



Navigating Incentives and Regulations for Green Building

YOU CATCH MORE FLIES WITH honey than you do with vinegar, or so the proverb tells us. That may be why new approaches to design and construction seem to be most successful when they are introduced first as voluntary measures that can be used to garner green credentials, or, increasingly, to benefit from government incentives. But as new approaches gain market acceptance they also

begin to show up as mandatory measures via codes or other regulations—quickly in some areas and very slowly in others.

Whereas incentives are welcomed by the private sector, green building requirements are not always greeted with as much enthusiasm. What regulations there are tend to begin in the public sector when governments make their own buildings meet environmental criteria. Now jurisdictions are beginning to extend regulations to the private sector as well, using a variety of approaches to mandate green building in both the commercial and residential arenas.

Green building incentives can offer significant financial benefits, and regulations are becoming increasingly common. This article explores a few of the incentive and regulatory mechanisms currently in place and some on the horizon, and provides tips for incorporating this information into design decisions.

Encouraging Green

Although green building requirements for private buildings are spreading, incentives are still the more common approach, particularly in the areas of energy efficiency and renewable energy. Incentives appear in different forms, from tax credits to expedited permitting, but all of them have an effect (sometimes a significant one) on a project's bottom line. Green criteria are also

(continued on p. 13)



Photo: Michael Ficeto, Hearst Corporation

Hearst Corporation's LEED Gold headquarters, which opened in 2006 in New York City, added a tower to the building's original facade, built in 1928. The building was a recipient of the New York State Green Building Tax Credit.

In This Issue

Feature Article 1

- Navigating Incentives and Regulations for Green Building

From the Editors 2

- Incorporate Passive Sustainability into Building Codes

What's Happening..... 3

- Carbon Offsets Get Oversight
- Energy Star Labels for LED Lighting
- New Type of Waterless Urinal Cartridge Focus of Lawsuit
- Certifying Buildings En Masse
- Gut Rehab Home Goes Platinum
- Newsbriefs

Product News

& Reviews 10

- Composite Panel Industry Adapts to Pending CARB Regulation
- Three-in-One Insulating Sheathing from Dow

BackPage Primer 20

- How the Sun's Path Can Inform Design

Quote of the month:

"It's much easier to do mainstream green within the international code today than it was several years ago."

David Eisenberg,
Director of the Development
Center for Appropriate
Technology
(page 18)

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ENVIRONMENTAL BUILDING NEWS (ISSN 1062-3957) is published monthly by BuildingGreen, LLC. EBN does not accept advertising. Subscriptions are \$99/year. Outside North America add \$30. Periodicals postage paid at Brattleboro, VT, and at additional mailing offices. POSTMASTER: Send address changes to Environmental Building News, 122 Birge St., Ste 30, Brattleboro, VT 05301.

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Printed on Rolland Enviro100 Print: 100% post-consumer content and Ecologo-certified environmentally friendly. Chlorine-free process using biogas energy.

From the Editors

Incorporate Passive Survivability into Building Codes



While staying with friends in western Connecticut recently, I got in a conversation with a real estate agent there. She told me that the high cost of building

materials was leading some builders in her part of the state to shift from 2x6 construction back to less-energy-efficient 2x4 construction. These builders tell her that most potential homeowners don't know enough to ask how much insulation is in their walls, and they won't own the houses long enough to care. What these homeowners don't realize is that poorly insulated homes leave them unnecessarily vulnerable to utility interruptions.

In December 2005, when we first argued for incorporating *passive survivability* into buildings (see EBN Vol. 14, No. 12), I thought of it as a smart design criterion that could provide another motivation for creating energy-efficient and environmentally responsible buildings. In a future of more intense storms that could cause extended power outages, with an ever-present risk of terrorism that could target energy distribution networks, and with higher energy costs and the prospect of fuel and water shortages, it makes sense to design homes and apartment buildings—along with certain other public-use buildings, such as schools and community centers—so that they will maintain livable conditions in the event of extended power outages or loss of heating fuel or water. Passive survivability can

be achieved with such features as a highly insulating building envelope, passive-solar design, cooling-load avoidance, and natural ventilation (see EBN Vol. 15, No. 5).

I now believe that instead of pursuing a voluntary approach for incorporating passive survivability into these buildings, we should mandate it. Passive survivability is a life-safety issue and should be incorporated into residential building codes (similar arguments also apply to commercial building codes). Passively survivable houses and apartments will protect the lives and well-being of residents. With loss of electricity or heating fuel, such a home in the winter will never drop below a temperature deemed adequate to keep the house livable—perhaps 55°F (13°C); the residents will remain safe and pipes won't freeze. Furthermore, when such an energy-efficient home is without power or heating fuel, it could be maintained at more comfortable conditions—temperatures of 68°F to 75°F, for example—with just a very small amount of heat that could be provided with a kerosene heater or woodstove.

Similarly, in the summer months, a passively survivable house or apartment won't get so hot that residents are at risk of heat stroke or hyperthermia. Overhangs will block the hottest sunlight, and windows will provide natural ventilation—as our vernacular designs did before the advent of air conditioning. With multi-family buildings and apartment complexes, the design challenges in achieving passive survivability are greater, but so too is the investment in architectural design. If we mandated such performance, design firms would gain the expertise needed to achieve it.

Widespread adoption of passive survivability would, as a major side

benefit, reduce greenhouse-gas emissions. Under normal operating conditions, a passively survivable building will use very little energy for heating and cooling—which will go a long way toward reducing carbon emissions.

We need a multi-pronged effort to incorporate passive survivability into building codes. We need to determine what constitutes “livable conditions” and how that varies regionally; we need to agree on the assumed duration of outages for the purposes of survivability; we need to identify a building-performance metric, such as a score close to zero on the Home Energy Rating System (HERS) scale, that could serve as a proxy for passive survivability; and we need to convince code authorities and government leaders that risks of interruptions in electricity and heating fuel supply present a significant enough life-safety risk that we should incorporate passive survivability into all new houses.

Voluntary green builder programs go a long way toward encouraging passive survivability, but these programs are not proliferating fast enough to protect the public. We may need to mandate minimum levels of energy performance. Global climate change is already making our homes more vulnerable, and fuel shortages are likely to become a reality well within the lifespan of houses we are building today. We have a responsibility to ensure that houses keep their occupants safe and protected from the elements—just as we have a responsibility to ensure that they are resistant to fires and earthquakes. Let’s take that responsibility seriously and mandate, through building codes, that our houses will keep us safe, even without power or supplemental heat. Let’s not wait for the tragedy of a major summertime heat wave or wintertime cold spell that coincides with an extended power outage or fuel shortage before we act.

– Alex Wilson

Carbon Offsets Get Oversight

Can you construct or operate a building without emitting greenhouse gases? Probably not, but the voluntary carbon-offset market offers an alternative: pay a fee to finance reductions of greenhouse gases or sequestration of atmospheric carbon, elsewhere. In 2007, the Aldo Leopold Legacy Center earned an innovation point in LEED on its way to a Platinum rating for achieving carbon neutrality with the help of carbon offsets. The project offsets emissions from its energy use with carbon sequestration from improved forest management nearby.

The voluntary carbon-offset market, soon projected to be worth billions of dollars by 2010, has

been plagued by doubters who see offsets as a means to reduce the customer’s guilt, not carbon emissions. New developments in the field, however, including a Green-e standard and labeling program for offsets and potential oversight from the Federal Trade Commission, may bring more discipline and trust to the market.

The voluntary market for renewable energy certificates (RECs), which are similar to carbon offsets but deal instead with offsetting the use of conventional electricity (see EBN Vol. 15, No. 10 for more), has for years benefited from the third-party Green-e certification provided by the Center for Resource Solutions, a California-based nonprofit. One of several standards for RECs, Green-e is the most widely adopted, including in the LEED rating systems.

Now there is also Green-e Climate, launched in February 2008 after

What's Happening

more than a year of work through a transparent, stakeholder-driven process. Lars Kvale, the Green-e Climate manager at the Center for Resource Solutions, said that the program tries to ensure that “when you purchase one ton [of carbon emissions reductions], you know where it’s coming from, and you know that it’s real.” Green-e is not the first program to provide that verification, but it is the first to focus on the voluntary, not the regulated, market and to provide a product label from an established brand supported by a published standard.

Green-e works by setting standards for both where an offset comes from and how it is sold. Since offset buyers want to reduce emissions, they assume that their purchases are funding projects that wouldn’t have already happened under “business as usual.” This assumption, referred



to as *additionality*, is hard to define in practice. “There is significant disagreement among stakeholders about which [additionality tests] work,” says Kvale. Rather than using a single test, Green-e requires a series of tests that together screen out inappropriate offsets. Projects producing Green-e offsets must come from 2000 or later, and any carbon reduction mandated by law is ineligible. Projects must also pass one more test, but project teams can choose from among three: one showing that the revenue from the carbon offsets made the project possible; one showing that the project is not business as usual in the relevant economic sector; or one showing that the project uses “groundbreaking” new technology. Finally, companies must follow specific accounting standards and disclose certain information about

their offsets, such as what location they come from and what types of projects they support.

