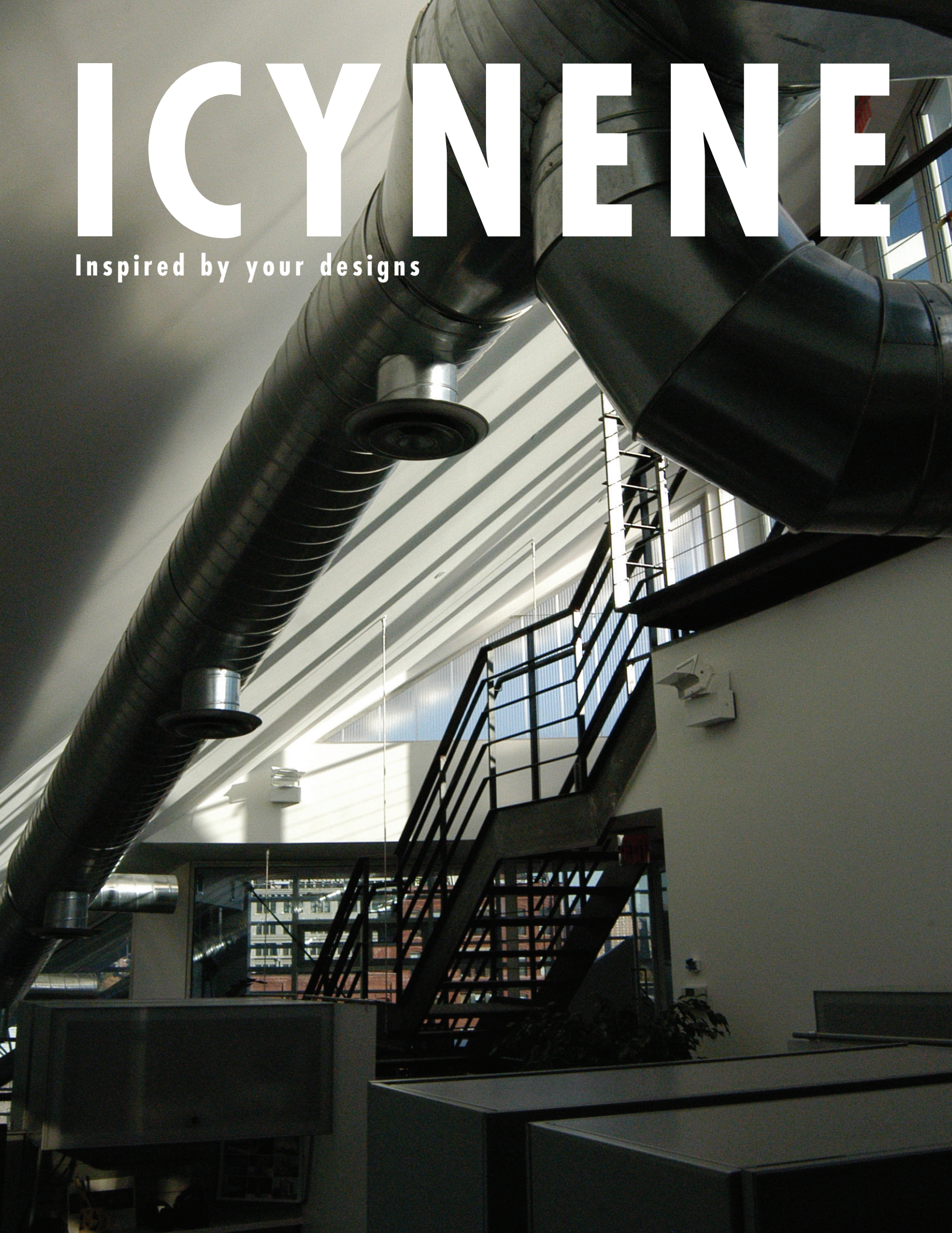


ICY NENE

Inspired by your designs





project: Gilman Ordway Building

Incorporating Icynene as part of its environmentally-intelligent design, the Gilman Ordway Building (Falmouth, MA) at the Woods Hole Research Center is selected as one of the Top 10 Green Projects by the American Institute of Architects (AIA) and its Committee on the Environment (COTE).

