The Chemistry of Sustainable Construction

BASF
The Chemical Company

West Virginia University Coliseum features an ELASTOSPRAY® roofing system.

Trump International Hotel and Tower gets its strength from high-performance self-consolidating concrete.

Cooper River Bridge features a BASF latex-modified concrete bridge deck overlay.

The Habben Home is built with structural insulated panels made with BASF polyurethane insulation.

ENERGY EFFICIENCY
DURABILITY
SPEED OF CONSTRUCTION

Chemistry is the building block of construction. It's used in almost every component of every structure—commercial, educational, infrastructure or residential. Chemistry helps save energy. Makes materials stronger. Speeds construction. The ingredients of improved sustainability.

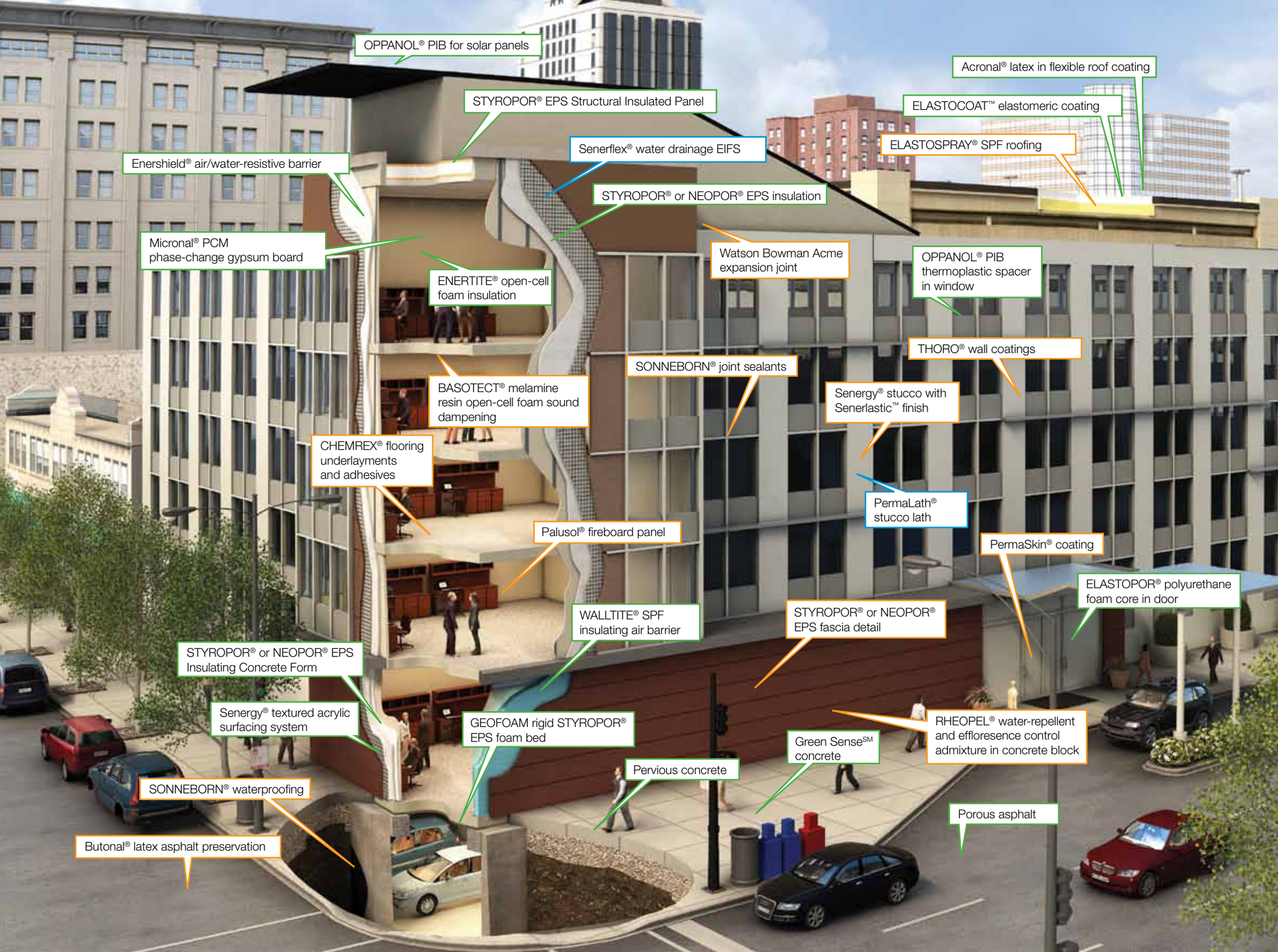
BASF, the world's largest chemical company, is a leader in the construction industry. With more than 600 products serving 75 construction product categories, we offer the broadest portfolio of products used directly on construction sites, or integrated into other products, to improve overall performance.

Our offer extends throughout the building envelope from roof to foundation. In wall systems and insulation. Sealants and adhesives. Concrete and asphalt. In bridges and pavement. In windows and doors. HVAC and plumbing. Interior. Exterior. Cladding. Landscaping. Electronics. Whether new construction, retrofit or historical restoration, BASF chemistry makes a significant contribution to improved performance.

