Energy Design Update®

The Monthly Newsletter on Energy-Efficient Housing

ASPEN PUBLISHERS Vol. 28, No. 1 January 2008

INDUSTRY NEWS

An Interview With Wolfgang Feist

In the 1990s, a movement arose in Germany and Austria to build extremely well insulated houses. Equipped with R-50 walls and triple-glazed U-0.14 windows, with maximum air leakage rates of 0.6 ACH @ 50 Pa, these homes have envelope specifications that beat most buildings in the world. The houses are performing very well, providing residents with a high degree of thermal comfort and extremely low energy bills.

The buildings adhere to standards promoted by Dr. Wolfgang Feist, a physicist from Darmstadt, Germany (see Figure 1). Feist calls these buildings, which can now be found in a dozen countries, "Passivhaus" buildings; the name was chosen because the buildings, in theory, have no active heating systems.

Figure 1. Dr. Wolfgang Feist, the founder and director of the Passivhaus Institut in Darmstadt, Germany, traveled to the US in November 2007 for speaking engagements in Washington, DC, and Urbana, Illinois.

Like the term "zero-energy home," the "Passivhaus" label has been challenged by some critics. As it turns out, almost all Passivhaus buildings in Central Europe include an active heating system — usually, a heating coil in the home's ventilation supply duct. Most of these heating coils circulate hot water produced by a gas-fired water heater or a heat-pump water heater; in some cases, electric resistance heat coils are used.

Early promoters of the Passivhaus standards often bragged that Passivhaus buildings were so energy-efficient that they did not require a heating system. More accurate writers explained that they did not require a "conventional" heating system; in Europe, a conventional heating system is understood to mean a hydronic system fueled by a gas-fired or oil-fired boiler.

IN THIS ISSUE

Wolters Kluwer
Law & Business

The majority of the world's 9,000 Passivhaus buildings are located in Germany and Austria, where winter heating design temperatures generally range from about 9°F to 16°F. In these countries, the specifications for Passivhaus buildings are strictly established and well understood: the annual energy consumption for space heating must be no more than 15 kWh per square meter; for a residence, the maximum annual energy budget for all purposes (including space heat, domestic hot water, lighting, appliances, and all plug loads) must be no more than 120 kWh per square meter.

In Central Europe, the vast majority of Passivhaus designers choose to deliver space heat through a home's ventilation system. This method imposes certain limitations; in Passivhaus buildings, ventilation airflow is usually in the range of 0.3 to 0.4 air changes per hour. Obviously, ventilation air cannot be delivered at unacceptably high temperatures; Wolfgang's Passivhaus Institut advises that ventilation air should be no hotter than 122°F. These criteria establish limits to the amount of heat that can be delivered by a Passivhaus ventilation system. In Central Europe, these limits do not pose an insuperable design barrier; but in northern Sweden and Minnesota, they do.

Because German and Austrian Passivhaus designers choose to deliver heat through ventilation ducts, they see heat-recovery ventilators as the key residential HVAC appliance. In the US, designers of energy-efficient homes in all but the coldest climates often use supply-only or exhaust-only ventilation systems; for Passivhaus designers, however, a ventilation system without heat recovery is inconceivable.

As the Passivhaus concept has spread to climates beyond Central Europe, designers have begun debating how Passivhaus standards should be applied in more extreme climates (see, for example, *www.passive-on.org/en/downloads/Passive-On-Long%20Description-v1-0.pdf*). Among the unresolved questions:

- What makes Passivhaus buildings different from other energy-efficient buildings?
- Should the 15 kWh/m² limit for space heat remain sacrosanct?
- Must all Passivhaus buildings deliver heat through the ventilation system, or are other methods of heat delivery acceptable?

In November 2007, Dr. Wolfgang Feist paid a visit to the US. Dr. Feist kindly took time out of his busy schedule for an interview with ***EDU***.

EDU: How did you become interested in low-energy buildings?

Feist: I started to work on energy topics during my studies at Tübingen University in the '70s, when we discussed all the different alternatives that could be used for meeting future energy requirements. We very soon discovered that a lot of the things discussed everywhere, like nuclear fusion, would not be available until 2050 or so. And of course all these climate change things were known among academics already in the '70s. So we knew there needed to be an alternative plan.

We knew renewables were a limited resource, so we had the idea to concentrate on efficiency. We did some theoretical studies on how far you can go to improve efficiency. At that time, there were a lot of other guys doing similar work around the world — for example, at Lawrence Berkeley Lab and at the Technical University of Denmark. We joined with that movement. We concluded there is a huge potential for developing more efficient equipment.

EDU: What was the origin of the Passivhaus concept?

Editor: Martin Holladay
Managing Editor: Vicki Dean
Publisher: Paul Gibson
Designer: Kathie Tingson

Energy Design Update (ISSN 0741-3629) is published monthly by Aspen Publishers, 76 Ninth Avenue, New York, NY 10011. (212) 771-0600. One-year subscription costs $459. *To subscribe, call 1-800-638-8437. For customer service, call 1-800-234-1660. POSTMASTER: Send address changes to* ***Energy Design Update,*** *Aspen Publishers, 7201 McKinney Circle, Frederick, MD 21704.* **Permission requests:** For information on how to obtain permission to reproduce content, please go to the Aspen Publishers website at *www.aspenpublishers.com/permissions*. Printed in the U.S.A.

Purchasing reprints: For customized article reprints, please contact Wright's Reprints at (877) 652-5295 or go to the Wright's Reprints website at *www.wrightsreprints.com*.
Editor's Contact Information: Martin Holladay, Energy Design Update, P.O. Box 153, Sheffield, VT 05866. E-mail: holladay@sover.net; Tel: (802) 626-1082; Fax: (802) 626-9982.

Feist: The Passivhaus concept came from research performed by Bo Adamson in the late '80s, when Adamson was an advisor to the Chinese government. There are some areas in China where heating is not possible, because of the limited availability of fuel, and the houses there are what he called "passive houses." The Chinese government realized that the comfort of these houses was really poor, so Adamson was hired to give advice on how to enhance the thermal comfort of the houses without making them "active" houses.

I was a guest researcher at that time at the University of Lund in Sweden, where he spoke to me about his idea. He said, "What about building passive houses in Europe?" I thought, okay — maybe. So we started looking into that. He insisted on really building one, and the building process for the first Passivhaus prototype started in 1990. At the time we knew about other similar buildings — buildings made by William Shurcliff and Harold Orr — and we relied on these ideas. There was important work in Copenhagen as well, so the idea is not completely new.

EDU: What do you say to critics who question the 15 kWh per square meter goal, calling it arbitrary?

Feist: The definition of a Passivhaus doesn't need any number. As long as you build a house in a way that you can use the heat-recovery ventilation system — a system that you need anyway for indoor air requirements — to provide the heat and cooling, it can be considered a Passivhaus. Since you need a house to be tight, you need a supply of fresh air. If you need that anyhow, the idea is to do everything else — the heating and cooling and dehumidification — with the ventilation system. To do that, the peak load for heating and cooling has to be quite low.

First you need to discuss the conditions, like indoor heat sources. In our opinion, these should be as low as possible, since efficient electrical appliances save money. Now you can calculate for each climate the capacity of the ventilation air for supplying heating and for cooling.

EDU: What about low-energy houses that deliver heat in different ways — not through the ventilation system?