Offset producers must also verify their offsets through one of Green-e's endorsed programs: the Clean Development Mechanism (CDM), which was established as part of the Kyoto Protocol; the Voluntary Carbon Standard, a system established by a group of organizations; and the Gold Standard, another voluntary standard developed by nonprofits. Green-e specifies implementation options with each of these that avoid their shortcomings. In choosing those programs, Kvale says, "We reached out to anyone we could think of [and ultimately focused on the ones] we feel are legitimate," using a set of criteria including transparency and development with stakeholder input. One notable program not included is the Chicago Climate Exchange (CCX), which pioneered offset trading but which has been criticized for problems with offset quality. (CCX did not respond to requests for comment for this article.)

Carbon-market expert Mark Trexler, Ph.D., managing director of the Eco-Securities consulting service, said that with Green-e Climate, the Center for Resource Solutions is "having a lot of success building on its previous Green-e brand." He raised concerns about how Green-e offers producers a choice of additionality tests, however, worrying that "people can avoid the ones under which they don't succeed." He added, "It increases the potential for false credits to sneak in." Trexler also has worries about whether mechanisms like CDM that Green-e relies on are proven in protecting offset quality. Citing a World Wildlife Fund study showing that 20% of CDM projects aren't additional, he said, "It's hard to get a project through the CDM, but that and whether it's a quality project are two different questions."

So far, four companies are offering

Green-e certified offsets: 3Degrees, the Bonneville Environmental Foundation, Community Energy, and Renewable Choice Energy. "This is the highest standard in the industry to ensure credibility and safeguards," said Jack Hardy, a spokesperson for Bonneville, a nonprofit based in Portland, Oregon. Bonneville is participating, he said, to communicate to customers that "they're getting what they're paying for." All four companies separately offer RECs certified by Green-e.

The Federal Trade Commission (FTC), which enforces federal laws prohibiting false or misleading marketing, also noticed recently that offset customers might not always be getting what they're paying for. Since 1992, FTC has published the Green Guides, which define common environmental claims like recycled content and biodegradability. FTC last updated the Green Guides in 1998 but began a review in January 2008, a year ahead of schedule, in response to the recent increase in environmental marketing. In its first public hearing, FTC looked at carbon offsets and RECs, listening to testimony from numerous parties, including the Center for Resource Solutions (the group behind Green-e). FTC did not signal what approach it might take with carbon offsets and RECs, and FTC spokesperson Frank Dorman said that any decisions on revising the Green Guides would take place after an undetermined number of hearings.

FTC's interest is a reminder that the federal government is largely waiting in the wings on carbon regulation. Kvale says he expects that government will step in sooner or later, but that even when it does, the voluntary market will still be relevant. "Most consumers and most companies will not have a cap," he predicts, but many will want to reduce their emissions. Even companies that have a cap may want to do more. He also speculated that any system would

take years to go into effect, leaving the voluntary market as a way for people to act sooner.

— Tristan Korthals Altes

For more information:

Green-e Climate
Center for Resource Solutions
www.green-e.org

Green Guides
Federal Trade Commission
www.ftc.gov/bcp/menus/consumer/energy.shtm

Energy Star Labels for LED Lighting

There will soon be an Energy Star label for light-emitting diode (LED) light fixtures. The U.S. Department of Energy (DOE) has tasked the Pacific Northwest National Laboratory (PNNL) with promoting the commercialization of LEDs, or *solid-state lighting* (the broader category of lighting into which LEDs fall; see *EBN* Vol. 16, No. 8). Energy Star product certification should help identify quality products and ensure consumer acceptance.

At the Better Buildings by Design conference in Burlington, Vermont, in February 2008, Jeff McCullough of PNNL described how radically different solid-state lighting is from any other lighting, calling it "the most disruptive technology to hit the lighting industry in 50 years." DOE and Energy Star are trying to avoid the problems that were experienced when compact fluorescent lamps (CFLs) were introduced to the marketplace (including unrealistic expectations and poor product performance). "We're seeking to avoid these pitfalls with LEDs," he said.

Based on that goal, Energy Star has developed eligibility criteria for solid-state lighting luminaires (fixtures). Version 1.0 of these criteria has been through two comment drafts and was released in September 2007. The effective date for Energy Star labeling is September

Energy Star Criteria for Specific LED Lighting Applications

Lighting application	Minimum output ¹	Minimum efficacy ¹
Under-cabinet kitchen lights	125 lm/ft. (410 lm/m)	24 lm/W
Under-cabinet shelf-mounted task lights	125 lm/ft. (410 lm/m)	29 lm/W
Portable desk task lights	200 lm	29 lm/W
Recessed downlights	345 lm (<4.5") 575 (>4.5")	35 lm/W
Outdoor wall-mounted porch lights	150 lm	24 lm/W
Outdoor step lights	50 lm	20 lm/W
Outdoor pathway lights	100 lm	25 lm/W

1. Initial lumens (lm)

2008—giving manufacturers time to test and certify products.

The eligibility criteria for Energy Star LED luminaires include both general requirements that apply to all LED luminaires or broad categories of them and additional requirements that vary by fixture type. Among the general requirements are the following: a minimum color rendering index (CRI) of 75; color maintenance within a narrow, precisely defined range; at least 70% light-output maintenance such that after 35,000 hours of use (25,000 hours for residential indoor products); automatic controls to ensure that residential outdoor luminaires greater than 13 watts are turned off during daylight hours; minimum power factor requirements of 0.70 (residential) and 0.90 (commercial); a Class A sound rating for the power supply; and a three-year warranty.

The table above shows the near-term application-specific Energy Star criteria for light output and efficiency. According to McCullough, over the next three years there will be a “convergent ratcheting” of the efficiency requirements to 70 lumens per watt. This ratcheting of performance stan-

dards will be possible because of the speed at which improvement is occurring. DOE raised its performance targets three times in the development of a 2009-2014 program plan for LEDs (published in March 2008) because products are “outperforming the projections,” he told EBN.

To carry the Energy Star label, LED luminaires must have been tested by an independent, third-party, DOE-approved laboratory.

There are currently two laboratories that do most of the testing, but PNNL is working hard to get other laboratories geared up and approved for this work. Testing laboratories will procure three samples of each luminaire through normal market channels.

—Alex Wilson

For more information:

U.S. Department of Energy
Solid-State Lighting, Building
Technologies Program
www.netl.doe.gov/ssl

New Type of Waterless Urinal Cartridge Focus of Lawsuit

Waterless urinals like those from Falcon, Sloan Valve, and the Waterless Company don't require flushing or an integral water-filled trap because urine flows through a replaceable trap, or cartridge, filled with a vegetable-oil-based fluid. However, customer dissatisfaction over the need to regularly replace those cartridges has fueled demand for a new elastomeric trap made by Ecotech Water. In turn, Ecotech's technology has been the focus of a lawsuit by Falcon as well as criticism that it

violates plumbing codes.

The selling point of Ecotech's cartridge is its lifetime warranty, which gives it a projected lifetime far beyond that of Falcon's cartridges, which need to be replaced every 7,000 uses, according to the company. (Some customers say the cartridges need to be replaced in a fraction of that time.) Unlike the cartridges that require vegetable-oil sealant, the Ecotech cartridge relies on a membrane that opens in response to fluid, letting urine pass through, and then curls closed to block sewer gases from entering the restroom. The seal is made from an elastomer, a rubber that maintains its shape as well as its resiliency. Ecotech sells its own brand of urinal that uses this cartridge, but until recently many of its cartridges were sold as retrofits for Falcon and Sloan waterless urinals (Sloan licenses its technology from Falcon).

Ecotech has been forced to stop selling its retrofit cartridge for use with Falcon and Sloan urinals, however, after Falcon sued Ecotech, and the two parties came to a legal settlement. According to Terry Janssen of Ecotech, Falcon's lawsuit was a nuisance suit to protect Falcon's business, which Janssen portrays as being built on selling cheap urinals and expensive replacement cartridges (Falcon sells a single cartridge and sealant together for about \$40, compared with Ecotech's cartridge for \$159, or the Waterless Company's \$10 cartridge, plus \$18 for a quart of BlueSeal). According to Janssen, Falcon customers tell him, “We're spending more on cartridges than we're saving on sewer and water.” Ecotech's cartridge is an antidote to that problem, but not one that Falcon's business would tolerate, says Janssen.

Danny Gleiberman of Falcon, however, says that Falcon sued Ecotech because the elastomeric trap isn't sanitary, and Falcon didn't want it used in Falcon urinals. “Plumbing

codes mandate liquid trap seals, and every single code also prohibits mechanical traps," Gleiberman told *EBN*. "Why? Because they can fail, and then people using the bathroom have a major health risk on their hands."