Improved building energy efficiency and life expectancy. Faster construction processes and rapid repairs. Enhanced health, safety and comfort for building occupants. Energy efficiency for accelerated return on investment.

For more than half a century, our construction solutions and chemical ingredients have helped architects, engineers, contractors and builders with their sustainable construction projects by enabling high performance with less material, energy consumption, waste and emissions.

Because at BASF, we create chemistry for a sustainable future.


OPPANOL® PIB for solar panels
STYROPOR® EPS Structural Insulated Panel
Acronal® latex in flexible roof coating
ELASTOCOAT™ elastomeric coating
ELASTOSPRAY® SPF roofing
Senerflex® water drainage EIFS
Enershield® air/water-resistive barrier
STYROPOR® or NEOPOR® EPS insulation
Micronal® PCM phase-change gypsum board
Watson Bowman Acme expansion joint
OPPANOL® PIB thermoplastic spacer in window
ENERTITE® open-cell foam insulation
THORO® wall coatings
SONNEBORN® joint sealants
BASOTECT® melamine resin open-cell foam sound dampening
Senergy® stucco with Senerlastic™ finish
CHEMREX® flooring underlayments and adhesives
PermaLath® stucco lath
Palusol® fireboard panel
PermaSkin® coating
ELASTOPOR® polyurethane foam core in door
WALLTITE® SPF insulating air barrier
STYROPOR® or NEOPOR® EPS fascia detail
STYROPOR® or NEOPOR® EPS Insulating Concrete Form
Senergy® textured acrylic surfacing system
GEOFOAM rigid STYROPOR® EPS foam bed
RHEOPEL® water-repellent and effloresence control admixture in concrete block
Green Sense℠ concrete
Pervious concrete
SONNEBORN® waterproofing
Porous asphalt
Butonal® latex asphalt preservation

This graphic is intended only to illustrate the breadth of the BASF construction portfolio and may not be an accurate design drawing of the structure. Not all materials and systems are necessarily compatible in combination with all other systems shown.

THE CHEMISTRY OF

SUSTAINABLE COMMERCIAL BUILDINGS

Commercial buildings play a vital role in our economy. We work, shop and often play in them. At the same time the 4.8 million commercial buildings in the United States are responsible for more than 20 percent of the nation's total energy consumption and 17 percent of annual greenhouse gas (GHG) emissions in America.

Whether new construction or retrofit, it's time to set the bar higher for our commercial buildings.

It starts with advanced building envelope solutions that enable commercial buildings to use less and offer more. Insulation materials that offer R-values as high as R-50. Air barrier technologies that keep conditioned air inside the structure. Warm-edge window systems sealed tight with thermoplastic spacers. High-performance spray-applied polyurethane foam (SPF) roofing systems that combine energy efficiency with industry leading resistance to severe weather. Wall technologies—Exterior Insulated Finishing Systems (EIFS), Structural Insulated Panels (SIPs) and Insulating Concrete Forms (ICFs)—that maximize both structural strength and aesthetic appeal while speeding construction.

All contribute to energy efficiency, durability and speed of construction.

Durability comes from the ground up with concrete for every application. Liquid admixtures help strengthen and enhance the durability of concrete beams, foundations, slabs, walls, and columns, and provide efflorescence control and water repellency. Specially formulated admixture systems can reduce carbon footprint by incorporating significantly more fly ash than traditional concrete mixtures. Pervious concrete and porous asphalt improve drainage and reduce or eliminate the need for storm water storage.

Then there's indoor environmental quality (IEQ). Wall board with phase-change material helps keep interior temperatures consistently comfortable and energy bills low. HVAC systems are quiet and safe thanks to insulation technology that combines sound absorption and safe fire behavior. Fireboard panels react to heat and create compression-resistant, non-combustible, heat sealing foam that fills joints and gaps to prevent the spread of fire and smoke. Office and area partitions that combine sound transfer control, design freedom and quick assembly and installation. Paints, flooring and finishings that emit little or no volatile organic compounds (VOCs).

Our portfolio is filled sky high with high-performance options for high-performance commercial buildings.

LEGEND

ENERGY EFFICIENCY
DURABILITY
SPEED OF CONSTRUCTION

THE CHEMISTRY OF

SUSTAINABLE EDUCATIONAL BUILDINGS

Schools are a focal point for our communities. Learning happens best in environments that are healthy, safe and comfortable. BASF chemistry helps schools achieve this while meeting mandates—and budgets.

Spend money on educating students, not energy bills, with insulation technologies and air barrier materials that get A+ marks for whole-wall thermal performance and air leakage control. Keep unconditioned air out of the classroom by using window systems sealed with thermoplastic spacers and sealants. Improve thermal comfort with phase-change gypsum board. Reflect heat away from the roof with coatings for interior and exterior sides of the roof deck.

IEQ is improved with products that emit little or no VOCs. Fireboard panels and fire barrier doors help prevent the spread of fire and smoke. Insulated HVAC systems combine sound absorption and safe fire behavior. Acoustic panels, suspended baffles and metal ceiling panels provide quiet study space with optimal sound insulation.

Kids can be tough on materials, but schools need to be built to last. Concrete plays a key role in school construction and admixtures play a key role in concrete. From ready-mix to precast, pervious to decorative, structural elements and pavements can be made stronger and last longer, with a reduced impact on the environment.

