

PROTECT

BETTER WALLS AND ENVELOPES
FOR BETTER BUILDINGS

ISSUE 6: Spring 2009

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Federal stimulus means better buildings for all.

A bottom-up building renovation at St Mary Axe in London exposes the building core. Reconstruction and retrofits will drive the construction market in 2009. Photo courtesy Simcoa.

BEC Focus: MASONRY

Rock Solid: Making Masonry Drainage Walls Better

By Adam Sullivan

Enclosures, the architect knows, do not resist moisture but direct it. This is the principle upon which the masonry drainage system is built: Moisture enters the wall system, and the properly designed drainage directs the moisture through the weep mechanisms to the outside of the building. But as with any aspect of the building project, issues arise from design error, improper specification, and glitches on the project site during the construction phase.

So what are the most common problems with masonry drainage systems, and how can they be avoided or corrected? We asked a few experts to weigh in on the topic:

1. **Design phase.** "The most common question we hear," says Jim O'Neill, technical sales engineer with Keene Building Products in Mayfield, Ohio, "is, 'If I buy your product, will it solve all my problems?'" It's the first mistake

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Codes Focus: AIR BARRIER AND INSULATION

Should Codes Dictate R-Values and Air Barrier Use?

By Barbara Horwitz-Bennett

Should buildings codes set required R-values? Should they also tell building owners whether to use air barriers or not?

The fact is that many of them do, but as to whether this is achieving the ultimate "good" in building performance – well, it depends on whom you ask.

"The IECC and ASHRAE Standard 90.1 dictate the minimum thermal resistance – R-values – and thermal transmittance – fenestration U-factors and solar heat-gain coefficient – for building envelopes," explains Ronald Lynn, director and building official, Clark County Department of Development Services, Las Vegas. "We adopted these codes and standards to ensure that all buildings built in Clark County provide energy cost savings to the building owners, but also to help conserve our most valuable resource: energy."

In other words, yes. Lynn is in favor of the codes establishing such requirements.

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NATIONAL NEWS: The AWCI and EIMA join forces, and a big May meeting draws BEC's to Montreal. (See page 3.) CODES AND STANDARDS: Building enclosures take center stage in the new LEED (For upcoming industry events and more news, see page 2.)

EIMA

Building Enclosures a Bigger Factor in the New LEED 2009

With the U.S. Green Building Council's recently released and revamped LEED Version 3 rating system increasing its emphasis on energy performance and regionalized site credits, building enclosure designs and consultants stand to weigh in heavier.

"LEED points available for optimizing energy performance have risen from 10 to 19 in the new LEED rating system, taking this aspect of design from approximately 14.5% to 19% of the total LEED score," relates Anica Landreneau, AIA, LEED AP, sustainable design practice leader, HOK, Washington, D.C. Consequently, "Enclosure experts and façade consultants, who have always played a role in building energy performance, will become increasingly important members of the design team."

With regards to regionalization, LEED 2009 includes six prioritized credits and four bonus points, which were determined by the different USGBC regional councils and chapters based upon specific environmental issues to that region. For example, "Many locations have emphasized building energy efficiency under the 'Optimize Energy Performance' credit, and some regional chapters and councils have identified priority credits that are heavily influenced by enclosure design," report Michael Waite, staff II, building technology, and Mark Webster, senior staff II- structures, Simpson Gumpertz & Heger, Waltham, Mass.

In addition, opportunities for Innovation in Design credits have increased to 5 points in the new rating system. This being the case, "If the enclosure consultant is involved from the early stages of a project, he or she can contribute to achieving these credits," they explain.

So overall, says Waite and Webster, based upon the tendency for many enclosure consultants to be particularly attuned to envelope considerations specific to the region in which they practice, "A good envelope consultant is a very valuable asset to a LEED project."

On the other hand, one shortcoming pointed out by the SGH engineers is LEED 09's lack of reward for continuous air barriers. "Compliance with ASHRAE 90.1-2007 is a prerequisite for most LEED - New Construction projects; however, this standard has only qualitative air barrier requirements that do not ensure an airtight building. This not only complicates the process of estimating building energy use, but also does not incentivize an important design consideration that can save significant amounts of energy," they explain.

