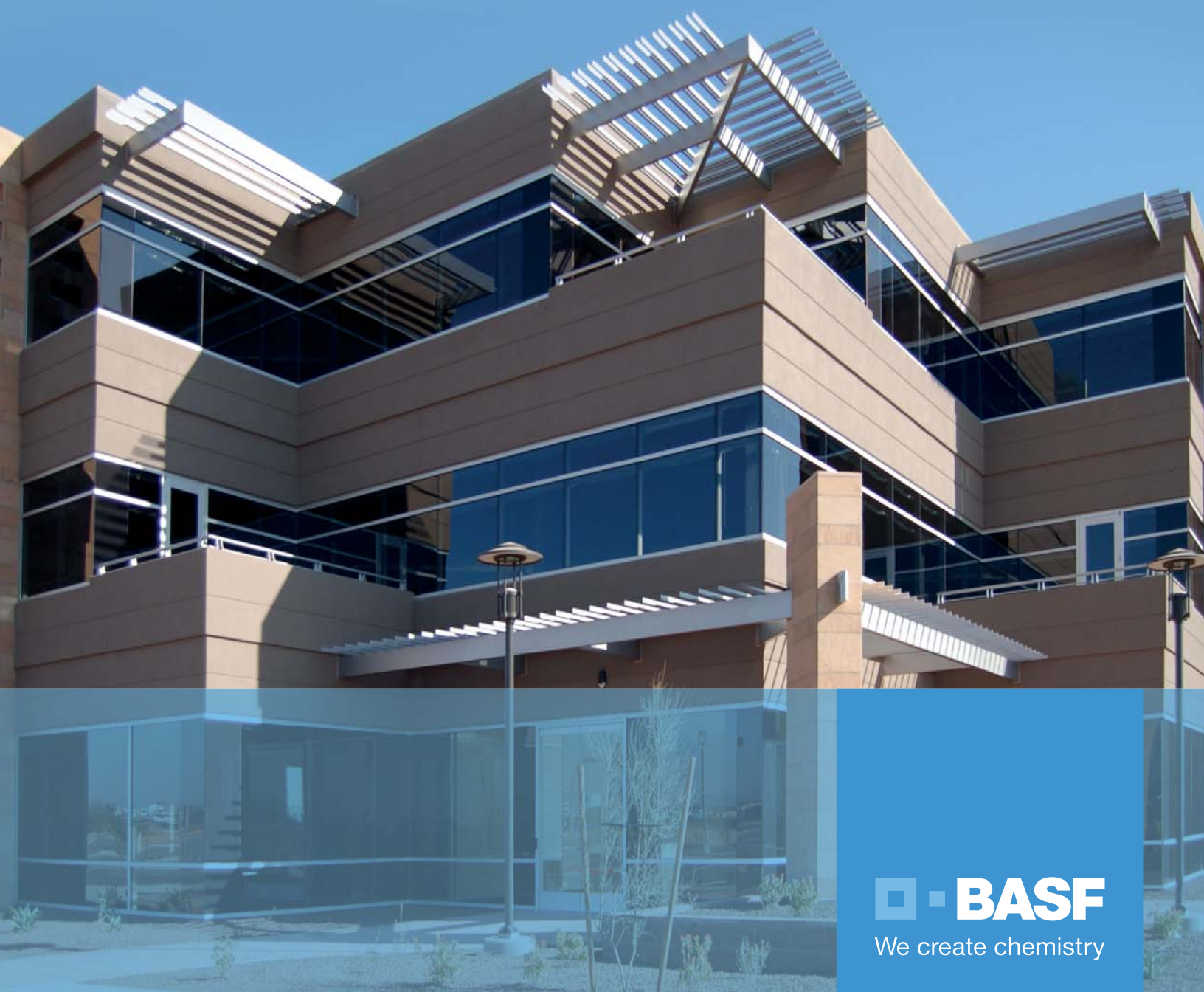


Potential Contributions to LEED

An introduction to the potential contributions our exterior insulation and finish systems (EIFS) can make towards LEED certification.



