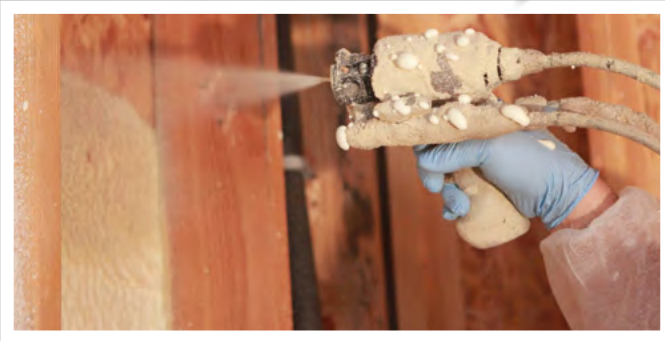




E-book / Reference Guide

# Spray Polyurethane Foam Insulation ENGINEERED THERMAL PERFORMANCE (ETP)



**PROSEAL™** Closed-Cell Polyurethane    **PROFILL™** Open-Cell Polyurethane    **PROFILL PLUS™** Open-Cell Polyurethane

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## Engineered Thermal Performance of Spray Foam Insulation

**QUESTION: What documents/information exists to help show the performance insulation value of sprayfoam over r value alone of fiberglass?**

From: Steve Loftis <Steve.Loftis@ncfi.net>  
To: Ted Medford (ted@profoam.com)

Ted,  
The best document we have is the Roanoke Case Study attached here.  
I also attached some of our ETP documents.

This is a very tricky issue. One has to be very careful with the language. The Federal Trade Commission prohibits speaking about an “equivalent R value”.

Attached are documents NCFI created almost 10 years ago based on testing of whole wall assemblies constructed with the current building practices...i.e. air leaky walls. The “performance” of the SPF walls was superior to fiberglass batt in leaky walls. So we coined the phrase...”Engineered Thermal Performance” or ETP.

SPFA funded the initial study and testing of multiple walls, which showed a much better thermal performance for the SPF insulated walls. This involved testing walls with equal values of fiberglass and SPF, open and closed cell, R 19 and R13 walls. But there was no “equivalent” testing done. So the program ended there. So NCFI took that data and tested walls with less R value of spray foam attempting to match the performance of R 13 and R 19 fiberglass walls. No other SPF company did this work. It was there for all to use, but only NCFI funded more testing. We were then able to show that a wall with less rated R value of spray foam would reduce the heat loss of a wall as much as a wall with R 13 or 19 fiberglass batt. So the R value is lower, but the performance is “equal to or better”...or ETP.

**If any spray foam applicators tells a builder or home owner...the foam is at 1 1/2” (R10) is equivalent to the R 13 fiberglass batt they are breaking the law.**

R value is R value....ETP is “Performance”.



Some local code enforcement officials would permit lower thicknesses of the SPF be substituted for the code prescribed R value batts. Other areas would not. In a few locations, this is still being used today.

**The most effective use of the ETP information today is showing homeowners/builders that if they choose SPF insulation installed to the required R value (as would be a fiber based insulation), they will get greater Thermal performance.....and Savings on Energy Cost!**

Houses built today with the current level of Air Tightness per 2012 and 2015 model codes would not be expected to have the same level of superior performance with SPF in the walls from a fiber based insulation. This would take another series of “whole wall assembly testing”. I am not aware of any company or organization offering to pay for such testing.

SPFA is participating in a long term study at Syracuse University....looking at the performance of many different wall assemblies with all types of insulation and building materials. This program is ongoing for the past couple of years, but we don't have any data to report. Many of those walls utilized exterior foam insulation boards. They used different framing sizes and techniques and various types of stud cavity insulation.

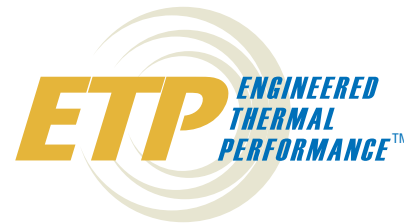
A long answer to your request, but hope it helps.