Sewer gases, which are not only unpleasant but also potentially toxic, can leak through an improperly functioning seal of any sort. Liquid seals, like those used in conventional water-using and waterless urinals, are unlikely to fail under normal circumstances. Mechanical traps, however, are prohibited by plumbing codes because of the perceived likelihood that, like any mechanism with moving parts, they will fail over time.

Janssen denies that the elastomer used in the Ecotech cartridges is a mechanical seal and prohibited by codes—"All it does is expand and contract," he said. "[There are] no moving parts about it." Gleiberman sees it differently: "Something that opens and closes, to me, is mechanical." G. J. Garrow, the Vermont State plumbing inspector, told *EBN* that regardless of how Ecotech defines "mechanical," the State plumbing board looks at mechanical traps as "anything that can fail—and this can fail." Garrow said that due to a



The underside of the Ecotech cartridge for waterless urinals shows the elastomeric membrane, which curls open to allow urine or water to pass through and then curls back up to prevent sewer gases from entering the restroom.

Photo: Ecotech

number of installations of Ecotech cartridges in the state that suffered problems, the products aren't allowed.

Bill Gauley of Veritec Consulting, a water-efficiency expert, said that traps like Ecotech's "have been considered mechanical seals, so they don't generally meet the code requirements." Gauley says that even though the traps work, they could still pose sanitation issues. "It's not a question of whether they work when they're new, but when they fail and what happens when they fail."

Another company, Caroma, appears to recognize the code issues and has taken a more cautious approach in introducing a new waterless urinal that uses an elastomeric trap. Based in Australia, Caroma is bringing its H₂Zero Cube urinal to North America (see *EBN* Vol. 16, No. 10) but isn't yet selling it widely. Caroma's Derek Kirkpatrick acknowledges that plumbing codes limit elastomeric seals like Caroma's, but, he said, "It's being reviewed as we speak." The H₂Zero urinal puts the elastomeric seal in a replaceable cartridge (sold for \$45–\$55), and Caroma recommends replacing it within about ten months, depending on usage, in contrast with Ecotech's lifetime warranty.

Gauley said that he is not against elastomeric traps on principle, but he believes they need to be better tested and that standards need to be developed to provide quality control and guidance to manufacturers and users, something that hasn't happened yet. Gleiberman agreed, saying, "We should all be receptive to new products," but manufacturers with new types of products "should develop a standard and go through a testing period." Although Gauley said that his firm will soon begin collecting data on the performance of several urinals, including ones using mechanical traps, he predicts that long-term development of the technology will be stymied by advances in

conventional flushing urinals. "The economics, rather than the technical aspects, are going to drive the mode of the market," he said. "With the introduction of high-efficiency urinals that use a pint of water per flush, the cost savings of a no-water urinal are reduced significantly," compared to a decade ago when almost all urinals used a gallon of water per flush.

—Tristan Korthals Altes

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Certifying Buildings En Masse

When property-management giant CB Richard Ellis (CBRE) committed to certifying 100 buildings under the U.S. Green Building Council (USGBC) LEED for Existing Buildings: Operations and Maintenance (LEED-EB) program in November 2007, following through on its pledge would have more than doubled the number of certified buildings (there were 59 LEED-EB certified projects at the time). While it's taking longer than CBRE had hoped to select and register those projects, the company is undaunted in pursuit of this commitment, which is part of a broader environmental initiative that includes making the company carbon neutral by 2010. "We have been pleasantly surprised and overwhelmed at how much interest this has gotten from our clients," said national director of sustainability David Pogue. CBRE manages 250 million ft² (23 million m²) of office space in the U.S. (more than twice as much as the next largest property manager),



Photo: Nadav Malin

CBRE is property manager for the 2-million-ft² (190,000-m²) Bank of America building under construction at Bryant Park in midtown Manhattan. The project is pursuing LEED for Core and Shell Platinum-level certification, while the Bank's interiors (in the building's lower 40-plus floors) are pursuing LEED for Commercial Interiors Gold.

and 1.7 billion ft² (160 million m²) of buildings worldwide. The 100 buildings going through LEED-EB represent about 10% of the U.S. office properties that CBRE manages.

To streamline the certification process, CBRE has become one of 40 pilot partners in USGBC's volume certification program in which credits that apply to the entire portfolio are preapproved. "[Building owners] have to submit the prototype documentation and a quality-control plan across the organization so we can know that there will be consistency in delivery and performance," explained Doug Gatlin, USGBC's vice president for market development. In the LEED-EB context, purchasing policies and green cleaning practices would be likely candidate credits for portfolio-wide approval. There are fewer candidate credits for volume approval in LEED-EB than in the new construction rating system because existing buildings tend

bility of the owner, the condition of the building, and the value of the LEED brand in the building's local market. Certifying existing facilities is especially useful for keeping them competitive in office markets "where there is new construction activity, creating new LEED buildings," Pogue notes. CBRE is doing a LEED gap analysis for candidate projects and finding that achieving basic certification should not be too difficult for many properties. Achieving the water conservation requirement is likely to require the biggest investment, Pogue predicts.

— Nadav Malin

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to be more idiosyncratic than multiple new buildings following standard prototypes, Gatlin notes. He expects the biggest advantage of a volume approach for certifying operations to come from streamlined collection and submission of performance data.

Pogue's team is analyzing over 100 potential buildings for participation in the program and has started registering a few of them with USGBC. The selection criteria include the interest level and sta-

Doug Gatlin, Vice President for Market Development
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Gut Rehab Home Goes Platinum

Having built one new LEED Platinum home (see *EBN* Vol. 16, No. 6), Richard Renner, AIA, shifted his attention to retrofitting an existing building and attaining the same "lofty" level of certification. His own 1,400-ft² (130-m²), two-bedroom live/work loft, located in a mixed-use neighborhood in Portland, Maine, is the first gut rehab in the Northeast (and the second in the nation) to achieve a Platinum rating in the LEED for Homes rating system.

Dan Kolbert Building & Renovations performed the rehab work for the 100-year-old, once-derelict commercial building, which now boasts high levels of insulation, triple-glazed windows, light tubes to bring daylight into the interior spaces, radiant-floor heating, heat-recovery ventilation, framing and floors certified to Forest Stewardship Council standards, low-flow plumbing fixtures, low-emitting finish materials, and a green roof, among other features.

Danuta Drozdowicz of Fore Solutions provided LEED documentation services for the loft. While Drozdowicz believes that "LEED for New Construction is very straightforward in terms of evaluating environmentally preferable materials," she finds there are "limitations within the LEED for Homes program in terms of what counts and what doesn't count as an environmentally preferable product." Renner, who says that LEED guides the environmental aspects of his firm's work in general, agrees with Drozdowicz in this respect: "The entire outside of the building is reused," he explained, "but LEED for Homes doesn't really give you credit for reusing a significant amount of



Richard Renner relaxes in his live/work loft, which earned a LEED for Homes Platinum rating. Because of the building's unusual configuration, Renner was challenged to develop a tightly organized floor plan that accommodates multiple functions without compromising the loft's long interior views.

Photo: Richard Renner Architects

the building shell." Although LEED for Homes doesn't address salvage and reuse, the team captured some credit for the building's reuse of existing resources in the category for local materials.

—Rachel Navaro

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Newsbriefs

Study Links Biobased Products with Emissions—A new study performed by University of Texas-Austin doctoral student Chi Phuong Hoang shows preliminary evidence that some green and biobased materials—often touted as low-emitting—may react with low levels of naturally occurring ozone to create

"secondary" emissions of volatile organic compounds (VOCs), which are harmful to human health. Hoang tested ten common wall, flooring, ceiling, and cabinetry materials that have been identified as green by a third party. She found that ceiling tile made from inorganic perlite, cork wallpaper, and wheat-straw board were the most reactive with "realistic outdoor and indoor concentrations" of ozone. The Greenguard Environmental Institute, a nonprofit organization that establishes acceptable indoor air standards for indoor products, environments, and buildings, funded the study. Carl Smith, CEO of Greenguard, thinks the study reveals, "in a meaningful way, a new facet of how to look at how one's product may contribute to indoor air issues." For more information, visit www.greenguard.org.



Federal 2009 Budget a Mixed Bag for Green Building—In February 2008, President George W. Bush sent his proposed budget to Congress,

which, if passed, would deliver a blow to some programs aimed at energy efficiency and renewable energy even as it increases the funding for others. The U.S. Department of Energy (DOE) would lose all of its funding for two programs: the Weatherization Assistance Program, which provides funding and technical assistance to state weatherization programs for low-income families, and the Renewable Energy Production Incentive, which provides financial incentives for electricity produced from renewable sources. The budget also cuts funding for solar energy programs by \$12 million from 2008 levels (about 7%). The Building Technologies program, however, which promotes high-performance buildings, would gain \$15 million over 2008 levels (about 14%). The 2009 budget, which is a starting point for the legislative process, is available at www.whitehouse.gov/budget/.



