Paint (International Fireproof Technologies, Inc.)

Test Standards:

Property	Standard
Core Density	ASTM D1622
Tensile Strength	ASTM D1623
Dimensional Stability	ASTM D2126
Thermal Transmission Properties	ASTM C518
Flame Spread and Smoke Developed	ASTM E84
Alternative Ignition Barrier Assembly	NFPA 286, as modified in AC377, Appx. X
Air Permeability	ASTM E2178
Alternative Thermal Barrier Assembly	NFPA 286
Exterior Walls Types I - IV Construction	NFPA 285

Building Codes and Code References:

1. 2009, 2012, 2015, 2018 International Building Code (IBC)
2. 2009, 2012, 2015, 2018 International Residential Code (IRC)
3. AC377 Acceptance Criteria for Spray-Applied Foam Plastic Insulation, 4/2016.

Summary:

1. **Surface Burning Characteristics, Thermal Barrier and Maximum Thickness:** Based on the test data submitted and the reference documents, NCFI 12-008 SPF insulation covered with a prescriptive thermal barrier of 1/2-inch minimum thick gypsum wallboard (or other material specifically prescribed by the appropriate building code) meets the requirements for use under 2009 IBC, 2009 IRC, 2012 IBC, 2012 IRC, 2015 IBC, 2015 IRC, 2018 IBC and 2018 IRC. When covered in this manner, the maximum thickness of NCFI 12-008 SPF insulation is not limited.
2. **Attics and Crawl Spaces:** Based on the test data submitted and the reference documents, NCFI 12-008 SPF insulation may be applied up to a maximum thickness of 8 inches for vertical surfaces and applied up to a maximum thickness of 14 inches for horizontal and overhead surfaces and coated with 7 mils wet film thickness (4.7 mils dry film thickness; 0.48 gal/100 ft^2 theoretical application rate) of DC315 Fireproof Paint. This qualifies as an alternative ignition barrier assembly without the

prescribed protection from ignition as required in 2009, 2012, 2015 and 2018 IBC Section 2603.4.1.6 or 2009, 2012 , 2015 and 2018 IRC Sections R316.5.3 and R316.5.4 provided the following limitations are followed:

1) Entry to the attic or crawl spaces is only to service utilities and no storage is permitted.
2) There are no interconnected attic or crawl space areas.
3) Air in the attic or crawl space is not circulated to other parts of the building.
4) Attic ventilation is provided when required by IBC Section 1202.2 (2015, 2012, 2009 IBC Section 1203.2) or IRC Section R806, except when air-impermeable insulation is permitted in unvented attics in accordance with 2018 IBC Section 1202.3, 2015 IBC Section 1203.3 or Section R806.5 of IRC (2009 IRC Section R806.4), Under-floor (crawl space) ventilation is provided when required by 2018 IBC Section 1202.4 (2015 IBC Section 1203.4, 2012 IBC Section 1203.3, or 2009 IBC Section 1203.3) or IRC Section R408.1, as applicable.
5) Combustion air is provided in accordance with IMC Section 701.

3. **Attic Floors Only:** When 12-008 SPF insulation is installed in attics on the attic floors only, the SPF insulation may be left exposed; prescriptive ignition barriers or coatings may be omitted. Thickness is not limited when the SPF insulation is separated from the interior with a prescriptive thermal barrier of 1/2-inch minimum thick gypsum wallboard (or other material specifically prescribed by the appropriate building code).
4. **Sill Plates, Rim Joists and Headers:** Based on the test data submitted and the reference documents, NCFI 12-008 SPF insulation at a maximum thickness of 3.25 inches would not need to be covered with a thermal barrier when applied to sill plates, rim joists and headers in accordance with IBC Section 2603.4.1.13 (Type V construction) or IRC Section R316.5.11.
5. **Thermal Resistance:** Thermal resistance values (R-values) are provided in Table 1 of this document.
6. **Vapor Retarder:** A vapor retarder shall be installed in conjunction with NCFI 12-008 SPF insulation as required by the applicable building code.
7. **Air Impermeable Insulation:** NCFI 12-008 SPF insulation qualifies as an air impermeable insulation at a thickness of 6.75 inches or greater.
8. **Alternative Thermal Barrier Assembly:** Based on the test data submitted and the reference documents, the thermal barrier required by IBC Section 2603 and/or IRC Section R316 may be omitted when:
   - The thickness of NCFI 12-008 SPF insulation does not exceed 8 inches on walls (vertical surfaces) and 14 inches on ceilings (horizontal and overhead surfaces); and
   - The NCFI 12-008 SPF insulation is coated with DC315 Fireproof Paint manufactured by International Fireproof Technologies, Inc. at 14 mils wet film thickness (9 mils dry film thickness; 0.87 gal/100 ft^2 theoretical application rate).
9. **Construction Types I - IV:** NCFI 12-008 SPF insulation may be installed on the exterior walls of Types I, II, III and IV construction when installed in accordance with Table 2 or Table 3 of this report.
10. **Installation:** All materials referenced in this report must be installed in accordance with the manufacturer's installation instructions by installers qualified and authorized by the appropriate manufacturer.

Labeling Requirements:

B-component for NCFI 12-008 SPF insulation must be identified with the manufacturer's name (NCFI Polyurethanes), address and telephone number; the name of the insulation product (NCFI 12-008 SPF insulation); the flame spread and smoke developed indices; the name of the third-party listing report number (UEL-5022); the IAPMO Uniform Evaluation Service Mark of Conformity; and the identification of the appropriate A-component.

Discussion:

1. **Surface burning characteristics**: The 2018 IBC and IRC (and earlier editions) require that unless otherwise allowed, foam plastic must be tested in accordance with ASTM E 84 as having a flame spread index of not more than 75 and a smoke-developed index of not more than 450.

   QAI Test Reports RJ6419F-1 and RJ6419F-2 (August 15, 2018) report the following at a thickness of four (4) inches in accordance with ASTM E 84:

Flame Spread Index	<25
Smoke Developed Index	<450

   Therefore, NCFI 12-008 SPF insulation meets the surface burning characteristics as stipulated in the IBC and IRC.

2. **Maximum thickness:** The maximum thickness that can be tested in accordance with ASTM E 84 is four (4) inches. For thicknesses greater than four inches, the IBC (Section 2603.3, Exception 4) and the IRC (R316.3, Exception) provide for testing greater thicknesses in accordance with the Special Approval and Specific Approval sections, respectively.

