



Performance You Can Rely On

Smart Insulation by Neopor® GPS.



 **BASF**
We create chemistry

CONTENTS

Table of Contents	Page 2
Good Reasons to Choose Neopor GPS	Page 3
Stability and Durability	Page 4
Moisture Management	Page 6
Adaptable to all climate zones	Page 7
Resource-efficient	Page 8
– Neopor GPS – A strong contribution to sustainable construction	Page 9
– Neopor GPS demonstrates low Global Warming Potential (GWP)	Page 10
Third-party validated and certified	Page 11
Reference Projects made of Neopor GPS	Page 12
Neopor GPS – From Top to Bottom	Page 16
Applications with Neopor GPS	Page 18
– Continuous Insulation Sheathing (CIS), Basement Wall and Basement Ceiling	Page 18
– Commercial Roof (Flat Roof) and Pitch Roof (Unvented / Vented)	Page 19
– Under Slab, Perimeter and Foundation	Page 20
– Attic and Insulating Concrete Forms (ICF)	Page 21
Neopor GPS Technical Properties	Page 22



GOOD REASONS TO CHOOSE NEOPOR® GPS

THE S.M.A.R.T. INSULATION

Neopor® GPS – the next generation of insulation

Neopor® GPS is a graphite polystyrene (GPS) rigid foam insulation that gives maximum efficiency, cost-effectiveness and sustainability on construction projects. Planners, architects, contractors and builder-owners benefit from insulation made of Neopor GPS because of the special advantages this material offers.

Grey Neopor GPS is comprised of many small pockets of air within a polymer matrix containing graphite. The graphite reflects radiant heat energy like a mirror, increasing the material's resistance to the flow of heat, or R-value.

Most polymer-based foams exhibit a greater ability to slow the movement of heat as the temperature decreases. Neopor GPS is in a unique class because it increases in R-value as the temperature outside drops.