Feist: Let's discuss all the alternatives. Direct electrical heat is cheap to implement, but the primary energy use is extremely high, so we think that is not a good idea. So we should exclude direct electrical heat, with some exceptions. A woodstove is okay, but if you use a woodstove, you need to keep the cost low, which means you need to have just one stove. If you do that, and you still want to have good thermal comfort all around the building, you need quite good insulation. It might be a little bit less or a little bit more than what we require, but it will be really near to that — so why not use the same figures?

Then there is another discussion: biomass is a limited resource, so it's a good idea not to use a lot of biomass. So, if you burn biomass in your house, the house should be well insulated — in the range of what we need for a Passivhaus. So, keeping the heat source in the ventilation system is not necessary, but in my opinion it is the cheapest way.

EDU: Many US builders of low-energy houses install exhaust-only or supply-only ventilation systems. Why do Passivhaus standards require heat-recovery ventilators?

Feist: If you can meet the requirements for a very low amount of additional energy, in summer and in winter, without a heat-recovery ventilator, why not? In San Francisco, for example, you don't need a heat-recovery ventilator; just build the house with openable windows.

I think it is important to install a heat-recovery ventilator. We prefer to install a heat-recovery ventilator before any other system in the house; that is a good recommendation. For example, you should install a heat-recovery ventilator before you have a forced-air heating system.

EDU: What do you say to critics who note that many European Passivhaus buildings are ugly — basically, cubes with a shed roof?

Feist: Maybe they are looking at photos from some of the early publications. Now, more passive houses have been built, and you can see all different kinds of buildings. You can turn almost any house into a Passivhaus.

When it comes to deciding what is ugly, there are different opinions from architects and normal people. Some architects find that postmodern houses are ugly. Some architects find a simple cube to be good architecture. And then maybe there are some architects that only like their own style.

If you are an engineer, you start with basic principles and simple shapes, perhaps because you want to monitor the buildings and know what is happening. Rather than call it ugly, you could call it really simple. I still think it is good to do it simple.

EDU: Can you explain the Passivhaus Institut's window performance specification, which seems very stringent to some North American designers?

Feist: The window specification depends on the climate. In Central Europe, we need an R-7 [U-0.14] window. You would not need the same window in Florida or California.

The reason for the number which we now use in Europe is the comfort of the occupants. It is a functional definition. During the winter, the coldest surface temperature in the room will be the window. If you don't have a radiator in your room, the difference between the surface temperature of the window and the mean surface temperature of the room should not be more than 3 degrees Celsius; that's for comfort reasons.

The only reason that ISO 7730 allows a 5 degree Celsius difference is that, when the standard was written, windows that good were not available. But now we have such windows. Of course, you can meet the functional definition with a different window in different climates, as long as you take care of thermal comfort.

EDU: What is the market penetration of triple-glazed windows in Austria and Germany?

Feist: In Austria, triple-glazed windows have 25 percent of the market now. In Germany it is much lower — maybe 2 percent. According to the next German energy code, triple-glazed windows will be mandatory in Germany. The idea is that if you make it mandatory, the price difference will drop to less than half of what it is now, so it pays off much better. That code change will happen next year.

EDU: In North America, many energy-efficient builders associate earth tubes with condensation and mold. Have earth tubes in Europe experienced these problems?

Feist: There were problems in northern Europe, especially in Scandinavia. In Central Europe we haven't had any hygienic problems so far. Actually, I'm not sure *why* we don't have these problems in Central Europe. But I don't advertise these systems any more, mainly because they are too expensive. If you have a good heat-recovery ventilator, you don't need it. Earth tubes are just one component of a building; no component is necessary in every climate.

Problems have occurred in very cold climates — climates that are cold during the summer as well as the winter, and humid all year. Even in Central Europe, it is humid during the summer, and no doubt you get condensation. But we don't get mold growth, and I'm not sure why. We always try to get a better scientific understanding of such things, but it's not always possible to do the research, since research is very expensive. I am a little bit skeptical about that earth-tube technology, and now it is clear that it is not necessary to use it.

EDU: Some low-energy houses use fairly complicated equipment — for example, elaborate solar thermal systems, or so-called "magic-box" appliances that integrate an air-source heat pump, a water heater, and an HRV. For some designers, such complicated equipment raises maintenance questions. How does a designer find the right balance between simplicity and low energy use?

Feist: I fully agree that a house shouldn't be an engineer's Christmas tree. There were some houses built like that, and the experience was that it didn't work. A house should be kept simple, by improving insulation and windows, and by installing a heat-recovery ventilator.

You need some additional heat. The idea we have now is to integrate a small heat pump into the HRV; that is still simple. If you go to produce this "magic box" on an industrial scale, you can get a very reliable system. Look at your car — your car is not a simple system. But if you produce it on an industrial level, you get a very reliable system.

A "magic box" is not the only way to get some additional heat; you can have a woodstove instead. But in the end, having a small heat pump will be the cheapest way for a small single-family home.

We have to distinguish between the innovative process going on now — after all, these are still innovative products, but they are already quite reliable and they are already competitive — and their future potential. If you have a few hundred thousand units a year, they will be much cheaper. Really, it's just a refrigerator compressor and a heat-recovery system; it should cost some two or three thousand dollars. In Europe, even a woodstove is more expensive than that.

We need more development in the future to improve the COP of these small heat pumps. There is big technical potential in that, using electrically commutated direct-current motors. These motors are already used in pumps, but they could be used in a compressor as well, so they can run at partial loads. If we can get COPs of 4 or 5 in the future, that will be the most efficient technology.

Of course, if there are other solutions that are good and cheap, why not use them? We shouldn't be concentrating on just one technology; we should look at several technologies.

EDU: Many green building programs include a scoring system that penalizes large houses. How do you respond to those who ask why the Passivhaus standards do not address house size?

Feist: That is one issue that we are going to change in the future. If you build a really small house, the standard will include certain requirements per person rather than per square meter; this would allow a somewhat larger energy use per square meter for really small houses.

One reason America is a little bit behind Europe is that people, those who love the American way of life, are afraid of green things. My decision is not to hurt them — I say, you can stay with that style of life, it is not a problem, but you should do that in an efficient way.

You can't convince Americans to do otherwise. We just tell them, "You can do better." At the recent conference I attended in Washington, the EE Global conference, I met a guy from the Environmental Protection Agency and one from the DOE. They are Republicans. They said, "We don't want to make any sacrifices, but we want to be efficient."

Even in Europe, we can tolerate big houses as long as they are efficient. After all, it is difficult to change habits. It seems that some people will still build big houses, so it is good to have a standard they can agree with. Then maybe later on, they may change their habits.

EDU: Some Passivhaus definitions appear to have a requirement that forbids "active cooling." Is it possible to build a Passivhaus with air conditioning?

Feist: We never said "no active cooling." With heating, you can reduce energy losses so far, but you can't reduce them to zero. It is the same with cooling. In my opinion there are some climates where you can't reduce the need for cooling to zero — for example, in Egypt there is some need for active cooling. That can be done, as long as you can provide the cooling with the heat-recovery ventilation system.

We must limit cooling and dehumidification to a very low level. We are still doing some research on the highest comfortable indoor humidity levels. We don't live in a cooling climate, so our experience is not there on cooling. We still don't agree, worldwide, about those figures.

EDU: Some Passivhaus promoters have made unfavorable remarks about the idea of zero-energy homes. Can you comment on that?

Feist: At the moment, the cost of electricity produced by photovoltaics is in the range of 40 to 50 cents per kWh, which is still ten times the cost of electricity produced by oil or gas. If you look at increased insulation and better windows, the equivalent kWh price without any subsidies is in the range of 2 or 3 cents per kWh.

