EPS Molders Association

Newsline

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Wall Assembly Performance in Mixed Humid Climates

NAHB FIELD TEST ASSEMBLIES

When designing a building envelope, architects and contractors must consider the regional climate in order to maximize moisture control strategies. A building's wall assembly is the first place to fortify a defense against moisture. With buildings being constructed tighter and more energy efficient, air sealing measures and additional insulation in exterior wall cavities create colder wall sheathing which is less able to dry naturally when it becomes wet. This makes the design of the wall assembly vitally important, not only to keep moisture from getting into the exterior walls, but also to allow the escape or dissipation of any moisture that penetrates the wall assembly.

The NAHB Research Center (a subsidiary of the National Association of Home Builders) recently completed a twenty-two month field study, *Effect of Cladding Systems on Moisture Performance of Wood-Framed Walls in a Mixed-Humid Climate*, to determine the most effective exterior cladding systems to help avoid excess moisture in exterior walls. Nine different north and south oriented wood framed wall assemblies were tested, including vinyl siding, fiber cement, stucco, brick and insulated vinyl siding, which included contoured EPS placed behind the exterior surface of the vinyl siding panel. The assemblies represent roughly 90% of the primary claddings used in new construction. The study revealed EPS insulated siding proved the best of all nine claddings tested, maintaining the lowest all-around sheathing moisture content value.

The study was conducted on the NAHB Research Center campus in Maryland, a mixed humid climate. The mixed humid climate has unique conditions, which typically includes moisture migration from the inside of a structure during the winter and from the outside during the summer. These dynamic

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Insulated Masonry

Plastics & Bricks Working Together for Energy Efficiency

by Jeffrey A. Nickerson

Masonry construction has long been recognized for its durability, along with its structural, acoustical and fire-resistant benefits. However, it is now also increasingly being seen as an excellent means to stave off increasing energy costs. Providing thermal mass, masonry walls quickly absorb excess solar heat and stabilize indoor temperatures.[1] These attributes are now being enhanced in a composite material that partners masonry with plastic foam insulation to help achieve increased thermal capacity and further inhibit heat flow.

Whether used in the structural load-bearing function of yesteryear or in a newer non-load-bearing wall, masonry has evolved into a highly engineered building component. Its versatility allows expanded polystyrene (EPS) and other foam plastic insulations to complement the energy profile for wall assemblies either as board insulation, custom-molded core inserts, or an aggregate for lightweight concrete.

Advancements in both concrete masonry and rigid foam insulation, along with improved construction methods, offer numerous options when designing for either residential or commercial building projects, including:

- interior and exterior insulated block;
- cavity-insulated block;
- pre-insulated block; and
- mortarless insulated block.

ASHRAE Energy Standards

American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE) 90.1, *Energy Standard for Buildings Except Low-rise Residential Buildings*, serves as the basis for energy code requirements at the federal level and within most states. As such, it is the most commonly referenced standard for establishing minimum energy efficiency parameters in the design and maintenance of indoor environments. Recognized within the *International Energy Conservation Code (IECC)* and National Fire Protection Association (NFPA) 5000, *Building and Construction Safety Code*, ASHRAE 90.1 has also been acknowledged as the benchmark reference for commercial buildings looking to qualify for tax deductions under the new *Energy Policy Act of 2005 (EPAct 2005)*.[2]

ASHRAE 90.1 addresses the building envelope's vital role in optimizing energy efficiency, covering both prescriptive and performance-based criteria.[3] Section 5 outlines space conditioning categories, compliance paths, and detailed product information and installment requirements for the building elements of wall, roof and floor assemblies. Citing eight climate zones, minimum insulation R-values are stipulated for the various construction methods with the reciprocal U-factors for the assembly maximum. Additionally, Normative Appendix B provides information to determine both U.S. and international climate zones.

In the prescriptive method, most energy codes make adjustments for walls with thermal mass, such as concrete and masonry, recognizing R-values are not a true indicator of energy performance. In most climates, buildings with insulated mass walls save energy compared to those that have the same R-value but lack mass.