Neopor GPS is S.M.A.R.T. Insulation:

Stability and Durability

Neopor GPS is adaptable in size, thickness, shape and density, providing maximum flexibility and durability. And, Neopor GPS is stable as it consistently delivers the highest true R-value performance over time.

Moisture-management

Neopor GPS is a breathable and semi-permeable high performance insulation that helps reduce the risk of mold, rot and structural damage associated with moisture condensation and long-term water retention.

Adaptable to all climate zones

Neopor GPS powers up when it gets cold outside. Insulating external walls with Neopor GPS increases the temperature of their inside surfaces which helps create a better indoor climate. And, Neopor GPS boards are thinner than others so the same effect is achieved with less material.

Resource-efficient

Neopor GPS uses up to 30% less material than other rigid foam insulation to achieve the same R-value, saving on building materials and installation labor.

Third-party validated and certified

Neopor GPS earned GREENGUARD Gold Certification and has been referenced by both The Collaborative for High Performance Schools (CHPS) and the Leadership in Energy and Environmental Design (LEED®) Building Rating System.

STABILITY AND DURABILITY

NEOPOR® GPS STANDS FOR STRENGTH

Neopor® GPS is adaptable in size, thickness, shape and density. This means you can specify the thickness you need.

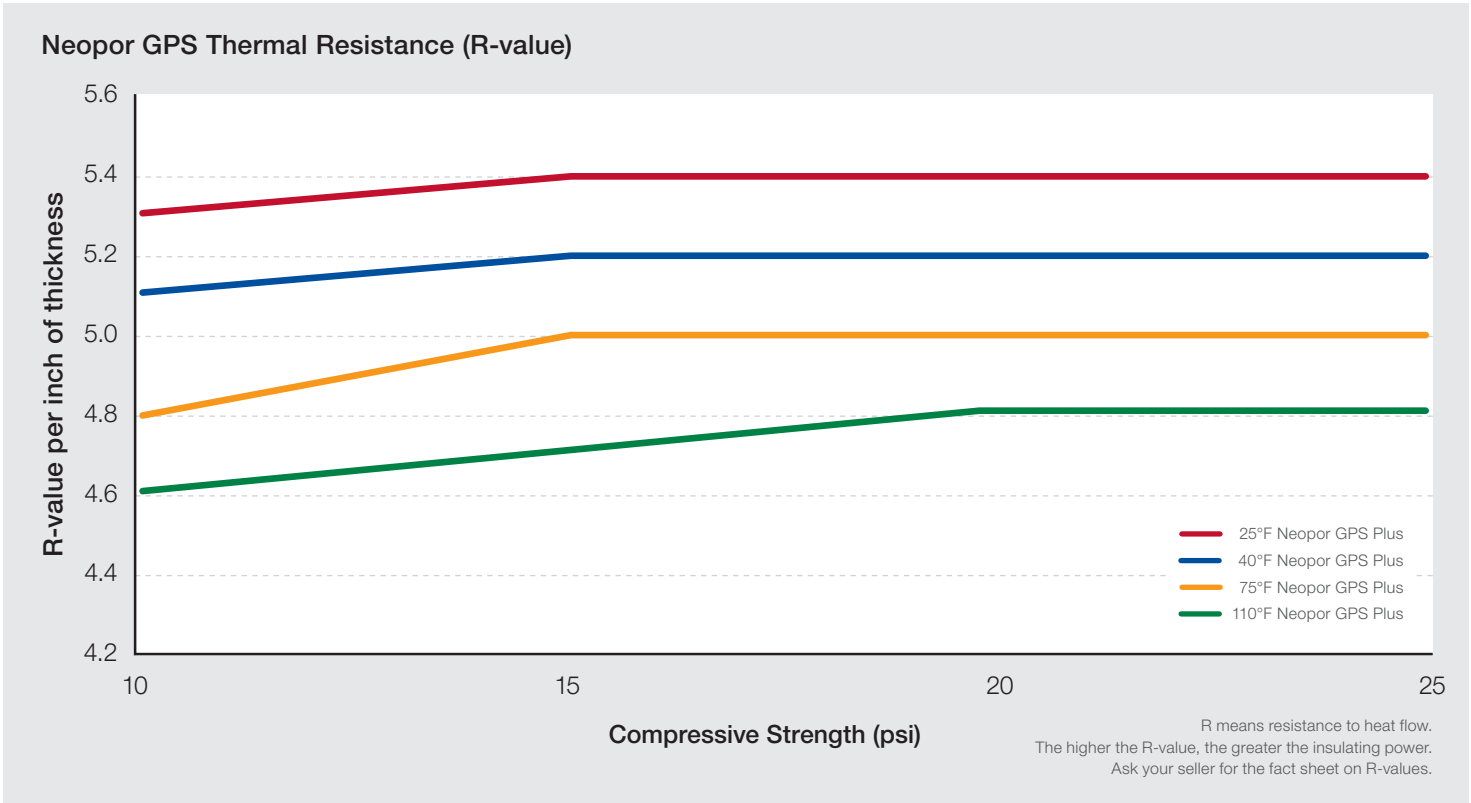
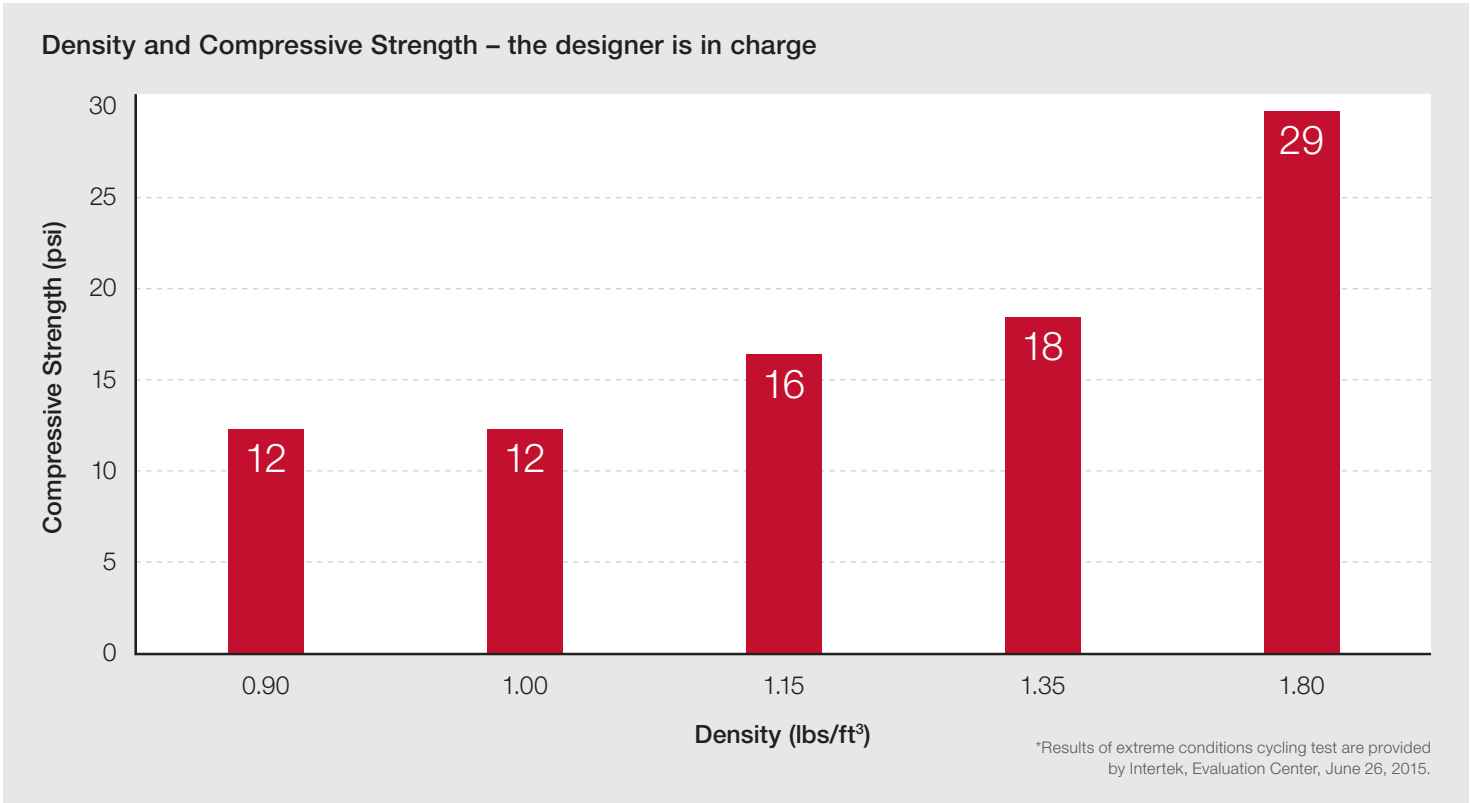
Neopor GPS is versatile. It has numerous applications in building and construction, packaging, cold storage, and more. The material can be shaped or formed to the design needed. It can be wire-cut to incorporate water drainage channels or precisely manufactured for insertion into window