On the flip side

Also skeptical of how the theory of LEED 09 will translate to building envelope designs directly earning credits in practice is Jillian Burgess, LEED AP, an associate with RMJM in Philadelphia. "Building enclosure is lumped into the energy use line, which is impacted by many factors, including building placement, mechanical systems and building function. Building energy is such a complex and integrated issue, so isolating building enclosure without considering all of the other factors isn't practical. Therefore, it is difficult to fully quantify the effect that doubling the energy credits will have specifically on building enclosure," says Burgess.

In a similar vein, Burgess also questions the extent to which the regionalized credits will ultimately award good enclosure design. "Although the anticipated regional credits will likely address the increased value of the energy credits in certain climates, especially colder and wetter regions, there are many other specific regional issues that will be vying for a small number of points, he says."

—by Barbara Horwitz-Bennett

For more information on the rollout and particulars of LEED 09, visit www.usgbc.org/LEEDv3.

About PROTECT

Better building enclosure design is the key to our sustainable future. And it's vital to the public's health and well-being, too. We applaud the recent formation of the Building Enclosure Councils (BECs).

So **PROTECT – Better Walls and Envelopes for Better Buildings** was created for building designers, façade experts, and code officials involved in this quest for excellence. We value letters and contributions; please send them to PROTECT@ccsullivan.com.

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PROTECT – Better Walls and Envelopes for Better Buildings

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News: ASSOCIATIONS

EIFS and Finish Groups in Alliance

Earlier this year, the trade groups AWCI and EIMA agreed to “join forces to advance EIFS,” according to the headline of a release issued by both groups. Though not precisely a merger, the association deal calls for a “closer working relationship” between the Association of the Wall and Ceiling Industry (AWCI, www.awci.org) and the EIFS Industry Members Association (EIMA, www.eima.com). And it reflects a recent insurance-focused collaboration between the two.

“EIMA’s expertise in product technology, codes and standards, in combination with AWCI’s industry education programs and association management skills, are a perfect marriage,” EIMA President David Boivin said.

Effective on March 1 of this year, the new alliance stems at least in part from the retirement of EIMA’s long-time executive director, Stephan E. Klamke. In light of this change, EIMA’s board of directors decided to undertake a strategic review to enhance the support and operations of the association. That led to identifying AWCI as a partner.

While the two groups will remain distinct and independent entities, EIMA will relocate its headquarters from Atlanta to the AWCI office building in Virginia.

The two associations already have a broad overlap of members, according to EIMA and AWCI leaders, and EIMA contributed heavily to the development of AWCI’s “EIFS—Doing It Right” educational program. For that initiative, a group of AWCI and EIMA manufacturer members including BASF Wall Systems, Dryvit Systems Inc., ParexLahabra Inc. and Sto Corp. joined AWCI to establish two insurance providers, AWCI Insurance Company and AWCI Risk Retention Group, to assure the availability of commercial general liability insurance for EIFS contractors. ■

—by PROTECT Staff

Stimulus Stimulates Energy-Efficiency Upgrades

With the approval of eco-friendly America, the Obama administration has pledged a substantial portion of stimulus funds to energy upgrades in homes, federal buildings and local government facilities. More than an estimated \$12 billion has been set aside for private and public housing units to make homes more energy efficient. Federal buildings and local governments will also share close to \$11 billion for building upgrades.

The largest amount of federal money goes to individual residences, whether provided by the government or self-owned. About \$2 billion is pledged to increase tax credits for purchases such as new furnaces and insulation, and another \$4.76 billion will go to repairing and modernizing public and Native American housing units as well as government-subsidized apartment buildings. An estimated \$5 billion has been pledged to increase financing for home weatherization programs.

Although private residences get a hefty amount pledged to their upgrades, the government’s pledge to its own structures is still quite impressive. The government is the largest employer in the U.S., and still a large portion of the work will be outsourced to small businesses. As for government and municipal facilities, the stimulus package boasts an estimated \$4.5 billion to our federal buildings alone and \$6.3 billion in grants to cities, counties and states to increase energy efficiency.

According to the U.S. Department of Energy, “A new federal commercial building must also be designed to achieve an energy consumption level that is at least 30 percent below the level achieved prior to January 2007.” That means the new buildings are under strict new codes that fall in line with the stimulus budget. It also means that more creativity will be necessary to bring old buildings into compliance with the codes that are in place.

Local governments will be a huge factor this new wave of efficiency upgrades, through the updating of schools and municipal buildings.