   Traditionally, small room corner tests (such as NFPA 286) were employed to test thicknesses greater than 4 inches, with the spray foam covered with a prescriptive thermal barrier (i.e., 1/2-inch gypsum wallboard). However, after reviewing voluminous small room corner test results, ICC-ES staff recommended and the ICC-ES board approved a modification to AC 377 wherein this test protocol may be omitted. Under this provision, the maximum thickness of the spray foam is not limited. The limitations placed on this provision reflect the data that ICC-ES reviewed, namely:
   - The spray foam product must have passed ASTM E84 testing at a thickness of four (4) inches with maximum flame spread and smoke developed results of 25 and 450 respectively.
   - The spray foam product must be separated from the building interior by a prescriptive thermal barrier (1/2-inch [min.] gypsum wallboard).

   The provisions described above are within AC 377, Section 3.2.2.3.

   NCFI 12-008 SPF insulation has been tested in accordance with ASTM E84 with flame spread of less than 25 and smoke developed of less than 450. Therefore, NCFI 12-008 SPF insulation falls within the provisions of AC 377, Section 3.2.2.3 and may be installed at any thickness provided it is covered with a prescriptive thermal barrier.

3. **Use in attics and crawl spaces:** Both the IBC and IRC provide exceptions to the thermal barrier requirement for the use of foam plastic insulation in certain attics and crawl spaces. Specifically, both model building codes provide for protecting the foam plastic from ignition through the use of coverings described as prescriptive ignition barriers (2009, 2012, 2015 and 2018 IBC Section 2603.4.1.6 or 2009, 2012, 2015 and 2018 IRC Sections R316.5.3 and R316.5.4).

   Omitting the prescriptive ignition barriers is permitted under both model building codes under the IBC Section 2603.9 Special Approval and the IRC Section R316.6 Specific Approval. However, neither the IBC or the IRC provides a specific test method for the approval of alternate materials or assemblies to prescriptive ignition barriers.

ICC Evaluation Service, in AC 377 Acceptance Criteria for Spray-Applied Foam Plastic Insulation, provides a protocol in Appendix X based on NFPA 286 to qualify alternate assemblies to those using prescriptive ignition barriers. ICC-ES accepts Appendix X test results for the purposes of issuing Evaluation Reports. Furthermore, this protocol is widely accepted within the building construction community as providing acceptable evidence under IBC Special Approval and IRC Specific Approval sections.

QAI Test Report No. TJ5768-1 (November 13, 2018) reports that NCFI 12-008 SPF insulation passes the AC 377, Appendix X protocol at maximum thicknesses of 8 inches in the walls (vertical surfaces) and 14 inches in the ceiling (horizontal and overhead surfaces) when coated with 7 mils wet film thickness (4.7 mils dry film thickness; 0.48 gal/100 ft^2 theoretical application rate) of DC315 Fireproof Paint.

Therefore, NCFI 12-008 SPF insulation without a prescriptive ignition barrier, when coated with DC315 Fireproof Paint as described in the preceding paragraph, meets the Special Approval and Specific Approval sections of the IBC and IRC respectively for use in attics and crawl spaces. The limitations as stipulated in AC 377, Appendix X apply.

4. **Attic Floors Only:** When 12-008 SPF insulation is installed in attics on floors only (i.e., no 12-008 SPF on the attic walls or overhead surfaces), the ignition barrier may be omitted. Intertek Report No. 103595925SAT-016 Rev1 (September 14, 2018) indicates that the critical radiant flux is greater than or equal to 0.12 watt/cm^2 qualifying 12-008 SPF for this use in accordance with AC377, Section 3.2.3.4.1.2. Thickness is not limited when the SPF insulation is separated from the interior with a prescriptive thermal barrier of 1/2-inch minimum thick gypsum wallboard (or other material specifically prescribed by the appropriate building code).

5. **Sill plates, rim joists and headers:** Based on the surface burning characteristics referenced above, NCFI 12-008 SPF insulation meets the requirements of IBC Section 2603.4.1.13 (Type V construction) or IRC Section R316.5.11for use on sill plates, rim joists and headers without being covered with a thermal barrier at a maximum thickness of 3.25 inches.

6. **R-Values**: Table 1 below lists R-values based on Intertek Report No. 103595925MID-003B (July 23, 2018), Intertek Report No. 103595925MID-003A (July 23, 2018) and the reporting procedures outlined in AC 377.

Table 1
THERMAL RESISTANCE (*R*-VALUES[1,2])

THICKNESS (inches)	*R*-VALUES (°F•ft²•hr/Btu)
1	3.7
2	7.3
3	11
3.5	13
4	15
5	19
5.5	21
6	23
7	27
8	30
9	34
10	38
11	42
12	46
14	53

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

[1] *R*-values are calculated based on tested *k*-values at 1 and 3.5-inch thicknesses for 90-day aged sampled.
[2] *R*-values greater than 10 are rounded to the nearest whole number.

7. **Vapor Retarder:** A vapor retarder shall be installed in conjunction with NCFI 12-008 SPF insulation as required by the applicable building code.

8. **Air Impermeable Insulation:** Air-impermeable insulation is defined in 2018 IBC Section 202 as "An insulation having an air permeance equal to or less than 0.02 l/s-m² [0.004 ft³/min-ft²] at 75 pa pressure differential tested in accordance with ASTM E2178 or ASTM E283." Based on PRI Report No. NCF-051-02-01 (November 20, 2018), NCFI 12-008 SPF insulation meets this criteria at a thickness of 6¾ inch or greater.

9. **Alternative Thermal Barrier Assembly:** In IBC Section 2603.9 (Special approval) and IRC Section R316.6 (Specific approval), the building code permits alternate assemblies to the use of the required thermal barrier when tested in accordance with specific tests. One such test is NFPA 286 (Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth) when used in combination with the acceptance criteria of 2018 IBC Section

803.1.1.1 (2015, 2012, 2009 IBC Section 803.1.2.1) or IRC Section R302.9.4. (NFPA 286 does not provide its own acceptance criteria, hence this is specifically defined within the building codes.)

NCFI 12-008 SPF insulation was tested in accordance with NFPA 286 with results reported in QAI Test Report No. TJ5768-2 (October 23, 2018) wherein the spray foam was coated with the intumescent coating DC315 Fireproof Paint. The test result successfully passed the acceptance criteria as defined in the IBC and IRC.

Therefore, the thermal barrier as required in IBC Section 2603 and/or IRC Section 316 may be omitted provided the following limitations are observed:

- The maximum thickness NCFI 12-008 SPF insulation in wall and ceiling assemblies is limited to 8 inches on vertical surfaces and 14 on horizontal and overhead surfaces; and
- The NCFI 12-008 SPF insulation is coated with DC315 Fireproof Paint manufactured by International Fireproof Technologies, Inc. at 14 mils wet film thickness (9 mils dry film thickness; 0.87 gal/100 ft^2 theoretical application rate).