Since the mass reduces peaks in the mechanical system loads, first costs for HVAC equipment may also be reduced in some climates. In Tulsa, Oklahoma, ASHRAE 90.1 requires an R-13 + R 3.8 continuous insulation frame wall or an R 11.4 continuous insulation mass wall in some buildings. These requirements are based on the fact that a mass wall is as energy-efficient on an annual basis as a frame wall for this particular climate. (Thermal storage benefits in mass wall construction are influenced by frequent temperature variations, solar radiation, wind and the building's design, operation and maintenance.)

First published in 1975, ASHRAE 90.1 has undergone numerous revisions—the latest changes are geared to simplify—thereby broadening its use. Tied to the sustainable design movement and increasing utility costs, many of the current revisions are intended to facilitate improved energy conservation. This includes a new appendix to rate the energy efficiency of buildings exceeding the standard's minimum requirements and to provide guidance on how to design for certification programs, such as the U.S. Green Building Council's (USGBC's) Leadership in Energy and Environmental Design® (LEED®).

Types of Insulated Masonry

The energy-saving abilities of an insulated masonry wall assembly are significant. Its compatibility with other construction methods allows numerous design configurations that can meet the environmental demands of extreme and moderate climates.

Depending on the materials and type of wall assembly selected, performance criteria can be specified to an exact degree. Designing for energy performance that exceeds minimum requirements is most easily achieved by adding foam plastic insulation.

As a basis of comparison, when using a 13-mm (0.5-in.) gypsum board on a single-wythe wall comprising 203-mm (8-in.) concrete masonry units (CMUs) without insulation, it has an R-3.4. When adding 51-mm (2–in.) of EPS, the R-value increases to 10. However, this does not account for other key factors in determining the assembly's overall energy performance (*e.g.* air tightness, thermal lag, and thermal dampening), making R-value a part of a larger equation.

Measurement systems to determine the thermal performance of independent building materials are based on steady-state coefficients (*e.g.* R-value; C-factor; U-factor), but are not geared to evaluate system performance. As such, they cannot deliver an accurate representation of the achievable interdependent energy savings.

For example, when accounting for the benefits of thermal mass, added insulation, and a 51-mm (2-in.) air space in a cavity wall, the theoretical R-value is 22 versus an R-14.5 when using steady-state data points. This emphasizes the benefit of newer computer software that can project overall thermal performance and further produce measurement gauges to evaluate their accuracy over time.

Interior insulated masonry is a good choice for those familiar with the more traditional block construction. Lightweight metal brackets and rigid foam insulation replace more costly traditional materials while allowing ample space for plumbing and electrical wiring and improved moisture protection. Lightweight aggregates can reduce the weight of the concrete block by up to 25 percent, when compared to traditional units. They also effectively reduce installation time by substantially increasing the number of units per hour a mason can lay.

In an exterior insulated system, the insulation is mounted onto the outside of the block wall and then finished with a simulated stucco or stone facing. These siding systems effectively stop moisture penetration since the insulation and finish are uninterrupted. Wiring or plumbing can be run through the block cavities or traditional furring for drywall can be used on the inside surface. With EPS insulation, increasing the thickness and/or density of the foam board can help improve the structure's energy performance. This method is ideal in climates experiencing temperature swings—the concrete mass on the inside is optimal for storing heat or coolness.

There are several methods available for in-block insulation, which is most commonly used to insulate single-wythe construction.

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hygrothermic conditions can be problematic for certain wall assemblies. The mixed humid climate is defined as having:

- More than 20 inches of annual precipitation;
- Between 3,600 and 5,400 annual heating degree days (base 65˚ F);
- An average monthly winter temperature below 45˚ F.