Although the stimulus package details seem to change constantly, enclosure experts can count on a substantial amount of it going to green building. ■

—by Bilal Hamm

Protect News Briefs

• **National High-Performance Building Conference debuts at Ecobuild America** Scheduled for December 7-10, 2009 in Washington, D.C. at the Washington Convention Center and sponsored by NIBS, Ecobuild America will feature a co-located conference dedicated to high-performance building issues. The NHPBC will include meetings, roundtable discussions, seminars, workshops and product exhibits. U.S. Representative Russ Carnahan of the High-Performance Building Congressional Caucus, among others, will speak.

• **Mr. NIBS goes to Washington** Speaking on behalf of the NIBS Board of Directors and as the Chair of the HPB Task Group, Dr. William J. Coad, P.E., testified before the House Committee on Science and Technology Subcommittee on Energy and Environment this past April. During the hearing on the topic of “R&D for high-performance buildings, industries and consumers, Dr. Coad told the Subcommittee members, “We now have an organization [the High Performance Building Council] ready to bring the industry together.”

• **MOA on BIM: How far off is a National BIM Standard?** Under the sponsorship of the buildingSMART alliance™, eight organizations will form teams to see how BIM can be used to create solutions for cost engineering and estimating problems. Positive results could mean steps toward candidate standards for the National BIM Standard. Says Executive Director Deke Smith, “With limited resources available, it is important that we do not duplicate efforts. By working together we can keep the lines of communication open.” The organizations include AACE, ASPE, ABC and the U.S. General Services Administration.

• **Call for 60% energy reduction by 2050** According to a new EEB study by the World Business Council for Sustainable Development, global climate change targets require a 60% reduction in energy consumption by the building sector. Also,

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MASONRY DRAINAGE Continued from Page 1

the architect will make with masonry drainage: he'll specify a system believing it to be a one-product solution." O'Neill insists that every element of the wall system must be incorporated into the design—drainage capacity, flashing, air flow, vapor barriers (if specified), insulation and anything else which may affect the performance outcome of the wall.

O'Neill recommends **building a mock-up** of the wall whenever the budget and timeframe allow. "Building the mock-up solves two problems: 1) incorrect specification and detailing, and 2) inadequate product knowledge." By the time the construction phase begins, many problems will have already been solved by superior design.

2. **Weep tubes.** Choice of weepage mechanism for drainage is likewise crucial. According to the team at RDH Group, a Vancouver, B.C.-based engineering firm, weep tubes are almost always a poor choice. According to Michael Aoki-Kramer, principal and building science specialist at RDH's Seattle office, weep tubes are "virtually useless."

"I understand why masons use them," continues Aoki-Kramer. "They must adjust the head joints to accommodate the layout of the bricks. This makes **specifying cell vents** a difficult choice, because they are rarely manufactured in varied widths." He hopes that manufacturers will respond to this dilemma by offering varied widths of cell vents, and suggests using alternatives to weep tubes, like cell vents or mortar net polypropylene mesh, whenever possible.

3. **Flashing.** With veneer-type systems, improper incorporation of flashing into the wall design can lead to devastating moisture issues. Says O'Neill, "We've often seen flashing specified below ground level. Not only does this prevent moisture from draining and drying, but it can actually allow moisture into the wall." Flashing should be above-grade, with proper weepage. "Also," says O'Neill, "if you're building on a slope you should use step flashing to match the angle of the slope. This helps prevent burying the flashing."

4. **Ventilation.** O'Neill also places a keen emphasis on proper ventilation. "Drainage is great, but the wall must also dry. We recommend not only weep vents above the flashing line, but also open head joints at the top of the wall. This will allow for cool air entering the vents at the bottom of the wall to escape at the top as it warms and rises." He also warns that specifying rope weep vents will not supply sufficient ventilation.

5. **A clear cavity.** Cavity wall systems can run into problems when mortar takes up space in the cavity, so masons have developed a number of methods to keep the cavity clear. Mike Wilson, P.E., a principal and senior building science specialist at RDH in Victoria, BC cautions, "raising a stick or 2x4 in the cavity does not suffice. I recommend placing a plastic sheet in the cavity with rope grabs; the sheet can be removed at the end of the day's work to clear out the loose remnants of mortar."