Durable, low-maintenance flooring systems for hallways, restrooms, kitchens and gymnasiums last longer. Indoor and outdoor sports surfaces help reduce the risk of sport-related injury and stand up to heavy use. Doors last longer and offer excellent insulation with protective coatings and polyurethane cores. Water repellents and waterproofing membranes help prevent moisture damage, efflorescence and spalling on the exterior. Stucco cement fascia and protective coatings keep the school looking good for years and years.

Schools often serve as evacuation centers when disaster strikes. Spray-applied polyurethane foam (SPF) roofing systems provide industry-leading wind uplift and severe hail resistance. Closed-cell insulation materials are approved by FEMA for flood resistance. SIPs and ICFs add structural strength, while expansion joint systems can withstand seismic events. EIFS are proven to withstand windborne debris.

With these solutions, any school can make it to the top of the class.

LEGEND

ENERGY EFFICIENCY

DURABILITY

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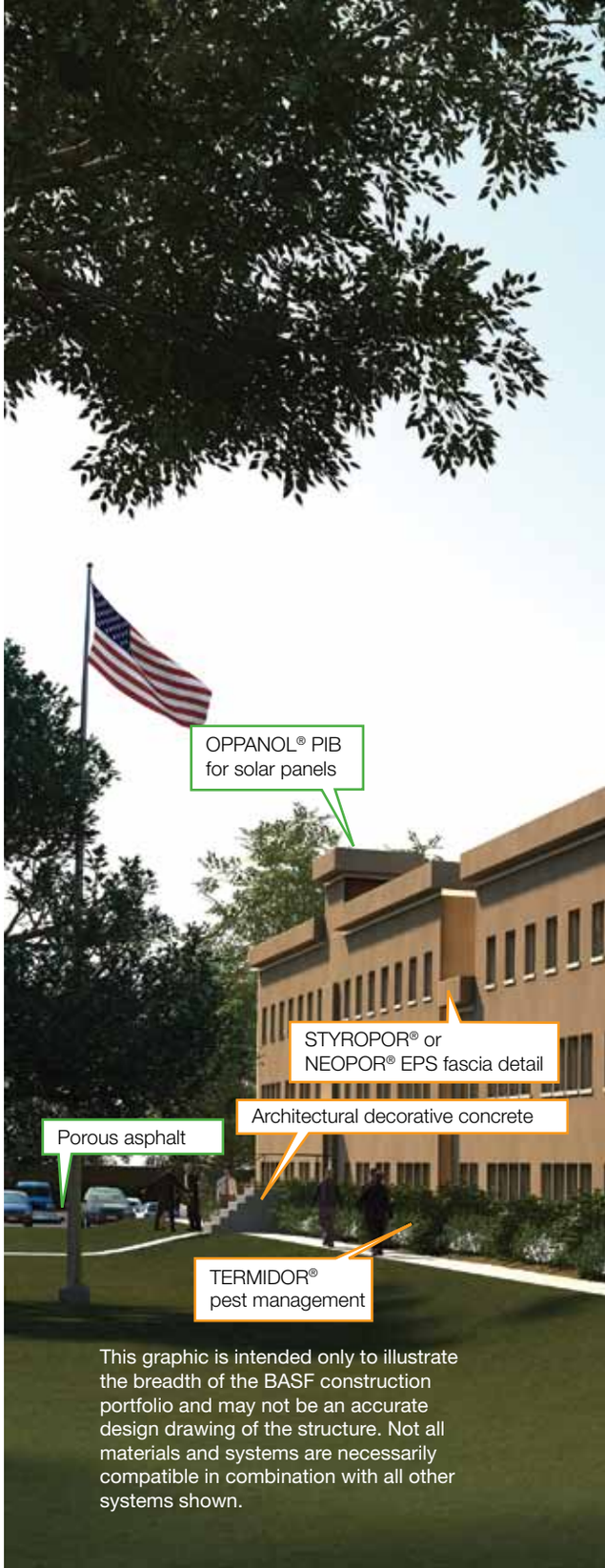

