

Word On Windows

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Shedding Some Light on Energy, Cost & Comfort

BY GORDON TULLY AND WILL ZACHMANN

Despite its proven effectiveness, high-performance, low-e glass has yet to emerge as the 'go-to' choice for most of America's production builders. The U.S. Department of Energy has funded four Building America teams under the management of the National Renewable Energy Laboratories to find out why, and to identify the ways and means of changing builder attitudes and habits. And while windows are far from Building America's only concern (the program focuses on sustainable, 'whole building' design - everything from insulated concrete foundations to high R-value structural insulated panel (SIP) walls and roofs), windows play a central role in achieving a well-integrated, thermally efficient building envelope.

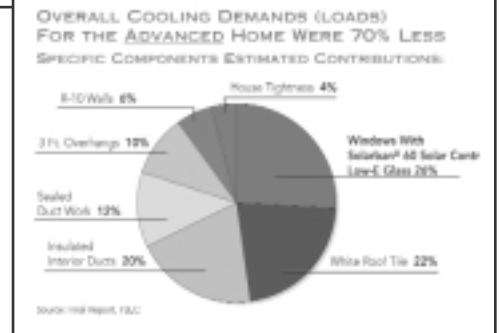
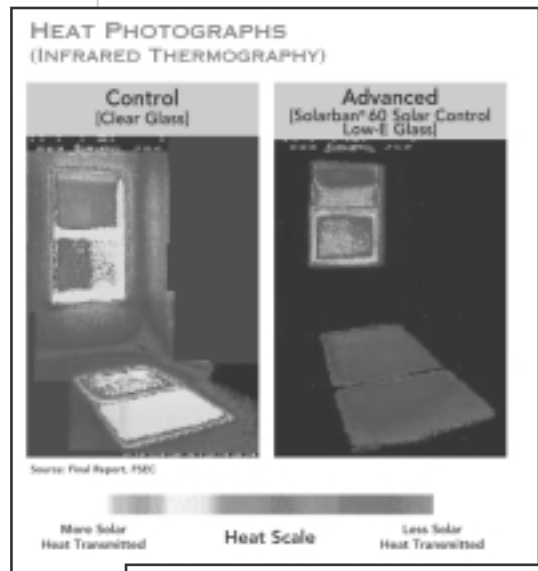
One of the Building America teams is the Consortium for Advanced Residential Buildings (CARB), headed up by Steven Winter Associates, Inc., a building systems consulting firm with offices in Norwalk, CT and Washington, DC. CARB has tackled the issue of high-performance glazing with nine builders thus far, ranging from industry giants Del Webb, Beazer, and NVR/Ryan, to smaller firms such as Colorado's Wonderland Custom Builders, which builds about 50 homes a year.

Traditionally, one of the main barriers to widespread adoption of high-performance glazing has been consumer indifference, driven by two decades of low energy costs and a lack of understanding on the buyers' part. So while homebuyers don't think twice about spending \$2,500 extra on hand-painted Italian tile, they'll blithely take a pass on a \$500 glazing upgrade that will save them \$100 a year in energy costs, every year they own the home. And while they may not realize it, they're also missing out on a more comfortable home.

CARB has surmounted the 'aesthetics over value' barrier by devising ways to upgrade the glass at no cost to the buyer; a process that entails finding savings to offset the added glass cost. One route toward savings is through value engineering, a methodical process wherein CARB examines all aspects of the home's construction to identify unnecessary labor and materials. But savings from 'stand alone' changes (such as a reduction in framing lumber) will be used by the builder to offset the overall cost of the home, rather than to pay for the investment in higher-grade glazing.

To crack this particular nut, CARB has had to identify savings that are dependent on the glazing upgrade. To get the savings, the builder has to invest in better glass. In this respect, CARB's job is easier in southern climates, where air conditioning is a must. Field tests confirm the common sense notion that better glass allows the builder to downsize the air conditioning equipment. The resulting reductions of \$400 to

\$500 a ton in A/C equipment cost pays for most of the added cost of high-performance glazing. Regardless of how big the home, or what the glass and A/C specs are when you start, the savings in equipment comes close to balancing the added glass cost in every case - an inter-



esting and encouraging outcome.