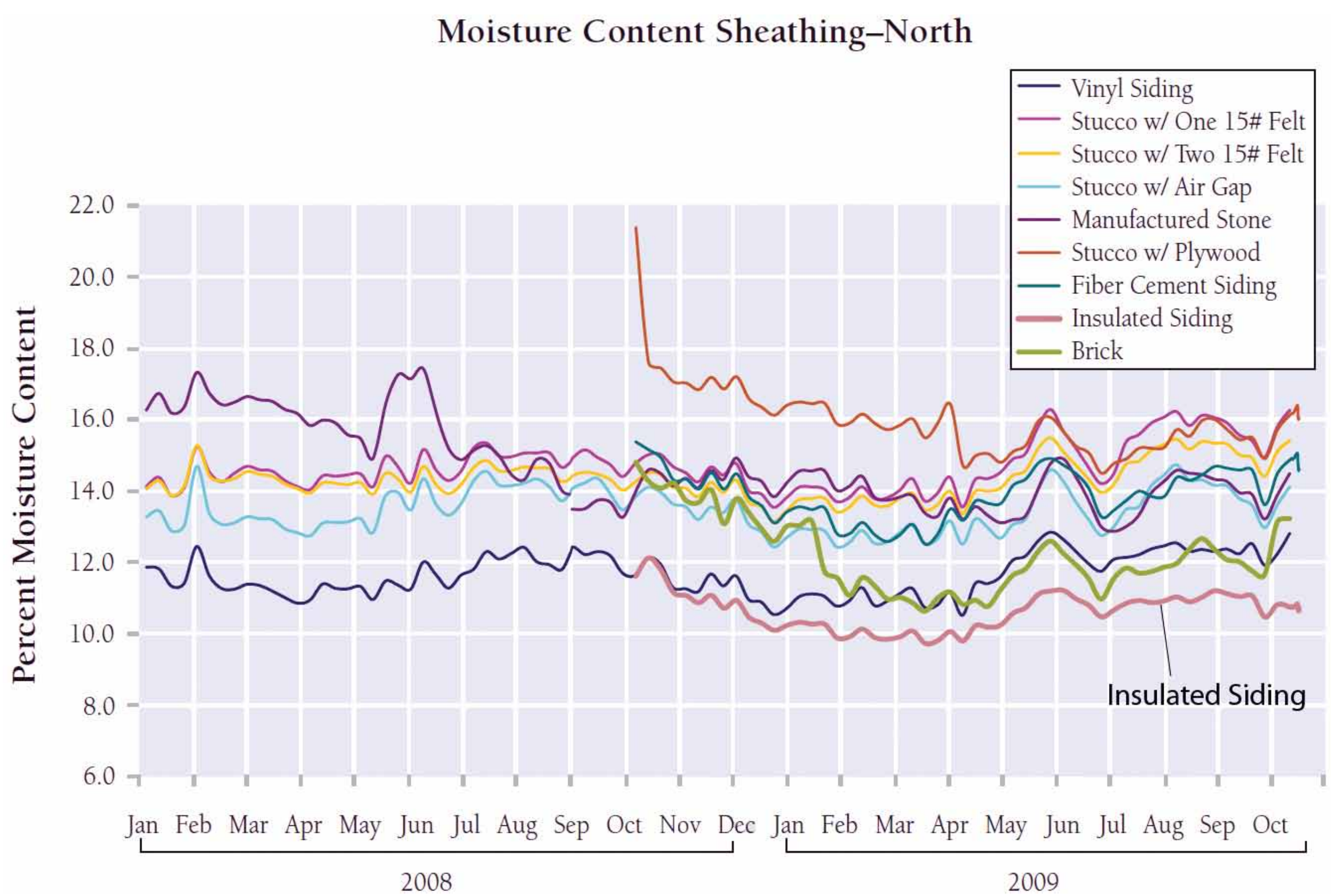
Testing was done in accordance with ASTM E96-05, *Standard Test Methods for Water Vapor Transmissions of Materials*. Results proved that the wall assembly with EPS insulated vinyl siding had the lowest all-around sheathing moisture value of all nine cladding systems tested.

To test the various wall sections, the Research Center performed controlled injections of water behind the cladding at set intervals throughout the duration of the research. Some walls were less able to drain or otherwise dissipate the injected water than others, but all performed satisfactorily in terms of the standard industry moisture content levels.

Under normal weather exposure, the studs and sheathing in all walls tested remained well below 20 percent moisture content, which is the long-accepted industry threshold for wood decay. EPS insulated vinyl siding, traditional vinyl siding and brick were the three driest claddings tested.

During winter months, the warmest wall in the north-facing orientation was the wall clad with EPS insulated vinyl siding. The wall pair with EPS insulated vinyl siding had the lowest all-around sheathing moisture content values. This is attributed to warmer within-wall temperatures during the heating season, which are afforded by the exterior insulation provided by the EPS backing. The warmer temperatures result in lower within-wall relative humidity values, corresponding lower equilibrium moisture content and increased drying capacity. This field study by the NAHB Research Center proves that vinyl siding with EPS insulation is proven to add energy efficiency to the home while effectively managing moisture and maintaining the driest wall system of all claddings tested.

