

# Word On Windows

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## Windows and Energy Codes: The Future Looks Bright

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As chairman of the Responsible Energy Codes Alliance, I am often asked about RECA's opinions and policies on energy-efficient windows and energy codes. To RECA, the most effective approach is quite simple. Local adoption of a mandatory building energy code, based upon the national model International Energy Conservation Code (IECC), is far and away one of the best ways to ensure that homes and commercial buildings are built and remodeled using energy-efficient windows.

Today, IECC-based energy codes require NFRC ratings and certification, appropriately recognizing many benefits of high-performance, energy-efficient windows. To maximize energy use and minimize discomfort, IECC utilizes maximum prescriptive requirements to set clear and concise targets for installation of windows in homes and commercial buildings. The requirements focus on two mechanisms:

- Solar control - to reduce cooling energy use and summer peak demand (maximum 0.40 SHGC), and
- Insulation benefits - to reduce heating energy use (maximum U-factors).

These requirements ensure homeowner comfort year-round and have led to more durable and better quality products. RECA has developed a series of "Builder Guides," posted on our website, that simplify the code even further and focus on these primary window (and insulation) code values that builders and homeowners must know. Also, please see our website for a current summary of the energy codes adopted and implemented across the U.S. ([www.RECA-codes.org](http://www.RECA-codes.org)).

Despite this progress and the clear importance of energy-efficient windows in the IECC, there is still much road left to be traveled and many holes left to be fixed, in both the code and "on the ground" in the states.

### 2004 IECC Prescriptive Fenestration Requirements

	Climate Zone	Fenestration Factor	Skylight U Factor	SHGC Value	
	1	1.20	0.75	0.40	} Low SHGC Low-E
	2	0.75	0.75	0.40	
	3	0.65	0.65	0.40	
} Low U-factor Low-E	4 (except Marine)	0.40	0.60	NA	
	Marine 4 - 8	0.35	0.60	NA	

For more information and zone maps, go to [www.reca-codes.org](http://www.reca-codes.org)

### WHAT DO NEXT-GENERATION ENERGY CODES HAVE IN STORE FOR FENESTRATION?

The next generation IECC – the 2004 Supplement version – takes a big step forward with its requirements singling out low-E windows as the best option for code compliance across the country. With this new code, RECA believes the future for fenestration looks promising.

In an article originally published in *Door & Window Maker* Vol. 3, Issue 5, (Nov/Dec 2002) in page 10.

*RECA's primary objective is to support and encourage all states and localities to adopt and implement the 2004 IECC. This code is in the best interest of building and home owners, operators and builders, manufacturers, and the general public welfare.*

As surprising as it may sound, RECA believes that one impediment to nationwide acceptance of low-E historically has been the code itself. First, a number of loopholes remain in the 1998-2003 IECCs and their accompanying compliance materials (RESCheck®). These "holes" make it far too easy to trade off

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## Berkeley Lab Wins Award for Breakthrough in Electrochromic Windows

Lawrence Berkeley National Laboratories (Berkeley Lab) was recognized with a 2004 R&D 100 Award, given by *R&D Magazine*, for a significant advance in energy-saving electrochromic windows. For over 40 years, these awards, called the “Oscars of technology,” have been given to the “100 most technologically significant new products and advancements over the past year.” Winners are selected based on their potential to “change people’s lives for the better.”

Berkeley lab’s award-winning Transition Metals Switchable Mirrors technology, invented by Tom Richardson and Jonathan Slack of the lab’s Environmental Energy Technologies Division, improves upon current electrochromic technology. It uses a thin film coating on the window glass made from an alloy of magnesium and one or

more transition metals, such as nickel or manganese. The window can be reversibly changed from a reflective state back to a transparent state by applying an electrical current or exposing it to hydrogen gas. By using transition metals rather than the rare earth metals, used in current electrochromic products, the Berkeley windows can absorb and reflect both visible and infrared light (heat). Avoiding the more costly rare earth metals should also significantly lower costs, making “smart” windows a truly intelligent choice for consumers.

The window can also be programmed to self-adjust to sunlight or weather conditions. It can reflect light and heat when it is hot and can absorb light and heat when it is cold. The Solar Energy Industries Association claims that electrochromic windows

can save up to 50 percent of a building’s energy use. This can lead to significant savings, with heating and cooling from energy losses through windows costing U.S. consumers about \$9.3 billion annually.

Richardson and Slack are already working with two companies to get this technology on the market.

*Windows and Energy Codes:  
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energy-efficient low-E windows for HVAC equipment upgrades and other envelope components that do not offer equivalent savings and benefits. In other words, despite the prescriptive code requirements for low-E windows in most areas, clear glass windows can be used relatively easily after inadvisable tradeoffs are applied. Another problem is that there are still some pockets of the country where even the prescriptive requirements in the 1998-2003 IECCs specify an inefficient clear glass double pane window.