frames. Neopor GPS can also be shape molded with corners, bulk-water management grooves and interlocking features “built-in” such as the interlocking features of Insulated ICF’s made of Neopor GPS.

And, since Neopor GPS can be produced in any density between 0.9 to 2.0 lbs/ft³, Neopor GPS lets insulation manufacturers select the density which affords them the strength and the R-value they need.

In fact, Neopor GPS maintains its ability to slow the movement of heat energy, year after year because it sustains its R-value. Compared to polymer-based foams like extruded polystyrene that use fluorocarbons as an expansion agent and insulating gas, Neopor GPS uses air. This means Neopor GPS maintains its R-value performance at its original level and does not deteriorate over time, a phenomenon called ‘Thermal Drift’.

This, and the material’s other unique attributes, leads to its choice as a specified ingredient in a variety of higher efficiency insulation products and highly engineered components.

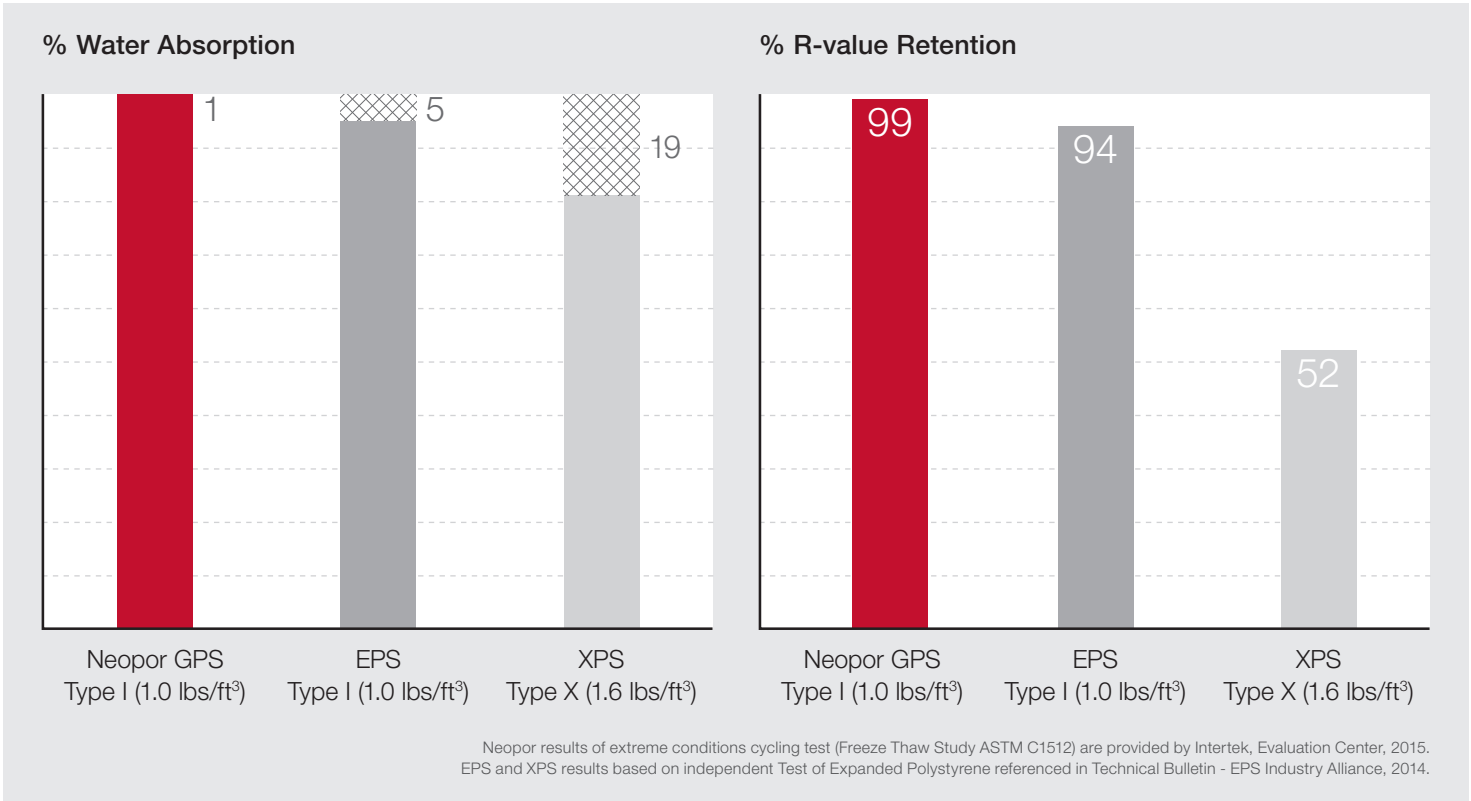


MOISTURE MANAGEMENT

DRYING POTENTIAL OF NEOPOR® GPS

An ideal insulation material has both the ability to shed bulk water and allow water to pass through it. Neopor® GPS does both—and maintains a significant proportion of its original R-value even after extensive contact with water.

Neopor GPS is a breathable and semi-permeable material. As an assembly component or stand alone application, it provides an opportunity for moisture to ‘dry out’. Neopor GPS starts dry and stays dry.



ADAPTABLE TO ALL CLIMATE ZONES

NEOPOR® GPS ‘POWERS UP’ WHEN IT GETS COLD OUTSIDE

Good insulation ensures a pleasant indoor climate

Thermal comfort in a room depends on two factors: the temperature of the air and the surface temperature on the insides of external walls. Insulating external walls increases the temperature of their inside surfaces, which helps create a better indoor climate. Insulation made of Neopor® GPS provides two benefits at once, because of its greater insulating performance, thinner boards achieve the same effect.

Good insulation is also essential for ensuring good hygiene indoors. Mildew can thrive in moist spots inside a house. These can result when condensation forms on cold surfaces. When walls are properly insulated with boards made

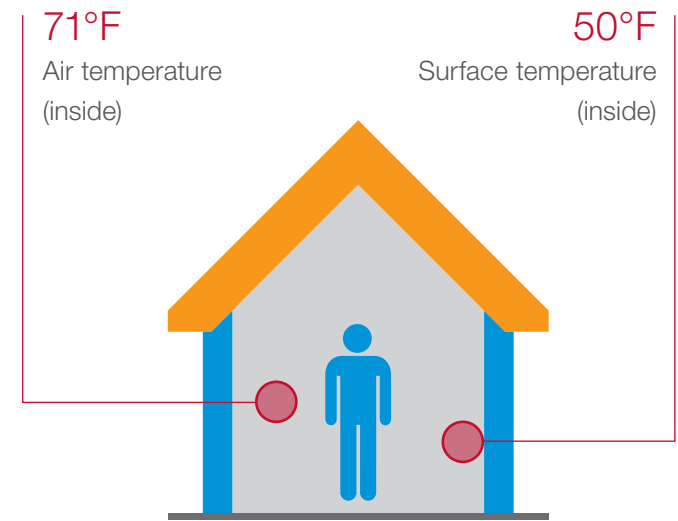
of Neopor GPS, they are warm on the inside and free of thermal bridges. The risk of mildew developing is therefore much smaller than on the insides of uninsulated and cold external walls.

Professional insulation protects the house

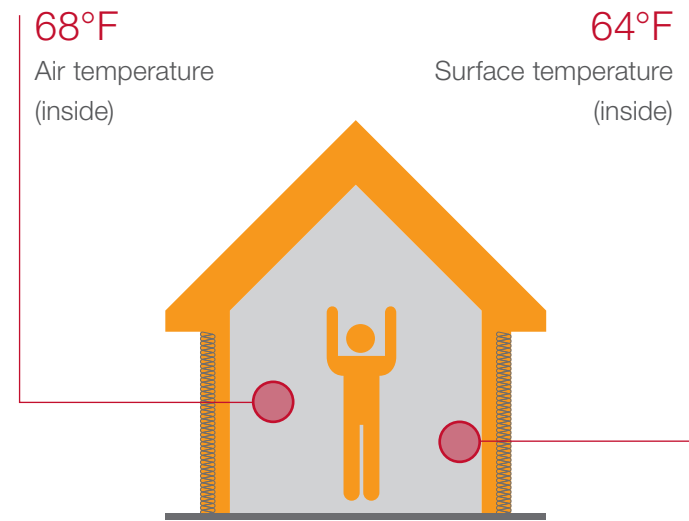
Insulation made of Neopor GPS offers a lot of possibilities when planning new buildings and renovating existing ones. To make sure that insulation has the desired effect of keeping a building in good shape for many years – and, ideally, even increasing its value – it is absolutely essential for the work to be planned and executed by experienced experts.

Thermal comfort – a comparison:

Building **WITHOUT** thermal insulation



Building **WITH** thermal insulation

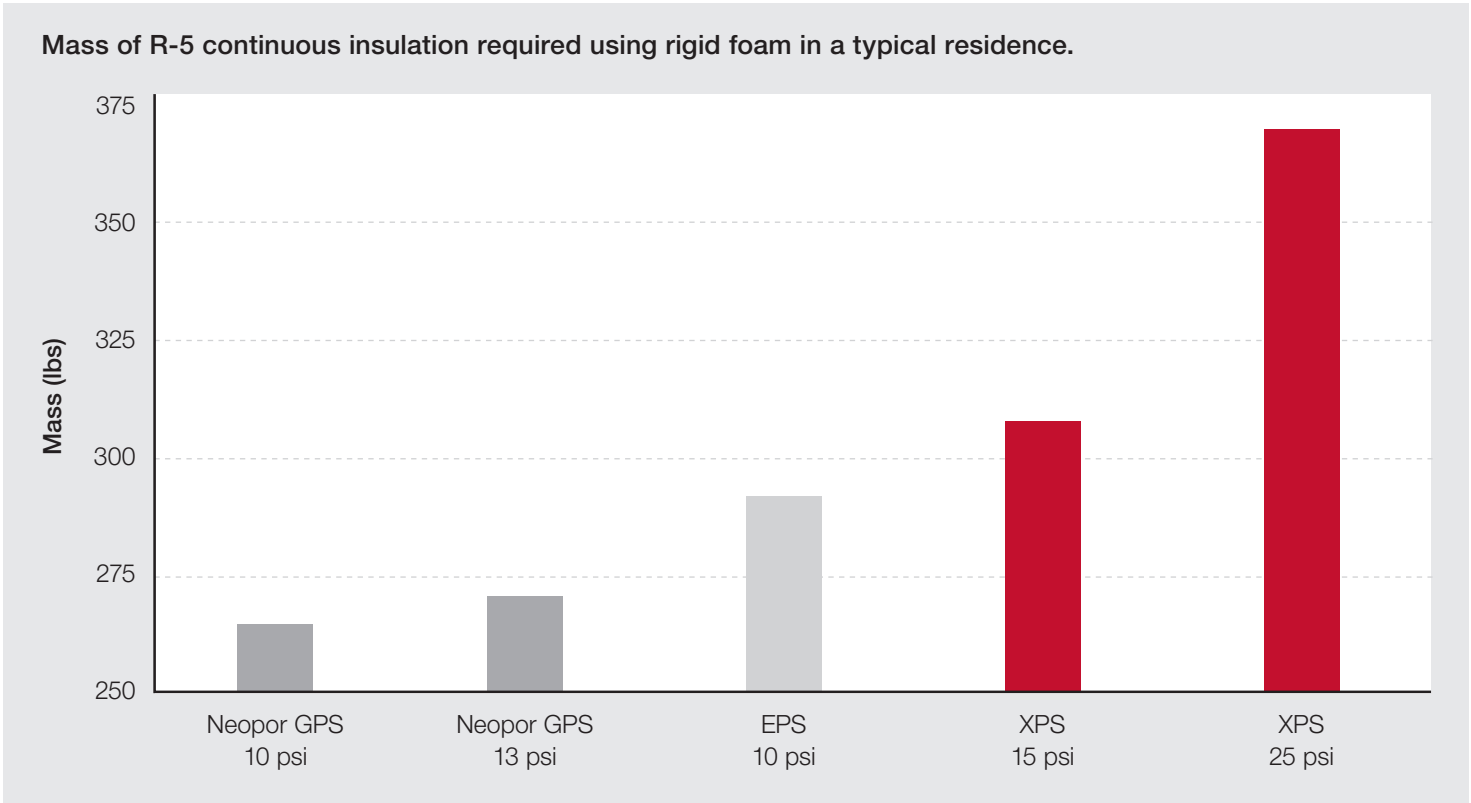
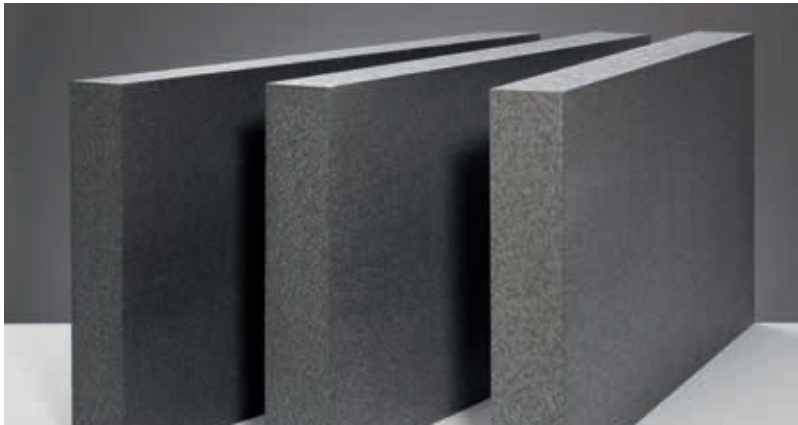


Source: Forschungsinstitut für Wärmeschutz e.V. München, FIW

RESOURCE-EFFICIENT

SPECIFYING NEOPOR® GPS MEANS USING RESOURCES MORE WISELY

Specification of Neopor® GPS can lead up to 30% material savings compared to conventional EPS and XPS. The chart below illustrates the mass (lbs) of various R-5 rigid insulation materials required for a typical 2,000 sq.ft. building (continuous insulation, 75% of exterior surface with 9 ft. tall exterior walls).



NEOPOR® GPS – A STRONG CONTRIBUTION TO SUSTAINABLE CONSTRUCTION

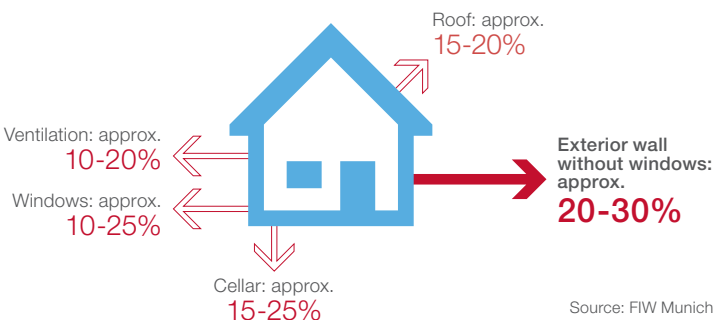
Insulating for the future with Neopor® GPS
To tell whether a building qualifies as sustainable, it has to be assessed in its entirety. Neopor’s exemplary eco-efficiency greatly improves overall sustainability assessments.

Houses mainly lose energy through their outer envelope. In the case of a single-family home, an uninsulated external wall without windows can account for between 20 and 30% of the total energy loss. To achieve energy-saving targets, whether they are prescribed by law or voluntary, Neopor GPS provides solutions to this challenge as numerous reference projects have shown.

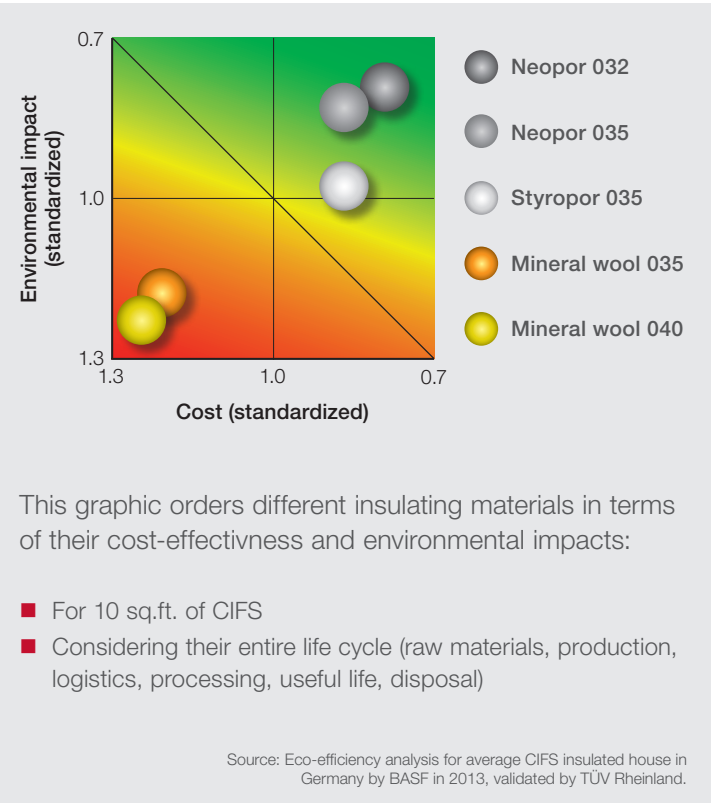
Properly executed and installed insulation made of Neopor GPS lasts for many years and greatly contributes to reducing heating costs.

Especially in the context of integrated concepts for increasing the energy efficiency of new or renovated older buildings, insulation made of Neopor GPS makes good economic sense.