Craig Drumheller, Senior Energy Engineer with the NAHB Research Center, concludes the following:

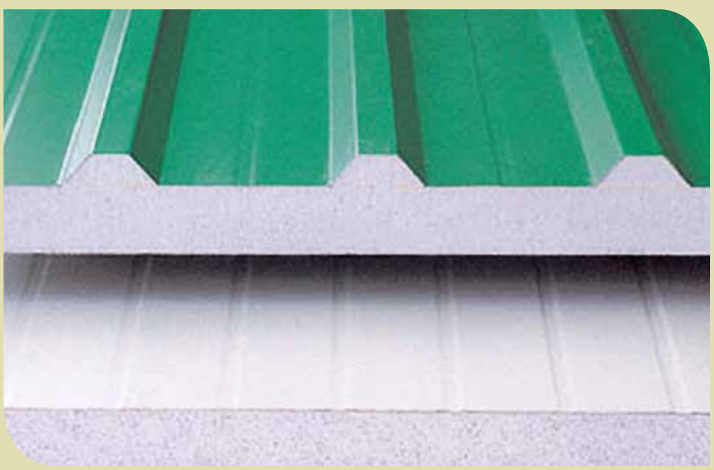


- "Insulated siding provides both thermal and hygrothermal benefits in light framed wall construction. The thermal resistance of insulated siding provides a double benefit: reduced heat flow in the wall assembly, thereby saving energy, and a higher wall cavity temperature, resulting in increased drying capacity."
- The full test report states that "moisture issues such as mold and rot, especially in exterior walls, have become a growing concern in residential construction, particularly as building envelopes have become tighter and have incorporated higher levels of thermal insulation as a result of more stringent energy codes and a growing demand for comfortable and energy-efficient homes."

For more information on EPS insulated vinyl siding see EPSMA's online member directory.