I am not against subsidies for renewable energy, but you shouldn't mix up [the issues] that way. The difference in price is just made by governmental subsidies. You have to be careful with governmental money.

We should calculate that the long-run price of energy, for a future boundary, might be in the range of 6 to 8 cents per kWh. With wind energy we are already in that range. Photovoltaics will eventually get that cheap, and we should pave the way for that with governmental subsidies, but all the things you can do that are cheaper than that are the things you should do first.

EDU: What does the Passivhaus standard say about plug loads, appliances, and lighting?

Feist: There is a limit [in the Passivhaus standard] for overall primary energy use, including appliances. The energy use is not "controlled"; rather, it is based on the best guess of the designer.

In the future it will be quite a simple thing to exchange an appliance. It depends on the availability of not-expensive high-efficiency appliances. Many of these are still not on the market. I am quite sure there will be better appliances in the future. We need to convince the producers of appliances to improve their products. We must also give lots of recommendations to homeowners, to show them that from an economic point of view it is best to buy energy-saving appliances.

What I have seen so far, looking at the Passivhaus examples I have monitored, is that most of them do have a reduced household energy demand [for plug loads] — about 70 to 75 percent of the average in Germany. That could be better in the future.

One important point: in the energy load for a Passivhaus, we should not calculate a high heat load from these appliances. We need to be able to heat these houses even without the heat from appliances, so that we plan for more efficient appliances in the future.

EDU: Do you see any special challenges for Passivhaus buildings in North American climates?

Feist: No, I don't see any really big differences. From what I have seen, most builders I have talked with in North America still think that increasing insulation is an expensive thing. Even back in the '80s, in the *Solar Age* publication, they had this discussion — "It is too expensive to have a high level of insulation." I'm surprised, because insulation is the cheapest thing you can do.

EDU: At least in theory, US insulation recommendations are based on cost-effectiveness calculations using current energy prices to determine the optimum insulation thickness.

Feist: I think it is important to do away with this idea of the payback calculation. We should do advertising to say that a payback calculation is not important for determining energy efficiency, because a house will be there for more than five years — it will be there for maybe 70 years.

EDU: Do you believe that the "peak oil" phenomenon will cause disruptive social changes?

Feist: If you ask for my opinion, energy prices will decrease in the future — not much, but a little bit. I think oil will be in 70 or 80 dollars per barrel on average, although there might be some peaks above that. There is enough coal all around the world, and you can produce liquid fuel and gas from coal. It's not environmentally a good thing at the moment, but in the future, you could take the CO_2 and put it into the ground again. What I think is, the environmental guys should make each new coal plant include the sequestration of CO_2. That might take five years, but we shouldn't accept any new coal plant without CO_2 sequestration.

If we succeed in our work, we will see far higher efficiency in 30 or 40 years, and a far higher part of energy will be supplied by renewables — as much as possible. There will be a small part left that is not supplied by renewables, and that might come from the OPEC countries, if they still want the market and don't raise their price any higher. If they decide to be out of the market, then we won't be able to avoid building coal power plants. But the price of energy won't be much higher than it is now.

EDU: Do you have any advice for North American designers and builders?

Feist: To designers I would say, "Join the AIA." I just heard a very good presentation from Mr. [R. K.] Stewart [president of the American Institute of Architects]. We fully agree, and I am surprised about that. In Europe, architects are not yet convinced about this [the need to design low-energy buildings].

To builders I would say, "Don't be afraid of insulation. And take some time to go to educational seminars."

NEWS BRIEFS

DOE Issues New Standards For Residential Furnaces and Boilers

WASHINGTON, DC — On November 19, 2007, the DOE announced new energy-efficiency standards for residential furnaces and boilers. As expected, the DOE stipulated in its Final Rule that gas furnaces must have a minimum AFUE of 80% beginning in 2015 (see ***EDU***, December 2006). A statement from the Alliance to Save Energy highlighted the irrelevance of the new standards, noting, "Ninety-nine percent of natural gas furnaces currently sold already meet the new minimum efficiency level." The DOE's position, disputed as needlessly rigid by many efficiency advocates, is that the Department cannot set a more stringent standard because it lacks the authority to establish regional standards that would account for climate differences. Andy Karsner, the DOE's assistant secretary of energy for energy efficiency, put a bold spin on the new standards by announcing, "Improving appliance standards is a top priority of the Department of Energy." In contrast, most observers responded to the DOE announcement with considerably less enthusiasm. "It's a do-nothing standard," noted the executive director of the Appliance Standard Awareness Project, Andrew deLaski. "If you care about efficiency it's kind of a joke. It's very disappointing." The DOE's "Standards for Residential Furnaces and Boilers: Final Rule" can be found in the *Federal Register*, November 19, 2007, volume 72, number 222, pages 65135-65170, and can be accessed through *www.access.gpo.gov*.

California Plan Calls For New Homes To Be Net-Zero-Energy By 2020

SACRAMENTO, CA — The California Energy Commission (CEC) has unanimously adopted the California Public Utilities Commission's non-binding plan for new California homes to be net-zero-energy users by 2020. In an article on the CEC decision, the *San*

Francisco Chronicle reported, "The concept of high-efficiency homes … will become one of the energy commission's long-term goals," said commission Chairwoman Jackalyne Pfannenstiel. "The commission already sets energy-efficiency standards for buildings and will probably ratchet those up as more-efficient lighting and building materials come on the market," she said. The CEC's Integrated Energy Policy Report is posted online at *www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CTF.PDF*.

FTC Will Review Green Marketing Claims

WASHINGTON, DC — The Federal Trade Commission (FTC) will hold a series of public meetings as part of a regulatory review of the Commission's environmental marketing guidelines. First issued in 1992, the FTC's "Guides for the Use of Environmental Marketing Claims" (*www.ftc.gov/bcp/grnrule/guides980427.htm*) are often referred to as the "Green Guides," in spite of the fact that the Guides neither define nor mention the word "green." The FTC is soliciting public comment on the Guides, as well as input on marketers' use of "'sustainable' and 'renewable' claims." An FTC announcement notes, "While the review was scheduled to begin in 2009, because of the current increase in green advertising claims, the Commission is reviewing the guides at this time to ensure they reflect today's marketplace." The Green Guides comment period will be open until February 11, 2008. For more information, visit *www.ftc.gov/opa/2007/11/enviro.shtm*.

Developing Green Remodeling Guidelines

WASHINGTON, DC — The US Green Building Council (USGBC) and the American Society of Interior Designers (ASID) Foundation are working together to create the first nationwide green residential remodeling guidelines. A draft of the guidelines, dubbed Regreen, has been posted for public comment at *www.regreenprogram.org*. If the Regreen developers are able to stick to their schedule, the final guidelines will be published in March.

Dow Develops Ozone-Friendly Styrofoam Foaming Agent

MIDLAND, MI — Dow Building Solutions has announced the development of a new foaming agent that can be used to manufacture extruded polystyrene insulation. According to Dow, use of the new foaming agent will "eliminate ozone-depleting compounds and cut greenhouse gas emissions in half." Dow plans to substitute its new proprietary foaming compound for the compound that Dow currently uses to manufacture Styrofoam, an ozone-depleting chemical called HCFC 142b. According to the terms of the Montreal Protocol, the use of HCFC 142b must be phased out in North America by January 1, 2010. Torsten Kraef, Dow Building Solutions president, explained, "By developing this solution well ahead of North American compliance deadlines, we can assure our customers of an uninterrupted supply of Styrofoam insulation."

