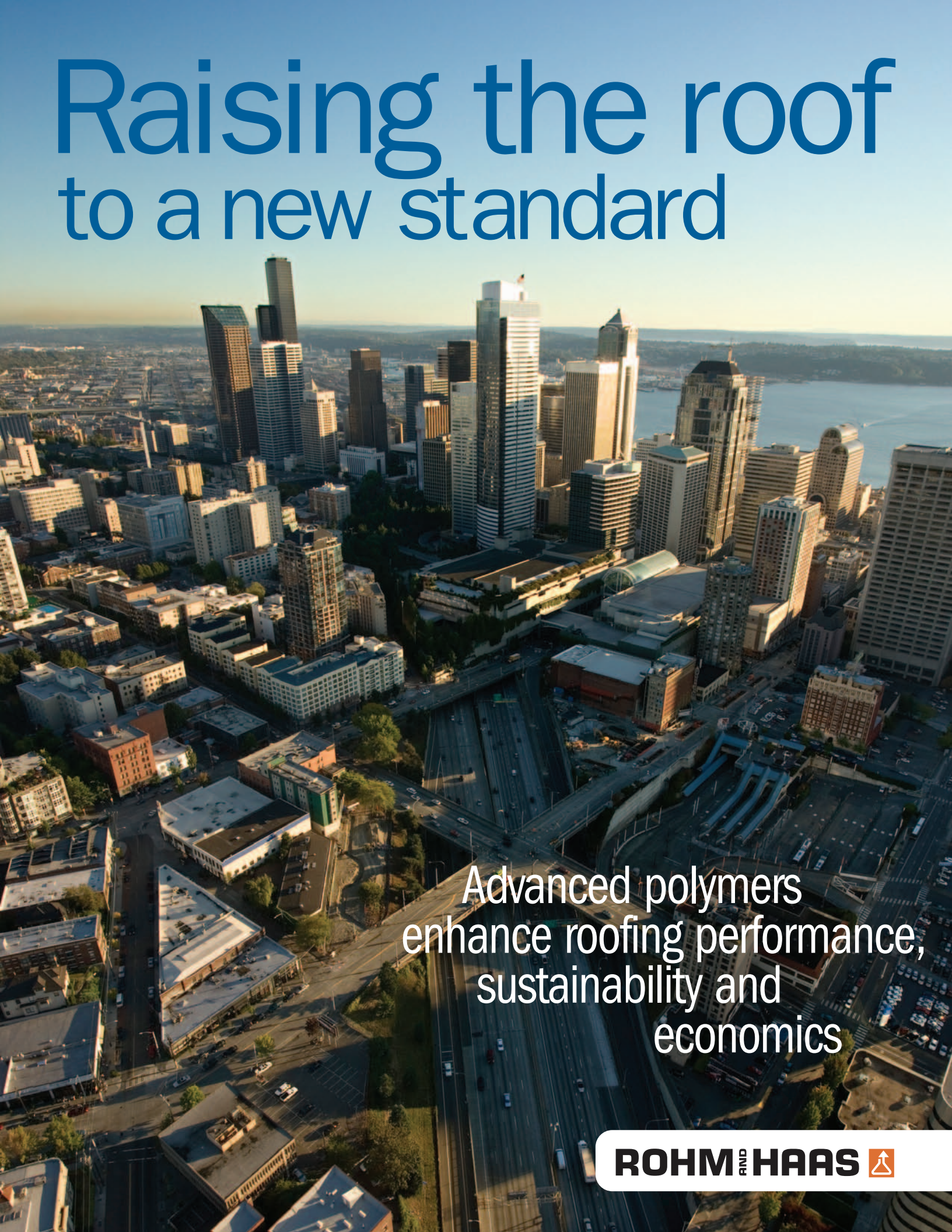
Raising the roof to a new standard



Advanced polymers enhance roofing performance, sustainability and economics

ROHM AND HAAS

Pick a beautiful, clear, sunny day. Charter a plane and fly above any city you like. You'll witness an immense sea of blacktopped roofs with an occasional beautiful white island here and there – these being testament to the expanding preference for white as a roof finish. These "islands of change" have been surfacing for a number of years now. Their energy efficiency has become a solution welcomed by commercial building proprietors and smart residential home-

owners. These white rooftops are most likely elastomeric roof coatings that are helping to drive a better energy initiative across the United States and around the world.

For example, California mandates "cool roofs" for all reconditioned commercial and industrial buildings. *Cool Houston!* is a program at the Houston Advanced Research Center designed to help reduce urban temperatures through use of cool technologies, including reflective roofing. Chicago is a major proponent of eco-friendly roofing. Tokyo is focusing on ways to moderate the heat island effect. From the Lawrence Berkeley National Laboratory to the International Council for Local Environmental Initiatives, activity is underway to address the heat island problem. Cool roof technology is a growing part of the solution.