IIDA Headquarters Achieves LEED Interiors Certification—The new headquarters for the 12,000-member International Interior Design Association (IIDA), located in Chicago's Merchandise Mart, is considered by IIDA to be "an illustration of green ideas at work, featuring products and materials that demonstrate how sustainable design can be both beautiful and functional." The design association earned a Gold rating in LEED for Commercial Interiors, with a space that includes underfloor air distribution, T-5 linear pendant fixtures, and glass walls and doors for private offices to maximize the penetration of natural light. Of the materials specified for the project, such as ceiling tiles and upholstered wall panels, 25% (by cost) contain pre- and post-consumer recycled content, and 5% (by cost) are made with rapidly renewable materials, such as cork. Envision Design, an architecture and interior design firm based in Washington, designed the

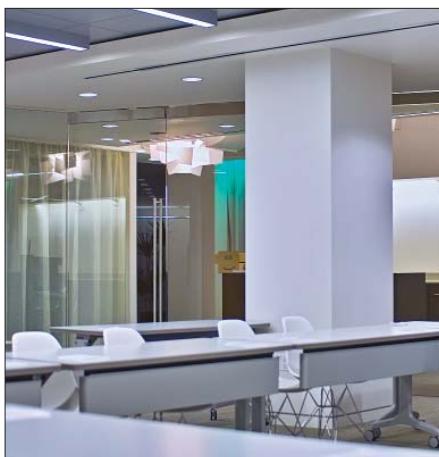


Photo: IIDA

The new IIDA headquarters feature private offices with glass walls and doors for natural light penetration and open workstations that allow views to the windows from a seated position.

space and provided LEED consultation. More information is available at www.iida.org.



New Jersey Switches from Solar Rebates to Certificates—In December 2007, New Jersey's Board of Public Utilities (BPU) announced that the state would be suspending its solar rebate program—one of the nation's most vigorous—and replacing it with one based on solar renewable energy certificates (RECs), tradable credits that represent the environmental attributes of the solar electricity. BPU made the policy switch because of overwhelming demand for the state's generous solar rebates, creating (since early 2006) queues for rebate funding. BPU has ordered rebates to be phased out entirely by May 31, 2012, and limited to small projects until then. The new REC program facilitates the sale of certificates to the electricity suppliers who, under New Jersey's renewable portfolio standard are required to invest in a minimum amount of renewable energy; by 2009, that amount will be the equivalent of 90 MW, or enough to power 8,000 homes. Any of New Jersey's solar photovoltaic owners with grid-connected generators are eligible to participate in the REC program. More information is at <http://srec.njcleanenergy.com>.



Sandy Mendler Joins Mithun to Open San Francisco Office—A leading green design firm doing business in Seattle for nearly 60 years, Mithun is expanding into California and increasing its staff to include Sandy Mendler, AIA, as a principal in its new San Francisco office. "I am so excited to join such a strong group," Mendler told *EBN*, "and to have the opportunity to help build a

San Francisco-based team that will provide great service, design excellence, and sustainable design in a fully integrated manner." In addition to Mendler's more than 20 years of professional experience, most recently as senior vice president and design principal for HOK in San Francisco, she has been instrumental in promoting high-performance design. A member of the advisory board of *EBN*, Mendler recently served on the national board of directors of the U.S. Green Building Council and chaired

The American Institute of Architects Committee on the Environment in 2000 and 2001. Recent projects include the headquarter facilities for the Environmental Protection Agency, the World Resources Institute, and the National Wildlife Federation. For more information, visit www.mithun.com.



Sandy Mendler, AIA



This 40-kW photovoltaic system (with 240 modules) was installed in Hopewell, New Jersey, less than a year before the "solar transition" took place, allowing it to benefit from rebates as well as RECs.

Photo: Advanced Solar Products



Many materials used in FEMA trailers off-gas formaldehyde, reducing indoor air quality and posing a health threat to long-term occupants.

Photo: Mark Wolfe, FEMA



CDC Finds Elevated Formaldehyde Levels in FEMA Trailers—The Centers for Disease Control and Prevention (CDC) has found formaldehyde levels ranging from 3 to 590 parts per billion (ppb) in trailers supplied by the Federal Emergency Management Agency (FEMA) to Americans displaced by Hurricanes Katrina and Rita. CDC found an average formaldehyde concentration of 77 ppb, compared with 10 to 30 ppb in typical indoor environments. These levels are high enough to pose health concerns—especially for elderly people, children, and those with asthma—and CDC encourages residents of the 34,000 trailers still in use along the Gulf Coast to move to safer housing as soon as possible. The findings, based on tests performed in December 2007 and January 2008 and published in an interim report, likely under-represent long-term exposures, since formaldehyde levels tend to be higher in newer trailers and during warmer months. More information is online at www.cdc.gov/Features/FEMATrailersFindings/. For more on formaldehyde and FEMA trailers, see EBN Vol. 16, No. 9.



Televisions Must Meet New Requirements to Earn Energy Star—Version 3.0 of the Energy Star specification for televisions has been finalized and is scheduled to go into effect November 1, 2008. The new specification requires all Energy Star televisions to be 30% more efficient than conventional models. While the one-watt maximum for the standby mode remains the same in the new version, the specification

now requires energy savings while the television is on. Currently, about 25% of the televisions on the market qualify under version 3.0, a percentage that is expected to grow. About 60% of products satisfy Version 2.0 requirements today, compared with 25% when the requirements were released in 2002. EPA expects the new specification to save about \$1 billion (over the life of the products) in energy costs. For more information, go to www.energystar.gov/pdtv.

Product News & Reviews

Composite Panel Industry Adapts to Pending CARB Regulation

On January 1, 2009, the California Air Resources Board (CARB) is scheduled to begin enforcement of its "Airborne Toxic Control Measure (ATCM) to Reduce Formaldehyde Emissions from Composite Wood Products." Adopted on April 26, 2007 (see EBN Vol. 15, No. 7 and Vol. 16, No. 6), this regulation is due to be ratified before April 22, 2008, and will be implemented in two stages: Phase I in 2009 will cap emission levels for medium-density fiberboard (MDF) at 0.21 parts per million (ppm), particleboard at 0.18 ppm, and hardwood plywood at 0.08 ppm; from 2010 to 2012, Phase II will lower levels further to 0.11 ppm for MDF, 0.09 ppm for particleboard, and 0.05 for plywood.

Currently, the only mandatory standard in the U.S. for formaldehyde emissions—listed as a known human carcinogen since 2004—is a 1985 regulation created by the U.S. Department of Housing and Urban Development (HUD) that sets limits for particleboard and hardwood plywood used in manufactured homes (mobile homes) at 0.3 ppm and 0.2 ppm, respectively. The HUD stan-

dard applies only to panels used in HUD-regulated manufactured housing and does not currently regulate formaldehyde emissions from MDF, though a 0.3 ppm standard for MDF is being developed. The CARB standard is much tougher and more comprehensive, but it is enforceable only in California and does not apply to manufactured homes used by HUD. Other states are sure to adopt similar standards, however, and CARB's regulations will be far reaching because all products made out of state and imported into California will have to comply.

But is the composite panel industry ready for these new standards? According to representatives from the Composite Panel Association and several panel manufacturers, most companies will be able to meet Phase I limits, and only some companies will be technologically challenged to meet Phase II limits. According to Jeff Lundegard, Western division director of sales at SierraPine, "We have products that are already Phase II compliant." He continued, "We could go to 100% Phase II if the market desired." Elizabeth Whalen, director of corporate sustainability at Columbia Forest Products, agreed: "We already meet Phase II, so CARB compliance isn't a big concern."

Panels made using urea-formaldehyde (UF) resins—the least expensive, highest emitting, and most common composite panel binder—can still meet Phase I limits but will have a hard time reaching the low Phase II limits. Most no-added-urea-formaldehyde (NAUF) panels and all no-added-formaldehyde (NAF) panels, however, will meet Phase II, and these panels have been on the market for years. (CARB will label NAUF panels that meet Phase II requirements “ultra-low-emitting formaldehyde” [ULEF] when its regulations go into effect.)

Typically, NAUF and ULEF panels are made with phenol-formaldehyde (PF), or phenolic resins, which take longer to cure than UF and are more expensive. Manufacturers of NAF panels have to turn to even costlier resins to avoid formaldehyde entirely. They use polyvinyl acetate (PVA, or white glue), methylene diisocyanate (MDI, a polyurethane), or soy-based resins.

Replacing UF at the factory level with alternative resin systems that meet the CARB standards will present challenges for manufacturers, according to Lundegard. These other resins (including MDI, PF, and PVA) have very different curing times and characteristics. “When we started to make Encore [which uses a PF resin], it took three to four months to make the switch,” explained Lundegard. And changing resins is just part of the equation. Resins react differently to different wood types, so even after a resin is tested, introducing it into another facility using different fibers can produce different results and cause further delays.