10. **Exterior Walls of Types I, II, III and IV Construction:** Based on engineering evaluations by Jensen-Hughes (October 4, 2018), the following assemblies are permitted to be installed on exterior walls of Types I, II, III and IV construction (Table 2 and Table 3):

Table 2

NFPA 285 COMPLYING WALLS – NCFI Closed-Cell SPF on Exterior

(Based on Table I of Jensen-Hughes Letter, Various NFPA 285 Complying Exterior Wall Constructions, No. 1JJB00035.000, October 4, 2018.)

Wall Component	Materials
Base wall system – Use either 1, 2 or 3	1. Concrete wall – minimum 2-inch thick 2. Concrete Masonry wall 3. One layer – ⅝-inch thick Type X Gypsum wallboard on interior, installed over steel studs: minimum 3⅝-inch depth, minimum 20-gauge at a maximum of 24-inch OC with lateral bracing every 4 ft. vertically.
Floorline Firestopping	4 lb/cu ft. mineral wool (e.g., Thermafiber) in each stud cavity and at each floorline – attached with Z-clips or equivalent. Mineral wool not required in stud cavities at floorlines when infill studwall[1] construction is employed for exterior wall construction.
Cavity Insulation – Use either 1, 2, 3 or 4	1. None 2. Full cavity depth or less of InsulBloc®, InsulStar® closed cell (2.0 lb/ft^3), or NCFI 11-033 SPF insulation applied using sheathing as substrate and covering the width of the cavity and inside the stud flange. 3. Full cavity depth or less of NCFI 12-008 open cell (0.5 lb/ft^3) SPF applied using sheathing as substrate and covering the width of the cavity and inside the stud flange. 4. Any noncombustible insulation (if batts, can be either faced or unfaced)
Exterior sheathing – Use either 1 or 2	1. ½-inch thick, exterior type gypsum sheathing 2. ⅝-inch thick, exterior type gypsum sheathing
Exterior insulation – Use either 1 or 2	1. None 2. InsulBloc®, InsulStar® – Total thickness to be a maximum of nominal 5 inches or NCFI 11-033 SPF insulation – Total thickness to be a maximum of nominal 4 inches.
Exterior Veneer – Use either 1, 2, 3, 4 or 5	1. Brick – Standard nominal 4-inch thick, clay brick. Installed with brick veneer anchors – standard types – installed maximum 24 inches OC vertically on each stud. Maximum 2-inch air gap between exterior insulation and brick. 2. Stucco – Minimum ¾-inch thick, exterior cement plaster and lath. A secondary water-resistive barrier can be installed between the exterior insulation and the lath. The secondary water-resistive barrier shall not be full-coverage asphalt or butyl-based self-adhered membranes. 3. Minimum 2-inch thick Limestone, natural stone or minimum 1½-inch thick cast artificial stone. Any standard non-open-jointed installation technique such as ship-lap, etc. can be used. 4. Terracotta cladding – Use any terracotta cladding system in which the terracotta is minimum 1¼-inch. Any standard non-open-jointed installation technique such as ship-lap, etc. can be used. 5. 1-inch thick, Clark Pacific glass-fiber-reinforced-concrete (GFRC) panels. Standard installation technique can be used.

[1]Infill studwall construction refers to the condition where the stud framing of an exterior wall is interior to the floorline slab edges, effectively terminating the stud cavity at each floorline and creating sectioned stud bays in between sequential floors.

Table 3

NFPA 285 COMPLYING WALLS – NCFI Closed-Cell or Open-Cell SPF in Wall Cavity Only

(Based on Table II of Jensen-Hughes Letter, Various NFPA 285 Complying Exterior Wall Constructions, No. 1JJB00035.000, October 4, 2018.)

Wall Component	Materials
Base wall system – Use either 1 (with interior, steel studs, minimum 3⅝-inch depth, minimum 20-gauge at a maximum of 24-inch OC with lateral bracing every 4 ft. vertically), 2 or 3	1. One layer of ⅝-inch thick Type X exterior gypsum sheathing installed on the exterior side of the steel studs. 2. Concrete wall – minimum 2-inch thick 3. Concrete Masonry wall
Floorline Firestopping	4 lb/cu ft. mineral wool (e.g., Thermafiber) in each stud cavity and at each floorline – attached with Z-clips or equivalent. Mineral wool not required in stud cavities at floorlines when infill studwall[1] construction is employed for exterior wall construction.
Cavity Insulation – Use either 1, 2, or 3; or any combination of 2 and 4; or any combination of 3 and 4.	1. None 2. Full cavity depth or less of InsulBloc®, InsulStar® closed cell (2.0 lb/ft^3), or NCFI 11-033 SPF insulation applied using sheathing as substrate and covering the width of the cavity and inside the stud flange. 3. Full cavity depth or less of NCFI 12-008 open cell (0.5 lb/ft^3) SPF applied using sheathing as substrate and covering the width of the cavity and inside the stud flange. 4. Any noncombustible insulation (if batts, can be either faced or unfaced)
Interior gypsum wallboard	Minimum ⅝-inch Type X gypsum wallboard
Exterior Wall Covering – Use either 1, 2, or 3	1. Any non-combustible exterior wall covering material 2. Any combustible exterior wall covering system that has successfully been tested in accordance with NFPA 285 3. Any combustible exterior wall covering system up to a maximum wall height of 40 ft above grade plane. If the combustible material is fire retardant treated wood, the maximum wall height can be 60 ft above grade plane. 4. For base wall 2 or 3, a covering is optional but not required. Use an exterior wall covering as described in 1, 2 or 3 above.

[1]Infill studwall construction refers to the condition where the stud framing of an exterior wall is interior to the floorline slab edges, effectively terminating the stud cavity at each floorline and creating sectioned stud bays in between sequential floors.

Conclusions:

NCFI 12-008 SPF insulation meets the requirements and intent of the IBC and IRC as specified and as limited in the Summary section above.

Respectfully submitted,
Deer Ridge Consulting, Inc.