 **BASF**
We create chemistry

BASF EIFS Potential Contributions to LEED Projects

The LEED Design and Certification Process

The Leadership in Energy and Environmental Design (LEED) for New Construction and Major Renovation rating system, created by the United States Green Building Council (USGBC), provides a set of performance standards for certifying the design and construction phases of commercial, institutional and high-rise residential buildings. It is a comprehensive rating system that deals with many criteria that are beyond the scope of an exterior wall system. BASF Wall Systems has prepared this brochure as an introduction to the potential contributions our exterior insulation and finish systems (EIFS) can make towards LEED certification.

More information on all LEED programs can be found at www.usgbc.org.

BUILDING PRODUCT SELECTION

Reflecting the fact that every building is unique, LEED points are awarded for buildings that meet specified design and performance criteria. The total design and overall building performance are evaluated, not just the individual parts.

Specific products contribute to LEED ratings in two ways. First, material composition can contribute to an overall score. For example, the recycled material content of a product becomes part of a total recycled material score that may qualify for a LEED point. Second, building products can facilitate attainment of building performance objectives. For instance, a product that adds insulation value contributes to the overall thermal performance of the building envelope, and therefore to attainment of energy consumption objectives.

DESIGN AND CONSTRUCTION PROCESSES

Perhaps the greatest challenge facing the green construction movement is creation of buildings that provide improved environmental performance at a competitive initial cost. This can be addressed through the Integrated Design process.

Integrated Design projects start with a series of charrettes, which are meetings that include architects, building owners, MEP engineers, code/regulatory officials, contractors and other stakeholders. By considering how building systems interact with each other early in the design process, architects are able to create designs that meet functional, environmental and cost objectives.

Once a project has been registered with USGBC, the design team can submit preconstruction data to USGBC for preliminary rulings. No LEED points are awarded at this time. USGBC evaluates this data and issues "Credit Anticipated" or "Credit Denied" rulings that help guide the design team.

After the building is complete, construction and building performance data are submitted to the USGBC, who evaluate the project and awards points. If all LEED prerequisites have been met, a Certified, Silver, Gold or Platinum rating is assigned, based on the total number of points awarded.

Attainment of environmental goals in addition to functional, aesthetic and economic objectives adds a new level of challenge to the architectural design profession. The Integrated Design process provides architects with greater resources by bringing together participants with diverse interests and expertise. Within the Integrated Design process, knowledgeable material selection that contributes toward multiple design objectives is one key factor that influences the degree of success a project will achieve.



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LEED Energy and Atmosphere Credit 1

OPTIMIZE ENERGY PERFORMANCE

As a key component of the building envelope, the most important area where BASF EIFS can contribute to LEED projects is attainment of Energy Performance objectives. Energy and Atmosphere (EA) Credit 1 provides up to 10 points for buildings that demonstrate improvements in energy consumption compared with a baseline case*. Further, as of June 26, 2007, all LEED projects must score a minimum of 2 EA Credit 1 points. That means all LEED-rated new construction projects must demonstrate energy consumption at least 14% lower than the baseline case.

Regardless of the level of energy reduction targeted, creating a tight, highly insulating building envelope is essential. Efficient building envelopes add relatively little cost to a project, and that premium is quickly returned through lower heating/cooling costs. In addition, efficient building envelopes can permit downsizing of HVAC systems. Such downsizing can more than compensate for higher building envelope costs, resulting in lower initial cost, reduced energy consumption and lower operating costs.

High performance BASF EIFS deliver the appearance of traditional materials with lasting energy savings and lower initial cost.

There are two ways to demonstrate improved energy efficiency. To earn up to 10 points under EA Credit 1, a Whole Building Energy Simulation is required. This involves using thermal modeling software to compare the energy performance of a baseline building design with the actual design. Many thermal modeling software systems are available; however, the US Department of Energy's eQuest program fully meets LEED requirements, and can be downloaded free at <http://doe2.com/equest>.

For projects where the complexity of thermal modeling is not warranted, Prescriptive Compliance Options are available. The prescriptive design defined by the *ASHRAE Advanced Energy Design Guide for Small Office Buildings* can be used for office buildings that are less than 20,000 square feet. Compliance with all requirements of the guide will provide 4 points under EA Credit 1. Similarly, for retail buildings with less than 20,000 square feet, the prescriptive design defined by the *ASHRAE Advanced Energy Design Guide for Small Retail Buildings* will become an option once LEED for Retail New Construction has been formally

launched. Both ASHRAE documents can be downloaded free at <http://www.ashrae.org/publications/page/1604>.