EPS Manufacturing

State of the Art & Streamlined

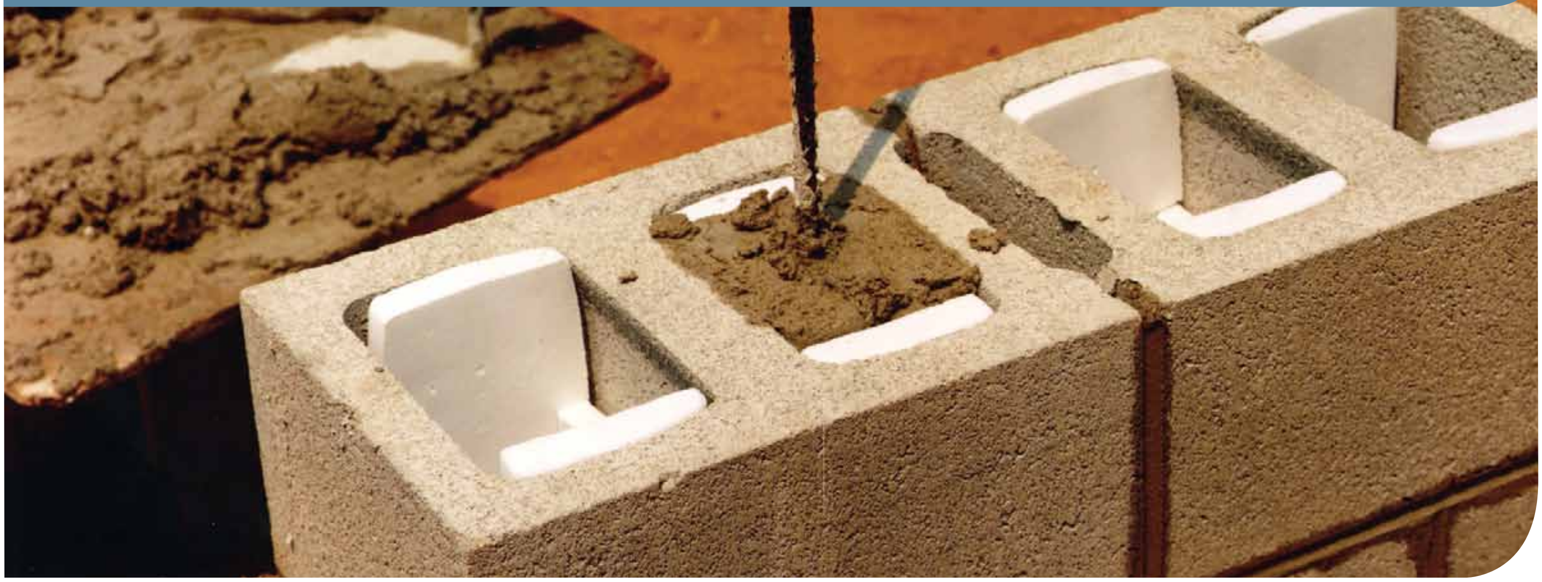


The EPS industry has always been on the cutting edge of manufacturing efficiency. Styro-Tek, a custom laminator of expanded polystyrene insulated panels, recently streamlined their manufacturing process when they relocated their lamination plant to their corporate headquarters in Birmingham, Alabama. The company simplified operations and consolidated its production processes under one roof. The move enabled Styro-Tek to design a new plant layout for its innovative manufacturing equipment, which improved their production flow, eliminated wasted space and increased operation efficiencies. Incorporating state-of-the-art computerized cutting equipment ensures product accuracy. The result? Less errors and product waste.

Versatility, cost effectiveness and lasting value make EPS ideal for a variety of wall and roof constructions. With its outstanding resistance to moisture absorption, EPS insulation provides dependable, long-term performance for interior and exterior construction applications. In addition to aesthetics, laminated EPS panels contribute to a structure's insulation and sound deadening properties. Bonded under pressure, laminated EPS panels can withstand a wide range of environmental conditions. Panels are available laminated on one side or both sides and can be custom cut to any design specification.

There's virtually no limit to laminated EPS applications, including insulated wall and roof panels, signage, service station canopy panels and architectural EPS shapes for schools, hospitals, airports, churches, residential homes and businesses. Exterior coverings for structural insulated panels (SIPS) are available in both stucco embossed aluminum, smooth textured aluminum and smooth textured fiberglass skins. Fiberglass reinforced panels (FRP) are commonly used walk-in coolers, clean rooms and public restrooms. Rigid, scrubbable and fire resistant, FRP's are easy to maintain. Styro-Tek uses an EnergyStar qualified textured polyester paint on its panels that is available in a variety of colors.

By investing in technology and lean manufacturing, the EPS industry is exceeding environmental expectations through reduced waste and increased efficiency.



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Although there are various masonry 'fills' that can be mixed and forced under pressure into the concrete core, a newer approach has been developed using EPS inserts fitted into the block cavity. This can eliminate the need for insulation on the interior of the wall, resulting in considerable cost savings over alternative methods. An effective example of this strategy is occupied warehousing that does not require finishing on either side of the wall.

With in-block insulation, the masonry units are either shipped to the site with the insulation already inserted between the interior and exterior surfaces of the block, or the insulation is added at the point of installation. Due to its light weight, transportation of building materials with built-in insulation is minimized by eliminating the need for a separate shipment to the job-site.

Another type of in-block insulation that offers even higher R-value is referred to as a pre-insulated block. By using partially expanded or recycled-content regrind EPS, bead-sized particles are used as an aggregate in the concrete to increase the block R-value from 2.0 (representing an 8″ hollow concrete masonry unit of 140 pcf) up to 8.0. When adding EPS foam inserts, the block can deliver an R-value as high as 20. These blocks can be cut, nailed and screwed like wood, facilitating inside mechanical installations without using strips. Mortar-less insulated block also uses foam inserts, where the CMUs are dry-stacked and then stabilized with a cementitious bonding on the wall's interior and exterior planar surface.

Masonry walls are often grouted and/or steel-reinforced by using designated block cavities within the assembly for placement. However, this eliminates their ability to be insulated. For instance, if a wall assembly has vertical and horizontal grouted steel every 1219 mm (48 in.) on center (oc) to meet structural requirements, it is conceivable up to 31 percent of the wall could remain uninsulated. However, EPS offers a significant advantage in its ability to be used within the block cores where grouting and reinforcement are placed without interfering with the structural function of these supports.

For more information on Insulated Concrete Masonry Products contact CBIS, Inc.