Roger V. Morrison, PE, RRC
President

Reference Documents:

1. 2009, 2012 and 2015 International Building Code: Sections 803.1.2.1; 2603.
2. 2018 International Building Code: Sections 803.1.1.1; 2603.
3. 2009, 2012, 2015 and 2018 International Residential Code: Sections R302.9.4; R316.
4. Intertek, Test Report No. 103595925MID-007, September 21, 2018 (Open-cell content).
5. Intertek, Test Report No. 103595925MID-004R0, September 27, 2018 (Density).
6. Intertek, Test Report No. 103595925MID-005R0, October 31, 2018 (Dimensional stability).
7. Intertek, Test Report No. 103595925MID-002B, October 23, 2018 (Thermal resistance at 1 inch).
8. Intertek, Test Report No. 103595925MID-002A, October 23, 2018 (Thermal resistance at 3.5 inch).
9. Intertek Report No. 103595925SAT-016 Rev1, September 14, 2018 (Attic floor critical radiant heat flux).
10. QAI Laboratories, Test Report No. RJ6419F-1, August 15, 2018 (ASTM E84).
11. QAI Laboratories, Test Report No. RJ6419F-2, August 15, 2018 (ASTM E84).
12. PRI Report No. NCF-051-02-01, November 20, 2018 (Air permeability).
13. QAI Laboratories, Test Report No. TJ5768-1, November 13, 2018 (AC377, Appendix X).
14. QAI Laboratories, Test Report No. TJ5768-2, October 23, 2018 (NFPA 286, alternative thermal barrier assembly).
15. Jensen-Hughes Letter, Various NFPA 285 Complying Exterior Wall Constructions, No. 1JJB00035.000, October 4, 2018.
16. NCFI 11-033 SPF insulation Technical Data Sheet
17. NCFI 11-033 SPF insulation Installation Instructions
18. Acceptance Criterial 377, April 2016.
19. Uniform Evaluation Service, Listing Report UEL-5022, December 6, 2018 (ASTM E84, surface burning characteristics).

Meeting the Energy Conservation Codes

International Energy Conservation Code, 2018 Edition: Developed and published by the International Codes Council, the IECC-2018 "establishes minimum regulations for energy efficient buildings using prescriptive and performance-related provisions. This code is founded on principals intended to establish provisions consistent with the scope of an energy conservation code that adequately conserves energy; provisions that do not unnecessarily increase construction costs; provisions that do not restrict the use of new materials, products or methods of construction; and provisions that do not give preferential treatment to particular types or classes of materials, products or methods of construction." The IECC allows for three different methods to gain approval for the Building Envelope. These methods are: Prescriptive approach, Performance approach and the HERS Rating approach.

Prescriptive Approach: The code option in which particular measures are required, such as specific air sealing characteristics and insulation levels or R-values. Under the prescriptive approach, these R-values are set by using the climate zone chart and are minimal requirements.

Performance Based: The energy code approach that requires an expected level of energy use based on modeling. Under Section 405 in the 2018 IECC allows a house to be evaluated based upon its annual energy consumption. This performance evaluation is typically performed by using Energy Modeling software such as the REM design or REM rate software. This software must show that the building will perform at least 30% more efficient than the baseline standard for the same home design. The REM programs will produce a standard IECC compliance report and a compliance certificate.

HERS Rating: This method of evaluation requires a certified HERS rater perform a number of test to provide an actual HERS rating for approval. Like the performance approach, this method heavily relies on a reduction of air infiltration which increases performance.

Spray Foam Insulation: There are many ways of increasing the performance of a home to comply with the performance approach to the 2018 IECC. One of the most effective ways to improve the efficiency of a home is to decrease the amount of air infiltration and increasing the thermal resistance of the insulated building envelope. Using a product such as spray foam insulation will provide the superior thermal insulation envelope as well as an air barrier (ASTM E283)
Using the Spray Foam Insulation approach will typically not meet the R-value requirements of the Prescriptive approach. However, this approach will meet the requirements for the Performance and HERS rating Approach with R-values that are substantially lower than the prescriptive approach. In Fact, The REM program will typically show that a Spray foam house at the lower R-values will outperform the prescriptive home by 30-50%.

Energy Modeling Agency
A Division of GreenBroker, LLC
www.EnergyModelingAgency.com
info@EnergyModelingAgency.com
1-800-524-2145

NCFI POLYURETHANES

SAFETY DATA SHEET According to GHS

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Dalton, GA | Hickory, NC | Mount Airy, NC | Salt Lake City, UT

Section 1: Identification

Product Identifier

Trade Name: R-11-016 G&M series
Chemical Name: Polyurethane Resin
Recommended Use: Component for the manufacture of Polyurethanes
Restrictions on Use:

Chemical Manufacturer Information

Name: NCFI Polyurethanes
Address: 1515 Carter St Mount Airy, NC 27030
Website: www.NCFI.com
Phone: (800) 346-8229
Fax: (336) 789-9586
Emergency Phone: CHEMTREC: 800-968-793 (Toll Free)

Section 2: Hazard Identification

Classification of the substance or mixture:

GHS Classification:	
• Skin irritation, Category 3	• Eye irritation, Category 2

GHS Labeling:

Warning

Hazard Statements:	
• May cause skin irritation	• May cause eye irritation
• May cause respiratory irritation	•

Precautionary Statements:	
• Do not breathe fume/gas/mist/vapors/spray	• Wear protective gloves/eye protection/face protection
• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
• IF ON SKIN: Wash with plenty of soap and water	

Other Hazards:

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Section 3: Composition

Hazardous Components

Type of product: Mixture

CAS#	Weight %	Name
460-73-1	12%	1,1,1,3,3-Pentafluoropropane ($CF_3CH_2CHF_2$ or HFC-245fa)
Proprietary	<4	Tertiary amine catalysts
156-60-5	<4	Trans-1,2-Dichloroethylene

Section 4: First Aid Measures

Inhalation:	Move to fresh air if symptoms develop. If breathing is difficult, give oxygen and call physician.
Eye Contact:	Flush with water for at least 15 minutes. See a physician if irritation develops.
Ingestion:	Do not induce vomiting unless told to do so by a medical professional.
Most Important symptoms and effects, acute and delayed:	May cause skin or eye irritation upon contact. Avoid breathing vapors. The dense vapors can displace and reduce breathing air in confined or unventilated spaces causing asphyxiation. Overexposure may cause tremors, confusion, irritation, and may result in cardiac sensitization.
Indication of immediate medical attention and special treatment, if applicable:	N/A
Skin Contact:	Wash with soap and water at first opportunity.

Section 5: Fire-Fighting Measures

Suitable extinguishing media:	Water, dry chemicals, CO_2
Unsuitable extinguishing media:	None
Special hazards arising from the chemical:	Overheated containers may rupture due to pressure produced by $CF_3CH_2CHF_2$. $CF_3CH_2CHF_2$ burns to form acids and noxious gases.
Precautions for fire-fighters:	A self-contained breathing apparatus should be worn to protect against toxic and irritating vapors.

Section 6: Accidental Release Measures

Personal precautions, protective equipment, and emergency procedures:	Clear area. Ensure adequate ventilation. Wear suitable personal protective clothing and equipment.
Environmental precautions:	Do not discharge into drains/surface waters/groundwater
Methods and material for containment and cleanup:	Absorb with sawdust, etc., and shovel into container. Waste material should be disposed of under conditions which meet federal, state, and local environmental regulations.

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Section 7: Handling and Storage

Precautions for safe handling:	Store between 65°F and 85°F out of sunlight. Relieve pressure slowly when opening container. Under no circumstances should empty drums be burned or cut open with an electric or gas torch.
Conditions for safe storage, including any incompatibilities:	Keep tightly sealed.