“We successfully made PureBond particleboard using our soy-based adhesive,” noted Whalen, “but we are not currently manufacturing it.” Market conditions and product priorities factored into the company’s decision to stop production. But Columbia is still making its core product, hardwood plywood, using its

Composite Panels Poised to Meet CARB’s Formaldehyde Emission Caps

Manufacturer	Product	NAF or NAUF	Binder	Certified recycled content
MEDIUM-DENSITY FIBERBOARD (MDF)				
Flakeboard www.flakeboard.com	Vesta	NAUF	PF	
Panel Source International www.panelsource.net	Purekor	NAF	PVA	100%
Plum Creek MDF www.plumcreek.com	Glacier Clear	NAUF	PF/MDI	88%
Roseburg www.rfpc.com	SkyBlend	NAUF	PF	80%
SierraPine www.sierrapine.com	Arreis, Medex, and Medite	NAF	MDI	88%, 82% (Medite)
PARTICLEBOARD				
Boise Cascade Corporation www.bc.com	Evergreen	NAUF	MF	
Collins Companies www.collinswood.com	FreeForm	NAUF	MF	
Flakeboard www.flakeboard.com	Vesta	NAUF	PF	
Panel Source International www.panelsource.net	Purekor	NAF	PVA	100%
Potlatch Forest Products Corporation www.potlatchcorp.com	Terramica	NAF	pMDI	
Roseburg www.rfpc.com	SkyBlend	NAUF	PF	92%
SierraPine www.sierrapine.com	Encore	NAUF	PF	91%

NAF: No added formaldehyde. These meet proposed Phase II emission standards.

NAUF: No added urea formaldehyde. These panels should have low enough formaldehyde emissions when CARB regulations go into effect to be considered ultra-low-emitting formaldehyde (ULEF) panels (defined by CARB as resins with average formaldehyde emissions consistently below the Phase II emission standards).

Binders: methylene diisocyanate (MDI); melamine-formaldehyde (MF); polyvinyl acetate (PVA); phenol-formaldehyde (PF); polymeric diphenylmethane diisocyanate (pMDI).

Recycled content values are pre-consumer, and all are third-party certified by Scientific Certification Systems. All the products listed except those from Panel Source also have second-party certification from the Composite Panel Association for conformance with its Environmentally Preferable Product (EPP) Specification.

PureBond technology. The company is working on partnering with other manufacturers to produce particleboard with its soy-based resin, according to Whalen.

What is the resin of the future? MDI and PVA panels will meet proposed Phase II limits, but both are expensive and have manufacturing challenges. PF resins can reach Phase II as well, but they produce a panel that is darker and takes longer to

cure than UF. Several manufacturers are now taking a closer look at melamine-formaldehyde (MF). Panels made from MF have a lighter color than UF and are less prone to chipping, but MF’s main advantage is that both UF and MF panels have similar run times, so the manufacturing shift would not be as abrupt as with other resin technologies.

CARB recognizes that these UF-free resins achieve its goals and has made

provisions in its regulations: NAF panels will be exempt from emissions testing, and ULEF panels will be subject to reduced third-party testing, with a three- to six-month test period to show compliance followed by periodic inspections. The costs of this testing are borne by the companies, so there is some incentive to produce exempt NAF panels.

"Because we don't know what the final testing and enforcement provisions will be, it is difficult to gauge how much it will cost," noted Curt Alt, vice president of marketing and communications for the Composite Panel Association. For some manufacturers, testing is less of a concern. "We test all of our products all the time for a variety of criteria," commented SierraPine's Lundegard. "UF is just part of that testing." But all panel manufacturers agree that making the transition to Phase II caps will be a financial challenge. Lundegard suggests that meeting proposed Phase II limits will add 20% to the cost of the company's MDF and 35%-37% to its three-quarter-inch particleboard.

The composite panel industry is facing additional challenges, such as the rising costs of all resins and having to install equipment in order to comply with the EPA's Maximum Allowable Control Technology for hazardous air pollutants, which goes into effect on October 1, 2008. Also, wood fiber shortage is a concern; with the housing market downturn, less wood scrap is being generated for the mills and there is more competition for that fiber from outside the composite panel industry. The pellet stove industry, for instance, uses the fiber to manufacture fuel.

Wade Mosby, senior vice-president of The Collins Companies, commented that because of high costs, the only buyers of CARB-compliant panels are those looking for LEED points or trying to manage indoor air quality, such as hospitals. He has concerns about the future costs of panels. "If

everyone in North America [including importers] has to comply with CARB, then it is a level playing field," he commented. "But if competitors have an 18-month grace period [to sell noncompliant products], then it will give them an advantage and it will be tough for us."

— Brent Ehrlich

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Three-in-One Insulating Sheathing from Dow

Dow Building Solutions fills three needs in one with a new product for stick-frame walls. Styrofoam SIS, for structural insulated sheathing, provides structural shear bracing, wraparound insulation, and a water-resistant barrier in a single 4x8, 4x9, or 4x10 sheet with half-inch and one-inch thicknesses, providing insulation values of R-3 and R-5.5, respectively. Styrofoam SIS performs all three functions adequately, if not

exceptionally, but its convenience and potential cost-savings are enticing and may encourage builders who don't already incorporate all three of those functions to do so.

Styrofoam SIS offers its three functions in three layers. A thin structural layer, which is essentially a Thermo-Ply-type composite panel, rests against the studs. Mostly composed of recycled cardboard, with some polyethylene, this layer contributes up to 80% post-consumer recycled content (by weight) for the entire product, according to Dow, although the recycled content is not independently certified. Most of the thickness of the panel is in the middle layer, a closed-cell, rigid polyisocyanurate foam with high compressive strength. A moisture- and UV-protective outer layer, blue in color and composed in part of aluminum foil, provides a drainage plane. An entire 4x8 sheet weighs 16 pounds (7 kg)—significantly less than conventional sheathing.

Proper installation is key to getting the most out of Styrofoam SIS. Dow requires a more aggressive nailing pattern than usual for either standard sheathing or rigid foam: three inches on center for supported edges, and six inches on center for interme-



Photo: Dow Chemical Company

Styrofoam SIS, for structural insulated sheathing, from Dow Building Solutions meets three needs in one: structural shear bracing, wraparound insulation, and weather-resistant barrier.

diate supports. Although nails will pass through much of the foam, they will provide the necessary holding power in the structural layer. According to Jim Gurnee at Dow, the nailing pattern, with roughly twice as many nails as would be needed for oriented-strand board (OSB), shouldn't be a problem for builders. "Contractors are saying it's not an issue because of pneumatic guns," which make nailing fast, he said. He also noted that nailing would be automated in panelization factories. The nails add some time and expense for a product that otherwise aims to save both, however.

Dow also recommends taping the seams of the panels with its Weathermate Construction Tape, which has enhanced adhesive and UV-resistance properties, compared with generic seam tape. Gurnee said that, although it's not necessary, some builders prefer to use housewrap with taped seams instead. According to Gurnee, Styrofoam SIS functions well as a drainage plane with cladding installed right up against it—without an air cavity to depressurize the plane and reduce movement of water film. Gurnee also said that taping the fastener holes is not necessary, even though they may catch water.

Joe Lstiburek, P.E., of Building Science Corporation in Massachusetts, who has tested the product in a mock-up over the last year, agrees that taping the holes is unnecessary. "Tar paper always leaked a little at the fastener holes," he said. "The key is to allow drying behind the sheathing." In practice, that would mean avoiding any vapor barriers to the inside—or to the outside—of the SIS. (SIS is a vapor barrier, with a perm rating of 0.3).

Lstiburek said that he would use furring strips to create an air cavity. He also noted that he was impressed with how well the seam tape has held up over the last year, despite having left it without protective

cladding. Lstiburek also uses flashing tape around penetrations, and the Weathermate tape to bridge the flashing tape and the SIS, because the Weathermate adheres better to the SIS.

"I think it's a good product," said Lstiburek, noting that "this is a pretty good solution for production builders" who want the benefits of continuous insulation to prevent thermal bridging at studs, and a weather-resistant barrier, but who want to avoid the additional trips around the house and other complications that are usually required for separate sheathing or bracing, rigid-foam, and housewrap products. Lstiburek noted, however, that for higher performance, he would personally prefer the racking resistance provided by OSB and the thermal benefits of three to four inches of rigid foam.

In its product specifications, Dow says that Styrofoam SIS "resists air infiltration," and a spokesperson told *EBN* that it "passes code as an air barrier." Dow did not provide any specifications to back that claim, however, despite repeated requests by *EBN*. Without further information, and without recommended details to maintain the barrier's continuity, the product should not be relied on for that purpose.

Styrofoam SIS is available in ten states, and Dow plans a national launch by July 2008, says Gurnee. Price will vary by location but should be roughly \$16–\$17 for a 4x8 sheet, he said, which in addition to labor savings should offer a savings in materials costs in most locations, when compared with buying three separate products. Dow is also working on improving the product and offering variations—for seismic and high-wind areas, for example.

—Tristan Korthals Altes

For more information:

Dow Building Solutions
www.styrofoam.com

Navigating Incentives and Regulations (from page 1)

showing up in funding competitions for affordable housing construction and other publicly funded projects.