Explore geometry and space

without compromising building envelope performance

Commercial Design considerations come with very specific challenges that can't be addressed with just any type of insulation. Complex designs that result from traffic patterns, acoustic considerations, light sources, and aesthetic qualities barely scratch the surface. What about sweating ceilings, corrosion, moisture build-up, and inefficient heating and cooling systems? It takes a FEMA-recognized, third party tested insulation and air barrier material to get the job done right and with ease. Icynene® lets you design without compromise. Ideal for wood – or steel-framed construction, Icynene conforms to unusual geometry and provides a continuous barrier that significantly reduces air leakage, minimizes airborne moisture transfer, and optimizes energy efficiency.

100% water-blown and resource-efficient, Icynene is sprayed into walls, ceilings, and floors, then expands 100 times its initial volume and cures within seconds. Once cured, the material remains soft and flexible enough so that it moves with the building substrate, leaving no gaps or seams that can compromise airtightness.

An insulation material that provides control of air leakage will greatly assist in resolving the associated health and economic concerns. Thermal performance, air quality, energy consumption, sound attenuation, and building durability are all negatively affected by uncontrolled air leakage. Integrating Icynene as part of a sustainable design strategy has proven to be an effective tool that allows design professionals to provide their clients with the advantages that come from a controlled environment.



INDOOR AIR QUALITY AND PRODUCTIVITY

The U.S. Department of Energy and the Rocky Mountain Institute (RMI) issued a report that documents increased productivity and reduced absenteeism amongst workers and students occupying green buildings. There are now hundreds of published testimonials about the health and productivity benefits that result from adopting green design strategies. For example, William Pape, the cofounder of VeriFone, reports that eighteen months after VeriFone employees began working in a building retrofitted to cut indoor pollutants and improve indoor environmental quality, absenteeism rates were down 40% and productivity was up by more than 5%. Pape notes that healthy workplaces have “done more to boost productivity than all the bandwidth in the world”.¹ Work-related asthma is fast becoming one of the most commonly diagnosed occupational respiratory diseases in the U.S.² According to the American Thoracic Society, an estimated 15% of all adult cases of asthma may be related to the workplace. Based on this estimate, approximately 1.3 million adult asthma cases could be attributed to occupational exposure.

FIVE DESIGN STRATEGIES FOR HIGH-PERFORMANCE BUILDINGS

1. INDOOR ENVIRONMENTAL QUALITY (IEQ) STRATEGY:

Facility owners and managers want buildings that promote physiological and psychological occupant health, minimize air pollution, improve sensory conditions (acoustical, thermal, visual), and enhance human comfort, productivity and performance. These requirements are positively benefited by insulating with Icynene. From healthcare facilities to museums, Icynene supports a project’s IEQ design principles by minimizing the causes of unhealthy buildings and “sick building syndrome” (SBS).

This blanket of soft foam insulation forms a continuous thermal barrier that seals around electrical boxes and other wall penetrations that allow unwanted air leakage. Icynene fills gaps and seams that would otherwise compromise air tightness and energy

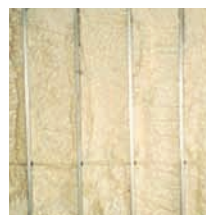
performance. Building occupants will appreciate an environment free from drafty areas, unwanted sounds, and other irritants that are transferred with outdoor air, such as the intrusion of outdoor allergens and pollutants. Icynene is the insulation of choice for a number of healthcare facilities where allergens such as dust and pollen must be minimized as they pose a threat to susceptible patients. Icynene also assists in maintaining positive pressure in critical care wards.

Combined with proper mechanical ventilation, Icynene is the ideal insulation material for a healthy structure so building occupants can control the quality of the indoor air they breathe. Integrating Icynene and a properly-sized HVAC system will ensure that there is always proper air movement and sufficient control of air exchange within the building.