Aoki-Kramer adds that the project team should be diligent about daily quality control where the cavity is concerned. "Masons stay alive by meeting meticulous construction schedules," he says. "But keeping the cavity clear, which requires time either during the layout or at the end of each day, is essential."

In addition to daily quality control, Aoki-Kramer recommends discussing with the mason in preconstruction meetings how he plans to keep the cavity clear, and taking careful notes of these meetings. "That way, if the mason grumbles when you point out that he is not applying the promised clean-out, you can point to your notes, and show him exactly what he promised."

By the way, if you're not convinced about the weep tubes, ask Dave Young at RDH in Portland. The principal and senior building science specialist once encountered a weep tube system that was badly clogged ... by live bees, who had made their nest in the cavity. The tubes provided them easy access to their cozy lair. ■



ENCLOSURE Q + A Continued from Page 5

piece of material, or for using an alternative design. For example, that might be considering paying an extra 15 cents per square foot for an envelope membrane. Until now they had to rely on consulting companies who might say, "We think this is best because of our prior experience." But owners want proof – a way to quantify their payback for investing in something.

PROTECT: What are the benefits of using WUFI?

Karagiozis: It's the industry standard. WUFI can be used for studying design and retrofit options as well as forensic analysis, to find faults in existing buildings. It's compelling evidence for construction litigation.

PROTECT: Are people aware of these benefits?

Karagiozis: Yes. The models are penetrating architecture and engineering firms, and building envelope consultancies. As for WUFI: we've had more than 9,000 downloads at ORNL since it went online in 2001. ■

LEFT: Photograph by Julie Kertesz

Enclosure Q+A: COMPUTER MODELS

Modeling Walls for Better Buildings

Interview by Chris Sullivan

PROTECT: More architects and engineers are using modeling tools to improve their building enclosure designs, and in particular WUFI, which lets them analyze moisture and heat transfer through walls. What's behind this trend?

Achilles Karagiozis, PhD: It's a necessary input to create more energy-efficient buildings. If you're not using modeling, such as WUFI, you are creating unnecessary risk for the person who owns the property. Anybody who's not using models to analyze their structures is living in the Stone Age.

PROTECT: How can models help the enclosure designer?

Karagiozis: For example, you need to be smart in the way you deal with moisture transport. We're adding more and more insulation to our buildings, and there's less free energy in the enclosure, meaning we need other ways to dry out the structures, such as using passive solar energy to enhance the drying potential. A model will help you look at the options you have.

PROTECT: But aren't building models complicated? What kind of specialized training do you need to create a realistic simulation?

Karagiozis: If someone has had a substantial education in building science, they don't need much introduction. For others, the program WUFI is easy to learn. Just take a WUFI workshop to learn where and how to use it, what the limitations are. WUFI has the most extensive help system of any engineering software I've seen.

PROTECT: How accurate are the models for describing actual enclosure performance?

Karagiozis: Over the last few years, we've taken major strides and achieved the capability to analyze real buildings and real building envelope systems. Until recently the models couldn't handle air-cavity ventilation, solar effects or water penetration – they just weren't ready for prime-time. Finally we're at a point where they compare very well with field measurements. WUFI takes into account the porous media structure of various building materials, which absorb and release water, and sorption and suction isotherms. WUFI also includes latent heat effects, though it does not include air infiltration and exfiltration.

PROTECT: What's the bottom line for building owners? After all, they're ultimately paying for the modeling.

Karagiozis: They can quantify what the consequences would be for installing a particular

continued on Preceding Page



Achilles Karagiozis, Ph.D., is a leading U.S. building scientist and a distinguished research-and-development engineer at Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tenn., where he focuses on the heat, air and moisture performance of buildings. Karagiozis has helped develop several advanced hygrothermal models, including WUFI, MOISTUREEXPERT, and LATENITE. His related research has concentrated on energy efficiency, sustainability, HVAC systems, and envelope hygrothermal performance. The U.S. representative for IEA Annex 41 on Moisture in Buildings and an active participant in ASTM and ASHRAE committees, Dr. Karagiozis has authored more than 120 technical papers on moisture in buildings.

Tools for Modeling Green

In addition to building envelope modeling, more architecture-and-engineering teams are taking advantage of whole-building system analysis, which has become almost a routine part of design work for new construction and renovations.