Steve Loftis  
NCFI Polyurethanes  
Manager of Code & Compliance  
336 783-3442  
800 346-8229 ex 2238  
steve.loftis@ncfi.net



Introducing

# Engineered Thermal Performance™



## NCFI Introduces a Method Based on Full Scale Testing for Calculating the True Performance of Insulation: Engineered Thermal Performance™ with InsulStar® Closed-Cell SPF

Comparing the true performance of fiber insulation with spray foam insulation takes a new way of thinking. R-value, the historical method to rate insulation, only measures one of the many mechanisms of insulation effectiveness. We, along with other industry leaders, believe testing real-world insulation performance requires a more rigorous testing regime: using real world conditions in large-scale wall assemblies with air and moisture penetration just like all homes and buildings. The results would realistically show relative insulation performance under those conditions, and how to maximize the insulation investment to meet the building code requirements. We call it Engineered Thermal Performance™.

We participated with Architectural Testing, Inc. (ATI), a nationally-recognized, fully accredited independent laboratory, to evaluate different insulations under a variety of conditions. ATI studied the true performance of spray foam insulation versus fiber insulation products in whole-wall assemblies. The results of this extensive test program prove that code-compliant thicknesses of SPF insulation can be designed into wall assemblies based on Engineered Thermal Performance™ (ETP™) that perform at the same levels of labeled insulation R-values.

According to Craig DeWitt, Ph.D., P.E., "the data show 1.5 inches of InsulStar® closed-cell SPF insulation in a wall will meet the thermal performance requirements of a similar wall with code-required R-13 insulation. A wall containing 2 inches of InsulStar® insulation will meet the thermal performance requirement of code-required R-19 insulation. In addition, 2 inches or more of InsulStar® will meet the insulation requirements for R-21 insulation." NCFI is proud to pioneer the process of Engineered Thermal Performance™ and products that best represent it.

### CODE COMPLIANCE

ETP™ is an ideal way to provide for the International Energy Conservation Code's performance path to compliance. The ATI data unequivocally demonstrates the greater insulation effectiveness of InsulStar® over fibrous insulations. Through the use of Engineered Thermal Performance™, builders can meet code-required energy efficiency with less foam insulation thickness.

IRC Requirement*	InsulStar® ETP™
R-13	1.5"
R-21	2"

\*IRC - the International Residential Code published by the International Code Council



NCFI Polyurethanes  
Div. of BMC  
P.O.Box 1528  
Mount Airy, NC 27030

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**RLC ENGINEERING, LLC**  
 DEDICATED TO IMPROVING THE PERFORMANCE OF  
 RESIDENTIAL AND LIGHT COMMERCIAL BUILDINGS

MEMORANDUM

DATE: August 12, 2008  
 TO: Building Code Officials  
 FROM: Craig DeWitt, Ph.D., P.E.  
 SUBJECT: **InsulStar®** Insulation



NCFI's **InsulStar** Spray-in-place Polyurethane Foam (SPF) insulation was tested in wall panels using ASTM C 1363-05. Based on this testing, the Engineered Thermal Performance™ of InsulStar SPF in the following thicknesses meets the requirements of 2006 IRC Section N1102.1.1 and **Wood Frame Wall, Floor, Basement Wall and Crawl Space Wall R-values** in Table N1102.1.

<u>IRC Requirement</u>	<u>InsulStar Thickness - nominal</u>
R-13	1.5" or thicker
R-19	2" nominal
R-21	2" or greater



SPECIALIZING IN WOOD, MOISTURE  
 & ENERGY ISSUES

Introducing

# Engineered Thermal Performance™



## NCFI Introduces a Method Based on Full Scale Testing for Calculating the True Performance of Insulation: Engineered Thermal Performance™ with Sealite™ Open-Cell SPF

Comparing the true performance of fiber insulation with spray foam insulation takes a new way of thinking. R-value, the historical method to rate insulation, only measures one of the many mechanisms of insulation effectiveness. We, along with other industry leaders, believe testing real-world insulation performance requires a more rigorous testing regime: using real world conditions in large-scale wall assemblies with air and moisture penetration just like all homes and buildings. The results would realistically show relative insulation performance under those conditions, and how to maximize the insulation investment to meet the building code requirements. We call it Engineered Thermal Performance™.