Even when CARB identifies an integrated, zero-cost package that saves energy and improves comfort (as better glass always does), significant obstacles remain. Homeowners are competitive about A/C tonnage, and regard it with the same 'bigger is better' mindset that determines the size of their gas grills and

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SUVs. In reality, an oversized A/C unit is much less efficient to run, reduces comfort, and in humid climates, can damage a home by allowing indoor humidity to build up. But these facts are not common knowledge among most buyers, so that downsizing the AC can be a real sales obstacle; especially when builders encourage the misperception by accusing their competition of 'cheating' on the A/C tonnage.

Another stumbling block is that window fabricators in some markets simply will not use high-performance glass. CARB's fall-back position here has been to upgrade to less efficient low-e glass. The cost numbers still work, but the energy savings are less.

In climates where A/C is not standard equipment, downsizing the furnace does not save enough money to pay for the glass. CARB addresses this problem by capitalizing on the other key advantage of high-performance glass: improved comfort. The windows feel warmer on the inside, so warm air grills don't have to be placed right at the windows to compensate for loss of comfort. Moving the registers to the center of the plan cuts duct runs, and the resulting savings help offset the difference in glass cost. Factor in the small saving from a downsized furnace, and the overall package approaches the sought-after zero cost increase.

As this approach is hard to retrofit into existing homes, CARB's greatest successes have been in the context of entirely new designs. Starting from scratch, CARB also tries to keep the now-centralized ductwork entirely inside the home's conditioned envelope; a strategy that results in additional energy savings.

Looking ahead, advances in glass manufacturing will inevitably lower the cost of high-performance, low-e glass. Today, some low-e coatings must be applied off the main production line, and fabricators must edge-delete the coating to ensure a good seal. Resolving these two problems will likely lower costs to the



DOE Gives "Thumbs Up" To '98 IECC Residential Code

In a decision that will have major impacts for efficient window manufacturers and many others, the U.S. Department of Energy made an initial evaluation of the 1998 version of the International Code Council's International Energy Conservation Code (IECC) and concluded that overall the IECC would achieve more energy efficiency in low rise residential buildings than the 1995 Model Energy Code.

ENERGY CODE (MEC).

The initial review found significant differences between the '95 MEC and the '98 IECC. Most of the changes improve energy efficiency in residential construction but there were two changes that were found to result in a possible loss of energy efficiency. These were: prescriptive thermal envelope criteria for certain room additions and default U-values for glazed products.

As a group, however, the positive changes outweighed the two negatives, DOE felt. The positive changes between the two codes include:

- * addition of a 0.4 solar heat gain coefficient for fenestration in warmer climates

- * required U-factor for replacement windows
- * use of approved compliance "tools"
- * tables for thermal envelope compliance by prescriptive specification
- * insulation of skylight shafts
- * air infiltration for manufactured windows and doors
- * heat traps for water heaters.

In other code news, the International Code Council this fall adopted two proposals submitted by Bill Prindle of the Alliance to Save Energy which together replace the International Residential Code's weaker draft energy code with a simplified prescriptive chapter that is consistent with and equivalent to the IECC. The Department of Energy had proposed replacing the IRC draft with a direct reference to IECC, but this was defeated and the compromise adopted allowing IRC to retain an energy chapter that is almost exactly a replica of the IECC code. The National Association of Home Builders proposed elimination of residential prescriptive criteria from the IECC, making IRC the only source for residential prescriptive energy codes. This also was defeated.

energy-saving technology. When they do, CARB and Building America will be hard at work identifying new ways to promote a balanced 'whole building' approach to design and construction.

Gordon Tully is a senior architect with Steven Winter Associates, Inc.; Will Zachmann is the firm's director of communications. Check out the Building America website at http://www.eren.doe.gov/buildings/building_america/ Visit SWA on the web at www.swinter.com <<http://www.swinter.com>> or for specific information on the Consortium for Advanced Residential Buildings, stop in at www.carb-swa.com.

Hard Coat Solar Control Low-E Glass Hits Market

Pilkington LOF's Solar E glass—designed for solar control in cooling-load dominated southern tier states—is scheduled to go into full production by year end. The product combines excellent solar control and thermal (U-value) performance in a color-neutral, durable, pyrolytic Low-E glass. Solar E is produced using Pilkington's leading-edge chemical vapor deposition coating technology.