Shares of heat loss in a typical unrenovated single-family home



Exemplary Eco-efficiency
BASF’s patented Eco-efficiency Analysis evaluates efficiency from both an economic and an environmental standpoint. Compared with alternative products, Neopor GPS insulating materials offer greater benefits at lower costs with less environmental impact. Neopor’s advantage is in its performance: its higher R-values means as much as 50% less raw material is needed. This lowers costs, saves resources and reduces the environmental effects of construction. Neopor GPS materials also achieve the same insulation effect at up to 30% thinner profiles, making it a highly eco-efficient insulation for modern thermal protection.



NEOPOR® GPS DEMONSTRATES LOW GLOBAL WARMING POTENTIAL (GWP)

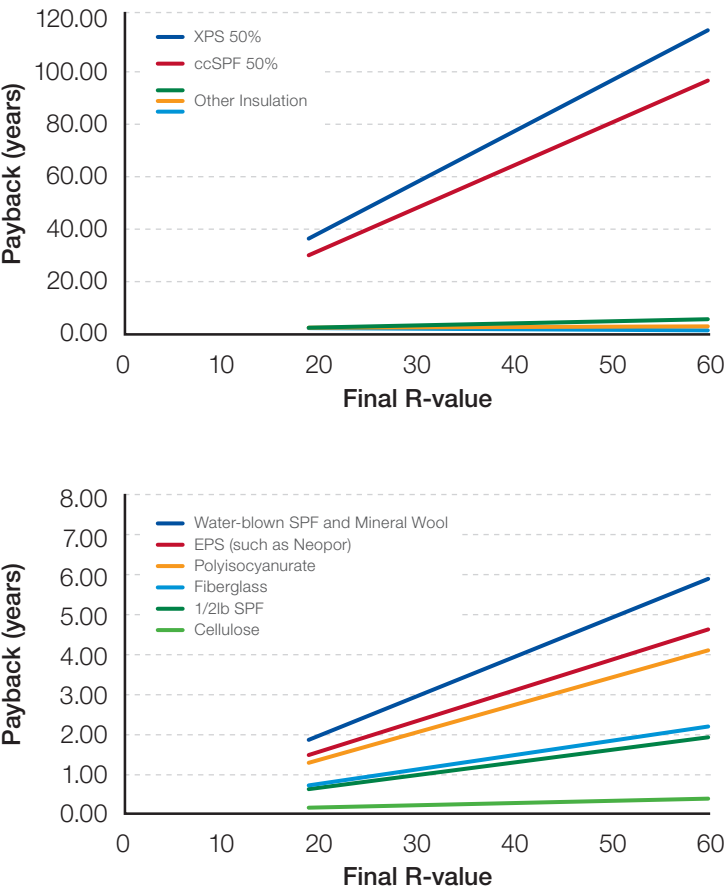
Insulation is key to reducing carbon emissions and global warming potential from buildings by saving energy consumption. On the other hand, all insulation materials take energy to manufacture and transport—something the industry refers to as embodied energy.

The amount of embodied energy depends to a great extent on the blowing agent in insulation material. Designers, architects and builders aiming to minimize the global warming impacts of their buildings should choose non-HFC (hydrofluorocarbon) foam insulation.

Two common foam insulation materials are produced with HFC blowing agents: Extruded polystyrene (XPS) and standard closed-cell spray polyurethane foam (ccSPF). Neopor® GPS is a non-HFC foam insulation and complies with the latest requirements published as part of the Significant New Alternatives Policy (SNAP, 2015) by the Environmental Protection Agency (EPA).

Payback (years) of insulation materials

The graphs show the payback period (in years) of different insulation materials based on their R-value. Payback refers to how many years of energy savings will be required to neutralize the global warming potential of the insulation. Neopor GPS, listed under EPS, with an R-value of 40 will be fully covered after 3 years. In comparison to XPS that will need almost 80 years for the same R-value.



Building Science Corporation at NESEA Building Energy Conference, 2010.

THIRD-PARTY VALIDATED AND CERTIFIED

NEOPOR® GPS MEETS STRINGENT PERFORMANCE STANDARDS

GREENGUARD Gold Certified for indoor air quality

Neopor® GPS has achieved GREENGUARD Gold Certification by UL Environment for products with low chemical emissions.

Products used to build indoor environments can have a significant impact on indoor air pollution levels. Those that have achieved GREENGUARD Certification are scientifically proven to meet some of the most rigorous, third-party chemical emissions standards—helping reduce indoor air pollution and the risk of chemical exposure while aiding in the creation of healthier indoor environments.

Neopor GPS is proven to perform

Neopor GPS meets ASTM C578 Type I, VIII, II, II (1.45 lbs/ft³), IX and CAN/ ULC S701 Type 1,2,3 requirements, complies with ASTM C1512, UL-723, UL S102.2 and is listed in NFRC 101 for use in fenestration products. Neopor GPS is described in ICC-ES ESR 3463, listed with UL and UL Canada under UL ER 5817-02 and listed on the QAI Laboratories Material Directory. The product is fire and code approved by UL and ICC for ASTM E84, NFPA 286 and NFPA 285 for use in commercial cavity wall with a wide range of cladding approvals (i.e. multiple masonry veneer finishes over steel stud frame). The use of Neopor GPS can earn points under the LEED® Energy Performance Process.



See complete UL Classification Marking on the product, product packaging or UL Certificate that accompanies the product.



REFERENCE PROJECTS MADE OF NEOPOR® GPS

BRUNCKVIERTEL DISTRICT IN LUDWIGSHAFEN, GERMANY



FACTS & FIGURES:

Continuous Insulation Finish System (CIFS), roof insulation and basement insulation made of Neopor® GPS

- Originally built in 1930 to accommodate workers
- Work to revitalize the district began in 1996
- Germany's first "three-liter houses"
- Development of innovative system solutions
- Residents involved in planning phase
- Long-term monitoring results in 2013: insulation system intact, reduction in heat consumption even greater than predicted in some cases, high level of tenant satisfaction



"In our climate zone, it's always a good thing when the heat stays inside. And we hardly ever have to turn on the heating, only on a few really cold days in the winter. We've benefitted enormously from the insulation and the ventilation system."

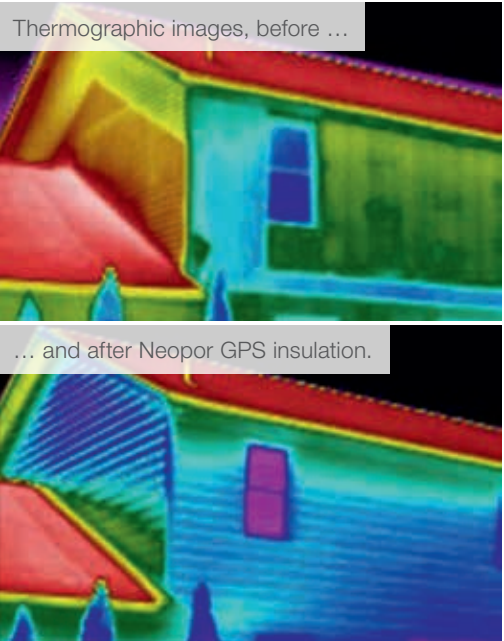
Peter Doland, Tenant

EXTERIOR REMODEL IN BOLIVAR, OHIO

Location: Bolivar, Ohio
Size: 2,500 sq.ft. home
Completed: Summer 2013
Builder: Kraiger Construction Co.