Boulder Considers New Regulations Governing Monster Homes

BOULDER, CO — In early 2008, Boulder County Commissioners are set to vote on a package of regulations, called BuildSmart, designed to address the construction of new monster homes. Going beyond earlier calls for builders of new monster homes to purchase "McMansion credits" (see "News Briefs," ***EDU***, August 2007), the BuildSmart regulations would require a new home larger than 3,000 square feet to include a renewable energy system supplying at least 50% of the home's energy budget. The proposal calls for new homes between 1,001 and 3,000 square feet to have a HERS rating of 60 or lower; for homes measuring 3,001 to 5,000 square feet, the maximum HERS rating would drop to 25, while homes measuring 5,000 square feet would need a maximum HERS rating of 10. Any new swimming pool, hot tub, or driveway snow-melt system installed in a new home of any size would not be permitted unless it obtained 100% of its energy from renewable sources. According to the Boulder Country Business Report, a local solar contractor, Sam Ley of Sunflower Solar, estimates that the cost of a photovoltaic system large enough to meet 50% of the energy needs of a 3,000 to 5,000 square foot home would be about $13,000 after local utility rebates. For more information, visit *www.co.boulder.co.us/lu/code_updates/buildsmart/buildsmart_media_index.htm*.

Solar Thermal Cooling in North Carolina

FLETCHER, NC — Rivercane, a new 400-unit housing project in Fletcher, is being touted as the "nation's largest residential solar thermal development." According to the [Hendersonville] *Times-News*, the multi-unit residential buildings at Rivercane will include 1,600 rooftop-mounted solar thermal collectors. The project's $2 million solar hot water system is designed to supply Rivercane residents with most of their domestic hot water and space heat. The system will also provide solar thermal space cooling using German-manufactured solar-assisted adsorption chillers. Rivercane's condos and town homes will be priced at $100,000 to $300,000.

Top Ten Green Building Products Announced

BRATTLEBORO, VT — Alex Wilson, the publisher of *Environmental Building News* (EBN), has released his

list of the top ten green building products for 2007; the list includes four products designed to improve energy efficiency. "Designers of LEED buildings are looking for green products, and manufacturers are responding," said Wilson. The four energy-saving products are: Alpen fiberglass-framed windows (see ***EDU***, November 2006); the LED downlight from LED Lighting Fixtures (a downlight with "a measured efficacy of 60 lumens per watt"); the Bosch Evolution 800 series SHE98M dishwasher ("the most energy efficient full-size dishwasher available in America"); and the SunEye from Solmetric Corporation ("a hand-held electronic device for measuring solar shading and calculating solar access"). All of the products on Wilson's top-ten list are included in the GreenSpec directory, a catalog of green building products published by EBN's parent company, Building Green. For more information, visit *www.buildinggreen.com/press/topten2007/top-10-list.cfm*.

USGBC Launches New Web Site

WASHINGTON, DC — The US Green Building Council's new Web site, the Green Home Guide, includes profiles of LEED-certified homes. Targeted at homeowners, the Web site "details the ways green homes can benefit your health and your pocketbook." Check it out at *www.greenhomeguide.org*.

New Report Examines Efficiency Paradox

TORONTO, ONTARIO — The development of increasingly efficient appliances, equipment, and vehicles has contributed to increased energy use, according to a recent report by CIBC World Markets, the investment banking division of the Canadian Imperial Bank of Commerce. According to the authors of the report, Jeff Rubin and Benjamin Tal, consumers have responded to the availability of more efficient air conditioners, cars, and refrigerators by buying more air conditioners, larger cars, and larger and more refrigerators, thereby increasing energy consumption; in short, "Americans efficiently consume ever-increasing levels of energy." Rubin and Tal report that this phenomenon, often called the "efficiency paradox," is occurring in every developed country. The report notes, "Most government efforts to promote greater energy efficiency have been targeted at the transportation and residential sectors, which together account for half of total end-use energy consumption in the American economy. And they have largely been successful at promoting large improvements in energy efficiency — 50% faster than the pace in the rest of the economy. But paradoxically, energy usage in the transportation and residential sectors has also risen faster than in the rest of the economy. In short, energy usage has risen fastest where energy efficiency gains have been the greatest." The authors advise that efforts to reduce greenhouse gas emissions should focus on energy conservation, not energy efficiency, concluding, "In order for efficiency to actually curb energy usage, as opposed to energy intensity, consumers must be kept from reaping the benefits of those initiatives in ever-greater energy consumption." The report, "Does Energy Efficiency Save Energy?," is available online at *http://research.cibcwm.com/economic_public/download/snov07.pdf*.

Forbes Magazine Calls Vermont the Greenest State

WASHINGTON, DC — Vermont is the greenest state in the country, according to a ranking by *Forbes* magazine. In an article titled "America's Greenest States," *Forbes* described its methodology: "We ranked each state in six equally weighted categories: carbon footprint, air quality, water quality, hazardous waste management, policy initiatives, and energy consumption." *Forbes* noted that the three top-ranked states (Vermont, Oregon, and Washington) have "low carbon dioxide emissions per capita (or 'carbon footprints'), strong policies to promote energy efficiency and high air quality, … [and are] among the states with the most buildings (on a per-capita basis) that have received the US Green Building Councils benchmark certification, known as Leadership in Energy and Environmental Design (LEED)." At the bottom of the *Forbes* list, in descending order, are Alabama, Indiana, and West Virginia. The complete ranking is available online at *www.forbes.com/2007/10/16/environment-energy-vermont-biz-beltway-cx_bw_mm_1017greenstates.html*.

Cold-Climate Heat Pumps Specified For Maine Military Housing

BANGOR, ME — A private company that manages military housing in Maine will use new cold-climate air-source heat pumps to heat 2,000 homes at McGuire Air Force Base. The Acadia model heat-pumps are manufactured by Hallowell International of Bangor. Jack Gafford, the director of development for United Communities, the contractor responsible for military housing at McGuire, noted, "We are not only creating a comfortable environment for these military families, but we are taking an active role in helping the environment by reducing our energy consumption." For more information on Hallowell's cold-climate heat pumps, visit *www.gotohallowell.com/acadia.html*.

British Columbia Proposes Changes To Building Energy Code

VICTORIA, BRITISH COLUMBIA — The British Columbia (BC) Housing Ministry has proposed

changes to the BC Building Code to improve the energy performance of new residential and commercial buildings. The proposal calls for new homes in coastal areas to include R-12 basement wall insulation and R-20 insulation in above-grade walls. Houses in the southern interior region would need R-44 attic insulation, while houses in the northern interior region would need R-60 attic insulation and R-24 basement wall insulation. According to the BC Office of Housing and Construction Standards, "For single-family, detached houses, [incremental] costs will vary between $1,300 and $3,900 ... with a simple payback on investment of four to nine years from energy savings. It is noted that consumers who take out a mortgage for purchasing new houses will see an immediate payback on investment, as the energy cost savings will exceed the increased mortgage payments immediately." If approved, the so-called "greening" of the BC Building Code will take effect in the spring of 2008. The code change proposals are posted online at *www.housing.gov.bc.ca/building*.

California Will Provide PV Subsidies For Low-Income Homeowners

SACRAMENTO, CA — The California Public Utilities Commission has launched a new photovoltaic (PV) incentive program aimed at low-income homeowners, according to the *San Francisco Chronicle*. The $108 million program will provide low-income Californians who install rooftop PV arrays with subsidies ranging from $2.50 to $7 per watt of installed PV capacity.

