The Chemistry of Construction

BASF
The Chemical Company
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.

As The Chemical Company, BASF is a leader in the construction industry. With more than 600 products serving 75 construction product categories, BASF offers the broadest portfolio of products used directly on construction sites, or integrated into other products, to improve the performance of construction projects.


Improved energy efficiency means lower operating costs, accelerated return on investment and lower environmental impact.

Increased durability means a lower cost of ownership due to reduced maintenance needs, resistance to natural disasters and safer, healthier places to live, work and learn.

Speed of construction enables increased productivity, lower labor requirements, easier staging, faster occupancy and income generation, rapid repairs and reduced call-backs.

For more than half a century, BASF construction solutions and chemical ingredients have helped architects, engineers, designers, contractors, owners, builders and original equipment manufacturers make construction projects better with material choices that are proven to make a tangible difference to the performance of construction projects throughout their entire lifecycle.
Commercial buildings play a vital role in our economy. They are where we work, where we shop and, often, where we play. BASF chemistry helps create building envelopes that enable commercial buildings to use less and offer more.

Energy efficiency is maximized with insulation materials for roofs, walls and foundations that allow you to meet or substantially exceed Code with R-values as high as R-50 or more. Air barrier technologies keep conditioned air inside the structure. Warm-edge window systems and glazing are sealed tight with thermoplastic spacers. Adhesives and sealants help contribute to airtight construction.

Elastomeric coatings for all roof types, roofing membranes and vegetative roofing systems help lower rooftop temperatures and reduce urban heat island effect. Solar panels with polyisobutylene adhesives and sealants provide renewable energy.

Indoors, gypsum wall board with phase-change material helps keep interior temperatures consistent and energy bills low. HVAC systems are quiet and safe thanks to melamine resin open-cell foam insulation technology that combines sound absorption and safe fire behavior. Fireboard panels featuring hydrated sodium silicate react to heat in the event of a fire to 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 made with melamine resin open-cell foam insulation combine sound transfer control, design freedom and quick assembly and installation.

Durability comes from the ground up with concrete for every application. Liquid admixtures strengthen and enhance the durability of concrete beams, foundations, slabs, walls, and columns, and provide efflorescence control and water repellency. Pervious concrete and porous asphalt improve drainage and reduce or eliminate the need for storm water storage.

Liquid-applied membranes and cementitious coatings prevent moisture penetration throughout the building. Wall systems featuring EIFS fascia materials require little maintenance.

Insulating concrete forms (ICFs) and structural insulated panels (SIPs) offer increased structural strength, while expansion joint systems can withstand everything from small movements to seismic events.

ICFs and SIPs arrive at the jobsite ready to install, and assemble quickly for increased productivity and reduced labor requirements. Ready-mixed concrete formulated with BASF admixtures is more durable and can be placed and finished at a much faster rate than untreated concrete.

Liquid- and spray-applied coatings for roofs, walls and foundations go on faster than sheet membrane products. EPS fascia detail, as well as fade- and crack-resistant textured acrylic surfacing provide a decorative touch with faster installation and increased durability.

Spray-applied polyurethane foam roofing systems can be applied directly to the existing substrate in most retrofit applications without tear-off, providing one of the fastest re-roofing installation options available.
THE ROLE OF CHEMISTRY IN 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 also meeting mandates—and budgets.

Spend money on educating students, not energy bills, with BASF insulation technologies and air barrier materials that include expandable polystyrene (EPS) and closed-cell spray-applied polyurethane foam (SPF). Used in every part of the building enclosure, these systems offer unparalleled energy saving performance.

Keep unconditioned air out of the classroom for many years by using window systems sealed with polyisobutylene 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. Acoustic panels, suspended baffles and metal ceiling panels made with melamine resin open-cell foam technology provide quiet study space with optimal sound insulation.

Kids can be tough on materials, but schools need to be built to last. Durable, low-maintenance flooring systems for hallways, restrooms, kitchens and gymnasiums feature BASF chemistry. Integrimally colored floors save money and are more durable. 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.

Indoor air quality (IAQ) is improved with products that emit little or no volatile organic compounds (VOCs). Fireboard panels and fire barrier doors featuring hydrated sodium silicate help prevent the spread of fire and smoke. HVAC systems are quiet and safe thanks to melamine resin open-cell foam insulation technology that combines sound absorption and safe fire behavior.

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.

Concrete plays a key role in school construction and BASF admixtures play a key role in concrete. From ready-mix to precast, pervious to decorative—beams, foundations, slabs, walls, columns and pavements are made stronger and last longer.

Schools often serve as evacuation centers when disaster strikes. Polyurethane foam roofing systems provide industry-leading wind uplift and severe hail resistance. Closed-cell insulation materials are approved by FEMA for flood resistance. Structural insulated panels (SIPs) and insulating concrete forms (ICFs) add structural strength, while expansion joint systems can withstand seismic events. Thermoplastic spacers for insulated windows can accommodate building movements, including stress from wind and earthquakes, while maintaining sealant integrity and insulating performance.