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ELASTOCOAT™ elastomeric coating
Enershield® air/water-resistive barrier
Senergy® stucco with Senerlastic™ finish
ELASTOSPRAY® SPF roofing
THORO® wall coatings
STYROPOR® or NEOPOR® EPS trim
Senerflex® water drainage EIFS
STYROPOR® EPS Structural Insulated Panel
STYROPOR® or NEOPOR® EPS insulation
SONNEBORN® joint sealants
BASOTECT® melamine resin open-cell foam
Micronal® PCM phase-change gypsum board
OPPANOL® PIB thermoplastic spacer in window
SRS® flooring
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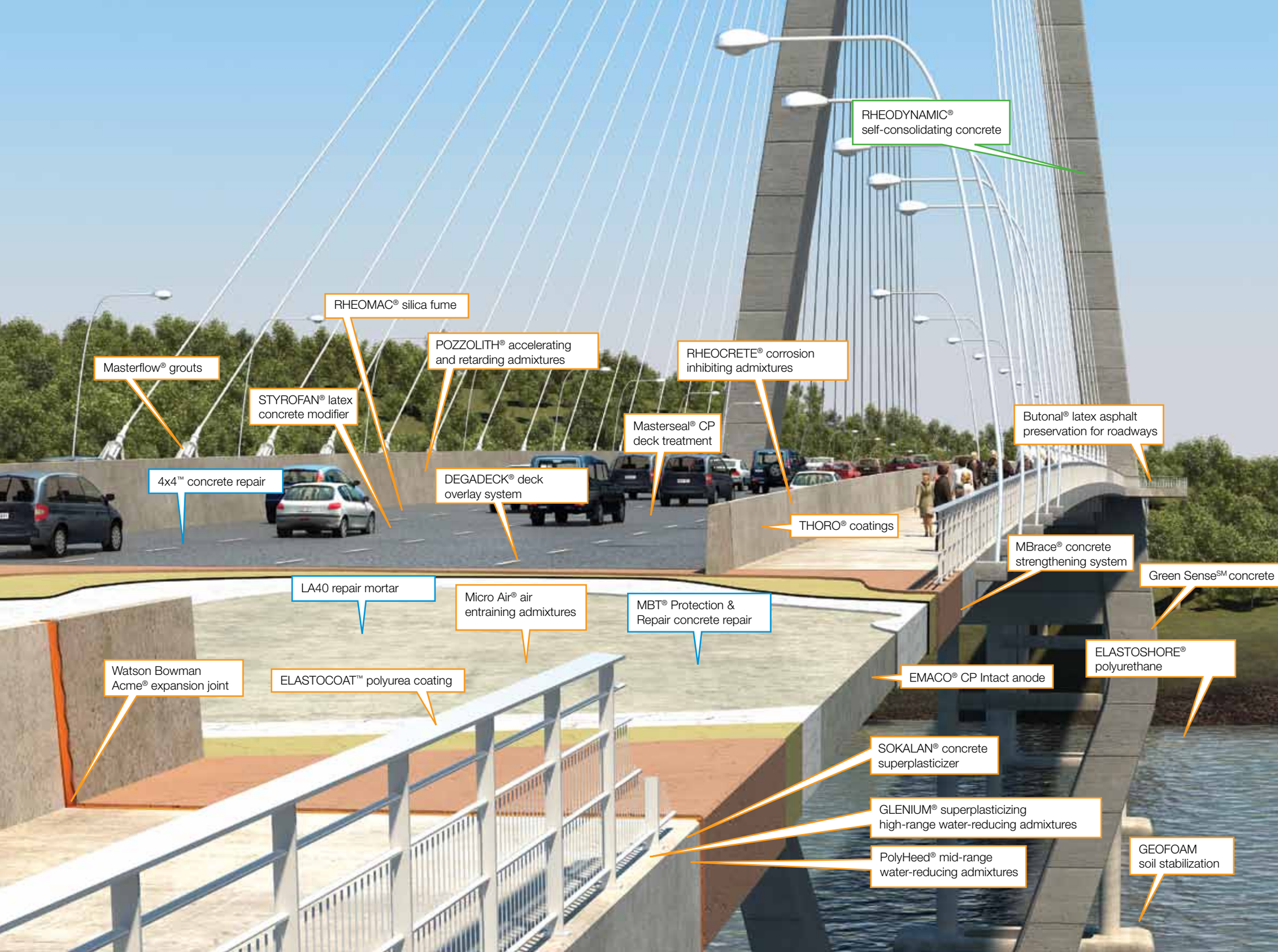
WALLTITE® SPF insulating air barrier
Watson Bowman Acme expansion joint
UCRETE® flooring
PermaSkin® coating
CONICA® sports surfaces
SONNEBORN® waterproofing
Green Sense℠ concrete
ELASTOPOR® polyurethane foam core in door
CHEMREX® flooring underlayment and adhesives
HYDROZO® water repellent
Pervious concrete
HIGHLAND HAWKS
HH
EXIT


RHEODYNAMIC® self-consolidating concrete
RHEOMAC® silica fume
POZZOLITH® accelerating and retarding admixtures
RHEOCRETE® corrosion inhibiting admixtures
Masterflow® grouts
STYROFAN® latex concrete modifier
Masterseal® CP deck treatment
Butonal® latex asphalt preservation for roadways
4x4™ concrete repair
DEGADECK® deck overlay system
THORO® coatings
MBrace® concrete strengthening system
Green Sense℠ concrete
LA40 repair mortar
Micro Air® air entraining admixtures
MBT® Protection & Repair concrete repair
ELASTOSHORE® polyurethane
Watson Bowman Acme® expansion joint
ELASTOCOAT™ polyurea coating
EMACO® CP Intact anode
SOKALAN® concrete superplasticizer
GLENIUM® superplasticizing high-range water-reducing admixtures
PolyHeed® mid-range water-reducing admixtures
GEOFOAM soil stabilization

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THE CHEMISTRY OF

SUSTAINABLE INFRASTRUCTURE

Infrastructure is integral to the economic vitality of modern society. Transportation alone contributes $950 billion to America's Gross Domestic Product each year. Yet 26% of America's bridges are structurally deficient or functionally obsolete. 33% of America's major roads are in poor or mediocre condition and 36% of the nation's major urban highways are congested.

Infrastructure depends on concrete.