Fortunately, the 2004 IECC Supplement ties up a number of these loose ends and helps solidify low-E as the baseline compliant window option across the country. The 2004 IECC also contains mandatory performance caps (maximum SHGC and U-Factor tradeoff limits) to ensure that efficient, cost-effective and comfortable low-E windows are never traded away for other envelope components or with equipment

that cannot offer equivalent benefits.

### 2004 IECC EFFICIENT WINDOW HIGHLIGHTS:

*Low prescriptive U-factors in the North and North Central U.S.*

*Maximum prescriptive 0.40 SHGC in the South and South Central U.S.*

The 2004 IECC has published the International Code Council, which is available for adoption everywhere. Its prescriptive window requirements are identified in the accompanying maps and table.

### THE FENESTRATION FUTURE IS BRIGHT

Eventually, the next innovation in window technology will be commercially available and ready to begin the process of education, transformation, and ultimate adoption in the IECC. However, until then, a lot of work is necessary to ensure that energy-efficient (low-E) windows are universally accepted across

the country. RECA believes state and local adoption of the 2004 IECC is the best mechanism available to make that happen, and we will continue our mission to support its adoption and implementation. Though a considerable amount of work remains, the state of our energy codes for fenestration is strong, and the future appears bright.

## NextGen Home Incorporates Efficiency, Affordability, and Safety

Today's new homes are more technologically advanced and efficient than ever before. What technologies will improve the homes of tomorrow?

NextGen incorporated a number of these advances in its 2004 NextGen Demonstration Home, unveiled in January outside the Las Vegas Convention Center. The NextGen home will be donated to Opportunity Village, a Las Vegas charity that serves people with intellectual disabilities.

The NextGen home was produced in coordination with the Partnership for Advancing Technology in Housing (PATH), a public-private initiative supported by HUD. PATH worked with NextGen to ensure a "whole house" approach that would incorporate technologies to maximize durability, safety, energy efficiency, and affordability, while minimizing waste.

The project's theme, *The Evolution of the American Home*, reflected NextGen's attempt to reconcile what it views as "tension between progress and permanence." While consumers desire the benefits of new technologies, these innovations must be integrated seamlessly into traditional home design.

Many concept homes are very large and serve more as an elaborate product showcase than a concept for a potential house. The NextGen home features many product innovations and sticks to the goals of "whole house" planning and affordability. At 2,300 square feet, the home boasts three bedrooms, two bathrooms, a kitchen, and a formal dining room, in addition to a breakfast room, great room, covered patio, and two-car garage. Rather than showcase new technologies, this average-sized home features key advances in energy-efficiency, automation and safety.

### ENERGY EFFICIENCY

The NextGen home, once placed on a permanent foundation, will be an ENERGY STAR® home, qualifies for the ENER-

GY STAR designation and saves from \$200 to \$400 each year on utility bills. The NextGen home's energy-savings features include:

- Icynene spray insulation that resists mold and has a higher insulating value than fiberglass and fills all framing cavities;
- Radiant barrier roof sheathing that reduces air conditioner load;
- High velocity HVAC with small-diameter duct work that fits in the home's insulated space and reduces heating and cooling loss;
- Low-flow plumbing fixtures that reduce water use;
- Tankless water heaters turn that on only when you need hot water, and
- ENERGY STAR-rated appliances that save energy.

### WINDOWS

Much of the efficiency possible in the NextGen home is due to its use of ENERGY STAR-rated windows, with low-E, spectrally selective glass. The windows, produced by Milgard, contribute greatly to the home's overall efficiency, saving a great deal in heating and cooling costs. In addition, windows enable the advanced lighting systems by providing ample daylight without great energy losses.

### AUTOMATION

In the NextGen home, lights can be set to brighten as the sun sets and dim as it rises. Looking for a midnight snack? Lights can automatically light a path from bedroom to kitchen, shutting off three minutes after you're back in bed. In the kitchen, the oven can refrigerate food and start cooking it in time to have dinner ready when you get home.

### SAFETY

The 2004 NextGen home also displays many safety features. The security system

can be monitored over the Internet. The Water Cop Flood Prevention system automatically shuts off the house's water if a pipe breaks. The house also uses hardware to secure the roof to the walls and the walls to the foundation, helping prevent damage from high winds.

Building on the success of the current NextGen home, the 2005 NextGen home is on the way! Titled the Safe & Sound Demonstration Home, the project will be the third generation of NextGen homes. The design is focused on providing a strong and safe home to consumers in severe weather areas. It will demonstrate that safety does not necessarily mean increased cost and can be provided while achieving maximum energy efficiency.