Energy Codes Influence New Designs for Concrete Blocks

To meet the more stringent requirements in energy codes, single-wythe masonry blocks have been re-engineered to further enhance performance. The majority of these efforts have focused on reducing the web area of the block and occasionally eliminating it altogether. EPS has become just one of the plastic materials for the insulation used in the redesigned blocks.

One proprietary system reduces the web area by nearly 50 percent, providing an EPS insert nearly 76 mm (3–in.) thick that also overlaps to insulate the mortar joints. This wall system has been used extensively in correctional facilities and schools because of its ability to provide higher thermal values while allowing walls to be grouted and reinforced both vertically and horizontally at 203 mm (8–in.) oc. This can offer a more cost-effective means to employ masonry construction within stricter budget requirements.

Other examples include blocks designed with a series of staggered cores to retard heat flow through the wall. It is important to consider that blocks redesigned for energy conservation should be sufficiently evaluated for structural performance as they are not considered equivalent to standard blocks until properly tested.

Green Masonry

Whether as individual systems or working in tandem, plastic insulation and masonry meet numerous environmentally responsible building criteria and can contribute toward green recognition in a variety of point or credit categories. EPS insulation provides long-term R-value and does not need to be adjusted for thermal drift. It also does not adversely affect indoor environmental quality.

Together, foam plastics insulation and concrete masonry can help owners and project teams take advantage of EPAct 2005. Commercial buildings demonstrating a 50-percent reduction in energy use, based on the ASHRAE minimum standard, are eligible for a tax deduction. Recently, the Internal Revenue Service (IRS) issued rules on how commercial building owners can qualify for the tax benefit, including a requirement that the energy savings be calculated using software tested according to American National Standards Institute (ANSI/ASHRAE) 140-2004, *Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs*.

While there are numerous ways to improve energy efficiencies, the U.S. Environmental Protection Agency (EPA) says "in most climates, it is both easy and cost effective to increase insulation levels beyond the minimum code requirement." Other benefits provided by increased insulation are the possibilities for improved comfort and indoor air quality (IAQ), increased construction quality and reduced utility bills. ■

Notes

[1] Originally, concrete and brick building units were used as the sole material to build thick, heavy walls in factories and homes, as design/construction professionals took advantage of their ability for direct thermal storage. Since heat flows from warm to cold areas, it can be stored within the exterior wall on a hot day, delaying the flow into the building's interior. Once the outside temperature decreases below the temperature inside the building, the stored heat flows back out.

[2] See Jared Blum's article, "Plastics and the *2005 Energy Policy Act*," in the June 2006 issue of *Modern Materials*.

[3] The prescriptive method is a straightforward process using tables that assign minimum requirements for the designated climate zones. Performance methods can be used to assess or project actual energy use, allowing for trade-offs in meeting the minimum requirements rather than dictating specifics.

EPS RECYCLING 20 YEARS STRONG

A new report released by the Alliance of Foam Packaging Recyclers shows exponential growth in the amount of expanded polystyrene (EPS) recycling since the process was created over 20 years ago. The *2010 EPS Recycling Rate Report* illustrates that 71 million pounds of EPS were recycled last year, which includes all post-consumer, commercial and industrial recovery. Post-use EPS is defined as any material that is recycled after its end-use. This information was collected from fifty-eight EPS manufacturers and independent recyclers across twenty different states.

EPS recycling consistently maintains one of the highest recycling rates among all of the plastics families. Including rigid, durable polystyrene and other grade materials, EPS post-consumer and post-commercial recycling represents 50% of all post-use polystyrene recycled in the United States. This is a significant achievement when considering that prior to 1988, EPS recycling was virtually non-existent. Over the past 20 years the establishment of local recycling programs, in conjunction with recycling initiatives from large companies that regularly deal with EPS such as Wal-Mart, have proven that creative solutions produce positive results.

The report showed that 28% of post-consumer and post-commercial EPS was recycled in 2010. This result was calculated by dividing the amount of recycled EPS by the amount of EPS sold in the given year. This represents an 8% increase over 2008. Twenty years ago, when the report was first established, the recycling rate was just 1.7%. These numbers conclusively show that EPS recycling is growing and will continue to develop; steadily increasing the sustainability of a product that already offers many environmental benefits.