Admixtures include corrosion inhibitors, accelerators, retarders, silica fume, normal-, mid- and high-range water reducers or superplasticizers and air entrainers. Each admixture contributes to specific performance enhancements for concrete—long-term durability, finishability, pumpability, compressive and flexural strength, setting time. Specially formulated additives even help significantly increase fly ash use to reduce the carbon footprint of concrete.

Self-consolidating concrete can flow into place, filling formwork and encapsulating even the most congested reinforcement, all with minimal to no mechanical vibration, and without compromising durability, cohesiveness or strength. Latex-modified concrete overlays create strong, flexible bridge deck surfaces that last for decades. This technology reduces water needs, creates higher flexural strength with tremendous adhesion and lessens formation of voids and cracks during curing.

Corrosion is the enemy of bridge durability. Combat the chemical reaction with chemical innovation—anodes that sacrifice themselves to corrode instead of steel rebar.

Expansion joints absorb stress and provide flexibility for safety and durability, even for the world's largest bridge structures that require state-of-the-art large movement or seismically designed joint systems. Asphalt pavement preservation technologies create roads that last longer, improve safety and motorist satisfaction—and also save taxpayer dollars.

To quickly return aging or damaged infrastructure to optimal condition, solutions include systems for rapid road repair, specialty mortars, cement-based and epoxy grouts, corrosion protection, underlayments, crack repair and bonding, as well as surface repair products.

BASF chemistry also improves durability and speed of construction for tank and pipe, water treatment, manway repair, on-shore and off-shore marine and flotation, sub-sea pipe strakes and other civil engineering projects.

LEGEND

DURABILITY

SPEED OF CONSTRUCTION

THE CHEMISTRY OF

SUSTAINABLE RESIDENTIAL BUILDINGS

America's 128 million homes are responsible for almost 20 percent of the nation's total energy consumption and 1,270 megatons of emissions each year, according to McKinsey & Company. The average American homeowner pays around $2,200 a year in energy bills according to Energy Star®, with 40% of that energy used for heating and cooling the home.

Advanced building envelope solutions are the key to unlocking residential energy efficiency, durability and speed of construction and can give smart builders a competitive edge whatever the market. Wall technologies like SIPs and ICFs combine structural strength and impressive thermal performance, while coming together significantly faster than stick-built construction. High-performance insulation and air barrier materials lock in comfort and energy savings.

Reflective coatings for roofs—as well as radiant barrier coatings for interior surfaces of roof decks—reduce solar gain. Insulating cores raise the thermal performance of exterior and garage doors, while polyisobutylene thermal spacers and sealants make windows a contributor to greater energy efficiency.

Phase-change gypsum board regulates indoor temperatures, keeping occupants comfortable and reducing HVAC system load.

Solar panels convert light to electricity and geothermal systems provide heat. When the house achieves energy efficiency, renewable energy systems achieve ROI.

Make curb appeal last for decades with stucco cement fascia, architectural colored concrete, textured acrylic surfacing and EPS fascia detail. Vinyl siding that looks good for many years. Composite and vinyl decking and fencing materials that last longer with almost no maintenance.

Concrete admixtures, water repellents and waterproofing membranes help prevent moisture damage, mold, efflorescence and spalling, while termiticides prevent pest infestations. Pervious concrete and porous asphalt used in hardscaping permit water to pass through easily to reduce runoff and prevent pooling.

BASF chemistry is helping to make housing more sustainable, whether it's a newly constructed net-zero energy home or a weatherization retrofit project.