We participated with Architectural Testing, Inc. (ATI), a nationally-recognized, fully accredited independent laboratory, to evaluate different insulations under a variety of conditions. ATI studied the true performance of spray foam insulation versus fiber insulation products in whole-wall assemblies. The results of this extensive test program prove that code-compliant thicknesses of SPF insulation can be designed into wall assemblies, based on Engineered Thermal Performance™ (ETP™) that perform at the same levels of labeled insulation R-values.

According to Craig DeWitt, Ph.D., P.E., "the data show 3.25 inches of Sealite™ open-cell SPF insulation in a wall will meet the thermal performance requirements of a similar wall with code-required R-13 insulation. A wall containing 4 inches of Sealite™ insulation will meet the thermal performance requirement of code-required R-19 insulation. In addition, 4 or more inches of Sealite™ will meet the insulation requirements for R-21 insulation." NCFI is proud to pioneer the process of Engineered Thermal Performance™ and the products that best represent it.

### CODE COMPLIANCE

ETP™ is an ideal way to provide for the International Energy Conservation Code's performance path to compliance. The ATI data unequivocally demonstrates the greater insulation effectiveness of Sealite™ over fibrous insulations. Through the use of Engineered Thermal Performance™, builders can meet code-required energy efficiency with less foam insulation thickness.

IRC Requirement*	Sealite™ ETP™
R-13	3.25"
R-21	4"

\*IRC - the International Residential Code published by the International Code Council



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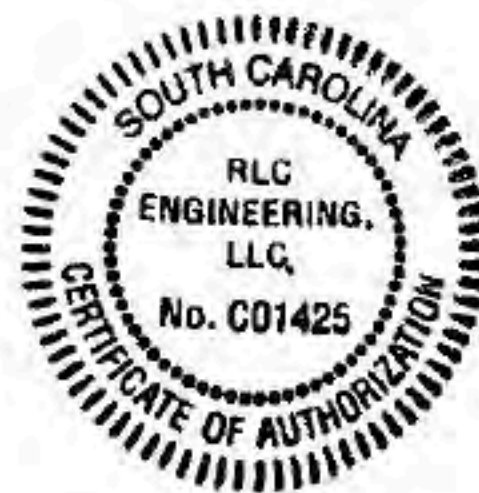
MEMORANDUM

DATE: August 12, 2008  
 TO: Building Code Officials  
 FROM: Craig DeWitt, Ph.D., P.E.  
 SUBJECT: Sealite™ Insulation



NCFI's Sealite Spray-in-place Polyurethane Foam (SPF) insulation was tested in wall panels using ASTM C 1363-05. Based on this testing, the Engineered Thermal Performance™ of Sealite SPF in the following thicknesses meets the requirements of 2006 IRC Section N1102.1.1 and **Wood Frame Wall, Floor, Basement Wall and Crawl Space Wall R-values in Table N1102.1.**

<u>IRC Requirement</u>	<u>Sealite Thickness - nominal</u>
R-13	Greater than 3 ¼" thick
R-19	4" nominal
R-21	Greater than 4" thick



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 & ENERGY ISSUES

## Case Study

### Homeowner Minimizes Energy Consumption with NCFI Spray Polyurethane Insulation System

Location: Roanoke, VA area

When John and Anne Bowling retired to the Roanoke, Virginia area from Memphis, Tennessee in 1997, they brought with them an insulation idea popular in Memphis: NCFI sprayed-in-place polyurethane insulation. The Bowlings specified the spray polyurethane system to insulate and reduce air infiltration in their new home.