Tax incentives

According to the Database of State Incentives for Renewables and Efficiency (DSIRE), operated by North Carolina State University and funded by the U.S. Department of Energy (DOE), there are 37 tax incentives for energy-efficient buildings, spread over 18 states, in addition to several federal incentives. Significantly more incentives—132 on the state level, plus a federal incentive—are available for renewable energy installations. These incentives cover personal and corporate taxes as well as property and sales taxes and include both tax deductions and tax credits. Generally, a tax *credit* offers a bigger financial advantage, since it reduces dollar-for-dollar the amount of taxes owed by a company or individual. A tax *deduction* reduces taxable income, which translates into reduced taxes based on the applicable tax schedule. Also, tax credits are often transferable from an entity that does not pay taxes to one that does, while deductions are not.

One of the federal government's incentives is a tax deduction for energy-efficient commercial buildings, created in the Energy Policy Act of 2005. According to Katherine Hammack, senior manager of tax advisory services for consulting firm Ernst & Young, the federal tax deduction for energy efficiency can be confusing for tax advisors and designers alike, and some of the requirements can be difficult to meet. "Most people throw up their hands," she said, "and don't go after the federal deduction."

The deduction, worth up to \$1.80/ft² (\$19/m²), covers three areas of a building—the lighting system, mechanical systems, and building envelope. Receiving the deduction in

all three areas is rare, as it requires a whole-building simulation showing at least 50% energy savings over the standards set in ASHRAE 90.1-2001. Achieving those savings, Hammack told *EBN*, "is not necessarily impossible, but it requires an intense focus on all of the building's systems" and their interconnectedness. At this level of energy performance, there are often tradeoffs between energy savings and other green building strategies such as daylighting or ventilation. For example, said Hammack, "A minor change to glass or window size has a dramatic effect on the rest of the systems in the buildings." While many of these tradeoffs and the design strategies addressing them are familiar to green builders, the 50% energy savings is still a challenging target.

The lighting portion of the deduction requirements, on the other hand, is fairly easy to meet with straightforward design strategies, thanks to improvements in lighting technology in recent years and rules that allow simple lighting power density calculations rather than energy simulations. Even for lighting, however, pursuing the deduction is worthwhile only on large projects, according to Hammack, because the documentation and verification costs exceed the savings available on

smaller ones. As with all incentives, Hammack recommends knowing the requirements of the deduction early so they can be incorporated into the design process.

At the state level, incentives for energy efficiency and renewable energy are fairly common, but only three states—New York, Maryland, and Nevada—offer incentives for green building more broadly. New York's tax credit, passed in 2000, provided \$25 million in income tax credits to owners and tenants of buildings over 20,000 ft² (1,900 m²) and tenant spaces over 10,000 ft² (930 m²). These credits, issued from 2000 to 2004, could be applied to taxes from 2001 to 2009, and represented up to \$10.50/ft² (\$113/m²) for a base building and up to half that much for tenant spaces. Seven buildings divided up the credits. For example, the \$114-million Solaire, a LEED Gold high-rise residential building in New York City, received \$2.8 million in tax credits from the State, spread over five years (for more information, see the case study in *BuildingGreen Suite*). The legislature has approved an additional \$25 million in tax credits, but the State has not yet set a date when they will be dispersed.

To receive the tax credit, buildings had to meet a set of green building

criteria that included energy performance above State code, indoor air quality measures, materials requirements, and commissioning. The criteria are maintained by the Department of Environmental Conservation with the help of the New York State Energy Research and Development Authority (NYSERDA) and are updated regularly. The updates allow the state to tighten the green building requirements and respond to changes in materials, technology, and regulatory codes. For example, the state recently updated its energy codes from the 1999 version of ASHRAE 90.1 to the 2001 version—and is working to update them again to the 2004 version by mid-2008, according to Craig Kneeland, a senior project manager at NYSERDA.

Maryland enacted a tax credit in 2001 that was nearly identical to that created in New York. As of August 2007, all of the available \$25 million had been assigned to projects in the state, and additional funding has yet to be approved.

In 2005, the Nevada legislature passed a bill giving owners of buildings certified through the U.S. Green Building Council's (USGBC) LEED Rating System up to a 50% discount on their property taxes for up to ten years, depending on the building's LEED rating. The State also offered a sales tax exemption for green building materials and technologies. But the popularity of the program with big developers soon overwhelmed the State's coffers. Developers with large casino projects on the boards worked quickly to incorporate LEED and earn the tax credit, and calculations showed that, if allowed to continue, the law would have cost the state an estimated \$900 million to \$2.5 billion in sales and property tax revenue over ten years. Initial estimates by the legislature had assumed the program would reach only a niche market and cost a fraction of that amount. In 2007, the leg-



The newly completed Orchard Heights development in San Jose, California, features building integrated photovoltaic (PV) systems on the roof of every home. Each PV system was eligible for a \$2,000 federal tax credit, which builder Pinn Brothers will pass on to the homeowner, and a rebate from the California Energy Commission worth \$5,417.

Photo: Kathy Schipper

islature eliminated the sales tax exemption and lowered the property tax credits to a maximum of 35% for future projects. Six projects, including several high-profile casinos in Las Vegas, that had already been approved for the incentives under the original law were allowed to keep those financial benefits, but many projects that had applied were given the lower level of incentives.

Non-financial incentives

Development incentives—for example, expedited permitting and density bonuses—have long been a popular method of encouraging green building and have proven particularly successful in Chicago and Seattle.

Chicago offers expedited permitting (with a goal of 30 days or fewer) through its Green Permits program, which also discounts review fees for projects that meet green criteria. For a tall office building, for example, the project team must achieve a LEED Certified rating, devote half of the roof area to a green roof, and choose one green strategy from a menu that includes transit-oriented development, on-site power generation, and natural ventilation, among others. To achieve the next tier of benefits—including a \$25,000 discount on review fees—the team must raise the building's LEED rating to Silver and its green roof coverage to 75%. The highest level, which includes free review and an even shorter permitting period, requires that the building have an additional menu item or achieve LEED Platinum.

Navigating Incentives	
Start early	Researching incentives on the federal, state, and local levels early in the design process will help you include green building strategies that meet those requirements. It is more expensive to add a strategy later in the process, and it's harder to document a strategy after it's been incorporated.
Find all the sources	Incentives are available from federal, state, and local governments as well as local utilities. DSIRE is an online database of incentives for energy efficiency and renewable energy—it includes green building incentives as well. Check with municipalities for local incentives.
Know the requirements	If a project is eligible for more than one incentive, the requirements for the incentives may overlap or may require different kinds of documentation. Finding these conflicts early in the design process may allow you to change the design or negotiate with one or more of the incentive programs.
Calculate the payback	Meeting the requirements of a regulation or incentive can be expensive. Documentation, inspection, and consultants can all add to the cost of a project. Calculate the expected payback of an incentive and compare it to the added expense of meeting the requirements for the incentive. Tax credits tend to be better deals than tax deductions.
Gather documentation	All programs require some level of documentation; many require documentation that must also be gathered for LEED certification. For others, however, documentation requirements are more extensive. Know the documentation requirements before the design and construction process begins, and know how much the documentation requirements for various programs overlap.
Hire an expert	As the number of incentives and regulations increases, it may make sense to hire a consultant specializing in compliance or to develop this expertise within your firm.

According to Helen Kessler, FAIA, principal of the consulting firm HJKessler Associates, the Green Permits program "has been a terrific incentive to build green buildings" in the city. The program has whittled the time needed for a permit from up to six months for a conventional commercial building down to six weeks for a green one. The increased efficiency has not reduced the City's oversight but rather has made the City more involved from the beginning of the design process. "You're not going to get a faster permit if your project isn't ready for it," said Kessler.

Most of the time, the benefits of expedited permitting are hard to quantify, as with the Exelon headquarters in Chicago, which achieved a Platinum rating through LEED for Commercial Interiors. According to Deb Kuo, director of real estate in the Exelon Business Services Company, the project team researched incentives when they began the design process in 2004 but found none

that applied to the office renovation. Soon, however, Chicago developed its expedited permitting program, and the project was able to take advantage of it. According to Kuo, working in collaboration with the city allowed the project team to focus less on permitting and more on design and construction management, which translated into a better design, greater efficiency on the project team, and fewer change orders. Although she couldn't put a dollar figure on these benefits, Kuo did note that the expedited permitting process "allows you a more thoughtful process that's less reactionary" because the City is involved earlier and more collaboratively in the process.

Seattle takes a different approach, offering density bonuses to green buildings in the heart of downtown that achieve a LEED Silver rating or higher. Since 2006, these buildings have been allowed to have larger floor area ratios—the ratio of the total floor area to the site area—and greater heights than are allowed by



The renovation of Exelon's headquarters in downtown Chicago achieved a Platinum rating in LEED for Commercial Interiors; the project was eligible for Chicago's expedited permitting program for green buildings.