The product gives the residential new construction and retrofit markets a new glass option that can be used in a window to comply with energy code and Energy Star program requirements for solar control in the south.

Use of Solar E glass in a 3/4"IG unit, for example, (1/8" lite of Solar E glass on the 2 surface, 1/2" air space, 1/8" lite of clear glass in a 24"x48"casement style vinyl window with butyl-metal spacer and zero air infiltration), provides a solar heat gain coefficient of 0.35 and a U-value of 0.35. These numbers satisfy the Energy Star Windows requirements for cooling-dominated southern markets.

The pyrolytic, or hard coat, means that the Solar E glass:

- * does not have to be protected in a sealed IG unit;
- * does not require edge deletion;
- * is resistant to handling scratches;
- * has an unlimited shelf life (ideal for replacement windows); and is temperable.

The hard, durable surface means that Solar E glass can withstand exposure and can be used as an add-on panel or even as a single glazed window, with the coating facing the interior. This application opens the way for energy efficiency in many single-lite aluminum residential windows, which are common in Florida and other southern states, even if it does not bring them all the way up to Energy Star standards.

Solar E complements Pilkington's

Energy Advantage Low-E glass, which has energy performance characteristics for northern states. "With the development of Solar E glass for cooling dominated markets, Pilkington LOF now has products that allow our customers to effectively meet energy code requirements throughout the country," said Paul Gore, residential products manager.

The slide is an actual, unretouched photograph comparing looking at a sky scene with Pilkington Solar E™ Solar Control Low E Glass (right) and without glass (left).

Efficient Windows Allow Minimized Duct Design

Builders of thermally tight homes with efficient windows may not need to extend ductwork out to the perimeter anymore, saving the builder considerable cost and saving the homeowner 10 to 15% on heating energy.

For many years, builders felt that perimeter heating was needed to warm cold window surfaces and counteract the cold downward convection that form around windows. It was also common belief that heat lost through uninsulated supply ducts was necessary to warm the floors above crawl spaces, garages and unheated basements.

But research conducted by Enermodal Engineering of Denver, CO and the National Renewable Energy Laboratory (NREL) found that perimeter duct distribution is unnecessary when the thermal envelope, particularly the windows, meets specified energy efficiency levels for a given climate.

To better understand how placement of diffusers affects comfort, NREL researchers measured changes in average temperature of the interior window surface under three different delivery positions: perimeter floor, interior ceiling and interior floor.

"Using the infrared camera, we could

see that both the perimeter floor system and the interior ceiling system really did get heat to the window and warm it up," said researcher Wendy Hawthorne of Enermodal. "The interior floor system was less effective, especially on the shorter, 10-minute cycle."

Researchers examined human comfort levels in the room, using lab results and computer simulations. They took air temperature, mean radiant temperature, relative humidity, air velocity, occupants' clothing and occupants' metabolic rate all into account.

The results indicated that on a zero degree Fahrenheit day, the interior ceiling or high sidewall system combined with doubled-glazed, low-E windows delivered slightly better comfort than the base-case perimeter system with double-glazed windows.

In Colorado, a minimized duct system should cost 20 to 25% less than a perimeter system. In a 1200 square foot prototype home, the change produced a \$260 net savings (\$500 minus the \$240 cost of upgrading the windows.) Thus the savings from minimized duct design more than paid the cost of more efficient windows.

(Source: Energy Design Update, Vol. 19, No. 1, pp 9-12)

SPOTLIGHT

On Collaborative Members

CHelsea BUILDING PRODUCTS

Chelsea Building Products is a leading designer and extruder of rigid vinyl and composite extrusions for window and door systems and other building products. Chelsea began as the Poly-Tex Company in 1975 with a window extrusion operation in a Pittsburgh, Pennsylvania suburb. It started with one extrusion machine in a small warehouse facility. In late 1979 it was purchased by Maynard Plastics and by the next year moved to larger quarters. Continuing to grow, the company in 1985 moved to its present location in Oakmont. In 1989, the company officially became Chelsea Building Products, as it began expanding its product development beyond windows and doors. In 1997, the company was purchased by a Belgium company, Group Tessenderlo, and became a part of their Plastics Processing Division. Chelsea has added to its Oakmont manufacturing facility several times, expanding the number of extrusion lines that run 24 hours a day, seven days a week and producing millions of feet of vinyl extrusions per year.