LEGEND

ENERGY EFFICIENCY

DURABILITY

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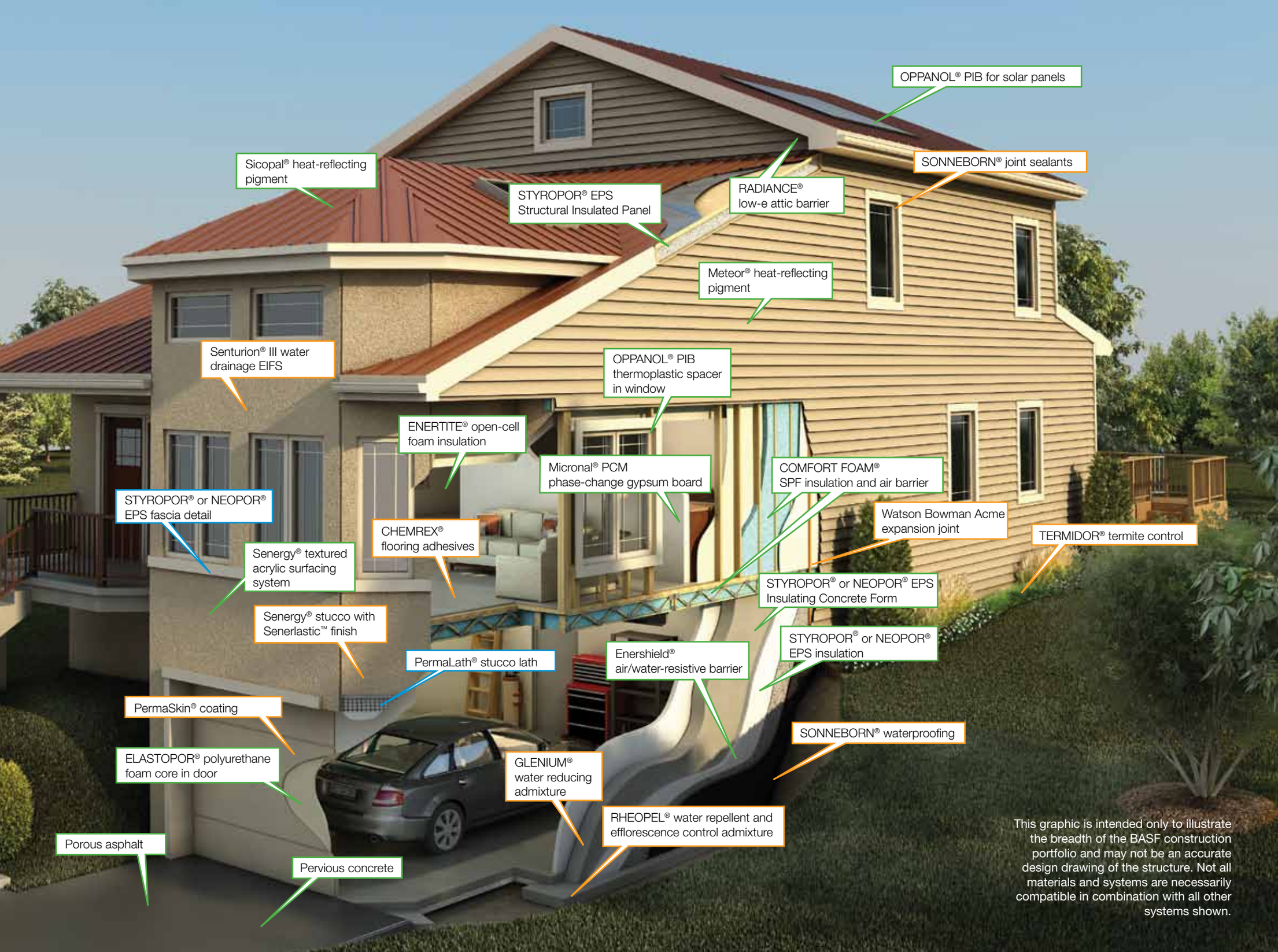

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THE CHEMISTRY OF

EMERGING TECHNOLOGIES

Chemistry allows scientists to engineer products at the molecular level. To optimize them for specific sustainable performance attributes. Superior insulation properties. Extreme durability. Reduced waste. Faster installation. Improved air quality. Lower environmental impact.

BASF invested $1.95 billion (1.5 billion Euros) in R&D in 2010. 70 major research and development sites around the world. 9,600 employees. All to address customer needs. Create new technologies. Provide customers with competitive advantages.

BASF is at the forefront of new product research and development in the construction industry. We introduced expandable polystyrene (EPS) insulation to the market in 1951, and enhanced it with graphite for 20% greater thermal performance in 1998. In 2006, we introduced a polyurethane-based invention that significantly increases coastal protection from erosion. We also recently introduced phase-change material for wall board. Our scientists work on game-changing emerging technologies. Technologies that could radically improve building energy efficiency. Technologies that could bring renewable energy systems closer to widespread reality.

What are we working on now?

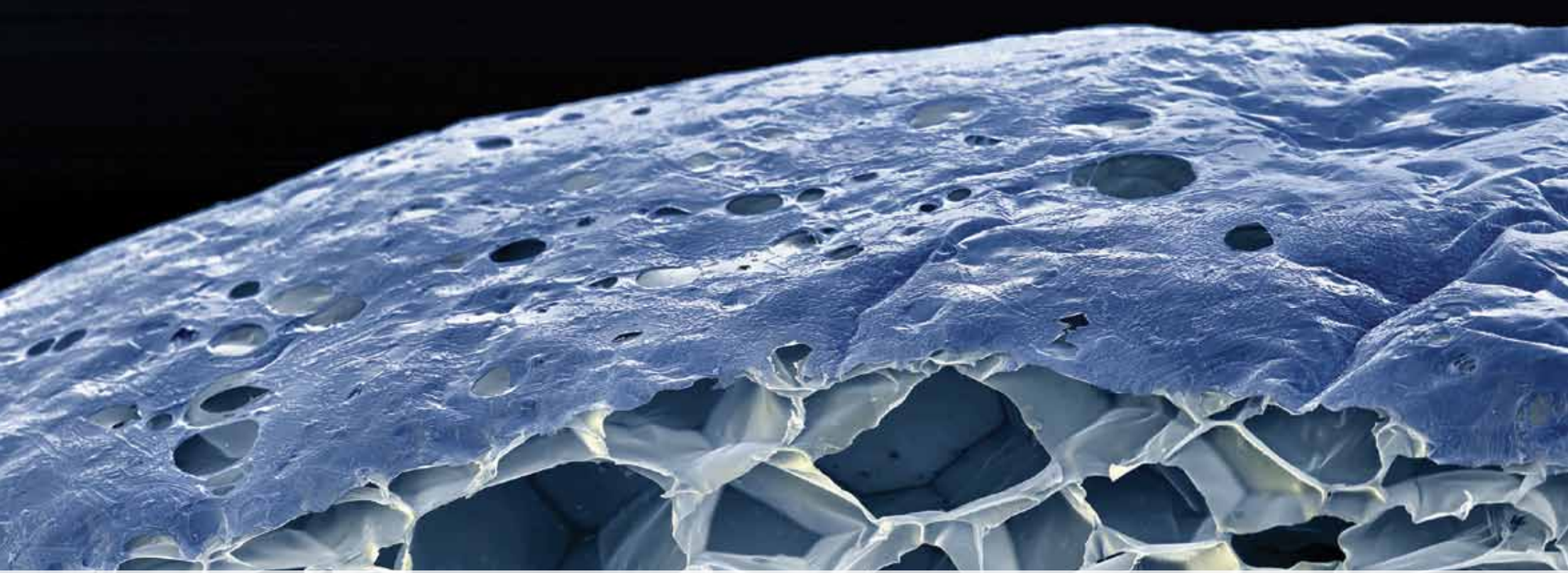
Next-generation nanofoam insulating materials that reduce heat conduction to less than half, marking a radical improvement to building energy efficiency. They are engineered to create materials with performance details on such a fine scale they are measured in nanometers. In perspective, if a meter is the planet Earth, a nanometer is a tennis ball.