Energy Efficiency Action Plan Released

WASHINGTON, DC — The *National Action Plan for Energy Efficiency*, a collaborative effort produced by representatives of 60 energy, environmental, and other organizations, has just been released. Facilitated by two US government agencies (the Environmental Protection Agency and the Department of Energy), the *Action Plan* provides a framework for developing energy-efficiency policies based on the goal of implementing "all cost-effective energy efficiency [measures] by the year 2025." According to Kevin Kolevar, DOE assistant secretary for Electricity Delivery, "The national action plan recognizes the role of prioritizing energy efficiency through incentive-based programs and policies which can reduce energy use, benefit our environment and add to a company's bottom line." To read the report, visit *www.epa.gov/cleanenergy/actionplan/resources.htm*.

PV-Equipped Homes In California

SACRAMENTO, CA — The Sacramento Municipal Utility District (SMUD) has agreed to provide home builder D. R. Horton with incentives for the installation of residential photovoltaic (PV) systems in new homes. In exchange, the builder has agreed to build 187 PV-equipped homes in the Provence neighborhood in Natomas, California. According to the builder, each Provence home will achieve a LEED For Homes Silver rating.

Ireland Bans Incandescent Bulb Sales After 2009

DUBLIN, IRELAND — Irish Environment Minister John Gormley has announced that the sale of incandescent light bulbs will be effectively banned in Ireland after 2009, according to Reuters News Service. "The aim of such a move will be to end the use of incandescent light bulbs in Ireland," said Gormley.

GAMA and ARI Merge

ARLINGTON, VA — The Gas Appliance Manufacturers Association (GAMA) and the Air-Conditioning and Refrigeration Institute (ARI) have announced that the two organizations will merge, forming a new trade association called the Air-Conditioning, Heating and Refrigeration Institute (AHRI). Located in Arlington, AHRI will be led by a board of directors consisting of the former directors of GAMA and ARI. The new AHRI board chose C. David Myers, a vice president of Johnson Controls, as board chair. "The merger will create a more efficient and influential organization to serve the needs of cooling, heating, and commercial refrigeration equipment manufacturers and their customers," said Myers. "The interests of the memberships of the two associations are so closely aligned that we expect a seamless integration."

Developing Standards For Energy Audits of Existing Homes

OCEANSIDE, CA — The Residential Energy Services Network (RESNET) has issued a draft standard for conducting energy audits of existing homes. The draft standard attempts to define an energy audit, and to describe the skills necessary for audit providers. No current standards exist for energy audits which are usually conducted by home inspectors, energy consultants, or utility personnel; as a result, procedures for such audits vary widely. Public comments on the draft standard will be accepted until January 17, 2008. For more information, visit *www.resnet.us/standards/mortgage/audits/default.htm*.

Massachusetts Launches New PV Incentive Program

BOSTON, MA — Massachusetts governor Deval Patrick has announced the launch of a new $68-million photovoltaic (PV) incentive program, to be financed

by public-benefit charges on Massachusetts utility bills. According to the *Boston Globe*, the incentives are designed to cover between one-half and two-thirds of the cost to homeowners of installing a PV system. "This is a really big deal," said Paul Gromer, executive director of the Solar Energy Business Association of New England. "This program will give us a world-class solar market right here in Massachusetts."

Why It's More Fun To Read *EDU* Than Other Construction Magazines

WASHINGTON, DC — As the fall 2007 issue of the *Journal of Building Information Modeling* came off the printing press, William Strunk twisted violently in his grave. Strunk's rollover was evidently caused by the following engineer-authored paragraph: "The development of COBIE demonstrates the benefits that can be achieved using a requirements-driven approach. Through a requirements-driven approach different groups of constituents that exist naturally in our industry today are able to meet their information needs. These needs are consistently translated into the IFC model through NBIMS and IAI with appropriate implementation standards that facilitate the capture and transmission of the data. By the consistent definition of each of these groups the answer to the question 'What is a BIM?' can be answered at the level of specificity that allows open-standard interoperability."

Quote Without Comment

"The blunt and alarming final report of the United Nations Intergovernmental Panel on Climate Change, released … by UN Secretary General Ban Ki Moon, may well underplay the problem of climate change, many experts and even the report's authors admit. … The IPCC chairman, Rajendra Pachauri, an engineer and economist from India, acknowledged the new trajectory. 'If there's no action before 2012, that's too late,' Pachauri said. 'What we do in the next two to three years will determine our future. This is the defining moment.' " ["Alarming UN Report On Climate Change Is Too Rosy, Many Say," *International Herald Tribune*, November 18, 2007.]

Correction

Due to an editorial error, the credit was omitted for one of the photos used to illustrate ***EDU***'s December 2007 article on the Solar Decathlon. Amy Gardner, associate professor at the University of Maryland School of Architecture, should have been credited for the photo of the liquid desiccant dehumidifier used in Figure 9. ***EDU*** regrets the error.

NEW PRODUCTS

Exhausto Makeup Air Fan Control

As the airtightness of new homes has improved, reports of depressurization problems caused by exhaust appliances have increased. Most US homes have at least some of these appliances — for example, a range hood, bathroom exhaust fan, clothes dryer, central vacuum cleaner, woodstove, fireplace, or atmospherically vented combustion appliance.

Problems can occur when the operation of one or two of these exhaust appliances pulls outdoor air into the house through an inappropriate opening. For example, smelly air can be pulled down a fireplace flue, or combustion gases can be spilled from a backdrafting water-heater flue.

These problems can be minimized by specifying sealed-combustion appliances and balanced ventilation systems. Thorny issues still arise, however, when a homeowner insists on a powerful range-hood fan and a wood-burning fireplace. (For more information on makeup air issues, see ***EDU***, May 2002, June 2002, February 2003, and August 2006.).

Makeup air fans are available from several manufacturers. These include the Fan-In-A-Can from Field Controls (*www.fieldcontrols.com*), the In-Forcer from Tjernlund Products (*www.tjernlund.com*), and the Makeup Air System from Shelter Supply (*www.sheltersupply.com*). These fans have limitations, however: they provide insufficient volumes of fresh air to satisfy large range hoods, and they are all designed to be controlled by a simple interlock relay, so that the operation of a single appliance activates the makeup air fan. None of these fans can respond to depressurization problems caused by multiple exhaust appliances.

Sensing Depressurization

Residential HVAC engineers have been on the lookout for a more sophisticated device that could operate a makeup air fan whenever the control senses that the

interior of a home is depressurized. As it turns out, such a control exists.

The Exhausto EBC 14 pressure control is designed for commercial applications — for example, to control a fan providing makeup air to a boiler room or to a commercial laundry with a dozen clothes dryers (see Figure 2). However, the control can also be used to address residential depressurization problems.

The EBC 14 consists of three components: a control box, an indoor pressure sensor, and an outdoor pressure sensor. The control box includes an LCD display showing the indoor room pressure. The control compares the indoor air pressure to the outdoor air pressure; if the indoor space becomes depressurized, the control energizes a variable-speed supply fan. The control modulates the fan speed in order to supply just enough fresh air to the house to correct the depressurization. (The EBC 14 can control a single-phase fan directly, or a three-phase fan indirectly, by means of a variable frequency drive.)