For more information on this report and other EPS recycling information, contact the Alliance of Foam Packaging Recyclers. ■

Domestic EPS Recycling During 2010

(In Millions of Pounds)

Post-Consumer	37.1
Post-Industrial	34.2
Total EPS Recycling	71.3

Exceptional ICF Projects Awarded

The Insulating Concrete Form Association (ICFA) announced the winners of its 2010-2011 Excellence Awards, all of which exemplify how insulating concrete forms (ICFs) are used in top commercial and residential projects. This year's winners are ARXX Corporation, Reward Wall Systems, Quad-Lock, and Cellox.

The awards were judged by several industry experts, including Amy Tuttle of *Walls & Ceilings Magazine*, Bud DeFlaviis of the Sustainable Buildings Industry Council, and Donn Thompson of the Portland Cement Association. ICF construction provided the cornerstone for energy savings with a solid thermal building envelope and unique design components due to ICF's structural flexibility. These projects demonstrate remarkable achievements, with energy savings of over 50% common.

Sustainability - Gold

Cascade Meadows Wetlands
& Environmental Science Center
Rochester, Minnesota
Reward Wall Systems

Cascade Meadows is a state-of-the-art 16,000 sq ft science center that will be used for educational exhibits, classrooms and local meeting space. It features an innovative storm water management system in the depleted wetlands that surround the building that will help to restore them to health. This restoration plan has already been adopted and 7 different types of wetlands communities have been identified for restoration. The entire design of the building was done with nature in mind; in fact the architecture draws inspiration from various forms of water, leaves, and local animals. The decision to use ICFs stems from the concept of the Bear, which depends on mass insulation.

Commercial – Gold

Project: Hood River Middle School
Hood River, Oregon
ARXX Corporation

Hood River Middle School has been designed to achieve LEED Platinum levels of energy efficiency and uses cutting edge technology to produce a building that functions not only as a place to contain students, but as a scientific lab. The building uses ICF with brick veneer and precast accents to complement the Jacobethan style of the adjacent National Historic Register school building. The building design boasts a complex form that includes sloped gabled end walls, and an interior wall to the music room that becomes an exterior wall above. The music room needed to be acoustically isolated from other spaces, making ICF an ideal material for the walls. Students have been involved in the design phase from day one, and worked with many of the professionals side by side on the planning. This school is a showcase for what a public building is capable of.

Residential – Gold

Project: Park-Raines Residence
Chicago, Illinois
Reward Wall Systems

The home builders wanted a sustainable home with a very contemporary urban appearance. A bright, open floor plan was very important to them. Every room in the house has natural daylight. This was accomplished with large windows on the front and rear elevations, skylights, and a rooftop penthouse that floods an open three story stair with light. The open floor plan and large window openings posed a structural challenge for sheer, which was able to be compensated for with additional rebar in the ICFs to create a rigid exterior frame.

Each entry was judged on achievements set forth in each category. Projects were judged individually. The judging panel was selected to provide impartial input from various industry perspectives. For more information about the award winning projects, visit www.forms.org. ■

THE CUTTING EDGE

This issue of EPS Newsline offers coverage on the most current U.S. and Canadian research focused on expanded polystyrene building and construction products. Please read our feature article to learn about the NAHB Research Center's efforts to evaluate peak energy efficiency in wall assemblies and see how EPS is improving the performance of traditional materials, from walls to roofs. This issue highlights how the EPS industry is incorporating manufacturing efficiencies that result in improved performance, reduced waste and a healthy environment. Other articles focus on innovative EPS products and their unique combination of technology, strength and sustainability. We also present the best of the best with the annual ICFA Excellence Awards, the premier industry recognition for the most ground-breaking and noteworthy ICF projects that are leading the charge toward building and living green.

The EPS Molders Association represents more than 50 U.S. and Canadian manufacturers of building insulation products – and almost just as many applications. Expanded polystyrene (EPS) is used in a variety of building projects from the foundation up. To bring you the latest in EPS product development, testing and building code issues *EPS Newsline* is a great source, helping you to envision how EPS may fit into your next project. To find out more about the use and performance of EPS applications visit our website at www.epsmolders.org. ■

Betsy Steiner
Executive Director

Diving Into Insulated Pools

Expanded polystyrene insulated concrete forms (ICFS) and structural insulated panels (SIPS) are well established construction methods for building efficient homes with minimal environmental impact. They are also leading the pack in innovation and versatility – both applications are used to construct naturally warmer, energy-efficient swimming pools.