Solar cells based on organic semi-conductor materials. Replace traditional silicon materials to offer thinner, more flexible solar panels that can be incorporated into windows, exterior wall cladding and roofing materials. And unlike silicon-based solar cells, organic photovoltaics can be mass produced, making the adoption of renewable energy more affordable, more quickly.

Transparent Near Infrared (NIR) reflective pigments that can be formulated to reflect up to 45% of solar radiation. NIR black pigments have solar reflectance of as much as 30% to decrease building surface temperatures by up to 68 degrees Fahrenheit (20 degrees Centigrade).

Vacuum insulated panels (VIPs) that provide an insulating value three to seven times greater than equivalent thickness of other foam board, bead, batt and blanket insulation materials.

BASF is creating chemistry for a sustainable future.



Background image: Bead-shaped particles of Neopor® after processing into foam blocks. Magnification 330:1 (12cm in width).

BASF Wildlife Habitat & Environmental Education Classroom

Structural Insulated Panels (SIPs)

The Atlantis Hotel Casino

Emaco®CP Intact Galvanic Anodes

WALLTITE® Insulating Air Barrier

Restoring the Royal Floridian Vacation Resort

Pervious Concrete

Water Intake Towers - Hoover Dam

The Pepper Viner High-Performance Home

OPPANOL® PIB sealant for solar panels

Award-winning LOGIX® Village Suites Student Housing

Watson Bowman Acme Expansion Joints

Enershield™ Air/Water-resistive Barrier

Scope Arena

The East Parkside Community Rejuvenation Project

The BASF Near-Zero Energy Home

ANALYSIS BEATS GREENWASH

Scientific measurement is the only way to accurately document the true impact of construction products over the entire lifecycle. Proof of performance—in the lab and in the field—identifies best-in-class technologies. Systems that rise to the challenges we face and provide the solutions we need.

To address unpredictable energy costs, construction projects must achieve new levels of efficiency. They need to be strong to withstand the damaging effects of severe weather. From production through disposal, construction products must have a minimal impact on the environment.

Projects need to realize ROI. Faster. At a greater rate of return. We know that our customers cannot manage what we do not measure. That's why we develop award-winning tools that help benchmark the impact of products and systems on the triple bottom line of ecology, economy and society.

The third-party validated Eco-Efficiency Analysis was developed to harmonize ecology and economy and enable scientifically accurate comparisons of similar products or processes. Assess the lifecycle of a product or manufacturing process from the "cradle to the grave" in five categories:

- Resource utilization
- Energy consumption
- Emissions to air, water and soil
- Toxicity potential
- Misuse and risk potential

Our SELECT™ (Sustainability, Eco Labeling & Environmental Certification Tracking) Eco-Label Manager was developed to help BASF and our external stakeholders strategically manage the abundance of eco-labels, environmental claims, product directories and green ratings systems.

The Total Cost of Ownership (TCO) analysis tool evaluates the cost of using one product and compares it to alternative products. Costs include raw materials, labor, manufacturing, energy, waste, capital and environmental health and safety (EHS) programs. TCO analysis often brings out the less obvious ownership costs that might otherwise be overlooked in making purchasing decisions or budget plans.

We also work with our customers to track real-world results. Energy data. Product life expectancies. Severe weather performance. Ease and speed of installation.

We learn what works. We fix what doesn't. We use science and third-party validation of the data to back up our promises. We offer proof.

SUSTAINABILITY LOVES CHEMISTRY

Sustainability achieves balance between economy, ecology and society. It happens when we look at the short-, mid- and long-term horizons and take a holistic approach. It's about changing the way we think and the way we act.

Chemistry is the catalyst for great ideas. The formula that leads to increased knowledge. The collaboration between people that builds success.

We create chemistry through innovation.

Our market-driven research, product development, refinement and enhancement have created a portfolio that features best-in-class technologies and systems.

Each construction project is unique. What works in one situation may not be the best option for the next. The BASF construction product portfolio features a selection of solutions that can meet or exceed project performance goals. From a myriad of ingredients for product manufacturers, through the value chain to complete end-use systems tailored for specific climatic conditions.

We create chemistry through education.

BASF is committed to technology transfer throughout the North American construction market.