Installing the Outdoor Sensor

The outdoor sensor is sold separately. It must be installed on a roof or exterior wall, and connected to the indoor control with a 50-foot length of silicone tubing. The installation instructions advise, "Select a mounting location as free as possible from rooftop obstructions. … Install the probe on an existing structure, like a pole, radio or TV antenna mast. Alternately, the L-shaped bracket can be attached directly to any wall or rooftop. … Obstructions such as trees, chimneys, signs, and buildings all cause turbulence, which results in abnormal and thus inaccurate static pressure. Position the probe as far from the sources of turbulence as possible."

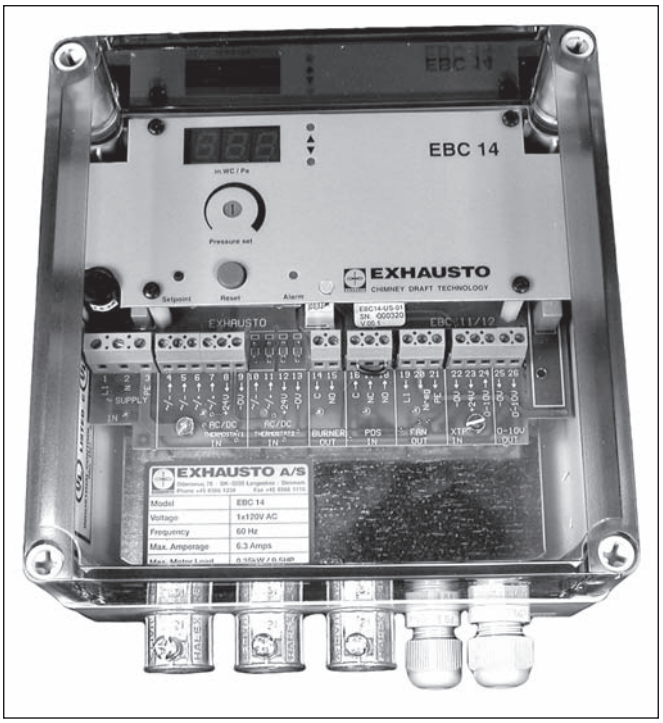

Figure 2. The Exhausto ECB 14 control can respond to house depressurization by energizing a supply air fan.

The main disadvantage of the EBC is its high price; it lists for $1,500, although contractors will pay significantly less. Moreover, a complete makeup air system will require several other components in addition to the EBC 14 control: the outdoor sensor, a supply air fan, and, in some cases, a heating coil to condition the makeup air.

For more information, contact Exhausto, 1200 Northmeadow Parkway, Suite 180, Roswell, GA 30076. Tel: (800) 255-2923 or (770) 587-3238; Fax: (770) 587-4731; E-mail: info@exhausto.com; Web site: *http://us.exhausto.com*.

INFORMATION RESOURCES

Consumer Guide to Home Energy Savings

The American Council for an Energy-Efficient Economy (ACEEE) has published the ninth edition of its useful paperback, the *Consumer Guide To Home Energy Savings* (see Figure 3). The three authors of the latest edition are newcomer Katie Ackerly and two veterans of the eighth edition, Jennifer Thorne Amann and Alex Wilson (editor of *Environmental Building News*).

House Doctors Defined

Since the *Guide's* focus and accuracy are better than ever, it is easy to recommend the book to homeowners searching for an introduction to residential energy-efficiency issues.

The authors appropriately advise homeowners of the benefits of seeking professional advice. The book accurately describes the work performed by "today's home energy specialists — sometimes called house doctors, energy auditors, raters, or home performance contractors," explaining the difference between energy auditors and RESNET-certified home raters.

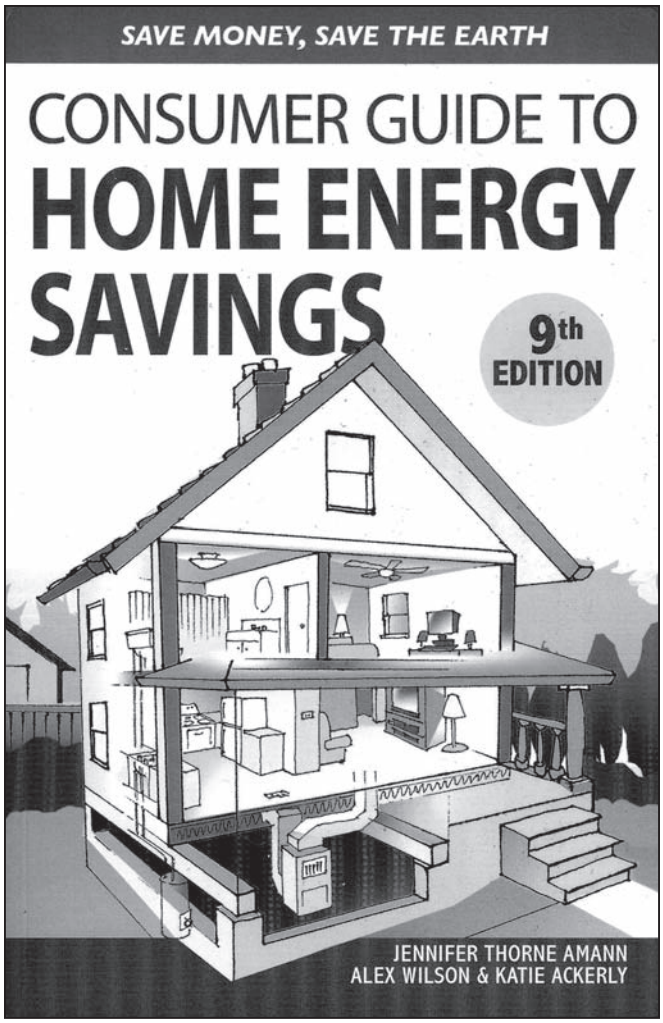

Figure 3. The ninth edition of the *Consumer Guide To Home Energy Savings* provides advice to homeowners interested in lowering residential energy use.

Where other authors miss their target, the *Guide's* authors usually aim true; for example, here is the book's advice on LED lighting: "The majority of available consumer [LED lighting] products are only a little better than incandescent lamps, but cost a lot more."

The book includes a good section on air sealing; unfortunately, it still includes much more information on window replacement (8 ½ pages) than on duct sealing (½ page), in spite of the fact that window replacement is almost never cost-effective.

Goodbye, Appliance Listings

Earlier editions of the *Guide* included tables listing the efficiency of appliances, water heaters, and furnaces by model number; these tables have been dropped from the ninth edition. Instead, readers in search of appliance efficiency information are directed to links maintained at the ACEEE Web site (*www.aceee.org/Consumer*). "We have tried to let people know what to look for through advice in the text rather than to spend our limited resources compiling data on appliance efficiency," Amann told ***EDU***. "By taking the approach we have — giving people guidance on how to make decisions when purchasing appliances — it should be easier for consumers to make good decisions in the future." The book's guidance is indeed helpful; for example, the authors note, "When shopping for major home appliances, … you can ask the salesperson for information about the efficiency of each model, but be aware that he or she may not know very much about energy performance."

In its January 2004 review of the eighth edition of the *Guide*, ***EDU*** questioned the earlier edition's recommendation that homeowners should insulate their basement walls with fiberglass batts. Fortunately, this section has been rewritten; the *Guide* now advises, "Materials that could be damaged by moisture, such as fiberglass batts and cellulose, should never be used to insulate a basement."