Section 8: Exposure Controls and PPE

Exposure Limits

Component:	Type	Value
1,1,1,3,3-Pentafluoropropane ($CF_3CH_2CHF_2$ or HFC-245fa)	TWA	300ppm recommended
Tertiary Amine Catalysts[1]	TWA	None established
Trans-1,2-Dichloroethylene	TWA	200ppm

[1]Not listed as a carcinogen (NTA, IARC, OSHA)

Exposure Controls

Respiratory Protection:	The specific respirator selected must be based on contamination levels of this material found in the workplace and the working limits of the respirator. A supplied air, full-face mask, positive pressure or continuous flow respirator or a supplied air hood is required when airborne concentrations are unknown or exceed threshold limit values. A positive pressure, self-contained breathing apparatus can be used in emergencies or other unusual situations. Full-face air purifying respirators equipped with organic vapor cartridges can be used in certain situations, ***see OSHA standard 29CFR 1910.134***. All equipment must be NIOSH approved and maintained.
Hand, eye, skin, body protection:	Wear goggles or chemical safety glasses and chemically resistant rubber or plastic gloves. Avoid eye and skin contact. Eye wash system and showers should be available.

Section 9: Physical and Chemical Properties

Basic chemical and physical properties

Appearance:	Liquid	**Flammability:**	N/A
Color:	Green	**Upper/lower flammability or explosive limits:**	N/A
Odor:	Ethereal odor	**Vapor pressure:**	N/A
Odor threshold:	N/A	**Vapor density:**	N/A
pH:	N/A	**Relative density:**	1.23g/mL
Melting pt/freezing pt:	<32°F	**Solubility(ies):**	Slightly soluble in water
Boiling pt/boiling range:	60°F	**Partition coefficient (n-octanol/water):**	N/A
Flash point:	>200°F	**Auto-ignition temperature:**	>500°F
Evaporation rate:	Slower than ether	**Decomposition temperature:**	>500°F

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Section 10: Stability and Reactivity

Chemical stability:	Stable
Possibility of hazardous reactions:	N/A
Conditions to avoid:	Temperatures over 85°F
Incompatible materials:	Isocyanates and other chemicals that react with hydroxyl groups.
Hazardous decomposition products:	When burned, CO, CO_2, NO_x aliphatic fragments, halogens, halogen acids, and possibly carbonyl halides.

Section 11: Toxicological Information

Acute toxicity:	May cause skin irritation
Chronic toxicity:	Not available
Likely routes of exposure:	Skin
Symptoms related to physical, chemical and toxicological characteristics:	May cause skin irritation
Delayed and immediate effects and chronic effects from short and long-term exposure:	May cause skin irritation; avoid contact with eyes
Numerical toxicity measures:	Not available

Section 12: Ecological Information

Ecotoxicity:	Not a marine pollutant
Persistance and degradability:	No known significant effects
Bioaccumulative potential:	Does not bioaccumulate
Mobility in soil:	

Section 13: Disposal

Waste disposal:	R component drums can be sent to drum reconditioners or disposed of as ordinary industrial waste in compliance with pertinent regulations

Section 14: Transport

UN number:	Not regulated
UN Proper shipping name:	Not regulated
Transport Hazard class(es):	Not regulated
Packing group, if applicable:	Not regulated
Marine pollutant (YorN):	N
Special precautions:	None

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Section 15: Regulatory

Relevant safety, health, and environmental regulations

Inventory Status:	All components TSCA listed
US Regulations:	No ingredients listed
US Superfund Amendments and Reauthorization Act (SARA) Title III Section 313 information:	No ingredients listed

Section 16: Other

MSDS Preparation Date:	06/26/2014
Revision Date:	

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Section 1: Identification

Product Identifier

Trade Name: A-11-016 G&M series
Chemical Name: Diphenylmethane Diisocyanate (MDI)
Recommended Use: Component for production of polyurethanes
Restrictions on Use:

Chemical Manufacturer Information

Name: NCFI Polyurethanes
Address: 1515 Carter St Mount Airy, NC 27030
Website: www.NCFI.com
Phone: (800) 346-8229
Fax: (336) 789-9586
Emergency Phone: CHEMTREC: 800-968-793 (Toll Free)

Section 2: Hazard Identification

Classification of the substance or mixture

GHS Classification:	
• Skin irritation, Category 2	• Acute toxicity, Inhalative, Category 4
• Sensitization of respiratory airways, Category 1	• Eye irritation, Category 2
• Carcinogenicity, Category 2	• Sensitization of the skin, Category 1
• Specific target organ toxicity (repeated exposure), Category 2	• Specific target organ toxicity (single exposure), Category 3

GHS Labeling:

Danger

Hazard Statements:	
• May cause an allergic skin reaction	• Causes skin irritation
• Harmful if inhaled	• Causes serious eye irritation
• May cause respiratory irritation	• May cause allergy or asthma symptoms or breathing difficulties if inhaled
• May cause damage to organs through prolonged or repeated exposure	• Suspected of causing cancer

Precautionary Statements:	
• Do not breathe dust/fume/gas/mist/vapors/spray	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
• Wear protective gloves/eye protection/face protection	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
• IF ON SKIN: Wash with plenty of soap and water	

Other Hazards: Persons with respiratory conditions should avoid handling this product.

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Section 3: Composition

Hazardous Components

Type of product: substance

CAS#	Weight %	Name
101-68-8	38.0%	Diphenylmethane-4,4'-diisocyanate (MDI)
26447-40-5	< 10.0%	MDI Mixed Isomers
9016-87-9	< 55.0%	P-MDI

Section 4: First Aid Measures

General:	Remove contaminated clothing
Inhalation:	Remove affected individual to fresh air and keep person calm. Assist in breathing if necessary. Immediate medical attention required.
Skin Contact:	Wash affected areas with soap and water. Seek medical attention for irritation.
Eye Contact:	Rinse for at least 15 minutes with water. Immediate medical attention required.
Ingestion:	Rinse mouth and drink plenty of water. Do not induce vomiting. Immediate medical attention required.

Section 5: Fire-Fighting Measures

Suitable extinguishing media:	Carbon dioxide, foam, dry powder, water spray
Unsuitable extinguishing media:	High volume water jet
Special hazards arising from the chemical:	Burning releases CO, CO2, oxides of nitrogen, isocyanate vapors and traces of hydrogen cyanide.
Precautions for firefighters:	Firefighters should be equipped with self-contained breathing apparatus and turn-out gear.

Section 6: Accidental Release Measures

Personal precautions, protective equipment, and emergency procedures:	Clear area. Ensure adequate ventilation. Wear suitable personal protective clothing and equipment.
Environmental precautions:	Do not discharge into drains/surface waters/groundwater
Methods/material for containment and cleanup:	Remove mechanically; cover remainder with wet, absorbent material **(e.**g. sawdust, chemical binder based on calcium silicate hydrate, sand). After approx. one hour transfer to waste container and do not seal (evolution of CO2?). Keep damp in a safe ventilated area for several days.