“Spray polyurethane insulation is very common in Memphis,” says John Bowling, “and our house plans were drawn up that way.” The Bowlings contacted North Carolina Foam Industries to recommend a spray polyurethane insulation applicator. “The installation went great. The applicators were

cracks and crevasses in the stud wall cavity. In this manner, air leaks and air infiltration are virtually eliminated. The closed-cell

**Based on this comparison, the Bowlings are using 42% of the propane used by their neighbors.**

foam also provides excellent insulation. “With the 2 ½-inch thickness within our walls we’re getting an R-value of over 16,” says Bowling.

NCFI spray-applied polyurethane insulation has been in use since 1967. The combined features of full adhesion, sealing, strength, and insulation make it the material of choice for a variety of applications. NCFI spray polyurethane’s use in new residential construction has recently skyrocketed due to increasing consumer awareness.

“As I looked at it,” says Bowling, “our energy efficient house will pay for this, especially in this climate with its strong winds. It’ll keep our energy bills low.”

And indeed it has. The Bowling’s home is a 2,240 square-foot ranch heated with liquid propane gas. The low fuel consumption of the Bowling home recently attracted the attention of the High-

land Propane Company, the local propane supplier. Between August 2000 and July 2001, the Highland Propane Company delivered 321 gallons of propane to the Bowling house.

For comparison, gas deliveries to ten similar homes, in the Roanoke area, insulated with conventional materials were examined. After adjustments for appliance differences, the gas deliveries varied between 456 gallons and 1230 gallons and averaged 769 gallons for the same one-year period.



very professional and finished the complete job in less than a day. I think it’s great, I didn’t know they could spray it that quick,” continues Bowling.

NCFI spray applied polyurethane insulation is sprayed on as a liquid which immediately rises in place to fill and seal all the



**Application of NCFI spray insulation to stud wall cavity.**



# NCFI RESIDENTIAL INSULATION CASE STUDY

**TABLE 1**  
Estimated Savings and  
Payback Periods

Cost of Propane (\$ per gal.)	Estimated Annual Savings	Estimated Payback Period (years)
1.20	\$ 537.60	2.8
1.40	\$ 627.20	2.4
1.60	\$ 716.80	2.1
1.80	\$ 806.40	1.9
2.00	\$ 896.00	1.7

This analysis simply compares one homeowner's experience with other in the same area. The energy savings illustrated here may or may not be realized in other cases. Energy consumption is influenced by many factors other than insulation and air infiltration.



Using products with the Energy Star® label can save energy. Saving energy reduces air pollution and lowers utility bills. As an Energy Star Partner, NCFI has determined that this product can significantly contribute to meeting the Energy Star guidelines for energy efficiency.



Based on this comparison, the Bowlings are using 42% of the propane used by their neighbors.

The actual savings and the payback period depend, of course, on the price the Bowlings pay for propane. The price of propane varies from season to season and year to year. Table 1 illustrates the annual savings and the payback period the Bowlings should expect based on various prices for propane. (The payback period is based on an estimate that the spray foam insulation cost \$1,500 more than conventional insulation would have cost.)

In addition to high R-value, NCFI spray insulation is an extremely efficient insulation because it is:

Closed cell: Air cannot flow through the insulation

Fully adhered: Air cannot bypass the insulation.

While NCFI spray insulation has a very high R-value, R-value is not the only factor affecting insulation efficiency. Homes insulated with NCFI spray polyurethane insula-

tion will consistently outperform homes insulated with glass fiber batts, even with equal R-value in the walls. The reason is air flow. When the wind blows, the thermal efficiency of glass fiber batts plummets. Costly house wraps, with their seams and imperfections, cannot compensate for this loss in efficiency.

**Homeowner's insulation investment yields payback every month**

With NCFI spray insulation, high thermal efficiency is maintained, regardless of the weather, and house wraps are not needed.

Conserving energy reduces fossil fuel consumption and the attendant pollution. Building your home to be comfortable for your family and friendly to the environment will actually pay for itself and save you money as long as you live in your house.

## WHEN JUST INSULATION ISN'T ENOUGH®



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