A lasting solution

When specialty materials company Rohm and Haas set out to apply elastomeric coatings technology to roofing, they could have restricted their focus to meet only the immediate need for durability. Instead, they raised their sights – and raised the roof to a new standard of performance, durability, functionality and eco-friendliness.

The task was to develop materials that could be used in formulations that would maintain and restore low-slope roofs over a variety of substrates under a broad range of conditions. The new polyurethane foam systems, available for low-slope roofing, posed a difficult challenge of their own. They required a coating that would protect them against UV light, but very few substances will adhere to their surface. Research scientists at Rohm and Haas had the expertise to accomplish both goals. They also had the experience to know that if they approached the problem in terms of improving roofing systems, not just protecting them, they could provide their customers and end users with even greater value.

Over the past three decades, the extent of that value has become increasingly clear. Elastomeric roof coatings, now recognized as key components of the building envelope, enhance structural integrity, reduce maintenance, increase longevity, improve energy efficiency, and provide significant, immediate and longer-term environmental benefits.

Strength in elasticity

The strength of elastomeric coatings lies in their elasticity, the property that enables them to expand and contract with the substrate, bridging and spanning small cracks as the temperature fluctuates. Especially in temperate climates, a roof can undergo dramatic shifts in surface temperature, even within a single 24-hour period. Hot summers, cold winters, and the variable bridge seasons of spring and autumn (when daytime heating from the sun alternates with significant nighttime cooling) all contribute to mechanical stress.

Under these conditions, achieving just the right balance between tensile strength and elongation is no simple task. "That's the trick," says Rohm and Haas research scientist Vincent Bralic. "It's got to be like a rubber-band. That's critically important. And we know how to do it."

To achieve that elasticity, elastomerics contain soft binders that behave like a liquid at room temperature. "But soft also means sticky," says Bralic. "The polymer itself is like flypaper. Dirt sticks to it. Rohm and Haas has unique chemistry in soft binders that gives them excellent resistance to dirt pickup. So, they retain their elasticity, but they also stay clean."

Eight steps to a high-performance elastomeric roof coating

A coating that meets all your expectations for durability, energy efficiency, and asset protection is guaranteed when you can answer yes to each of these questions.

- Will you be applying a top-quality 100 percent acrylic coating?
- Does the coating meet or surpass technical norms such as the ASTM D-6083 specification (the American Society for Testing and Materials' Standard Specification for Liquid Applied Acrylic Coating Used in Roofing)?
- Are the coating's energy-saving properties certified by the Cool Roof Rating Council, or does it meet the Energy Star program requirements?
- Will the coating be applied in at least two passes, for a minimum total thickness of 20 thousandths of an inch?
- Will a roller, a brush, or a spray applicator be used and how will you make sure you obtain the right thickness with either one of these tools?
- If there are any leaks, will proper repairs have been completed before the application of the coating?
- Has the proper surface cleaning and preparation for my type of roof been included as part of the bidding process (e.g., spray-washing, removal of debris, priming, etc.)?
- Should my coated roof be inspected and cleaned regularly as part of a preventive maintenance program?

White, clean and green

Clean is a real challenge because the coatings are white. Why white? According to Bralic, "If you have roof coatings, why choose black? Asphalt is black because it has to be. But anyone who has ever worked on a black roof knows how hot it gets. If you could make it white, you'd certainly be smart to do it."

That intuitive approach brings demonstrable benefits. Heat and sunlight degrade roofing materials. Plus, excess heat on the roof adds to cooling costs throughout the building. A 100 percent acrylic coating provides great resistance and protection against UV light. Furthermore, if that same 100 percent acrylic coating is white, it will additionally provide solar reflectivity and emissivity. The result is a cool roof, lower air temperature and energy savings.

"With proper maintenance, a coated roof could last the lifetime of the building."

Cool and greatly improved

Affordable cooling is what first brought white elastomeric roof coatings to the attention of Liz Robinson, executive director of Philadelphia's Energy Coordinating Agency. In this city of brick and masonry homes with flat black roofs, "excess heat events" have been literally, and tragically, known as "killer heat waves" because many low-income homeowners can't afford air conditioning. Robinson's agency saw a five-degree reduction in indoor, upstairs temperature from the use of the elastomeric coatings in combination with nighttime fans. Outside, the temperature of a roof surface tends to fall by an average of fifty degrees during a hot summer day. Robinson calls the reduction, "the perfect approach for our housing stock and our region." The summer cooling effect more than offsets any heat gain by a black roof in winter by more than tenfold, according to Bralic.

Other advantages soon became apparent as well. Robinson points out, "A lot of buildings fail because black roofs fail. Elastomeric coatings change all that and help preserve housing stock. They help change the home from a liability into an asset." Robinson's work includes block-long projects in Philadelphia, where all the buildings received roof coatings. That's resulted in added cooling both indoors and out, because white roofs reduce the urban heat island effect, unlike dark roofs and pavement that absorb heat, raising the temperature in their vicinity.