SICK BUILDING SYNDROME: CAUSES AND INDICATORS

The four major causes of, or contributing factors to, sick building syndrome are inadequate ventilation, chemical contaminants from indoor sources (adhesives, cleaning agents, VOCs), chemical contaminants from outdoor sources (motor vehicle exhausts) and biological contaminants (bacteria, molds, pollen, viruses). Indicators of SBS include: headache; eye, nose, or throat irritation; dry cough; dry or itchy skin; dizziness and nausea; difficulty in concentrating; fatigue; and sensitivity to odors. Most of the complainants report relief soon after leaving the building.³



“As far as we are concerned, Icynene® is the future of insulation technology. It is the perfect choice for steel frame builders who seek performance from their insulation in terms of energy efficiency and sound reduction and who do not want to deal with moisture problems later on.”

Del Bonds, President, Inter-Steel Structures, Seattle, WA.

2. MOISTURE MANAGEMENT STRATEGY

Air leakage can account for as much as 99% of the moisture movement through the building envelope.^{iv} Minimizing air-flow through the building envelope is an effective method of designing a healthy, durable, and efficient building. An integrated, soft foam insulation and air barrier material, Icynene significantly reduces air movement into and out of a structure. The small volume of moisture that is transferred via diffusion passes through the material can be easily removed from the building envelope by natural drying cycles. Icynene provides the double benefit of limiting condensation while continuing to operate at peak performance once dried (see Figure 1).

So effective is Icynene at minimizing the potential for condensation, moisture build-up, and the growth of mold or mildew, the product is often specified for use in museums, art galleries, and libraries where condensation-control is critical to preserving the integrity of valuable collections.

Testing by Texas Tech University found Icynene not to be a food source for mold.

Part of a sound risk management plan is proactive mold mitigation, which involves taking measures early on to minimize the potential for mold growth and preclude litigation. Construction-defect and mold claims continue to rise and the potential list of defendants are many – builders, contractors, subcontractors, and design engineers are just a few of the groups that can become involved with high-profile mold lawsuits. Specifying the right building materials and systems is crucial. Design professionals who specify superior products for their projects are setting the standard for total protection. Icynene, in particular, addresses moisture concerns at various levels of the construction process without causing delays or interference, giving you the freedom to

push the envelope of design and construction.

3. ENERGY EFFICIENCY STRATEGY

Energy often represents the single largest operating expense in a commercial property. In fact, reducing energy use by 30% can be equivalent to increasing net operating income (NOI) and building asset value by 5%.^v Wasteful amounts of energy that cut into profits are easily avoidable by implementing energy-efficient features like Icynene, which can save facility owners and managers up to 50%.

Case in Point: Exceptional Energy Performance in a Healthcare Facility

Icynene was selected to insulate The Darling Home for Kids, a hospice and respite center located in a biosphere reserve area in Ontario, Canada. Sustainable design and construction was the focus of this project. Urbana Architects Corporation (HOK World-wide alliance partner) selected Icynene because it is a material that is respectful of the environmental and health considerations of the Home. Icynene's air-sealing properties minimized random air leakage and allowed for the installation of a smaller, less expensive HVAC system. Although this facility requires a significantly higher-than-normal level of air changes per hour (6 ACH) to dilute and remove airborne contamination, an energy analysis demonstrated that HVAC operating costs amounted to 37% less than if the building was insulated with conventional air-permeable insulation.^{vi} Icynene allowed the builder to incorporate a smaller HVAC system that uses less

energy to heat and cool the structure, resulting in initial savings of equipment costs as well as ongoing savings of operating costs.