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# SPOTLIGHT On Collaborative Members

## CHPS GIVES CALIFORNIA SCHOOLS LESSON IN ENERGY EFFICIENCY

It is well known that schools and educators often struggle to provide the highest level of education possible with limited resources. With burgeoning student populations, teachers frequently need to augment classroom supplies with their own resources or ask students to bring some items from home. However, in many schools throughout the United States, more money is spent on energy than on books and supplies combined! In California, a state that educates one of every eight K-12 students in the United States, the Collaborative for High-Performing Schools (CHPS) is taking action.

Started in 2000, CHPS aims to make California's public schools more energy-efficient through information and incentive programs marketed directly at school districts and building designers. The group, comprised of members from a wide array of government, private industry, and nonprofit organizations, hopes to increase the number of "high performance" schools, which provide energy-efficient, healthy, well-lit and comfortable learning environments.

To achieve these goals, the CHPS program designs schools using an integrated design strategy. By viewing each construction element—windows, walls, insulation, and heating and cooling systems—as parts of the whole, CHPS schools provide comfort for students while meeting the constraints of tight budgets.

### CERTIFICATION

Part of the CHPS program involves certification of schools meeting the high performing school criteria. Certification requires that schools meet all the program's prerequisites and earn at least 28 of 81 possible points for other improvements.

The prerequisites include complying with environmental codes; creating a water-use budget; storing and collecting

recyclables; and meeting indoor air quality, climate control, and acoustical standards. Points are awarded for schools located near public transportation, exceeding California's energy standards by 10 percent, using building materials with certain levels of recycled content, incorporating natural ventilation, and using ENERGY STAR® products. The point system facilitates compliance with high performance designation standards. Beyond the prerequisites, CHPS gives great flexibility to schools for improving the efficiency and comfort of their buildings.

### PROBLEMS, SOLUTIONS, BENEFITS

A crucial area of the program is the use of daylighting and windows. A study by the consulting firm Heschong Mahone Group of student performance in one school district with diverse daylighting conditions showed significantly dissimilar results. The study found that the students with the most daylighting in their classrooms progressed 20 percent faster on math tests and 26 percent faster on reading tests than those with the least daylighting. Those with the largest window areas were found to progress 15 percent faster in math and 23 percent faster in reading than the students with the least window area.

Air quality is another important consideration. Children are believed to be much more vulnerable than adults to environmental contaminants. Inadequate ventilation can lead to the buildup of carbon dioxide and other pollutants. Continued exposure to volatile organic compounds has been linked to increasing rates of asthma, which is especially common in urban schools. The CHPS program encourages schools to focus on preventing air quality from becoming a problem, which is less costly than taking corrective actions later.

For more information on California High Performance Schools, check out the website, <http://www.chps.net/overview/>.

## The Clear Incentive For Energy-Efficient Windows

Installing new energy-efficient windows may be more beneficial than you know. Many states offer rebates or other incentives promoting the purchase of energy-efficient windows, doors, and skylights. The table below lists the number of such incentive programs in each state:\*

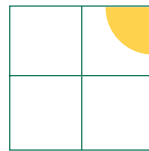
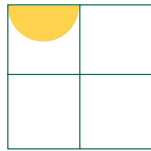
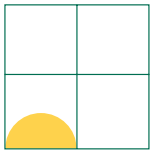
Check out <http://efficientwindows.org/new.cfm> for a complete list and description of the programs offered:

	Programs
California	13
Colorado	1
Idaho	3
Iowa	3
Maryland	1
Massachusetts	3
Montana	2
New Hampshire	1
New Jersey	1
New York	1
Oregon	27
Washington	15
Wisconsin	1
Wyoming	1

\*DOE fact sheet, September 2004, "ENERGY STAR® for Windows, Doors and Skylights State and Utility Incentives and Activities"

## Do You Have News You'd Like to Share?

We're always interested in reporting on new technology and research in residential windows. If you have something you would like to share with us please contact Kipp Rhoads at [krhoads@ase.org](mailto:krhoads@ase.org).



# CollaborativeNEWS

The EWC has launched the new **EWC Window Selection Tool**, designed to link consumers to qualified energy-efficient window products on the EWC web site. Consumers frequently ask us where they can find efficient products that are described generically on our site. In response, the EWC designed the **EWC Window Selection Tool**.

The EWC is also undertaking a renewed focus on transforming the new construction sector to more energy-efficient products. According to ENERGY STAR®, this sector lags behind the retrofit market in penetration of qualified products—it is estimated that only 20 percent of the products in residential new construction market qualify for ENERGY STAR, compared with 60 percent of the products in the retrofit market. The EWC will conduct research to identify more effective methods to reach this sector with the energy efficiency message.

The EWC also will target the low-income market in the coming year, undertaking new research to identify opportunities for increasing efficiency in this sector. Considering the age of existing housing stock—over 70 million homes in the US are at least 20 years old (US DOE EIA)—we believe there are untapped opportunities for increasing market penetration of efficient window products in the low-income sector.