The industry standard is arguably **DOE-2** (www.doe2.com), a widely used and accepted program for building energy analysis. The freeware predicts energy usage and cost on an hourly basis using inputs for the building layout, occupancy, electromechanical systems, local utility rates and weather data. DOE-2.2 is the latest release, and eQUEST is an interactive product for analyzing building energy use for users without a high experience level.

Another established modeling product is **Hevacomp** (www.hevacomp.com), which was acquired in early 2008 by Bentley Systems, Inc. Hevacomp incorporates the EnergyPlus engine, developed by the U.S. Department of Energy, and software certified to perform CO₂ emissions calculations required under U.K. building regulations. The resulting design software assists in energy analysis, heating and cooling load calculations, pipe and duct sizing, and electrical system design.

Based on the move to building-information modeling (BIM) design tools, a number of new modeling applications have been added to the software products. For example, Autodesk's Revit Architecture is linked directly to the **Green Building Studio** (GBS) online service offered by GeoPraxis (www.geopraxis.com). GBS creates a geometrically correct thermal model of the building, applies local building code assumptions and DOE-2 input to run an energy analysis, available through a web browser.

Whether an analysis is undertaken in the earliest design phases or to assess the operational benefits of a planned retrofit, these tools allow designers to base their decisions on sound, quantifiable data.

— PROTECT Staff

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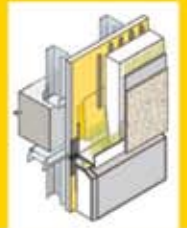
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SHOULD CODES DICTATE? Continued from Page 1

Similarly, Patrick Parsley, a building official in Fairmont, Minn., states, "An effective energy code will have minimum criteria for compliance whether based on performance or by prescription for the conservation of energy. In order for that to be accomplished, R-values and air barriers will be a part of the design."

Specs influence codes, too

At the same time, William D. Dupler, building official, County of Chesterfield, Chesterfield, Va., sees the potential for tighter air barrier specifications to influence what the codes need to require. "As a future trend, I expect to see recognition that insulation values can be reduced, in lieu of recognizing the effectiveness of air barriers as their use becomes more commonplace," says Dupler.

That said, Parsley ponders whether energy codes and accessibility codes are necessary at all. "At first glance, an argument can be made that neither are necessary for public safety," he explains. "Though this may be true, it can also be argued that both are developed and enforced because they are in the public interest."

Coming to the conclusion that yes, the codes are important, Parsley reasons, "These types of codes facilitate public interest objectives that profit-motivated industry may not value or pursue."

Offering her opinion, Cindy L. Davis, C.B.O., a building official in Butler, Penn., concurs that, "Whether energy codes should be voluntary or mandatory is often a hot political topic, and is likely to become even hotter."

Green building issues

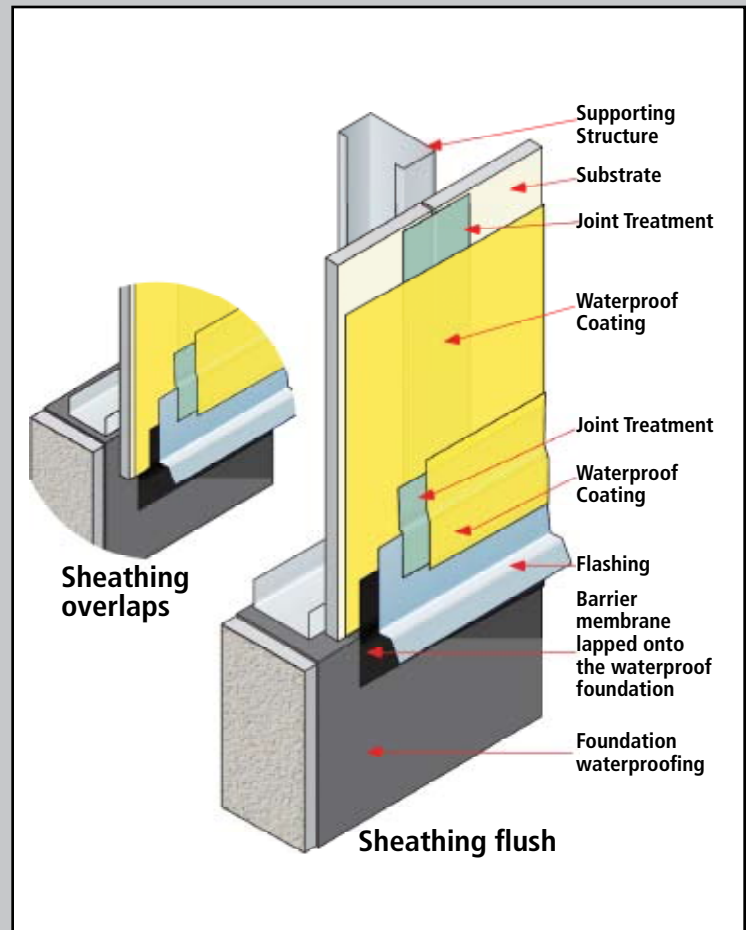
In addition, Davis points out that the same could be said of green and sustainable building programs.