ICF and SIPS pools can be installed above ground, on sloped ground, semi inground or inground. Because of the superior thermal insulation properties of EPS, there is no need for an insulation layer on the pool shell which saves time and money during the construction process. Additionally, the light weight of these applications means a full pool kit can be easily handled onsite and installed quickly, even on sites with poor access. SIP pool panels are typically made with acrylic-coated aluminum that resists oxidation and corrosion; the panels have spline connectors for efficient installation. For ICF pools the EPS forms are left in place permanently after the concrete has cured – providing internal and external insulation. Despite their light weight, ICF and SIPS pools are durable and strong, they do not warp or crack. Once installed ICF and SIPS pool can be finished using gunite, tile and/or paint.

ICF and SIPS pools generally do not need a heater, which reduces heating costs. The EPS insulation in the forms and panels acts as a thermal break, preventing the outside ground temperature from extracting heat from the pool water. Heat gained from the sun is retained, maintaining the pool's water temperature, even overnight, when other types of pools lose up to 10° F. Because the pool water heats up faster and is kept warm longer, the swimming season may be extended by up to two months depending on the region. ■

A Green Skyscape

Today's urban areas face the challenges of increases in energy consumption and storm water management, both of which impact the local community infrastructure and the environment. Green roofs provide many sustainability benefits to a building, especially in urban areas. They reduce runoff by managing rainwater, provide insulation, creating habitat for wildlife and helping to lowering urban air temperatures.

EPS is an ideal roof substrate for green roofs, combining insulation, high loading capacity and flexible, efficient installation. EPS can be installed on a roof deck without special equipment and does not add any appreciable load to the roof structure. And, EPS can be easily cut or trimmed to fit odd geometries and create interesting architectural and landscape profiles.

The British Columbia Institute of Technology (BCIT) Centre for the Advancement of Green Roof Technology (CAGRT) recently completed a two year research project on the performance of various green roof structures. Quad-Lock, an ICF manufacturer in Surrey, BC, partnered on the research. Utilizing Quad-Lock's Insulating Concrete Forms (ICFs) and Quad-Deck products, the Roofing Evaluation Module (REM) is the first all-concrete test structure at BCIT's CAGRT, which was established in 2003. This new REM will be alongside wood frame REM structures that incorporate both green and conventional roofs.

Quad-Lock's test structure (referred to as REM-10) incorporated an R-10 insulated slab foundation, R-22 walls (6" concrete), and R-22 Quad-Deck (9" EPS panels with 3" concrete slab) for the roof structure topped with a green roof layer. This was compared side-by-side to a "control roof structure" featuring wood-framed walls and a roof with an asphalt roofing layer (called Reference Roof). The BCIT collected electronic data and evaluated the following:

- Thermal performance and associated energy cost savings;
- Carbon emissions saved per square meter;

- Stormwater runoff quantity and quality for reuse;
- Plant species growth, soil media performances and maintenance requirements

Highlights of the findings include:

Heat Loss: Depending on the season, the EPS REM-10 structure demonstrated a 50 to 75% reduction in heat loss, compared to the wood-framed control structure.

Heat Gain: Across all seasons, the REM-10 demonstrated an average 99% reduction in heat gain, compared to the wood-framed control roof structure.

Stormwater Runoff: Compared to a conventional roof without green roof layer, the REM-10 retained a yearly average of 69% of the rain falling on the roof surface, with 31% potentially available for reuse or disposal in a municipal system.

EPS green roofs provide the essential characteristics that owners and designers of today's buildings are seeking in their quest for sustainable solutions and LEED certification. ■

EPSMA Member Companies

ACH Foam Technologies
ADLAM Films, Inc
AFM Corporation
Alamo Foam, Div. of Houston Foam Plastics
Arvron, Inc.
Atlas EPS, Div. of Atlas Roofing
BASF Corporation
Beaver Plastics Ltd.
Cellofoam North America, Inc.
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Powerfoam Insulation, Div. of MetlSpan LLC
Produits Pour Toiture Fransyl Limite
Progressive Foam Technologies, Inc.
Promass SRL
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Reward Wall Systems, Inc.
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