New life for old roofs

In more ways than one, elastomeric roof coatings are "green," or environmentally advanced, if you will. Not only do they help provide energy savings, but they also reduce landfill waste and provide substantial savings in maintenance and replacement costs.

This is because over time, heat, sunlight and cracking due to expansion and contraction degrade roofs. The traditional model was to tear off the aging roof and replace it after 15 or 20 years. Elastomeric coatings can change all that. "A coated roof could last the lifetime of the building with regular maintenance," says Rohm and Haas's George Daisey, group leader, Elastomeric Roof Coatings – Paint and Coatings Materials. Maintenance is limited to occasional cleaning with a hose or power washer and reapplying the coating every 10 or 15 years.

Extending roof life indefinitely could have enormous impact. According to Jeff Christian, manager of Oak Ridge National Laboratories Buildings Envelope Research Center in Tennessee, a mere 5-year increase in roof service life should reduce the cost of

A "soft" wall of tough protection

The benefits of elastomeric coatings are not limited to roofs. Wall coatings formulated with this tough 100 percent acrylic elastomeric material remain flexible but retain their tensile strength to protect over a wide range of temperatures. Their flexibility and softness also provide excellent resistance to dirt pickup and prevent wind-driven rain and moisture from seeping into cracks and causing structural damage, even in humid, hurricane-prone regions. Elastomeric wall coatings keep homes in one piece – safe and dry.

By bridging micro-cracks, elastomeric wall coatings help maintain masonry walls, protecting and renovating older buildings and providing integrity and maintainability for new construction. Recent technological advances by Rohm and Haas enable modern elastomeric wall coatings to achieve new levels of performance, appearance and functionality.

A superior solution to conventional paints

Micro-cracks make protecting masonry surfaces a special challenge. Conventional paints, including masonry paints, are based on "hard" polymers and form rigid films at ambient temperatures. As underlying cracks expand, the paint cracks along with them, violating the integrity of the coating. Protecting masonry requires a "soft" solution: coatings based on elastic polymers that can stretch across the gap, bridging cracks and preventing water and salt from penetrating, and then "snap back" to their original state when the crack narrows.

roofing by 21 percent, saving the country $2.5 billion a year and cutting landfill waste from roofing by 25 percent. Roofing waste currently represents almost four percent of the total volume of solid wastes in the United States.

Partnership assures performance

Joe Rokowski, a research scientist at Rohm and Haas, notes that after 30 years of experience, "We know how roofs fail.

We have to know that so we can keep them from failing. And that means working closely with approved roof coatings manufacturers who buy our resins. They're the experts on formulation, manufacturing and real-world application conditions. That information is invaluable, and they have it." Well trained, certified contractors are also key in assuring performance. "Someone who's only experience is painting houses can't do it," says Rokowski. "It must be a trained applicator who knows which coating to use on a given substrate and has the knowledge and skill to apply it correctly."

Forming collaborative working relationships with customers and customers' customers is a core value at Rohm and Haas — one that market manager Javier Banos credits. "Close cooperation in the development of elastomeric coatings and their continuous improvement is what's made the business what it is today."

Banos also cites his company's active participation in trade circles, adherence to rigorous standards such as ASTM specifications, the Miami-Dade County building codes and California's Title 24, and its role in initiatives such as EPA's Energy Star. "Roofs are complex structures, and there's a proliferation of roofing substrates," Banos points out. "These coatings must be able to adhere to all of these substrates and to perform under a variety of conditions, whether the roof is weathered or new and smooth." Collaborative partnerships help assure that they do.

Not just paint...

House paint is typically about 4 mils (0.004 inches) thick, while elastomeric roof coatings cures to five times that thickness – 20 mils (0.020 inches).

Sustainable success

Elastomeric roof coatings are environmentally advanced and truly sustainable, says Banos. "Not only because they reduce energy consumption and landfill waste, but also because of what they are: water-based and very, very low in volatile organic compounds (VOCs)." Rokowski adds that that's meant they've had to change very little in the last 20 years, even to meet California's stringent standards.

As good as today's products are, Rokowski says, "We're always trying to improve them. We were first in the market, and we're committed to maintaining the lead, making sure our customers have the best products out there."

Because customer and marketplace needs are constantly changing, Rohm and Haas is continually working toward new, best solutions. For example, coatings must be robust enough to cure despite dew or light rain in the hours after they are applied. Banos says that's been mastered, and while "hard rain resistance is still a challenge, we think we can solve it."

Different regions pose different problems. Rohm and Haas market manager Ian Penboss says that in Asia-Pacific cities like Shanghai, high levels of pollution make dirt resistance a major benefit, and in Tokyo, awareness of the heat island effect is focusing increased attention on cool roof technology.

A winning combination

From skyscrapers in China to homes in America, elastomeric roof coating technology is "a win-win for everybody who uses it," says Banos. "It's a dual performance product that maintains roofs and makes them more energy efficient. The benefits converge when you consider the need to replace roofs. Then you're looking at total economy and environmental sustainability over the lifetime of the building. That makes it even more compelling."

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