Remaining Bugs

A few misstatements, however, have crept into the ninth edition:

- "The relatively large electric power use of ERVs and HRVs generally make them a luxury option in mild climates and should not be considered as an economic option for most existing buildings." In fact, properly installed ERVs and HRVs do not use any more energy than other types of mechanical ventilation equipment; the reason that ERVs and HRVs are often considered to be an expensive option is their high capital cost, not their operating cost.
- "To perform most efficiently, [air conditioners] should be out of direct sunlight." In fact, the shading myth has long since been disproved (see ***EDU***, July 1995).
- "In New England, it is possible to have a complete [solar hot water] system that will provide one half of the hot water requirements for a typical family of four for around $5,000 installed." In fact, most contractors charge $8,000 to $9,000 for such a system.
- "If you live in a dry climate (or a place with cold, dry winters), and it is uncomfortably dry inside, check the fan speed on any ventilation equipment you might have installed before running out to buy a humidifier." In fact, a home's ventilation rate has almost nothing to do with ventilation equipment fan speed; moreover, many ventilation fans have a single speed. If a home's ventilation rate is excessive, the usual remedy would be to operate the ventilation equipment for fewer hours rather than to adjust the fan speed.

- "There are thousands of homes in the northern United States and Canada with yearly energy bills that total just $200 to $300." This is a surprise. If thousands of North American families actually have energy bills totaling only $16 to $25 per month, that's news. Readers falling into this category are invited to notify ***EDU*** by e-mail; remember to include monthly expenditures for all forms of energy, including electricity, natural gas, oil, and firewood.

Consumer Guide To Home Energy Savings, Ninth Edition (ISBN 978-0-86571-602-5) is available for $16.95 from the American Council for an Energy-Efficient Economy (*www.aceee.org/store*) or New Society Publishers (*www.newsociety.com*).

READERS' FORUM

Astounded

Dear Martin,
I was very pleased to see the article about intumescent coatings and the International Code Council Evaluation Service using kraft facings as the baseline for acceptance [***EDU***, November 2007]. NAIMA has warnings about leaving kraft facing exposed, and all of our members print warnings on their facings. I was astounded when I learned the ES was using that as the baseline.

Charles C. Cottrell, vice president for technical services
North American Insulation Manufacturers Association
Alexandria, Virginia

Comparing Paint-Covered Foam To Paper-Faced Fiberglass

Dear Martin,
I read with great interest the recent ***EDU*** article concerning the testing and use of ignition barriers in which my company was mentioned, our Aldocoat 757 Ignition Barrier Protective Coating referenced, and I was quoted. Allow me to offer two comments:

1. You wrote: "Brenk emphasized that the SwRI test for AldoCoat 757 compared the AldoCoat product to ¼-inch plywood, not the exposed kraft-faced fiberglass." Nowhere in my October 2, 2007, e-mail to you that was used to [source this] quotation did I say that my product was not tested against a baseline of the exposed paper-faced fiberglass batt insulation. Our initial test in 2005 used the plywood as the baseline and we have run several subsequent tests as well, including those using the fiberglass product. The fiberglass batt test is in question by some for the code related reasons you do mention in the article (IRC R320.1)

2. You also quote another industry participant in the article as saying "SwRI Test Procedure … is not among code-accepted test criteria." In reality, 99-02 has been accepted by ICC-ES, which has published evaluation reports on behalf of various manufacturers based on this test.

Further, the crawlspace configuration, not an attic, was chosen as one that may geometrically represent a "worst-case scenario" for testing purposes. Failure to mention this, along with omitting my point in #2 above, may leave a reader with the impression that corners are being cut in order to market product.

We acknowledge the current test requirements are not perfect. Several industry participants are involved in this very discussion now. It is important for the SPFA and its membership to proceed in a prudent manner as the market continues to grow for polyurethane spray foam insulation. Given that, we feel it is in the best interests of all to question leaving spray foam exposed in any application. We also support working together with media such as your publication to insure that relevant and accurate information is getting to the final decision makers at the local level.

Bob Brenk, president
Aldo Products Company
Kannapolis, North Carolina

Editor's Reply

In an telephone interview with ***EDU*** on October 2, 2007, Mr. Brenk said, "The original baseline test was ¼-inch plywood." Based on that information, ***EDU*** reported that "the SwRI test for AldoCoat 757 compared the AldoCoat product to ¼-inch plywood." Since Mr. Brenk's most recent letter notes, "Our initial test in 2005 used the plywood as the baseline," it appears that ***EDU***'s report was accurate.

In his letter, however, Mr. Brenk provides further information; he explains, "We have run several subsequent tests as well, including those using the fiberglass product." The clarification is appreciated. ***EDU*** 's November 2007 story explained why these tests — comparing spray polyurethane foam coated with intumescent paint to kraft-faced fiberglass batts — are more controversial than the conservative tests comparing painted foam to ¼-inch plywood. It's up to ***EDU*** read-

ers to decide whether Mr. Brenk's clarification increases or reduces confidence in his product's contribution to ignition resistance.

The ***EDU*** report quoted Neal Ganser, who wrote that SwRI 99-02 "is not among the code-accepted test criteria" — an apparent reference to the fact that SwRI 99-02 is not mentioned in IRC 314.6. (IRC 314.6 specifically mentions only four test procedures: NFPA 286, FM4880, UL1040, and UL 1715.) Mr. Brenk correctly notes that the International Code Council Evaluation Service (ICC-ES), which has the authority to assess whether new materials can be accepted as equivalent to code-mandated materials, has issued evaluation reports referencing SwRI 99-02. As ***EDU*** reported, these evaluation reports are controversial, in part because some of them compare spray polyurethane foam's ignition resistance to that of non-code-compliant exposed kraft-faced fiberglass batts.

Asked to comment on the controversy, Michael Beaton, a senior regional manager at the International Code Council Evaluation Service, noted that the SwRI 99-02 test "is not one of the tests that is listed in the specific approval section of the code. But in my interpretation, that is a suggested list. What that section is intended to say is that you have to run a test that is indicative of end use."

Opinions differ as to whether a crawlspace ignition test like SwRI 99-02 accurately reflects the performance of materials installed in an attic. As Mr. Brenk notes, "the current test requirements are not perfect," and "industry participants are involved in this very discussion now."

Two Different Trades

Dear Martin,
Obviously, I appreciate ***EDU***'s coverage of our initiative ["Low-Cost High-Performance Buildings," December 2007]. Both my wife who teaches writing and I think it is well written.

The only comment I would have made concerns the second paragraph in the "Instant Payback" section, where you state, "Construction documents must compel the insulation contractor to achieve a guaranteed level of airtightness." A major part of the envelope in terms of performance is the air barrier, so I might have used "envelope contractor" or "and air barrier contractor" in place of just "insulation contractor." These are not always installed by one tradesperson, so mentioning both as trades is appropriate.

Henri Fennell, president
Foam-Tech
North Thetford, Vermont

Dripping Water

Dear Martin,
I just read the article in the November 2007 ***EDU*** on "flash and dash." Some contractors use spray cellulose, not fiberglass, in front of spray polyurethane foam. Since spray cellulose has a higher density than fiberglass, and it disallows an airspace between foam and fiber insulation products, it is less likely to experience air-transported moisture issues inside the wall.

This is a very tender issue for me. I have been an all-foam guy for several years, but recently I have been forced to compete in lucrative markets with a flash-and-dash guy, and I do not trust that system for all the reasons you cite in the article.

I had a failure once, and it was the only time I tried that process. In that case, we had an all-ICF [insulated concrete form] house, footer to roof. The ceiling was all TJI rafters. We were asked to insulate the roof deck by inserting a ½-inch-thick rigid foam sheet across the top web of the wood I-beams to create ventilation, then install 1 inch of spray foam on the rigid and R-30 fiberglass to fill the remainder of the cavity.