Our BASF Online Campus for High-Performance Construction offers design professionals access to registered continuing education courses 24 hours a day, seven days a week. We contribute to third-party educational resources. We work with trade associations to help train installation teams and establish health and safety standards.

We create chemistry through collaboration.

BASF has thousands of professionals working together across the entire construction value chain in North America to provide innovative chemistry that improves building products and projects. Construction Chemicals to Polyurethanes. Engineering Plastics to Dispersions and Pigments. Petrochemicals to Performance Chemicals.

Also in North America, our BASF Center for Building Excellence team works directly with residential and commercial builders to advance the implementation of leading-edge, beyond-code construction, and facilitates innovation by working across multiple BASF business units to discover new synergies and create new solutions.

BASF's on-staff LEED® Accredited Professionals offer guidance to design teams and building owners. Product specialists help specifiers select systems that meet performance criteria, Code and budget. Technical application field staff help contractors achieve the best-possible installation. Market development specialists help manufacturers create new products with higher performance levels and higher margins.

Other companies just make products.
At BASF, we create chemistry for a sustainable future.

GLOBAL MISSION

Sustainability is more than a buzz word at BASF, it's a core belief. For us, sustainable development means the combination of long-term oriented economic success with environmental protection and social responsibility.

With sustainability as part of our global strategic guidelines, we're committed to constant improvements in safety, protection of health and environmental conservation. That's why we created the role of Global Climate Protection Officer.

Embrace sustainable development as a global core strategic guideline. View the balance of social responsibility, environmental stewardship and profitable business growth as a precondition to long-term success.

Around the world and here at home, the construction product portfolio is recognized as increasingly important to BASF's own sustainability goals, as well as to the business success of its customers.

In the North American construction market, BASF is proud to be an official partner of the Federal Alliance for Safe Homes Inc. - FLASH®, one of the most respected disaster preparedness organizations in the nation. Each year we join the U.S. Department of Energy (DOE) to honor homebuilders for their exceptional achievements in high-performance building through the Builders Challenge Awards.

We are a preferred supplier of the Clinton Climate Initiative, working to reduce greenhouse gas emissions by providing sustainable solutions to cities around the world.

BASF is an ENERGY STAR® partner, member of the United States Green Building Council (USGBC), Sustainable Buildings Industry Council (SBIC) and the Urban Land Institute (ULI). Our product and market development professionals also lend their time and expertise to countless construction industry associations throughout North America.

CREDENTIALS FOR LEADERSHIP

It often surprises people, even those in the building industry, to learn how much chemistry goes into construction. According to the American Chemistry Council (ACC), $11.9 billion worth of chemical ingredients were used for construction in 2009.

Whether a commercial, educational, infrastructure or residential project—new construction or retrofit—BASF's innovative solutions and team of technical experts provide proven and trusted competitive advantages in durability, energy efficiency and speed across nearly all construction systems.

BASF is a global leader in sustainability and corporate social responsibility, committed to constant improvements in safety, protection of health and environmental conservation.

BASF was a founder of the UN Global Compact platform in 2000—a call to companies around the world to align their strategies and operations with ten universal principles in the areas of human rights, labor, environment and anti-corruption—as well as the UN Global Compact LEAD initiative in early 2011, a platform that sets a new benchmark for corporate sustainability.

In both 2008 and 2009, BASF was ranked first among companies in the materials sector on the Carbon Disclosure Leadership Index. In 2010, BASF shares were included in the Dow Jones Sustainability Index for the tenth year in succession and remained a member of the FTSE 4 Good Index. BASF also earned the top rating of 100 percent in the 2009, 2010 and 2011 Corporate Equality Index (CEI) results, an annual survey administered by the Human Rights Campaign (HRC) Foundation.

In 2010, BASF became the first chemical company to become a member of The Sustainability Consortium, an independent organization of diverse global participants that work collaboratively to build a scientific foundation that drives innovation to improve consumer product sustainability.

Already a supplier to the majority of leading building product manufacturers, BASF will not only continue to develop sustainable building materials, it will lead innovation in the industry. We will continue to work with industry stakeholders—from builders and designers to governments to building material manufacturers—to develop more solutions that help make construction projects more energy efficient, durable and faster to build.

www.basf.us/construction

BASF - The Chemical Company

BASF Corporation, headquartered in Florham Park, New Jersey, is the North American affiliate of BASF SE, based in Ludwigshafen, Germany. BASF has approximately 16,400 employees in North America, and had sales of $17.7 billion in 2010. For more information about BASF's North American operations, visit www.basf.us.

BASF is the world's leading chemical company: The Chemical Company. Its portfolio ranges from chemicals, plastics, performance products and agricultural products to oil and gas. As a reliable partner BASF creates chemistry to help its customers in virtually all industries to be more successful. With its high-value products and intelligent solutions, BASF plays an important role in finding answers to global challenges such as climate protection, energy efficiency, nutrition and mobility. BASF posted sales of about €63.9 billion in 2010 and had approximately 109,000 employees as of the end of the year. BASF shares are traded on the stock exchanges in Frankfurt (BAS), London (BFA) and Zurich (AN). Further information on BASF is available at www.basf.com or in its Social Media Newsroom at newsroom.basf.com.

www.basf.us/construction

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