MOISTURE TRANSPORT VIA DIFFUSION vs. MOISTURE TRANSPORT VIA AIR LEAKAGE

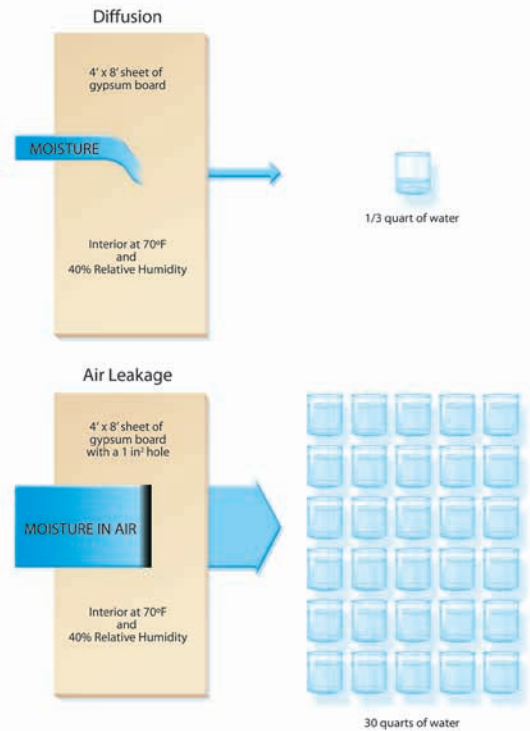


Figure 1: Almost 99% of moisture travels through the air, while diffusion represents only 1% of the total moisture flow. Diffused moisture travels through the sheathing and the insulation to the interior space where it is easily removed from the air by the A/C system.

energy to heat and cool the structure, resulting in initial savings of equipment costs as well as ongoing savings of operating costs.

4. MATERIALS STRATEGY

Selecting an insulation material that supports your sustainable design efforts is a challenge. A truly “green” insulation will not only address the threats that originate from the external environment, such as air pollution and rising energy costs, but it will also support sustainable principles in the following ways:

Material Composition

As a green building product, Icynene is the ideal insulation for a healthy indoor environment. Icynene is recognized for

R-VALUE AND ENERGY SAVINGS: A LEAKY STORY

Building scientists have recognized that air leakage can have a greater impact on energy consumption than R-value. In fact, air leakage can contribute to as much as 50% of building energy loss.^{vii} Building design that promotes air-sealing offers far greater potential energy savings than adding R-value to a leaky building. While R-value measures an insulation's ability to inhibit conductive heat flow, it does not measure convective heat flow (or air leakage). Air leakage creates an environment that's uncontrollable by building

occupants who often describe the environment as too hot or too cold, too drafty or too noisy – all of which create an uncomfortable space and reduce productivity.

AIRTIGHT SOLUTION TO SUPERIOR BUILDING ENVELOPE PERFORMANCE

Since R-value doesn't measure an insulation's ability to control air leakage, design professionals and facility owners must look at other material properties to determine which products are suitable for healthy, energy-efficient design

and construction. Air permeance, for instance, measures the air leakage rate of an insulation material. An insulation material that is air permeable permits air movement within the cavity. And when moisture-laden air is moving from the exterior to the interior of the building, air conditioning equipment must work overtime to remove this moisture. Not only does this result in increased energy consumption, but this can also pose a threat to durability and to the quality of the indoor environment.

INTERNATIONAL SPOTLIGHT



Top Left: Wat Paknam Temple, Daiei-cho, Katori-county, Chiba Prefecture, Japan

Top Right: Galleria Hi Brand Shopping Mall, Seoul, Korea

Bottom Left: Yanzhou Sports Centre, Yanzhou, Jiangsu Province, China

Bottom Right: Mashiko Forest Museum, Mashiko, Haga-county, Tochigi Prefecture, Japan

improving air quality in buildings across North America. Icynene uses water as its only blowing agent to create an environment free from harmful, long-term emissions in its cured form. The open-cell structure of Icynene is filled with air.

Material Use

Icynene supports a waste management strategy because it assumes two tasks: thermal insulation and air barrier. Icynene can help achieve an airtightness level of 0.1 air changes per hour at natural pressure (ACH_{nat}) without the extensive use of labor-intensive sealing materials, which would otherwise be required with the installation of conventional air-permeable insulation.

In addition, Icynene's low density open-celled structure allows any excess foam to be easily compacted, thereby minimizing the volume of waste material and the impact on the waste stream. In one step, Icynene allows designers and builders to create a durable, airtight thermal envelope while supporting the principles of sustainable design and construction.