The floor was a radiant slab; it was poured in June and first fired in October. No sheetrock was on the ceiling when the floor was first fired. Within hours of firing the floor, water began to drip out of the roof. We pulled all the fiberglass and installed another inch of foam, and then reinstalled all the fiberglass. That solved the problem. The roof was 5,000 square feet, and most of it was 16 to 28 feet above the floor. It was an expensive lesson, and I don't intend to repeat it.

In 2005, we began to do a critical-seal method using 2-pound spray foam in critical locations — rim joist, soffit edge, projecting floor cavities, and anywhere else it is necessary — with cellulose elsewhere. That system is working well, but it is not as big a savings as flash-and-dash when the fiberglass installers are paid piece-rate, and the contractor is buying on volume through an established discount.

To me, this issue would be moot if the foam industry and code people would establish a method of identifying the performance of foam and dense-pack cellulose that recognized the fact that R-value is nearly irrelevant to those products.

If I won the lottery, I would want to find out how much difference there is between an all-fiberglass job at R-21, a spray-foam job at R-14, and a flash-and-dash job at R-23 (1 inch of foam and an R-19 batt crushed in a 2x6 wall). I think there would be none, or the R-14 wall would perform best. Why can't the codes begin to recognize this?

Pat Dundon
Dundon Insulation
Windsor, New York

The Skylight Was Expensive

Dear Martin,
Thank you for including the brief mention of the University of Maryland Solar Decathlon house [***EDU***, November 2007] and the liquid desiccant wall. We were honored to be included in ***EDU***.

I was surprised to see such a thorough discussion of the Darmstadt house, with no mention of the cost of the house. In contrast, the UMD house discussion begins with a discussion of the cost of the house, with very little other detail. While I see that you took costs from the UMD Web page, there was no other info to substantiate how the costs were relevant to the design. For instance, you stated that doors and windows were $62,000, but in fact our Web page states that this number includes a skylight. The UMD house engineering was predicated on an abundance of daylight, including that which was afforded by a super-Nanogel-insulated skylight, and so the dollar figure becomes more meaningful. I understand you had limited space, but stating the dollars seems an unfortunate representation of the project.

Moreover, no discussion was made of the fact that the Darmstadt house generated up to 2.5 times the power than any of the other houses in the Decathlon, including the BIPV elements on the louvers. Yes, it may have been "Deutschland über alles," but the article didn't help readers understand the issue in greater detail with some simple cost and power generation facts for comparison.

Amy Gardner, associate professor
University of Maryland School of Architecture
College Park, Maryland

No Particular Technology Is Recommended Over Another

Dear Martin,
Thank you for the piece on the new *Insulating Guide* in the December issue of ***EDU***. I appreciate your review and recognition that this Guide "treads lightly" on product-specific recommendations and instead focuses on general principles.

From my perspective it is the failure to observe these general principles that contributes to most building-envelope problems. So, with Stephanie's beautiful drawings and the decades of experience embodied in these details, we try to simply describe and illustrate these principles.

Yes, in this first edition we tried to be very balanced in presenting the principles and to specifically NOT recommend a particular product or technology over another. The reason for this was our desire to involve as many different factions of the insulation industry as possible in helping to get these important general principles out — a "rising tide" approach to making ALL buildings better, regardless of the specific construction or material recipe employed. Please note that we do, in some instances, indicate where certain products may be better suited for a particular problem area (spray-applied insulations in convoluted cantilevers, for example).

The bottom line: I'd love to see every wall insulated with foam sheathing, well air-sealed and properly insulated in ALL these common problem detail areas. You know well my belief — we should build our homes so that they can be "heated with a match and cooled with a ceiling fan and last a VERY long time."

Until then, we'll be continuing to teach the principles and allowing builders to continue to explore the MANY ways that good building envelopes can be constructed. And I am hopeful that the second edition of the *Guide* will offer even more specific and useful recommendations that will help make all of our buildings better.

R. Christopher Mathis, president
Mathis Consulting Company
Asheville, North Carolina

BACK PAGE

Green Invaders

If an American builder had fallen asleep, Rip-Van-Winkle-style, in 1997, awakening this year, he might be startled to discover that green invaders have apparently taken over the US construction industry. This horde of green creatures, spreading westward from Madison Avenue, recently infiltrated the exhibitors' hall at the October 2007 conference of the Energy and Environmental Building Association (EEBA) in St. Paul, Minnesota.

To decorate their booths, 19 exhibitors at the EEBA conference eschewed all colors but green:

- Appleton Insulation asked, "Are some insulations greener than others?"
- Broan Nutone calls itself "America's choice for green builders."
- CenterPoint Energy announced that "the gas is always greener."
- CertainTeed advertised that its fiberglass insulation is "GreenGuard certified."
- Cocoon insulation is now known as GreenFiber insulation.
- C.O. Experts noted that its products are "Green Specs" listed.
- Demilec explained that "the future of insulation just turned green."
- Dow wanted customers to know that it is "building a greener world."
- Light Concepts announced that it has "the brightest ideas for green living."
- Minnesota GreenStar offered "certified green homes."
- Morr Construction explained "the benefits of building green."
- Owens Corning asked, "How do you know a product is green?"
- NuWool explained that "green isn't always a color."
- Panasonic promoted its exhaust fan, the WhisperGreen.
- Shelter Supply described itself as "your green partner."
- The Structural Insulated Panel Association advised, "Building green starts with SIPs."
- Uponor called itself "a clean, green, and healthy alternative."
- Venmar advertised its HRV as a "green building product."
- Whirlpool advertised that "Making green makes sense."

What Is Sustainable?

Most definitions of green building advise builders to "minimize damage to the natural environment" and aim for "sustainability." It would appear, however, that few green designers understand the implications of the "sustainable" label. Determining what level of land development, if any, is sustainable is an extremely complicated problem; and when it comes to energy, who knows what level of energy use is sustainable? To equal the global average per-capita use of energy, Americans would need to reduce their energy use by 83%. Even such a drastic reduction, however, would not achieve a sustainable result, since the world's current level of energy use is clearly unsustainable.

As an example of misplaced emphasis, consider a new book by Jerry Yudelson, *Green Building, A to Z*. Adopting the format of an encyclopedia, Yudelson's book provides short articles on 107 topics. Inevitably, readers will assume that the topics were chosen because of their relative importance to the practice of green building.

Although the book lacks an article on energy efficiency, it includes "energy conservation," a topic that merits 1 ½ page — about the same space that Yudelson devotes to articles on "Feng Shui" (1⅓ page) and "Vastu Shastra" (1 ¼ page). Yudelson defines Vastu Shastra as "a design philosophy and approach" that is "similar to Feng Shui." Each of these topics — energy conservation, Feng Shui, and Vastu Shastra — is eclipsed by "interior design," which rates 2 ½ pages.

Yudelson's skewed priorities reflect the obsessions of many green building advocates. Current controversies over flooring or countertop specifications would fade into irrelevance if builders remembered the most basic principles of green building, namely:

- It is better to leave a site undisturbed than to erect a building on it.
- Remodeling an existing building is preferable to new construction.
- If it is absolutely necessary to build a new building, it should be as small as possible.
- The environmental impact of the energy used to operate a building over its lifetime dwarfs the environmental impact of the materials used in its construction.

Of course, since these four principles discourage consumption, they are unlikely to be embraced by marketers of building materials. But these principles, if taken to heart, would provide a beneficial dose of humility to anyone embarking on a green construction project.