As always we will continue to partner with and provide outreach to manufacturers and suppliers. However, in the coming year the EWC will target small window manufacturers. The EWC is interested in helping to increase the number of small manufacturers that participate in NFRC testing and certification, as well as ENERGY STAR partnerships among small manufacturers across the nation.

We will keep you updated on our activities through our newsletter and email announcements. We are always interested in feedback from the industry,

so we hope that you will share your insights and goals with us at [krhoads@ase.org](mailto:krhoads@ase.org).

Check out the following link on the EWC website to see when we will be in a city near you: [http://efficientwindows.org/new\\_activities.cfm](http://efficientwindows.org/new_activities.cfm).

## The Low-E Revolution

The fenestration industry has come a long way from the days of the single pane, uncoated window. New window technology has transformed the fenestration market with innovations such as high-tech spacers, low-E glass and gas-fills. All of these technologies aim to improve insulation and energy-efficiency, maximize personal comfort, and reduce energy costs for consumers. Notably, windows with low-E (emissivity) glazing are making a big hit.

One cutting-edge low-E technology is the Heat Mirror – a high-tech glazing system that can match or exceed the energy efficiency of triple pane windows. It is constructed by suspending a sheet of low-E film between panes of insulated glass. Two layers of Heat Mirror may also be suspended between panes of glass with gas-filled spacers to form Super-glass, the most expensive glazing system on the market, but one of the best insulators.

Another new technology, developed by Lawrence Berkeley National Lab's (LBNL) Environmental Energy Technologies Division, is the Transition-Metal Switchable Mirror (TMSM). TMSMs are dynamic glass panels with a magnesium alloy-transition metal coating that can switch back and forth between a transparent state and a reflective state. This is done by application of an electric field (a process dubbed electrochromic switching), or by exposure to dilute hydrogen gas (gasochromic switching). According to the April 2004

issue of Science Beat, unlike Absorbing Electrochromic (AE) windows, TMSMs reflect visible and infrared light and heat, have a greater range in transmitting (50% to 0.5% or lower) and reflecting (75%-10%) heat and light, and provide better privacy.

Low-E coated and ENERGY STAR® rated windows can cost from 5 to 15 percent more than their less energy efficient counterparts. However, the extra costs are minimal compared to the long-term energy savings and the added benefits of low-E windows. These benefits include: reducing fading in furniture and carpets, reducing glare, and providing extra security in wind, seismic and other high-hazard zones. Low-E windows keep you safer, warmer and more comfortable in any given season.

### EWC Offers New Energy-Efficient "Word on Windows" Newsletter

The EWC is always striving to improve. In an effort to save energy and decrease pollution, we now offer our Word on Windows newsletters in e-mail format. Although we will still produce limited numbers of printed copies, we urge you to sign up for the electronic version. Please e-mail us at [ewc@ase.org](mailto:ewc@ase.org) to be added to the newsletter list. Include your name, address, phone number and email address. Thank you for your cooperation and for doing your part to save energy!

**The EWC does not send spam or share e-mail addresses with third parties.**

## New online Energy Codes Resource Center Offers a One-Stop Source For Information on Building Energy Efficiency Codes

The U.S. Department of Energy (DOE) recently launched a new building technology website, the Building Energy Codes Resource Center, a comprehensive, online resource that links users to energy codes, construction techniques, and technologies. The interactive website, which went live October 1, offers detailed information on topics ranging from techniques for framing window headers and on insulation to the latest research on mold and moisture. The site's major focus is residential codes and beyond-code construction.

The Resource Center provides information on hundreds of topics in a variety of different formats, including:

- Articles—Fact sheets, reports, and general information about energy codes and code resources.

- Graphics—Diagrams and photos that illustrate concepts related to energy codes and beyond-code construction.
- Online tools—Interactive web-based applications that guide users through energy code and related processes. An example is online energy code compliance or energy advisors.
- Presentations—PowerPoint documents detailing energy code topics and presentations.
- Videos—Short clips that discuss subjects ranging from building science to energy codes.

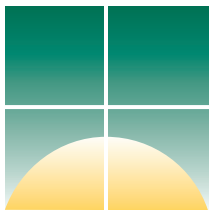
The Resource Center gathers content from the Building Energy Codes Program's (BECP) archives, as well as from resources across the Internet, such as

ENERGY STAR®, Building America, building scientists, and code groups. Users can search topics by category using the "browse" menu, or by keyword using the "search" feature. While visiting the Resource Center, users also can link to REScheck™, BECP's energy code compliance software, now in use in many states.

The Resource Center content is the product of years of work by DOE's Building Energy Codes Program, and it has been developed to provide a central point of access to energy code and construction information.

Look for the Resource Center by linking from BECP's website at [www.energy-codes.gov](http://www.energy-codes.gov).

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