Buildings up to 100,000 square feet (excluding health care, warehouse or laboratory projects) can use the *Advanced Buildings Core Performance Guide* created by the New Buildings Institute to attain 2-5 points. Information on the *Core Performance Guide* can be found at: www.advancedbuildings.net.

This lightweight BASF EIFS wall recreates the look of brick and masonry. It features an integral air barrier and high insulation value.



The look of metal composite panels can be created at a very attractive cost, with high insulation value and no thermal bridging.



* Baseline cases must comply with the minimum requirements defined by ASHRAE/IESNA Standard 90.1-2004.

LEED BUILDINGS NEED AIR BARRIERS

Wall cladding design is directly impacted by two aspects of these performance validation methods – air barrier and insulation requirements. All of the Prescriptive Design Guides require the use of air barriers, while energy modeling software incorporates the beneficial effect of air barriers into their thermal performance calculations.

Water drainage EIFS offered by BASF under the Senenergy, Finestone, and Acrocrete brands incorporate fluid-applied air barrier materials that are designed to function as part of an overall air barrier system. These air barrier materials facilitate use of adhesively fastened EIFS, eliminating the need to puncture the air barrier with cladding fasteners. They also act as water-resistant barriers that protect sheathing from incidental moisture intrusion. BASF spray- and roller-applied air barrier materials* are suitable for use behind all cladding materials, allowing the air barrier to be fully installed and inspected before claddings are applied, even on buildings that feature mixed cladding systems.

INSULATION IS A KEY CONSIDERATION

The second aspect of EA Credit 1 that impacts wall claddings relates to insulation of the building envelope. Thermal modeling programs use R-values and U-factors for various materials and wall assemblies that are listed in ASHRAE 90.1-2007 Appendix A. The ASHRAE standard takes into account thermal bridging, where heat is conducted through the wall by studs, particularly those made of metal. Thermal bridging can reduce the effectiveness of cavity insulation by up to 55%, whereas the continuous exterior insulation in a BASF EIFS yields its full R-value.

Prescriptive compliance methods offer the option of defined exterior wall insulation schedules based on wall configuration and climate zone (see Figure 1). For steel and wood framed structures, these schedules call for use of continuous exterior insulation to address thermal bridging, plus additional cavity insulation. While these systems provide the needed insulation value, they are not suitable for all applications. The blend of exterior and cavity insulation can create an inappropriate dew point location within the wall cavity. Economic factors may also come into play.

Architects can select alternative insulation methods as long as they meet maximum U-factor requirements. When a BASF EIFS is used, the optimum solution in most cases is reached by selecting an expanded polystyrene (EPS) insulation thickness that provides the required U-factor.

The labor cost to install 4" of EPS insulation is the same as the cost to install 1", but the added energy savings are substantial.

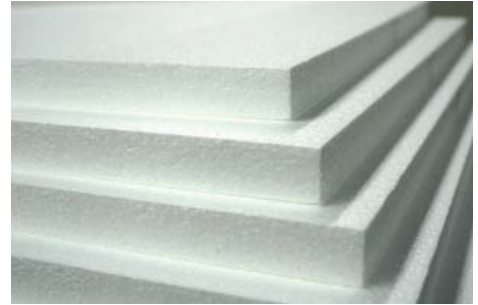


FIGURE 1
Map of U.S. Climatic Zones

- Zone 1
- Zone 2
- Zone 3
- Zone 4
- Zone 5
- Zone 6
- Zone 7
- Zone 8 (Alaska)