Spill area can be decontaminated with the following recommended decontamination solution:

Decontamination Solution #1: 8-10% sodium carbonate and 2% liquid soap in water

Decontamination Solution #2: Liquid/yellow soap (potassium soap with ~15% anionic denside): 20 ml; Water: 700 ml; Polyethylenglycol (PEG 400): 350 ml

Section 7: Handling and Storage

Precautions for safe handling:	Provide sufficient air exchange and/or exhaust in work rooms. Occupational exposure limits should not be exceeded (refer to Section 8). Contact with skin and eyes and inhalation of vapors must be avoided. Keep away from foodstuffs, drinks, and tobacco. Wash hands before breaks and at end of work.
Conditions for safe storage, including any incompatibilities:	Keep container tightly closed and protect against moisture. Segregate from bases. Store from 32F – 110F.

Section 8: Exposure Controls and PPE

Exposure Limits

Component	Type	Value
P-MDI	OSHA PEL	CLV 0.02 ppm 0.2 mg/m3
Diphenylmethane-4,4'-diisocyanate (MDI)	OSHA PEL	CLV 0.02 ppm 0.2 mg/m3

Exposure Controls

Respiratory Protection:	Respiratory protection required in insufficiently ventilated working areas and during spraying. An air-fed mask, or for short periods of work, a combination of charcoal filter and particulate filter is recommended.
Hand, eye, skin, body protection:	Chemical resistant protective gloves should be worn to prevent all skin contact. Wear eye/face protection. Wear suitable protective clothing

Section 9: Physical and Chemical Properties

Basic chemical and physical properties

Appearance:	liquid	**Flammability**	not applicable
Color	dark amber	**Upper/lower flammability or explosive limits**	
Odor	earthy, musty	**Vapor pressure**	0.00016 mmHg
Odor threshold	not established	**Vapor density**	not established
pH	not established	**Relative density**	1.24
Melting pt/freezing pt	3°C	**Solubility(ies)**	Reacts with water
Boiling pt/boiling range	> 300°C	**Partition coefficient (n-octanol/water)**	not established
Flash point	> 250°C	**Auto-ignition temperature**	not applicable
Evaporation rate	not established	**Decomposition temperature**	not established

Section 10: Stability and Reactivity

Chemical stability:	Polymerises at about 200°C with evolution of CO2
Possibility of hazardous reactions:	Exothermic reaction with amines and alcohols; reacts with water forming CO2; in closed containers, risk of bursting owing to increase of pressure
Conditions to avoid:	Avoid moisture
Incompatible materials:	water, alcohols, strong bases

Hazardous decomposition products:	carbon monoxide, hydrogen cyanide, nitrogen oxides, aromatic isocyanates, gases/vapors

Section 11: Toxicological Information

Acute toxicity (inhalation):	LC50: 490mg/kg , vapor, 4hr rat
Chronic toxicity:	2 years, inhalation; NOAEL: 0.2mg/m3, (rat, Male/Female, 6hrs/day 5 days/week)
Likely routes of exposure:	Skin, inhalation
Symptoms related to physical, chemical and toxicological characteristics:	Minor skin irritation; asthma-like symptoms
Delayed and immediate effects and chronic effects from short and long-term exposure:	Possible sensitization
Numerical toxicity measures:	

Section 12: Ecological Information

Ecotoxicity:	LC0: >1,000mg/l (Zebra fish 96 hrs) LC0: >3,000mg.l (Killifish 96hrs)
Persistance and degradability:	0%
Bioaccumulative potential:	Does not bioaccumulate
Mobility in soil:	

Section 13: Disposal

Waste disposal:	Incinerate or dispose of in a licensed facility. Do not discharge substance/product into sewer system. Do not burn empty drums or cut open with gas or an electric torch as toxic decomposition products may be liberated. Do not reuse empty containers.

Section 14: Transport

Land transport

USDOT	Not classified as dangerous good
China	Not classified as dangerous good

Sea transport

IMDG	Not classified as dangerous good

Air transport

IATA/ICAO	Not classified as dangerous good

Further information
DOT: This product is regulated if the amount in a single receptacle exceeds the Reportable Quantity (RQ). Refer to Section 15 for the RQ of this product.

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Section 15: Regulatory

Relevant safety, health, and environmental regulations:	
Inventory Status:	TSCA listed
US Regulations:	Not regulated
US Superfund Amendments and Reauthorization Act (SARA) Title III Section 313 information:	Methylene Bis Phenylisocyanate 101-68-8 5000 lbs. See MSDS – A Component (Same as Diphenylmethane diisocyanate (MDI) Polymeric Diphenylmethane diisocyanate 9016-87-9 See MSDS – A Component

Section 16: Other

MSDS Preparation Date:	06/26/2014
Revision Date:	10/17/2014

IMPORTANT NOTICES
This notification is a part of the Safety Data Sheet document and must not be detached. Any copying and redistribution of the Safety Data Sheet shall include copying of this notice and attaching the copy to the redistributed Safety Data Sheet copies.

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APPLICATOR BULLETIN

JOBSITE SAFETY & VENTILATION

1. ONLY TRAINED APPLICATOR PERSONNEL WEARING REQUIRED PERSONAL PROTECTIVE EQUIPMENT (PPE) SHOULD BE ALLOWED WITHIN 50 FEET OF THE SPRAY ZONE AND FOR 24 HOURS AFTER COMPLETION OF SPRAYING.

2. MARK THE AREA WITH WARNING TAPE AND SIGNAGE TO PREVENT UNPROTECTED PERSONS FROM ENTERING THE WORK ZONE. THIS INCLUDES THE AREA AT THE EXHAUST FAN OUTLET.

3. CREATE A VENTILATION PLAN FOR THE WORK ZONE. HOMEOWNERS SHOULD BE COMPLETELY EVACUATED DURING AND FOR 24 HOURS AFTER COMPLETION OF SPRAYING. LARGER STRUCTURES OR THOSE WITH MULTIPLE FLOORS CAN BE PARTITIONED AND ISOLATED WITH PLASTIC FILM SO THAT OTHER TRADES ON THE JOBSITE NOT WEARING PPE CAN CONTINUE TO WORK SAFELY.

4. MAKE SURE THAT IGNITION SOURCES AND HVAC SYSTEMS INCLUDING INLET VENTS ARE SHUT DOWN AND MASKED OFF TO PREVENT ACCIDENTAL USE DURING APPLICATION.