Labor is expensive. BASF chemistry helps make construction materials that install faster with less dependence on highly skilled labor. Concrete that can be easily placed in a wider range of climates. Spray-applied and liquid coatings and membranes that make detailing simpler.
MBrace® concrete strengthening system
Watson Bowman Acme expansion joint
rHEOCRETE® corrosion inhibiting admixtures
rHEOMAC® silica fume
POZZOLITH® accelerating and retarding admixtures
rHEOCRETE® corrosion inhibiting admixtures
4x4™ concrete repair
SOKALAn® concrete superplasticizer
Butonal® latex asphalt preservation for roadways
polyHeed® mid-range water-reducing admixtures
STyrOFAn® latex concrete modifier
DEGADECK® deck overlay system
THORO® coatings
MBT® protection & repair concrete repair
GLEnIuM® superplasticizing high-range water-reducing admixtures
PolyHeed® mid-range water-reducing admixtures
Masterflow® grouts
STYROFAN® latex concrete modifier
RHEODYNAMIC® self-consolidating concrete
MBT® protection & repair concrete repair
ELASTOCOAT™ polyurea coating
GLENium® superplasticizing high-range water-reducing admixtures
DEgADECK® deck overlay system
RHEOMAC® silica fume
rHEOMAC® silica fume
RHEODYNAMIC® self-consolidating concrete
Infrastructure, including roads, bridges and tunnels, is integral to the economic vitality of modern society. Drivers, pedestrians and cyclists want to reach their destination without hassles from lengthy construction and repair activities. BASF chemistry helps you build infrastructure faster that lasts longer.

Infrastructure depends on concrete.

Admixtures include corrosion inhibitors, accelerators, retarders, silica fume, normal-, mid- and high-range water reducers or superplasticizers and air entrainers. Concrete additives help increase fly ash use up to 50 percent.

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, lessens formation of voids and cracks during curing and greatly reduces rebar corrosion by slowing penetration of road salts.

Asphalt pavement preservation technologies create roads that last longer, improve safety and motorist satisfaction—and also save taxpayer dollars.

Expansion joints absorb stress and provide flexibility for safety and durability. BASF offerings include solutions for the world’s largest bridge structures that require state-of-the-art large movement or seismically designed joint systems. They can be installed quickly so roadways can be opened to traffic sooner.

To quickly return aging or damaged infrastructure to optimal condition, solutions include 4 x 4 concrete 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 strengthening systems use high-quality carbon fibers, E-glass fibers, and aramid fibers, as well as epoxy resins.

BASF also offers products that improve 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.
Everyone should have a great place to live. Somewhere safe, comfortable and healthy that’s also affordable to own and occupy. BASF chemistry is helping to make housing more sustainable.

In 2001, the average American homeowner paid around $2,000 a year on energy bills according to Energy Star®. Solar panels featuring polyisobutylene adhesives and sealants convert light to electricity. BASF expandable polystyrene (EPS) and spray-applied polyurethane foam (SPF) materials offer industry-leading insulation and air migration control for foundations, walls and attics—all of which can help increase efficiency and cut energy bills.

Vegetative roofing systems using polyisobutylene and reflective coatings for roofs—as well as coatings for interior surfaces of roof decks—reduce solar gain. Polyurethane 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.

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

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.

BASF chemistry also contributes to HVAC, plumbing and electronic components; underlays for carpet; adhesives for subflooring, laminate and ceramic flooring; moldings and decorative trim; acoustic panels; UV finishes for wood trim and furnishings; door handles, wardrobes, balustrades and paints—all with a longer life expectancy with lower maintenance, increased safety and greater aesthetics with a wide range of colors.
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.
CHEMISTRY AND SUSTAINABILITY

Practicing sustainability can help identify and capitalize on opportunities, boost profit and help generate new business for construction professionals. BASF is committed to developing innovative construction products and technologies that contribute to the harmonization of people, the planet and business profits.

With a suite of tools and resources, as well as access to extensive R&D facilities at home and around the world, we work toward continuous improvement for BASF construction solutions. To develop technologies that help reduce maintenance, energy consumption, carbon footprint and waste sent to landfills. Technologies that improve the comfort, health and safety of occupants and reduce operating and lifecycle ownership costs.

**Eco-Efficiency Analysis**

At BASF, we believe that analysis beats greenwash. That scientific measurement is the only way to accurately document the true impact of construction products over the entire lifecycle. That’s why BASF developed the award-winning, third-party validated Eco-Efficiency Analysis. To harmonize ecology and economy, it assesses 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

The purpose of the Eco-Efficiency Analysis is to enable scientifically accurate comparisons of similar products or processes. This involves carrying out an overall study of alternative solutions to include a total cost determination and the calculation of ecological impact over the entire lifecycle.

The BASF Eco-Efficiency Analysis process won three major awards of interest to the building and construction industry: the Design for Sustainability Award (Society of Plastics Engineers), the Presidential Green Chemistry Challenge Award (U.S. Environmental Protection Agency), and the Best Sustainable Practice Award in the Sustainable Research, Development, Construction Process and Demonstration (Sustainable Buildings Industry Council).