The remodel project in progress.



FACTS & FIGURES:

Exterior remodel features three products made of Neopor® GPS, forming an integrated, highly effective insulation envelope around the exterior of the home

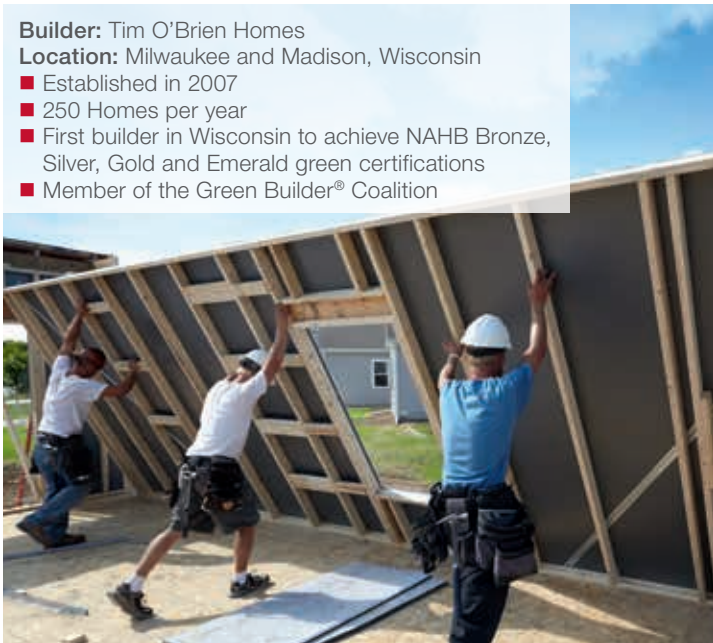
- Halfback H₂O by Progressive Foam Technologies as continuous insulation, which significantly improved the performance of the existing wall insulation
- CraneBoard 7-inch clapboard vinyl siding by Royal Building Products, backed by Solid CoRe insulation — an R-3 insulated siding product that integrates Neopor GPS to further mitigate thermal bridging through the existing wall structure
- Fiberglass entry door by JELD-WEN, which features an insulating core made of Neopor GPS



"We are so pleased with how our project turned out. Our home used to be drafty in the winter, and in the summer we had some rooms that were too warm to enjoy. We have already noticed a difference in the comfort level of our home."

Ben and Kathy Higl, Homeowners

TIM O'BRIEN HOMES IN MILWAUKEE, WISCONSIN



FACTS & FIGURES:
BASF HP+™ Wall System made of Neopor® GPS

- The builder participated in the HP+™ Wall System, which featured advanced framing and incorporated four control layers in a single-wall design to deliver integrated control of heat, air, moisture and vapor flow
- The home achieved a significantly lower HERS score
- The process also enabled the builder to allocate costs in an extremely efficient manner, in some areas reducing both materials and labor
- Plus, since the HP+ Wall System's design capacity has been demonstrated to be 35% greater than the design capacity of a wall built with standard framing and OSB with full sheathing, its installation also positively impacted the home's structural integrity



"Overall, I have to say that it was a wonderful experience from which we learned a great deal that will allow us to achieve higher performance at a price point that delivers outstanding value to our customers. We are proud of the homes we build, and now, with BASF, they're even better."

Tim O'Brien, President, Tim O'Brien Homes

WÄLDERHAUS IN HAMBURG, GERMANY



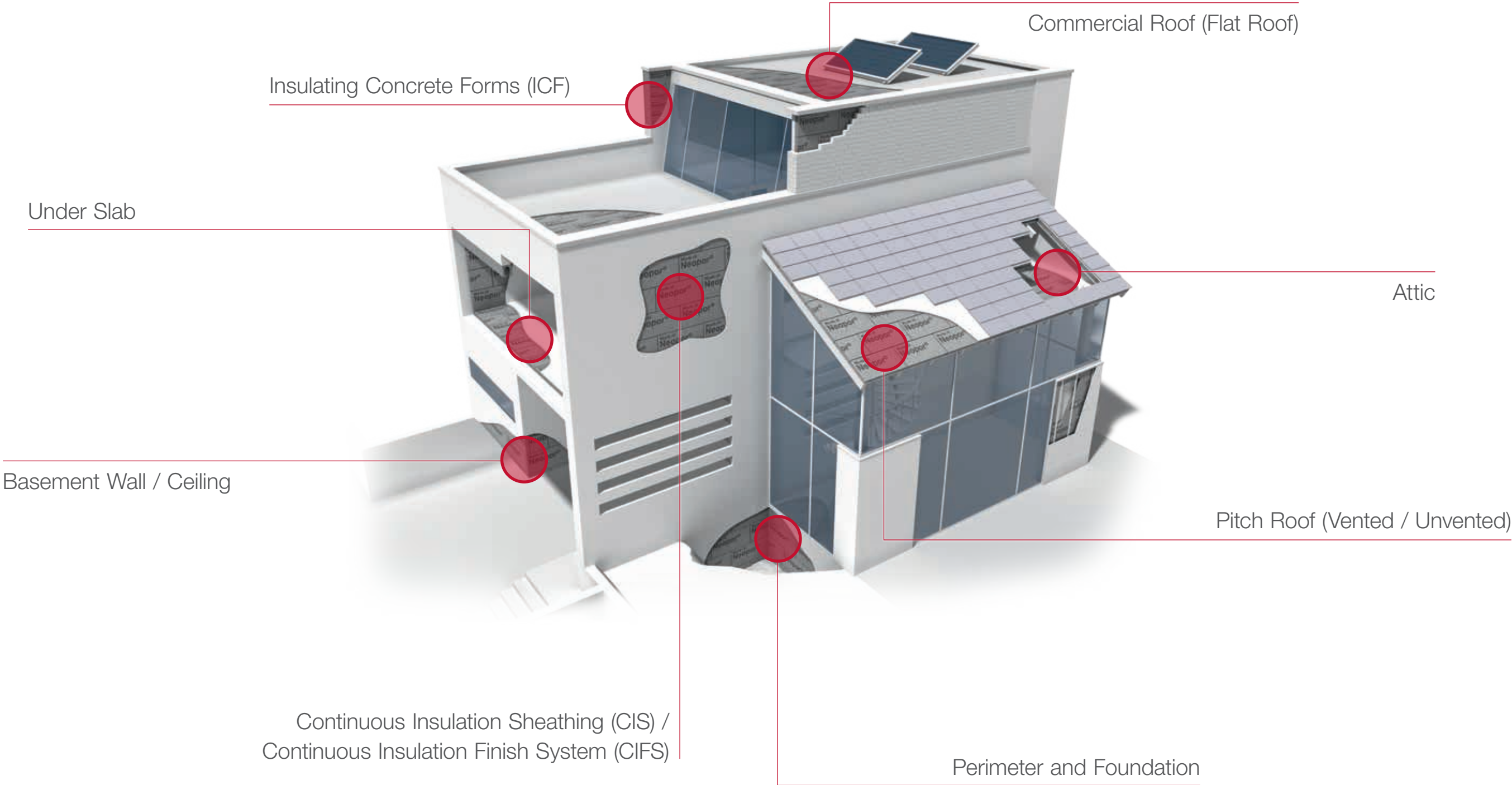
FACTS & FIGURES:
Commercial Roof (Flat Roof) made of Neopor® GPS