Chelsea has been responsible for many innovations in the vinyl window and door industry:

- 1 In 1975, introduced the first all-vinyl double hung tilt window system in the US
- 2 Chelsea was one of the first U.S. extruders to offer colors
- 3 Chelsea's innovative designs have been awarded several U.S. patents
- 4 The company was the first to offer a consumer warranty on its products



5 The most comprehensive design and production assistance program in the industry.

Chelsea supplies vinyl window and door systems to both the new construction and replacement markets in the United States and internationally. As an extruder, Chelsea markets its vinyl lineals to fabricators of windows and doors.

Chelsea certifies its vinyl lineals through AAMA (American Architectural Manufacturers Association) for heat reversion, shrinkage, impact retardation and weathering. AAMA has been certifying Chelsea's lineals for the last seven years. In fact, Chelsea's Quality Assurance Lab, located at the Oakmont facility,

is an AAMA certified Lab. Window and door products produced with Chelsea lineals go through regular rigorous testing through AAMA (water infiltration, air infiltration, structural, forced entry) and NFRC (National Fenestration Rating Council) (U-value).

TITON INC. VENTILATION PRODUCTS IMPROVE INDOOR AIR QUALITY

Healthy indoor air is a proper concern of all conscientious builders and of all those who occupy buildings for any length of time. Titon Inc., based in Granger, IN, markets integrated window "trickle" ventilators. A trickle ventilator (or a passive air inlet) is a small, manually operable device that is incorporated into a window or door to allow a controlled amount of fresh air to "trickle" into a home.

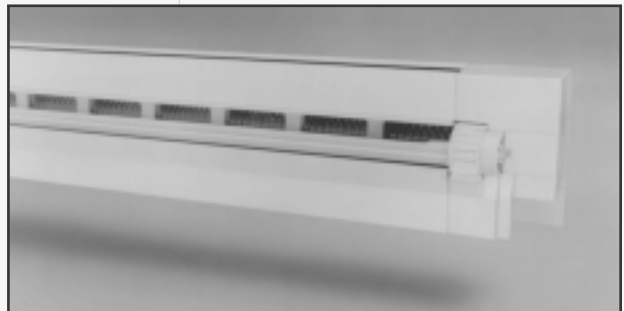
Much more energy-efficient than opening a window, trickle ventilators are usually fitted onto the top of windows and serve to reduce condensation, as well as improve air quality in the room. They can work with mechanical

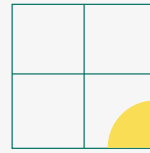
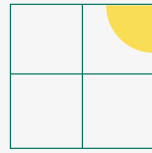
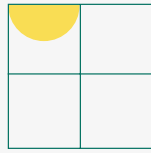
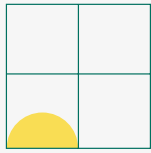
systems such as exhaust fans located in kitchens and baths.

Titon Hardware Limited of Essex, England was founded in 1972 and is a leading innovator of passive ventilation systems sold throughout Europe. The concept of passive ventilation originated in Scandinavia in the early 1970s and the technology is now widespread in France and the United Kingdom. Japan recently discovered trickle ventilation and the idea is expanding rapidly, as US and Canadian window manufacturers incorporate ventilators into windows destined for export to Japan and other Pacific Rim countries.

Titon Inc., a subsidiary of Titon Hardware, was established in 1989 to bring the trickle ventilator concept to the U.S. market. The company offers a variety of models fabricated from aluminum and PVC vinyl extrusions as well as injection molded. They are available as glazed-in systems, slot-fitted and surface mounted. The ventilators which range in cost up to \$75 can be installed in new or retrofitted into most types of windows, patio doors, skylights, sunrooms, garden windows and storm doors.