More information on this science-based tool can be found at www.basf.com/sustainability

**Total Cost of Ownership**

The BASF Total Cost of Ownership (TCO) analysis is another powerful tool that 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. Often one product may have a higher initial purchase price, but its total cost of ownership is lower due to reduced waste, reduced energy consumption or lower maintenance costs.
Global Mission

Sustainability is more than a buzz word at BASF, it's a core belief. With sustainability as part of our global strategic guidelines, BASF is committed to constant improvements in safety, protection of health and environmental conservation. That's why we created the role of Global Climate Protection Officer.

The groundbreaking 2008 Carbon Balance report compares the greenhouse gas emissions created during the manufacture of BASF products with the emissions savings realized by their use. Believed to be the first report of its kind in industry, the results, confirmed by the Öko-Institut in Freiburg (Germany), show that BASF products—including insulation materials and other construction solutions—can save three times more greenhouse gas emissions than the entire amount caused by the production and disposal of all BASF products.

In 2008, BASF was ranked first on the Carbon Disclosure Leadership Index, an honor roll for corporations addressing the challenges of climate change and carbon disclosure practices. The Carbon Disclosure Project represents some 385 global institutional investors, with more than $57 trillion in assets under management. As an independent not-for-profit organization, CDP collects key climate change data from more than 1550 major corporations around the globe.
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), $14.8 billion worth of chemical ingredients were used for construction in 2007. Whether a commercial, educational, infrastructure or residential project, 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.

The LEED® Platinum rated BASF Near-Zero Energy Home in Paterson, N.J., is a demonstration of innovative BASF technologies that provide durability, affordability, energy-efficiency and ecological benefits in new housing. The Waldsee BioHaus Environmental Learning Center in Minneapolis features innovative and technologically cutting-edge BASF building systems and components. Other projects include rebuilding the community of East Parkside in Philadelphia, tsunami relief in India and Sri Lanka, the Three-Liter House in Germany and the BASF House at Nottingham University’s Creative Energy Homes Project in the UK. In China, environmental futurist William McDonough is using BASF technologies to help build seven new cities over the next 12 years, with housing for 400 million people.

Not just a leader in its industry, BASF is a global leader in sustainability and corporate social responsibility. The company is included in the Innovest Global 100 list—among the world’s most successful companies in the areas of environmental protection, social affairs and corporate governance. BASF is also listed on the FTSE4Good Index and Storebrand SRI Funds.

In 2008, BASF was named the leading chemical company in the Dow Jones Sustainability World Index (DJSI World), recognized for its climate strategy, its environmental and social reporting and for developing innovative and eco-efficient products. BASF also earned the top rating of 100 percent in the 2009 Corporate Equality Index (CEI), an annual survey administered by the Human Rights Campaign (HRC) Foundation.

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.com/construction
BASF - The Chemical Company

We don’t make a lot of the products you buy. We make a lot of the products you buy better.®

BASF Corporation, headquartered in Florham Park, New Jersey, is the North American affiliate of BASF SE, Ludwigshafen, Germany. For more information about BASF's North American operations, or to sign up to receive news releases by e-mail, visit www.basf.com/usa.

BASF is the world’s leading chemical company: The Chemical Company. Its portfolio ranges from oil and gas to chemicals, plastics, performance products, agricultural products and fine chemicals. As a reliable partner, BASF helps 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 shares are traded on the stock exchanges in Frankfurt (BAS), London (BFA) and Zurich (AN). Further information on BASF is available on the Internet at www.basf.com.
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 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, 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 THE BASF 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 DESCRIPTION, DESIGNS, DATA OR INFORMATION GIVEN OR RESULTS OBTAINED, ALL SUCH BEING GIVEN AND ACCEPTED AT THE READER’S RISK.

4x4™, Acronal®, BASOTECT®, Butonal®, CHEMREX®, CONICA®, DEGADEC®, ELASTOCAT®, ELASTOFOR®, ELASTOSPRAY®, GLENIUM®, HYDROZOT®, LURAN®, Masterflow®, Miflare®, MRT®, Micronal® PCM SmartBoard®, NEOPOR®, ORPHANY®, Palusol®, PermaLath®, PermaSkin®, PolyHeed®, POZZOLITH®, RADIANCE®, RHEOCRETE®, RHEODYNAMIC®, RHEOMAC®, RHEOFLEX®, SENERTEX®, SENERLASTIC®, SENERSHIELD®, SENTURION®, SOKALAN®, SONNEBORN®, SRS®, STYROFOAM®, STYROPOR®, THERMIDOR®, THORO®, UCRETE®, and WALLITTE® are trademarks of BASF Corporation. COMFORT FOAM® is a trademark of BASF Polyurethane Foam Enterprises LLC. Energy Star® is a trademark of the United States Department of Energy. LEED® is a trademark of the United States Green Building Council.

© 2008 BASF Corporation.

www.basf.com/construction