- Award-winning project at the 2013 International Building Exhibition in Hamburg
- Builder-owner: Association for the Protection of German Forests, which has the motto "Learning About, Understanding, and Practicing Sustainability"
- The proven excellent eco-efficiency of Neopor GPS supports the goal of sustainability
- Its ease of use enables quick and simple installation on flat roofs
- Its very good insulating properties yield considerable energy savings



NEOPOR® GPS – FROM TOP TO BOTTOM

ONE INSULATION, MANY USES





Continuous Insulation Finishing System (CIFS)



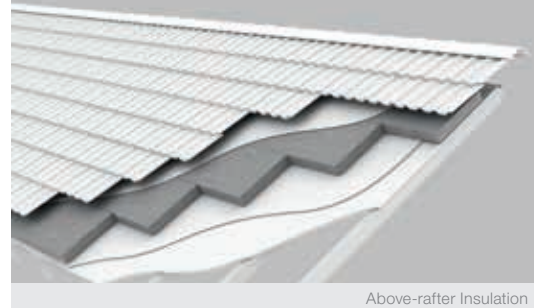
Basement Wall



Basement Ceiling



Commercial Roof (Flat Roof)



Above-rafter Insulation



Between-/Under-rafter Insulation

APPLICATIONS WITH NEOPOR® GPS

CONTINUOUS INSULATION SHEATHING (CIS)

Advantages

- Efficient thermal insulation
- Uncomplicated and economical
- Excellent for facade renovations

Heat lost through wall surface thermal bridging can add up to annual energy losses of 40%. Optimum thermal insulation from Neopor® GPS Continuous Insulation Sheathing (CIS) is the practical way to help reduce such losses. Neopor GPS CIS has excellent structural-physical properties for thermal insulation of residential and commercial exterior walls. By using Neopor GPS CIS, builders can meet the latest energy codes and home owners can benefit from energy savings as well as increased comfort of people inside.

BASEMENT WALL

Advantages

- Rooms heat up quickly
- Simple and cost-effective implementation
- Improved thermal insulation

Internal thermal insulation achieves very good insulation results for new construction or renovation projects wherever external thermal insulation is not an option. Spaces that have to be heated up quickly or only for brief periods of time definitely benefit from interior thermal insulation.

Because of the outstanding thermal insulation properties of Neopor GPS insulating boards, better insulation performance is achieved with smaller thicknesses than other insulation materials. This means less valuable interior space is lost.

BASEMENT CEILING

Advantages

- Improved insulation performance
- Low installation height
- Cool basements, warm living spaces

Basement ceilings can be optimally insulated with insulation boards made of Neopor GPS, the existing ceiling height is only minimally reduced, and as a result, the heating energy consumption is lowered.

COMMERCIAL ROOF (FLAT ROOF)

Flat roofs are subject to high thermal stress and the resulting strains, which has an effect on the roof waterproofing and the building construction. Insulation boards made of Neopor® GPS protect the construction from the effects of temperature fluctuations and ensure reliable thermal insulation. Insulation boards made of Neopor GPS are used for warm roof constructions. They are suitable for almost all conceivable sealing materials, as well as protective and top layers. Environmentally friendly and economical flat roofs are realized with insulation boards made of Neopor GPS. An additional thermal insulation layer with insulation boards made of Neopor GPS is used for roof renovations. This modernizes the flat roof to meet today's thermal insulation standards.

PITCH ROOF (UNVENTED / VENTED)

Above-rafter insulation

From a structural-physical point of view, above-rafter insulation is an optimal construction, since the insulating layer is installed virtually without gaps above the roof construction. In doing so, the visible rafters are integrated as a decorative element in the interior design of the rooms.

In order to optimally fulfill the thermal insulation requirements, insulation materials made of Neopor GPS are installed efficiently in the form of panels or roof elements for above-rafter insulation. Professionally renovated areas under steep roofs offer valuable living space. The sufficiently dimensioned insulation layer made of Neopor GPS is of special importance in this regard: In the summer, living spaces under the roof can stay cooler and in the winter, the thermal insulation can restrict the loss of expensive heating energy.

Between-/Under-rafter insulation

Slotted thermal insulation boards made of Neopor GPS are ideal for between-rafter insulation. Special longitudinal slits make the insulation board flexible and elastic, which enables a perfect fit of the panels between the rafters.

The combination of between- and under-rafter insulation with insulation boards made of Neopor GPS provides increased thermal insulation with minimal installation height. The energetic restoration of the attic with insulation boards made of Neopor GPS provides a healthy and cozy living space and contributes to the conservation of and increase in value of the building.

Advantages

- Reliable thermal insulation
- Economical constructions
- Installation independent of weather conditions

Advantages

- Complete insulation layer
- Water-repellent and open to diffusion
- Easy handling

Advantages

- Dust-free and fast laying
- No skin-irritant effects
- Firm and dimensionally stable



Under Slab



Perimeter and Foundation



Attic



Insulating concrete forms (ICF)

UNDER SLAB

Floor insulation is important for preventing heat loss to the soil substrate. Due to their high compression strength, Neopor® GPS boards are excellently suited for distributing loads when used for this application. Because Neopor GPS insulates more effectively than other insulation materials, thinner boards can be installed. This reduces construction costs in addition to delivering other benefits.

Advantages

- Low water uptake
- Resistant to aging and decay
- High compression strength and bulk density

ATTIC

Regardless of building code requirements, it is recommended for all owners to check the thermal insulation in the attic, which may help to significantly save costs. In many homes, the ceiling of the top floor is poorly insulated or not insulated at all. The attic can be optimally insulated using insulation boards made of Neopor® GPS.

Advantages

- Optimal insulation
- High energy cost savings
- Recommended for older buildings

PERIMETER AND FOUNDATION

Heat loss from heated basements to the surrounding ground can be significantly reduced by installing technically approved Neopor GPS perimeter insulation panels on the exterior of basement walls.

Perimeter insulation panels made of Neopor GPS have good R-values and therefore strong thermal insulation properties. In addition, they are stable under pressure at different installation depths and pressure loads, and are highly resistant to normal soil moisture.

During installation, it is important to follow the specifications of local building codes for the relevant area of application.

Neopor GPS insulation panels also provide the base of a building with effective protection against heat loss.

Perimeter and Foundation insulation panels do not assume functions such as providing drainage or sealing buildings against moisture.

Advantages

- High resistance to normal soil moisture
- Perfect supplement to thermal insulation composite systems

INSULATING CONCRETE FORMS (ICF)

Insulating concrete forms made of Neopor GPS are suitable for all types of building elements, particularly for those requiring thermal insulation and a simple design. They are used as wall and ceiling elements for single-family homes as well as high-rise buildings. They offer enormous potential savings for do-it-yourself builders.