5. ACTIVE VENTILATION SHOULD BE USED WITH FAN(S) POSITIONED TO MAINTAIN A MINIMUM OF 30 ACH (AIR CHANGES/HOUR) TO EXHAUST VAPORS AND ODORS WHILE THE FOAM IS SAFELY CURED. VENTILATION PLANS WILL VARY ACCORDING TO SIZE OF THE SPACE, LAYOUT AND SCHEDULING.

6. FILTERS SHOULD BE USED OVER THE EXHAUST FAN INLET DURING SPRAYING TO PREVENT BUILDUP OF RESIDUE ON FAN BLADES WHICH WILL DECREASE AIR MOVEMENT SUBSTANTIALLY.

7. OPTIONAL INLET FANS CAN BE USED TO INCREASE AIR MOVEMENT, TAKING CARE THAT THE EXHAUST FAN IS MOVING AIR AT A GREATER RATE TO MAINTAIN NEGATIVE PRESSURE WITHIN THE SPRAY ZONE.

8. REFER TO NCFI PRODUCT STEWARDSHIP MANUAL, SFC GUIDANCE ON BEST PRACTICES FOR APPLICATION OF POLYURETHANE FOAM, www.sprayfoam.org AND EPA VENTILATION GUIDANCE www.epa.gov/dfe OR CALL NCFI AT 800-346-8229 FOR RECOMMENDATIONS BEFORE COMMENCING WORK.

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TECHNICAL DATA SHEET

SPRAY FOAM SYSTEM (11-016)

DESCRIPTION:

InsulStar® is a two component, self-adhering, seamless, closed cell, spray applied polyurethane foam system. This NCFI system has been formulated with highly insulating HFC-245fa as the blowing agent and contains an anti-microbial ingredient to inhibit the growth of molds. The InsulStar® insulation system is suitable for application on the exterior or interior side of Class I, II, III, IV, & V buildings as well as other insulation applications. It complies with AC 377 and ASTM C1029. InsulStar is certified for application in ABAA projects.

DISTINGUISHING CHARACTERISTICS:

- High R-Value
- Zero ODP
- Moisture Vapor Retarder - Class II @ 1.3"
- High Yields
- High Closed Cell Content
- Air Barrier, ABAA Certified @1"
- Good Dimensional Stability
- Meets ASTM E-84, FS ≤25, SD ≤450 @ 4"
- FEMA Flood Resistance - Class 5
- Water Resistive Barrier (AC71) @ 1"
- Passed NFPA 285
- Approved in multiple UL Fire Resistive Assemblies

For proper use of this NCFI insulating material refer to the NCFI Application Information and any of the following codes or guides:

- 2012 International Building Code Chapter 26
- 2012 International Residential Code Section R316 and R806
- ICC-ES Evaluation Report 1615
- API Fire Safety Guidelines for Use of Rigid Polyurethane and Polyisocyanurate Foam Insulation in Building Construction (AX230)

TYPICAL PHYSICAL PROPERTIES*[1]:

Free Rise Core Density*[2] ASTM D 1622	2.0 pcf
Compressive Strength ASTM D 1621	27 psi
Moisture Vapor Transmission - ASTM E 96	1.3 perm·in
Closed Cell Content ASTM D 6226	>90%
R-value @ 1" - ASTM C 518	6.8
Air Permeance @1" Infiltration ASTM E 283 & 2178 Exfiltration	0.000 cfm/ft² @ 1.57 psf 0.000 cfm/ft² @ 1.57 psf
Bacterial & Fungal Growth ASTM G 21 & E 1428	Negligible*[3]
STC - ASTM E 90 OITC - ASTM E 90	31*[4] 24*[4]
Flammability ASTM E-84 @ 4 inches	Flame Spread ≤25 Smoke Dev ≤450
Potential Heat—NFPA 259	1989 Btu/ft²/in
Max Service Temperature	180°F

*[1]The above values are average values obtained from laboratory experiments and should serve only as guide lines.

*[2]Free rise core density should not be confused with overall density. Overall densities are always higher than free rise core densities and take into account skin formation, thickness of application, environmental conditions, etc.

*[3]See page 4 for details.

*[4]As measured in a 2" x 4" studwall assembly.

InsulStar® Insulation Fact Sheet

R-Values*			
Thickness (inches)	R-Value (°F·hr·ft² / Btu)	Moisture Vapor Perm	Installation Limitations Limits based on NFPA 286
1"	6.8	1.3	Maximum Thickness in walls is 8" Maximum Thickness in Roof Decks or Ceilings is 12"
2"	13	0.65	
3"	19	0.43	
3.5"	22	0.37	
8"	51	0.16	
12"	77	0.1	
*Note: As with all insulating materials, the R-value will vary with age and use conditions.			

Property	Test Method	Test Condition	Result
Air Barrier Certification	ASTM E 283	Infiltration @ 1.57 psf	1 inch thickness 0.0000 cfm/ft²
	ASTM E 2178	Exfiltration @ 1.57 psf	1 inch thickness 0.0000 cfm/ft²
Water Resistance	AATCC 127-1998	@ 56.5 ft	1 inch thickness No failure
	ASTM E 331	6.24 psf	1 inch thickness No Penetration

Florida Product Approval #9975 for increased wind resistance when installed to the roof deck between the rafters/truss top chords. Plywood decks rated to 190 psf OSB decks rated to 200 psf.

InsulStar® provides the Secondary Water Resistive Barrier

InsulStar® closed cell spray foam system is an approved Air Barrier material per the Air Barrier Association of America (ABAA) and is certified per AC 71 as a Water Resistive Material when installed on the exterior side of walls. Exterior wall coverings of this spray foam system may be restricted. Contact NCFI for the current approvals.

Read This Before You Buy

What you should know about R values

The chart shows R value of this insulation. R value means resistance to heat flow. The higher the R value, the greater the insulating power. Compare insulation R values before you buy. There are other factors to consider. The amount of insulation you need depends mainly on the climate you live in. Also, your fuel savings from insulation will depend upon the climate, the type and size of your house, the amount of insulation already in your house, and your fuel use patterns and family size. If you buy too much insulation, it will cost you more than what you'll save on fuel. To get the marked R-value, it is essential that this insulation be installed properly.

InsulStar® Application Information

STORAGE AND USE OF CHEMICALS:
The InsulStar® chemicals should be between 65°F and 80°F for proper processing through the spray equipment. Chemicals shipped during winter or summer months may need extra time in moderate temperature storage to stabilize back in the proper application range. Cold chemicals can cause poor mixing, pump cavitation or other process problems due to higher viscosity at lower temperatures. Storing chemicals above 90°F should be avoided as much as possible. Excessively warm chemicals should be cooled prior to opening the drums. Do not store in direct sunlight. Keep drums tightly closed when not in use and under dry air or nitrogen pressure of 2-3 psi after they have been opened. The shelf life of InsulStar® is six months

SAFE HANDLING OF LIQUID COMPONENTS:
Use caution in removing bungs from the container. Loosen the small bung first to allow any built-up vapor pressure to stabilize before completely removing. **R component will froth at elevated temperatures.** Avoid prolonged breathing of vapors. In case of chemical contact with eyes, flush with water for at least 15 minutes and get medical attention. For further information refer to www.spraypolyurethane.org, Resources box, "Health and Safety Product Stewardship Workbook for High-Pressure Application of SPF".