Photo: Exelon Corporation

the zoning laws governing the area. The law also allows the city to penalize buildings that fail to meet their LEED targets. According to Peter Dobrovolny with the city's Department of Planning and Development about two dozen buildings, most of which are high-rise residential developments, have taken advantage of the bonus.

Dobrovolny says the bonus program was a natural outgrowth of the city's green building policy, which required all City-owned buildings to achieve a LEED Silver rating. "The intention was to lead by example, not by fiat," he said, and the City saw incentives as the way to encourage green building in the private sector. Now the City is hoping to make the program more stringent as it expands it to the rest of Seattle. "We're looking at incorporating threshold requirements in some areas, including energy performance beyond current code requirements," Dobrovolny said. He also noted that the city is moving green building into the regulatory realm, looking at increasing energy-efficiency requirements, and incorporating green building strategies in the building codes.

Qualified allocation plans

In the residential sector, a widely used tool for encouraging green building is the Low-Income Housing Tax Credit, created by a federal law in 1986 and administered by the states through qualified allocation plans (QAPs), which set eligibility criteria for the credit. The law mandates credit for projects that offer rentable, affordable housing units, but leaves additional criteria, such as energy or resource efficiency, up to the states. In the last several years, most states have added various green building criteria to their QAPs—according to a 2007 report by Enterprise Community Partners, 42 states now require some aspect of green building from all projects. The level of commitment to green varies widely, from basic energy-efficiency or smart-growth measures to registration with a green building program. However, a large majority of the states (48, according to Enterprise) demonstrate a preference for green building beyond the baseline requirements when making funding decisions.

Like most states, Virginia ranks applicants for the low-income housing

tax credit by assigning points for certain criteria. Beginning in 2006, Virginia's QAP included 15 points for certifying a project through the EarthCraft green building program or through LEED. In 2008, the number of points available for EarthCraft- or LEED-certified projects was doubled to 30 out of the 450 points needed to be considered for the tax credit. According to Karl Bren, president of GreenVisions Consulting in Richmond, 52 out of 54 applicant projects chose to pursue certification this year. Including this provision in the QAP, Bren said, "has really increased the number of builders who will do green building who would never have done it otherwise."

Requiring Green

Regulations not only encouraging but requiring public and private buildings to meet environmental standards—often defined by LEED or other rating systems—are becoming more common. Building codes are also changing to incorporate green building strategies, but the change is slow. National green building standards currently in development that can be adopted into local codes may soon expedite the transition from voluntary to mandatory mechanisms.

Rating systems as regulations

USGBC keeps a list of all of the initiatives—both incentives and regulations—that refer to LEED in some way. According to USGBC's current list, LEED figures into initiatives in 12 federal agencies, 27 states, 23 counties, 75 cities, and 17 towns in the U.S. Jason Hartke, the director of advocacy and public policy for USGBC, says that the inclusion of LEED in regulations, especially in the private sector, "is not something that USGBC is actively advocating," because it would rather promote prescriptive approaches to requiring green building (as with Standard 189, below). Regardless, governments across the country are requiring

LEED for their public buildings and increasingly doing so for their private buildings. Among the larger jurisdictions requiring LEED for public buildings are Boston, Chicago, Portland, San Francisco, Seattle, and Washington, D.C.; Boston, Portland, and Washington also require LEED (or green performance comparable to LEED in the case of Boston) for private buildings over certain sizes, with other cities considering similar legislation (see *EBN* Vol. 16 No. 2).

Not all jurisdictions requiring LEED are large cities. In 2006, the small resort town of Tybee Island, Georgia, approved a resolution requiring all city buildings to meet LEED Silver standards if the payback for the green features would be less than five years (actual LEED certification is not required). For smaller projects, such as a recent campground residence built by the town, those standards are proving hard to meet in a cost-effective way, according to city council member Paul Wolff. But a new civic center for the town, currently in the design phase, is expected to achieve the LEED goals and the payback requirement, and be certified by USGBC, in part because of its size. The \$3.5 million project will house the police and fire departments as well as courtrooms.

Despite support for LEED in towns like Tybee Island, the requirements can be expensive, particularly with certification through USGBC. Many jurisdictions, whether because of expense or legal concerns, require buildings to be "certifiable" under LEED but not certified. According to Hartke, this trend is troubling for USGBC. "We've seen a growing amount of anecdotal evidence that there are performance discrepancies between the certifiable and the certified," he told *EBN*. That's not hard to imagine, given that LEED-certifiable buildings are not subject to the rigorous documentation required by LEED, and commissioning may be foregone because it is sometimes per-

ceived as more of a documentation and verification step than as part of the construction process. Nevertheless, several governments—including Tybee Island's—find that gaining popular support for LEED requirements often hinges on the "certifiable" option.

Although LEED is the most popular rating system referred to by governments, it is not the only one. Legislation in 13 states refers to Green

and GreenPoint Rated in California, which can require less documentation than LEED for Homes, making certification less expensive.

Building codes

As jurisdictions require green building by referencing LEED and other rating systems, they are also working to incorporate green building strategies into the building codes and zoning laws already in place. David Eisenberg, co-founder and director of the Development Center for Appropriate Technology, says he has seen a shift in recent years in how the code community has responded to green building. "It's much easier to do mainstream green within the international code today than it was several years ago," he said, referring to the model codes maintained by the International Code Council (ICC). However, less mainstream strategies and technologies still present problems in the international codes. Some technologies now allowed in international codes, such as waterless urinals, are still prohibited in many jurisdictions that develop codes locally or use older versions of the international codes. Passive design strategies are also often difficult to implement without backup mechanical systems, according to Eisenberg, because performance-based codes are not yet widely used.

Changing the code to include more stringent requirements for building performance, either at the state and local level or in the international codes. In the current round of code changes, for example, several organizations lobbied ICC for significant improvements to the International Energy Conservation Code (IECC). The Energy Efficient Codes Coalition, for example, wanted to make the code 30% more energy efficient, but its proposal was voted down. Other proposals approved by ICC contained lesser energy efficiency improvements, and will be considered for final approval and adoption in September 2008.

New Ordinances

Below are some notable additions to the list of local and state green building programs (some are still pending).

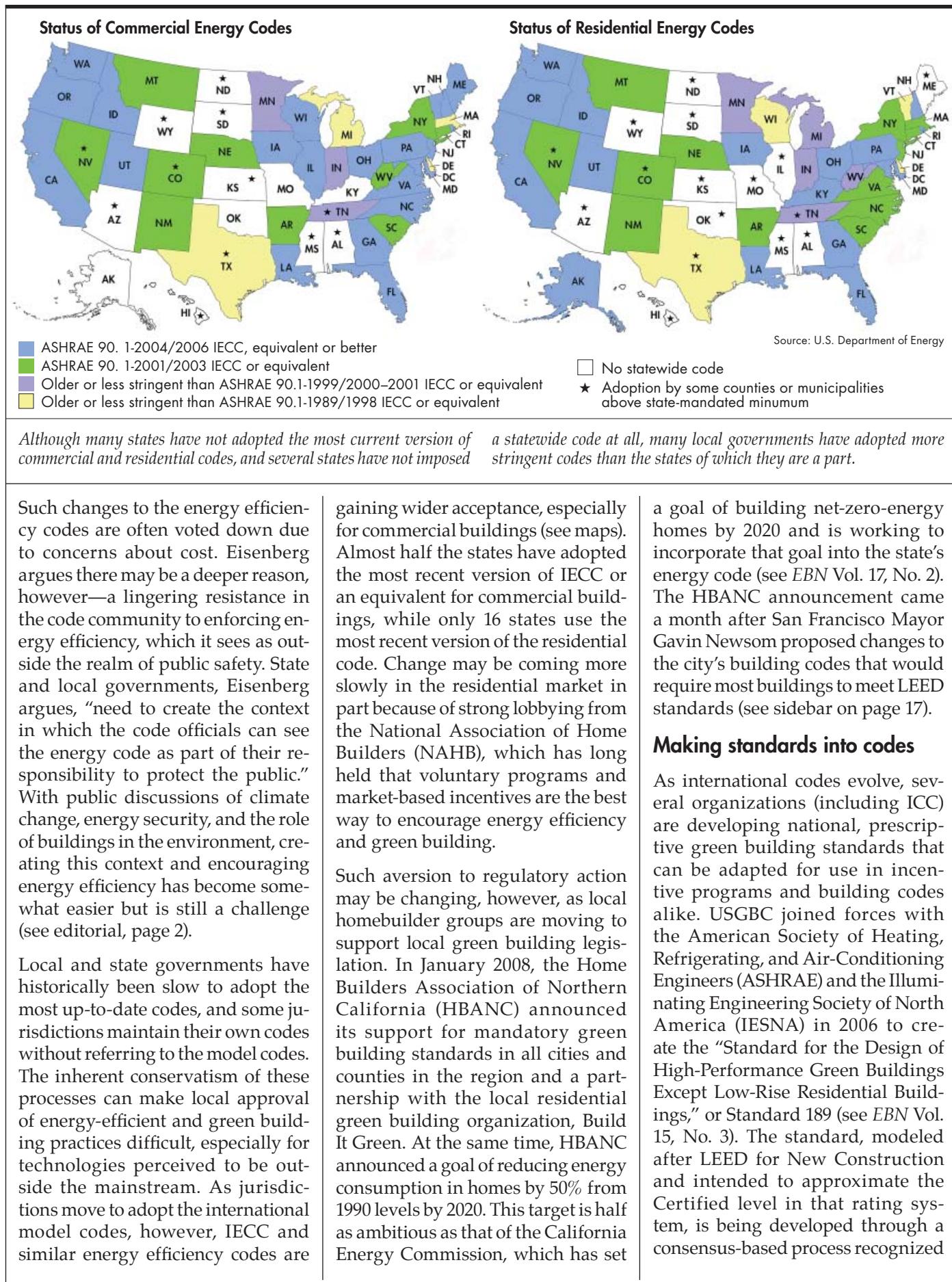
San Francisco: In December 2007, Mayor Gavin Newsom proposed requirements that would be phased in over a number of years. Large buildings—over 25,000 ft² (2,300 m²)—would be required to achieve LEED Gold by 2010.