Formwork elements made of Neopor GPS make it possible to build and insulate exterior walls at the same time. The elements are available in various wall thicknesses and designs – for example, lintel elements that are free of thermal bridges, floor surrounds, roller shutter housings, or cantilevers. Thanks to their good thermal-insulating properties, formwork elements made of Neopor GPS are well-suited for the construction of low-energy and passive houses.

Advantages

- No thermal bridges
- High degree of thermal insulation
- Simple and fast handling

NEOPOR® GPS TECHNICAL PROPERTIES

FOR NORTH AMERICA

Neopor® GPS rigid foam is today’s energy-efficient and cost-effective insulation solution for architects, builders and contractors.

Property	Unit	Neopor GPS F5300 Plus				
ASTM C578 Classification		Type I	Type VIII	Type II	Type II+	Type IX
Compressive Resistance	at yield of 10% deformation in psi (min)	10.0	14.0	15.0	20.0	25.0
Thermal Resistance (R-value)	°F · ft² · h/BTU (°C · m²/W) at 75°F	4.8	5.0	5.0	5.0	5.0
	°F · ft² · h/BTU (°C · m²/W) at 40°F	4.9	5.1	5.2	5.2	5.2
Water Vapor Permeance	Max perm (ng/Pa · s · m²)	4.0	3.1	3.1	3.1	2.5
Water Absorption by Total Immersion	Max volume % absorbed	1.1	1.1	1.1	1.1	1.1
Flexural Strength	psi	25.0	32.0	39.0	40.0	50.0
Density	lbs/ ft³ (min)	0.90	1.15	1.35	1.45	1.80

Please note:
R means resistance to heat flow. The higher the R-value, the greater the insulating power. Ask your seller for the fact sheet on R-values.
The technical and physical metrics provided in this table are reference values for insulation products made of Neopor GPS.
The values and properties may vary depending on how they are processed and produced. The R-value properties are based on 1-1/16 in thickness.





Important Note:

While the descriptions, designs, data and information contained herein are presented in good faith and believed to be accurate, they are provided for guidance only. Because many factors may affect processing or application/use, BASF recommends that the reader make tests to determine the suitability of a product for a particular purpose prior to use. NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE REGARDING PRODUCTS DESCRIBED OR DESIGNS, DATA OR INFORMATION SET FORTH, OR THAT THE PRODUCTS, DESCRIPTIONS, DESIGNS, DATA OR INFORMATION MAY BE USED WITHOUT INFRINGING THE INTELLECTUAL PROPERTY RIGHTS OF OTHERS. In no case shall the descriptions, information, data or designs provided be considered a part of BASF's terms and conditions of sale. Further, the descriptions, designs, data and information furnished by BASF hereunder are given gratis and BASF assumes no obligation or liability for the descriptions, designs, data or information given or results obtained, all such being given and accepted at the reader's risk.

Neopor® is a trademark of BASF SE.

ICC-ES is a registered trademark of ICC-ES.

UL® and GREENGUARD are registered trademarks of UL LLC.

QAI is a trademark of QAI Laboratories.

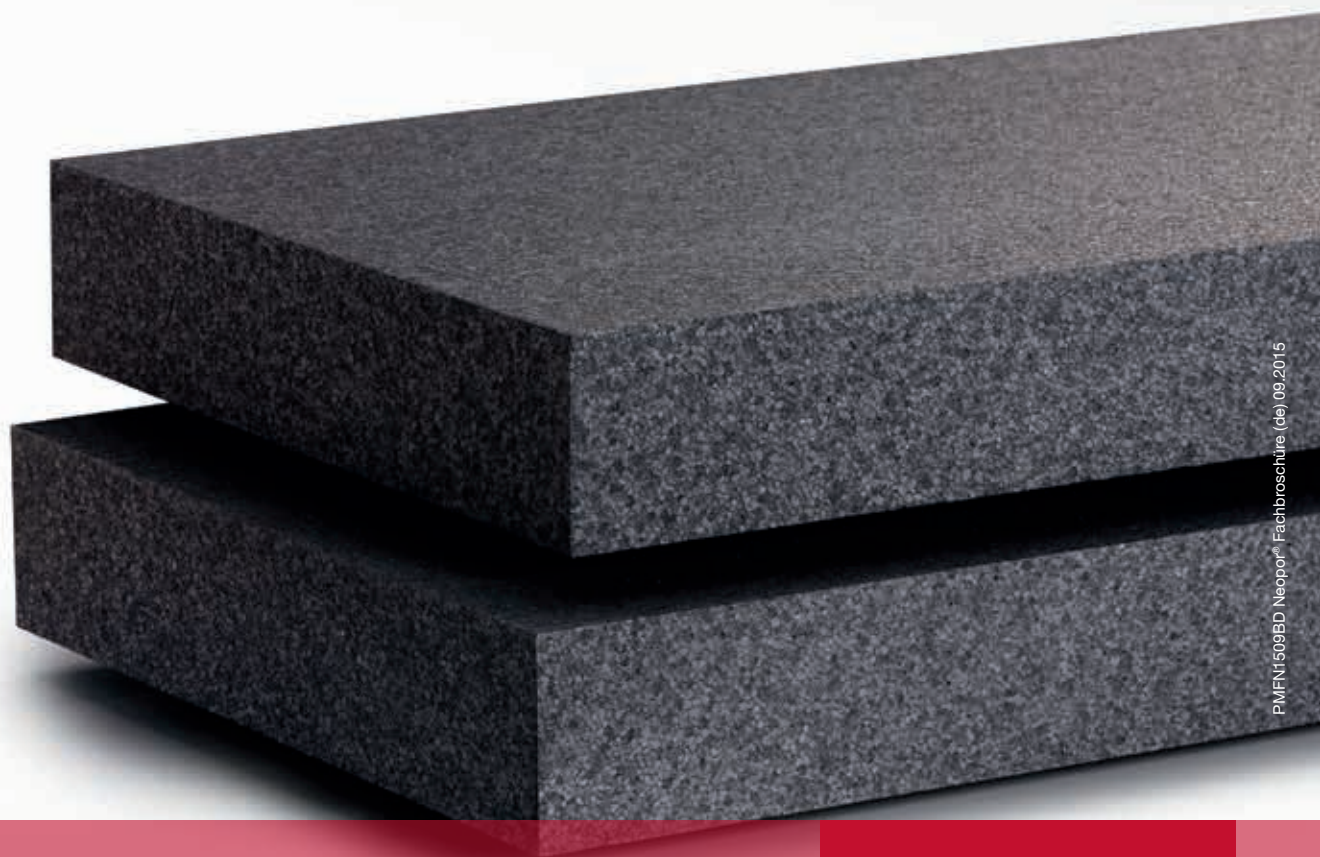
NFRC is a registered trademark of the National Fenestration Rating Council.

LEED® is a registered trademark of the U.S. Green Building Council®.

© BASF Corporation, 2015

BF-10308

Neopor® U.S.A.



PMFN1509BD Neopor® Fachbrochure (de) 09.2015

BASF Corporation

1609 Biddle Avenue

Wyandotte, MI 48192

phone: 800-543-1747

fax: 800-667-4706

email: neopor-us@basf.com

www.Neopor-insulation.com



We create chemistry