Environmental Impact

Some conventional closed-cell insulation materials off-gas as time passes, which means that they eventually suffer degraded R-value. Because the open-cell, air-filled structure of Icynene

does not off-gas in its cured form, it maintains its efficiency with no loss of R-value. Icynene will provide total thermal comfort for its occupants as specified by the designer both today and for years to come. Selecting products that provide longevity will eliminate the need for the installation or re-installation of additional material in the future.

5. WHOLE BUILDING DESIGN STRATEGY

Buildings provide shelter, encourage productivity, and embody culture. But they also consume vast amounts of energy and materials. Building scientists have discovered that incorporating the "whole building" approach in design policy is essential in addressing the energy and resource crisis. Rather than analyzing the components and systems of a building and optimizing them separately, we've learned that a much more efficient and cost-effective building can be produced when we understand that all building systems are interdependent. The choice of a mechanical system might, for example, impact the quality of the air in the building, the ease of maintenance, and operating costs. In turn, the size of the mechanical system will depend on factors such as the type of insulation used, how much natural daylight is brought in, how the space is organized, and the facility's operating hours. A consistently insulated and air-sealed building envelope provides much fewer problems with distribution of heating

and cooling as well; so balancing, commissioning and maintenance of the system becomes significantly easier.

The "whole building" principle requires an interactive approach to the design process; even building materials should play a supportive role. Icynene integrates well with other building components because it delivers optimal airtightness levels, allowing for proper mechanical ventilation to create a healthy, efficient building envelope. In tandem with a properly-designed HVAC system, Icynene helps ensure that indoor relative humidity levels remain between 35% and 55% - a level at which mildew, dust mites and other allergens are minimized. Reducing excess moisture also helps to extend the life of the structure and the systems within it.

Problems with Metal Buildings Averted

Insulating steel roofs is no challenge. When applied directly to the underside of the roof, Icynene adheres to the substrate, remaining flexible and soft which allows it to expand and contract in order to prevent delamination. The material delivers a reliable air-seal, minimizing the potential of condensation and corrosion. Even if Icynene gets wet through a roof leak, the water will drain down through the insulation out of the bottom surface without spreading so that it, as well as surrounding materials, can quickly dry. Once the leak is repaired the insulation will dry out. There is no need to replace the insulation.

"The foam (Icynene) insulation had many desirable features, including the ability to insulate the exterior walls/roof of the building and significantly air tighten the structure by filling nearly all of the cracks and crevices inherent with steel building construction."

Florida Solar Energy Center, Final Report FSEC-CR-1153-00, February 2000, page 4

Icynene's unique chemistry remains unaffected by wetting and drying so that it continues to operate at peak performance levels once dried. "After all, the problem isn't that water gets in - it's that it can't get out."^{viii} Roof leaks are easier to detect and their repair does not necessitate extensive removal of insulation to facilitate drying. And since roof leaks do not impede Icynene's performance, owners and managers can enjoy savings in maintenance and operating costs.

Icynene also addresses other critical considerations for steel roofs, in particular, including simplicity of installation, thermal performance, life expectancy, and maintenance costs. Unlike conventional insulation, Icynene fills every framing cavity and conforms to the details with no hang-up on fasteners, plumbing or wiring.

Meet the Insulation Challenges for Metal Buildings

Low-maintenance buildings mean stress-free building owners and managers. Icynene is the ideal solution for a durable, extended building life:

- Minimizes moisture problems
- Controls air leakage to deliver optimal energy efficiency
- Solves framing challenges by completely filling and sealing any shaped cavity and design
- Maintains its original cured form without shrinking, sagging or settling
- Provides a one-application, permanent solution to uneven temperatures and thermal comfort.

Icynene Helps Designers and Owners get with the Program

Local and national green building programs make it easier for architects, engineers, and building owners and managers to incorporate sustainability into new or existing commercial and institutional buildings. Offering workshops, guidelines, tools, and financial incentives, these programs provide clear direction and support for energy-efficient, sustainable design practices.

The United States Green Building Council's LEED (Leadership in Energy & Environmental Design) Program, for instance, is designed to recognize environmental leadership in the building industry. The program provides a complete framework for assessing building performance and meeting sustainability goals. Getting your building LEED-certified is within reach when using products that contribute to the achievement of LEED credits. Icynene, for example, contributes to the achievement of LEED points in four out of the six categories for new construction including: Energy &

Atmosphere, Materials & Resources, Indoor Environmental Quality, and Innovation & Design Process.