Los Angeles: The City is close to requiring buildings over 50,000 ft² (4,600 m²) to meet LEED Certified standards, although certification will not be required.

Portland, Oregon: Since 2005, new City buildings have been required to achieve LEED Gold. Now the city is considering a requirement that private buildings meet green building standards. Those exceeding Oregon's energy code would receive a rebate or a deduction on a "carbon pollution fee" levied on new building projects.

New Mexico: The legislature is considering a tax credit for commercial and residential green buildings. The amount would vary according to the size of the building and the level of LEED certification, up to \$6.25/ft² (\$67/m²) for new commercial construction under 10,000 ft² (900 m²) and \$9/ft² (\$96/m²) for new residential construction for homes under 2,000 ft² (180 m²).

Globes, the rating system developed by the Green Building Initiative (see *EBN* Vol. 14, No. 3). In the residential arena, many jurisdictions refer to regional green building programs, such as EarthCraft in the Southeast



by the American National Standards Institute (ANSI).

Standard 189 is currently in its second public comment period, which ends in April 2008. According to John Hogan, AIA, P.E., chair of the development committee for the standard, the final version could be ready by the end of 2008, assuming no significant changes arise from the second comment period. DOE's preliminary analysis of the first draft of the standard found that the average energy savings expected from the minimum prescriptive measures in the standard was 24.9% over ASHRAE 90.1-2007 standards, a bit below the committee's stated goal of 30% savings. However, the analysis did not take into account changes made in the second draft; DOE is working on a second analysis that may show additional savings.

Once the standard is finalized, it will be available for jurisdictions to use in codes or refer to in incentive programs. However, Hogan cautioned that "to adopt this as a code is not necessarily simple or straightforward." Because different parts of buildings are regulated in different codes, Standard 189 would have to be broken up and adopted piecemeal in various areas such as plumbing and zoning. Nonetheless, Hogan says he has heard from several jurisdictions that are watching the development process closely and hoping to adopt part or all of the standard. "What you might see is that jurisdictions pick up different pieces depending on what the issues are in their areas," he told *EBN*.

In the residential arena, NAHB is working with ICC on another ANSI-accredited standard, the National Green Building Standard. The process began in early 2007, and the public comment period for the second draft closed in February 2008. Based on the NAHB Model Green Home Building Guidelines, the standard is meant to be voluntary, rather than prescriptive, and allows each build-

ing to achieve points towards one of four ratings. According to NAHB, the standard could also be adopted by planning departments as a guide toward compliance or, potentially, used in the development of building codes.

Final Thoughts

The relative effectiveness of incentives and regulations on promoting green building remains a matter of debate. Many, like Karl Bren, view incentives as far more effective tools for encouraging green building. "My first preference is to provide incentives and let people do it on their own," he told *EBN*. "There's always pushback when we're forced to do things." There are also those, like Tybee Island's Paul Wolff and others in local and state government, who feel that requiring green building (through LEED or otherwise) is a good way to push the market in a certain direction.

From a project team's perspective, incentives are more desirable, since they can finance the learning curve for new technologies and allow the team to promote green building with little, if any, cost premium.

Green building requirements based around LEED or another rating system are also popular, since they allow designers room for flexibility in reaching performance goals. From a government perspective, however, requiring private-sector buildings to be certified through a third party can be difficult legally. Prescriptive requirements, such as building codes, are thus seen as a more effective tool for requiring green building from private buildings. These requirements often grow out of incentive programs already in place, so knowing the requirements of incentive programs is good preparation for meeting later regulations and codes.

—Allyson Wendt

For more information:

Chicago Green Permit Program
www.cityofchicago.org (search for "green permit program")

Database of State Incentives for Renewables and Efficiency
www.dsireusa.org

International Code Council
www.iccsafe.org

Seattle Density Bonus Program
www.seattle.gov/dpd/greenbuilding

Standard 189
spc189.ashraepcs.org



Photo: Paul Wolff

Development in Tybee Island, Georgia, is encroaching on the town's sensitive marsh habitat. Hoping to lead by example, the town passed a law requiring City buildings to meet LEED Silver standards if payback on added green features could be expected within five years.

BackPage Primer

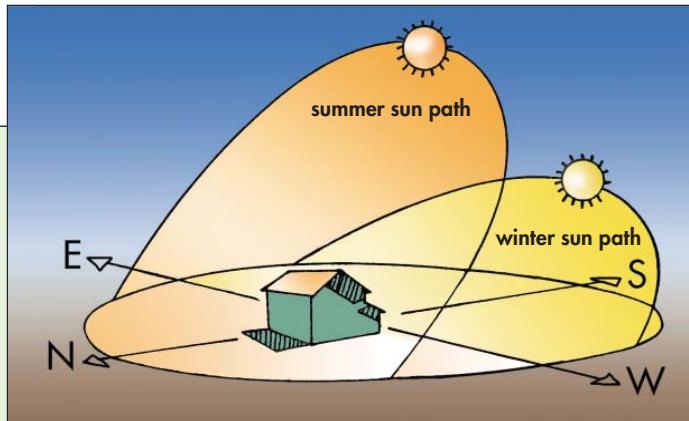
How the Sun's Path Can Inform Design

Sun shining into a building provides free heat and natural light. It can also create glare and, when the heat isn't needed, discomfort and added demand for cooling. Using sunlight when it's needed and deflecting its power when it's not are two of the most important tasks in building design.

The sun rises in the east and sets in the west. Because the earth rotates on an axis that is tilted, however, the sun doesn't stay exactly in the east or west. In summer, it rises north of east, travels high across the southern sky, and sets north of west. In winter, it rises south of east, travels low across the southern sky, and sets south of west. How high it gets in the summer and how low in the winter depend on how far you are from the Equator. (If you're reading this in the Southern Hemisphere, north and south are reversed.)

Passive-solar design suggests putting most of the glass on the south façade and shading it with overhangs that keep the sun out in summer but allow it to penetrate and provide free heat in winter. The need for cooling tends to dominate the energy profile of large buildings everywhere and almost all buildings in the southern U.S., however, even in winter, so in these places shading the glass year-round is beneficial, and putting more of it on the north is an option. In almost every case glazing on the east and west façades is problematic, because it's hard to control glare and overheating from the low morning and afternoon sun. That's why energy-efficient buildings are ideally elongated on an east-west axis, with longer façades facing south and north.

Artists and others who are sensitive to light quality tend to prefer indirect light from northern windows. Modern energy-efficient glazing technologies make it possible to



provide this light without compromising thermal performance as much as was once the case. It is still advisable not to overglaze on the north, however, and to plan for some direct sunlight entering through north-facing windows during the summer in early mornings and late evenings.

To maximize the benefit of the sun's rays while mitigating problems, some designers specify different glazing for different orientations. Low-emissivity (low-e) coatings can be adjusted to create glazing systems with different levels of thermal transmittance (U-factor), solar transmittance (solar heat gain coefficient, or SHGC), and visible light transmittance (T_{vis}). On the north, glazing should have a low U-factor to minimize heat loss and a high visible light transmittance. On the south, if solar gain is desirable in winter, glass should have a high SHGC, while the desired U-factor and T_{vis} depend on how the spaces will be used. And on the east and west the goal is to minimize solar gain, so a low SHGC is the priority.

For more information:

"Getting to Know a Place: Site Evaluation as a Starting Point for Green Design," *EBN* Vol. 7, No. 3

Heating, Cooling, Lighting: Design Methods for Architects, 2nd Edition, by Norbert Lechner (Wiley: 2000)

Sun, Wind, and Light: Architectural Design Strategies, 2nd Edition, by G. Z. Brown & Mark DeKay (Wiley: 2000)