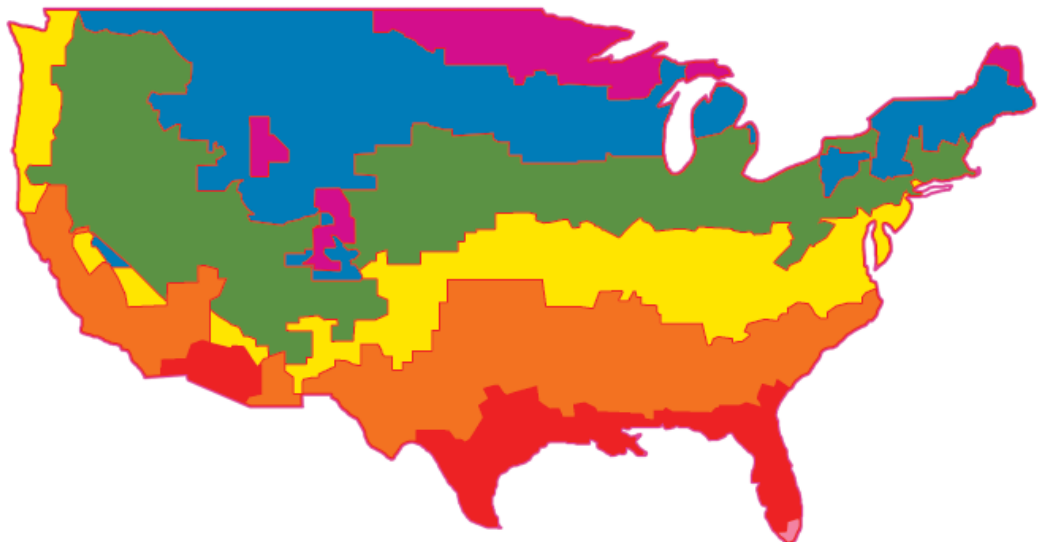


Figure #2 shows the maximum U-factors required by ASHRAE Guides. Since the two prescriptive guides and the ASHRAE 90.1-2007 standard contain slightly different requirements, this table lists the most stringent ASHRAE value for each climate zone. Figure #2 also shows the minimum EPS insulation thickness required in a BASF EIFS to meet these requirements.

Figure #3 shows U-factor and BASF EIFS EPS insulation thickness requirements for the *Advanced Buildings Core Performance Guide*.

In the continental United States, 4" of continuous exterior EPS insulation in a BASF EIFS meets or exceeds all insulation requirements for all prescriptive guides.

Placing all of the insulation outside the wall cavity also reliably moves the dew point outside the sheathing in all climate zones, beyond the air and water-resistive barrier. This minimizes the risk of condensation within the wall cavity.

Since BASF EIFS in all cases use exterior insulation, no additional labor is needed to reach the target insulation value. The cost of adding insulation is limited to the cost of EPS insulation alone. Furthermore, because BASF EIFS are much thinner than masonry walls, the impact on wall thickness is minimized.

While projects that use thermal modeling software to quantify energy consumption have no specific insulation requirements, they also benefit from continuous exterior insulation. The high insulation value of BASF EIFS is captured by thermal models, while the low cost of adding insulation in this way improves project economics.

FIGURE 2
ASHRAE Advanced Energy Design Guide Requirements

Above Grade Wall Maximum Insulation U-Factors

Climate Zone	1	2	3	4	5	6	7	8
Mass, Exterior insulation		U-0.123	U-0.090	U-0.080	U-0.080	U-0.080	U-0.071	U-0.071
Metal Framed	U-0.124	U-0.124	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.040
Wood Framed and other	U-0.089	U-0.089	U-0.089	U-0.064	U-0.051	U-0.051	U-0.051	U-0.045

EPS Thicknesses That Meet All ASHRAE Requirements*

Climate Zone	1	2	3	4	5	6	7	8
Mass, Exterior insulation	1.5"	2"	3"	3.5"	3.5"	3.5"	4"	4"
Metal Framed	1.5"	1.5"	3.5"	3.5"	3.5"	3.5"	3.5"	
Wood Framed and other	2.5"	2.5"	2.5"	3.5"	4"	4"	4"	

Note: Some ASHRAE Design Guides may allow higher U-factors in certain climate zones. The U-factors above represent the most stringent ASHRAE requirements.

FIGURE 3
New Building Institute Core Performance Guide Requirements

Above Grade Wall Maximum Insulation U-Factors

Climate Zone	1	2	3	4	5	6	7	8
Mass, Exterior insulation	U-0.142	U-0.142	U-0.110	U-0.110	U-0.078	U-0.078	U-0.061	U-0.061
Metal Framed	U-0.077	U-0.077	U-0.077	U-0.077	U-0.077	U-0.077	U-0.064	U-0.045
Wood Framed and other	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.059	U-0.038

EPS Thicknesses that Meet All NBI Requirements*

Climate Zone	1	2	3	4	5	6	7	8
Mass, Exterior insulation	1.5"	1.5"	2"	2"	3"	3"	4"	4"
Metal Framed	3"	3"	3"	3"	3"	3"	3.5"	
Wood Framed and other	3.5"	3.5"	3.5"	3.5"	3.5"	3.5"	3.5"	

Note: U-factor conversions to EPS thicknesses are based on values listed in ASHRAE 90.1-2007 Appendix A Tables A3.1D, A3.3 and A3.4. All thicknesses have been rounded up to the nearest 1/2 inch, and meet or exceed prescriptive requirements.