Case in Point: Icynene-Insulated School of Performing Arts Becomes LEED-Certified

The Detroit School of Arts (DSA) in Detroit, MI occupies a six-story building that contains performing, visual, communication and media art spaces. The high school building also houses the new production center for Detroit Public Television (DPTV), the local PBS affiliate, and a new radio facility for WDTR, the Detroit Public Schools FM radio station.

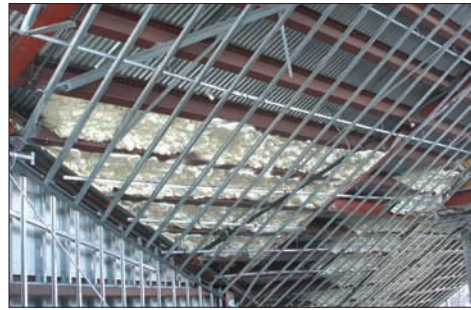
- i "Healthy, Wealthy, and Wise" www.inc.com
- ii American Journal of Industrial Medicine, June 2005
- iii www.epa.gov,
- iv Canada Mortgage and Housing Corporation
- v www.energystar.gov
- vi REM/Design – Residential Energy Analysis Software v10.21 (Icynene Application Case Study: "A Paradigm for Sustainable Healthcare Design")
- vii Department of Energy
- viii "Pushing the Envelope," Lawrence Herzog



project: Isbell School

Icynene is one of the high performance features installed in the Bert and Eloise Elementary School (Frisco, TX), which now provides an ideal environment for young minds to grow.





project: Scarano & Associates Architect's Office
 With its innovative architecture and challenging site location, the Scarano & Associates Architect's office (Brooklyn, NY) serves as an instructional laboratory for structure and design. Situated on top of a one hundred year-old building with its skyline views of New York City – the Manhattan Bridge on one side and a busy expressway on the other – Scarano & Associates selected Icynene to alleviate concerns with disruptive noise levels, structural durability and energy efficiency.
Winner of a Metal Architecture's 2005 Design Award

project: Lake Highlands Presbyterian Church

Icynene was applied to the steel-framed walls and wooden roof trusses to increase the comfort and energy efficiency of the Lake Highlands Church (Frisco, TX). Applying Icynene to the underside of the roof deck, keeps the temperature in the attic space within a few degrees of the space below. This allowed for the installation of a less expensive water sprinkler system that required no freeze protection.



ICYNENE® Insulation Comparison Chart

Compare the benefits of ICYNENE LD-R-50™ (renewable-based spray foam) and ICYNENE LD-C-50™ (classic spray foam) with alternate products on the market to demonstrate why Icynene® is the insulation of choice. Comparisons should consider product testing results and certifications, including ASTM testing and compliance with programs such as ICC-ES SAVE™ and the USDA BioPreferred™ Program.

Desired Features	ICYNENE LD-R-50™	ICYNENE LD-C-50™	Alternate Insulation
Material air-seals insulated cavity without extra sealing and labor	✓	✓	
Completely fills irregular or hard-to-reach spaces	✓	✓	
Contains no HFCs or PBDEs	✓	✓	
No harmful long-term emissions	✓	✓	
Not a source of food for mold	✓	✓	
Won't shrink over time	✓	✓	
Not damaged by water	✓	✓	
Minimizes airborne sound transfer	✓	✓	
No framing distortion	✓	✓	
No settling or sagging	✓	✓	
Contains "rapidly renewable" material (USGBC definition, requiring a 10-year or less re-growth time frame)	✓		
Exceeds renewable requirement for a bio-based material as per the USDA BioPreferred™ Program	✓		
Meets requirements for an Environmentally Preferred Product (EPP) CHPS E.Q. 2.2 Compliant	✓	✓	

Download the latest specs, technical data, test results, and more by visiting Icynene.com/Architect

Always refer to Icynene's Technical Data Sheets for the most up to date information



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