However, Davis sees a growing understanding of the "massive threats" that conventional building practices pose to the environment. "Voluntary programs [and codes] are incapable of addressing the problem at the scale, or market penetration, which is necessary to curtail them," she concludes. "They suggest that only mandatory programs have a chance of addressing these problems successfully."

But on the other side of the coin, Mark Bomberg, professor of building physics at Syracuse University, Syracuse, N.Y., emphatically states, "Legally speaking, codes cannot and should not regulate things like R-value and air barriers. Design needs to be based on performance, not prescriptive requirements or we run the danger of hindering progress."

While Bomberg is all for energy efficiency, he believes that such designs should be motivated by societal pressure. For example, the individual buying the building should require that additional 30% in energy efficiency, as opposed to the building and enclosure designers being told that they have to achieve this.

If anything, Bomberg would like to see commissioning required by the codes as that is the only way to ensure that a building is actually performing as designed. ■



In Focus: FOUNDATIONS

Key Detail: Where Sheathing Meets Foundation

When sheathing terminates at grade, successful detailing of the foundation and cladding assembly will play a large role in determining how durable and effective the enclosure will remain over the life of the building. This key detail impacts energy efficiency and moisture resistance – and ongoing property value.

For the termination at grade, the sheathing will either overlap the foundation or fall flush with it. In either case, it is critical to protect the wall assembly from moisture rising through the concrete foundation.

On top of a structurally supported and continuous air barrier, it's ideal to use a barrier membrane lapped onto the foundation waterproofing. On top of that, flashing is secured and lapped at the top with a suitable joint treatment. This should be laid over with the air barrier material to create a continuous, integral barrier.

IMAGE: StoGuard™ "Termination at Grade, Flush" and "Termination at Grade, Overlapping" Details No. 20.10aG and 20.10bG, 2007

SOURCE: Sto Corp., ©2009

Protect News

(continued from Page 3)

WBCSD finds that buildings account for 40% of the world's energy use and a greater portion of its carbon output than does the transportation sector. The study goes on to recommend achieving the goal through a combination of public policies, innovation, and informed decision-making by customers and the business community.

- **EU keen on Smart Metering** The European Union voted twice in April to support the rollout of Smart Metering in the EU. Smart meters, which are intended to improve infrastructure capability by matching power consumption with power generation, generally include features like real-time sensors, power outage notification, and power quality monitoring. The Electricity Directive foresees full deployment by 2022 at the latest, with

80% of consumers equipped with Smart Metering systems by 2020. On April 23, the European Parliament, in its first reading of the Energy Performance of Buildings Directive (EPBD), voted to expedite the implementation by requiring that all new buildings and buildings undergoing renovation be equipped with Smart Meters.

- **GREENGUARD Children & Schools standard earns LEED credits** The GREENGUARD Environmental Institute has announced that all flooring and insulation products certified under the GREENGUARD Children & Schools standard can earn LEED credits across multiple ratings systems. There are over 10,000 such flooring products and up to 15,000 building insulations which qualify. "These approvals will not only increase the availability of sustainable flooring and insulation options," says GEI founder Dr. Marilyn Black, "but further promote the

importance of protecting building occupants' health and well being."

- **Green building jobs in NYC** The combination of federal stimulus and New York's "green building" initiative may provide a boost in jobs for HVAC specialists among others in the industry, according to city officials. Addressing HVAC specialists at a gathering in the city, Laurie Kerr, a senior policy advisor for Mayor Michael Bloomberg, said that a "green work force" would be included in a "Greener, Greater Buildings Plan", a policy initiative unveiled on Earth Day and intended largely to address the energy efficiency of existing structures.

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