* When used in a BASF EIFS Cladding

LEED Credits Synergistic with EA Credit 1

Other Contributions to LEED Ratings

BUILDING REUSE

Materials and Resources Credits 1.1 and 1.2 provide LEED points for maintaining 75% and 95% of existing walls, floors and roofs respectively. The light weight and ease of installation of BASF EIFS make them an ideal choice for recladding existing buildings, helping to refresh and renew existing structures. In doing so, BASF EIFS lower the U-factor of the building envelope, also contributing to EA Credit 1 described above. Since the energy use reduction required by LEED is less stringent for major renovations compared with new construction, the contribution made by BASF EIFS can be substantial.

THERMAL COMFORT

Environmental Quality EQ Credit 7.1 offers a point under Indoor and HVAC systems. The building envelope must meet the requirements of ASHRAE Standard 55-2004 Thermal Comfort Conditions for Human Occupancy. The carefully integrated design of both building envelope and HVAC systems described under EA Credit 1 above clearly contributes to attainment of EQ Credit 7.1.

RECYCLE CONTENT

Materials and Resources Credits 4.1 and 4.2 provide points for incorporating 10% and 20% post-consumer recycled materials respectively.

To earn this credit, designers teams are advised to keep records documenting the recycle content of heavy materials used in large quantities. Structural steel, concrete, synthetic gypsum board and copper are good examples. Although research targeting incorporation of recycled materials into BASF EIFS products is ongoing, the light weight of BASF EIFS limits the significance of its contribution to this LEED credit.

REGIONAL MATERIALS

Materials and Resources Credits 5.1 and 5.2 offer points for projects that use 10% and 20% respectively of materials “extracted, harvested or recovered, as well as manufactured, within 500 miles of the job site”. BASF operates six (6) manufacturing facilities strategically located throughout North America, using materials extracted from a number of sites. Depending on the location of the project and the products used, BASF wall cladding products may contribute toward these points.

CONSTRUCTION WASTE MANAGEMENT

Materials and Resources Credits 2.1 and 2.2 offer points for diverting 50% and 75% of construction waste respectively from disposal in landfills or incineration. BASF EIFS produce very little waste and all BASF packaging materials – pails, paper and plastic bags and cardboard – are recyclable. EPS insulation scraps are also recyclable.

Outdated, uninviting and lacking continuity, these stores were excellent candidates for renovation with BASF EIFS.



Before

After



BASF EIFS tied the shops together with detailing and harmonious colors and added insulation value.

Conclusions

The benefits of BASF EIFS in LEED projects are derived from their ability to create an exterior appearance that meets the architect's aesthetic objectives while providing high insulation value and an integral air barrier, at a very attractive cost.

By incorporating BASF EIFS in the early stages of a project, design teams can advance multiple project objectives simultaneously. Doing so contributes to overall project success in addition to realization of a targeted LEED rating.

BASF EIFS provide the look that clients want, with the environmental performance and building science design professionals need, at a cost that works for everyone.





References

USGBC New Construction and Major Renovation (Version 2.2) Reference Guide, Third Edition October 2007, www.usgbc.org

Advanced Design Guide for Small Office Buildings, American Society of Heating, Refrigeration and Air Conditioning Engineers, www.ashrae.com
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Advanced Design Guide for Small Retail Buildings, *ibid.*

Advanced Buildings Core Performance Guide, New Buildings Institute, www.advancedbuildings.net

ASHRAE Standard 90.1-2007

BASF Wall Systems is a leader in the EIFS industry, providing EIFS, stucco, specialty finishes and coatings throughout North America under the Acrocrete®, Finestone®, and Senergy® brands. With 6 manufacturing locations, and over 250 points of distribution, BASF Wall Systems is uniquely positioned for excellence in serving the local needs of its customers.



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