APPLICATION GUIDELINES:
InsulStar® is suitable for application to most construction materials including wood, masonry, concrete, and metal. Application can be to the exterior or interior side of wall surfaces. InsulStar® can be applied to surfaces that will be in contact with soil and intermittent contact with water, such as below grade exterior foundation and basement walls or under concrete slab floors. To ensure proper adhesion, all substrate surfaces should be dry, clean of dust or flaking surface rust, ice or frost. All metal surfaces must be free of oil, grease, etc. Uncoated metals may require a primer coat.

No flammable chemicals, such as wasp and hornet sprays, should be sprayed in the area of the foam application 24 hours before the application. No such chemical can be sprayed after the foam application until the foam has cooled to room temperature.

APPLICATION AROUND PLASTIC PIPES:
Based on a series of extensive studies, the InsulStar® system can be applied in contact with PVC, CPVC, ABS, PP-R and PEX plastic pipes. The pipes must not be pressurized during the foam application. Each foam pass shall not exceed 2" thick, and a 10 minute cooling/curing time must be allowed between each subsequent pass. The total foam thickness is limited to that thickness permitted in that area of the building assembly.

APPLICATION AROUND ELECTRICAL WIRES:
Based on NCFI testing, the InsulStar® system can be applied in contact with electrical wires. Spray foam applicators must spray the foam in such a manner that the expanding foam does not stretch and distort the wires. Light gauge wires which will be encapsulated in the foam layer should have the foam installed behind the wires and allowed to cool prior to applying a top layer to cover the wire. Use a shallow lift of 3/4" of foam to cover the wire. Wait the required 10 minutes between passes when adding more foam thickness to achieve the desired R-value.

APPLICATION PASS THICKNESS:
Spraying foam will generate heat. Foam which is applied too thick in single passes can build temperatures which will degrade cell structure and not produce foam with optimum properties. In the most extreme case, InsulStar® could reach dangerously high temperatures inside the finished foam which could lead to splitting, charring, or even spontaneous combustion. The maximum pass thickness for InsulStar® is 2 inches, and a 10 minute cooling time is required before adding additional foam passes. Multiple layers can be applied to reach the desired R-value.

VENTILATION OF SPRAY AREA:
Spraying foam will generate a mist and fumes with a distinct odor. For interior applications the building area must be vented with fresh air to dissipate the odor. The amount of air flow and time for venting will vary based on each situation. A closed attic area may require fans to force air into and out of the space. An open building that does not have the doors and windows installed may have sufficient air flow to vent the odor fairly quickly. Reentry time for closed-in areas being vented with fans is typically about 24 hours. Other workers should remain out of the immediate area during this venting time period.

InsulStar® Application Information

EQUIPMENT AND COMPONENT RATIOS:
It is preferred that this system be processed with Graco Polyurethane Spray Equipment. R-11-016 is connected to the resin pumps with A-11-016 being connected to the isocyanate pumps. The proportioning pump ratio is 1 to 1 by volume. **Graco preheater and hose temperature should be set at 130°F to give a good pattern. Due to equipment variations, the application temperature settings may be adjusted to achieve a good spray pattern.** For higher-pressure settings above 1,000 psi, temperature settings can be slightly lower.

OPTIMUM ADHESION TEMPERATURE OF SURFACE TO BE SPRAYED:
The surface should be between 10°F and 120°F. In this range the warmer the surface, the better the adhesion. NCFI has three grades of InsulStar® foam for this application range: G-series designed for temperatures no lower than 50°F, M-series designed for temperatures as low as 20°F and the X-series, when processing must be conducted down to temperatures as low as 10°F. For best results, when surfaces to be sprayed are cooler than 60°F, a flash coat should be applied with the second coat following as soon as the original coat is no longer tacky to the touch.

BACTERIA AND FUNGUS RESISTANCE:
InsulStar® is formulated with an anti-microbial ingredient to inhibit the growth of bacteria and fungus (mold). The anti-microbial properties do not protect occupants of spaces insulated with InsulStar® from potential deleterious effects of molds, mold spores, or disease organisms that may be present in the environment.

VAPOR BARRIER PROTECTION ON COLD STORAGE APPLICATIONS:
When InsulStar® is used in structures subject to continuous cold temperatures, such as coolers and freezers, a Class I moisture vapor barrier (0.1 perm or less) is normally required on the "warm" side of the foam insulation. Contact NCFI for specific recommendations.

WEATHER PROTECTION OF FINISHED FOAM ON EXTERIOR APPLICATIONS:
The finished surface of sprayed polyurethane foam should be protected from adverse effects of ultraviolet rays of direct sunlight which can cause dusting and discoloration. Protective coatings designed for use with polyurethane foam are available. On exterior applications where a masonry veneer or mechanically attached covering is to be installed, the InsulStar® foam surface may be exposed to UV light up to 6 months.

CODE-COMPLIANT FIRE RESISTANCE:
Where foam is sprayed over large areas of building interiors, building codes require the installation of an approved thermal barrier between the foam plastic insulation and the interior of the building. ½" gypsum board or other tested and approved material may be installed as a thermal barrier. Refer to specific building codes for details. When Fire Resistive Wall Assemblies are required, contact NCFI Polyurethanes for specific alternate approvals for InsulBloc®.

OTHER APPLICATION AND SAFETY CONSIDERATIONS:
Before InsulStar® is to be applied, there are many safety and application situations to consider. All spray foam applicators must evaluate the job prior to beginning the spray foam application. It is impossible to anticipate every issue and provide explicit guidance in this product data sheet. If there is a question regarding some aspect of the planned application, consult with NCFI for more guidance. The NCFI Product Stewardship Manual contains additional information and should be reviewed often enough by all spray foam applicators to remain familiar with the contents. The American Chemistry Council (ACC), the Center for Polyurethanes Industry (CPI) and the Spray Polyurethane Foam Alliance (SPFA) also publish information regarding the safe handling and application of spray foam chemicals.
If there are any questions regarding the application of the InsulStar® system, contact an NCFI representative.

Certificate of Completion

Is hereby awarded to

Oscar A. Contreras

for successfully completing the

Spray Foam Technician Certification

on this 16th day of May, 2016

Randall Williamson - Regional President

IBP

Training Operations Center

- Branch Manager