Builders are pleased with trickle ventilators because of their simplicity and reasonable costs. References to trickle ventilators are now contained in Building Regulations of the Department of the Environment in the United Kingdom and are also referenced in the Ventilation and Indoor Air Quality codes of Washington and Oregon, states recognized as leading influences in ventilation codes. Residential builders generally install one ventilator per habitable room as long as cross ventilation is adequate, while the need varies in commercial construction.





Collaborative NEWS

WELCOME TO NEW EWC STAFF

The EWC would like to welcome Allison Tribble, new Research Associate at the Alliance to Save Energy and Kate McGinnis, new staff Intern. In addition to these in-house professionals, we are happy to announce that the EWC will have a new staff member located in Florida. Arlene Stewart will join the EWC on a part-time basis and will be working with the Florida Solar Energy Center and the Florida Energy Extension Service.

DATABASE DETAILS

- Now is the time for everyone to take a careful look at the sample of the EWC database. It can be found on the web at the following address:
www.research.cala.umn.edu/ewcprototype. This URL contacts the entire web site plus the sample database, so you must follow these directions to get to the prototype:
- Type in the URL address above
 - Click on WINDOW SELECTION from the home page
 - Click on MIDWEST (Illinois)
 - Click on CHICAGO
 - Click on COMPARE ANNUAL ENERGY COSTS
 - Click on the triple-paned product (the last window example on the page.) DO NOT click MORE WINDOW SAMPLES located underneath the last window example.
 - Click on WENDY'S WONDER WEATHER BEATER Window (should be underlined in gray.)
 - Click on SPEC SHEET on the first line of the prototype database for an example of manufacturer marketing materials that may be available.

Remember, the EWC needs your comments as soon as possible so that this database is constructed in the most useful way possible to promote your efficient products. We encourage you to make a list of issues you think will need to be

resolved before we move forward on the contract for the final design. Please send your comments via email to ewc@ase.org.

ON THE ROAD AGAIN . . .

The EWC will be hitting the road (or the airways) with instructional seminars coming up across the country. In December, the EWC will conduct a builder training with the Austin Green Building group. In January, the EWC will attend the NAHB conference and the AAMA anniversary conference. We will also be conducting seminars for PH Tech's US and Canadian sales force in January and will meet with builders, home energy raters, and remodeling contractors at a training in Wisconsin sponsored by the Wisconsin Energy Conservation Corps. Millwork manufacturer Mathews Bros. of Belfast, Maine will host an EWC training session for its sales staff, distributors, and builder customers in February. Contact Alecia Ward at (202) 530-2245 if you are interested in scheduling a seminar for your in-house sales staff or for your clients.

SALUTE TO OUR NEW-IN-1999 MEMBERS

The Efficient Windows Collaborative welcomes the following members to its ranks: B.F. Rich Co, Interstate Building Materials, Inc. | Kolbe & Kolbe Millwork Co. Inc. | LaBerge | Daylight Consulting | Norandex/Reynolds | Soft-Lite Windows | United Window and Door Manufacturing, Inc. | Vinyl Building Products, Inc. | Windows From Us | Window and Door Manufacturing Association

EWC AROUND THE STATES


*Florida is making major strides in promoting efficient windows to builders and developers around the state. The Florida Energy Extension Service (FEES) and the Florida Solar Energy Center have been at the forefront of these educational efforts.

*With the help of Vinyl Building Products, the EWC is hosting a preliminary meeting with window manufacturers in the Texas marketplace. We will be hosting several formative meetings in Texas as we begin our Texas Windows Initiative. If you are interested in becoming involved, please contact Alecia Ward or Allison Tribble at the Alliance.

*The Wisconsin Windows Initiative held its "kick-off" meeting with manufacturers in November. Alecia Ward, EWC Executive Director, addressed the group along with representatives from NFRC and Energy Star.

ANDERSEN WINDOWS IN SUMMER HOUSE

The Summer House in Gainesville, FL will shine next year, thanks in part to efficient windows donated by Andersen Corporation. The building will serve as a reception and educational center for the more than 35,000 visitors that annually delight in the Kanapaha Botanical Gardens. Summer House was designed as sustainable, environmentally- and energy-efficient building that will complement the lovely natural setting.




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Fannie Mae Offers Residential Loan Program for Energy Saving Measures

Fannie Mae, the nation's largest source of home mortgage funds, is offering low interest rate, unsecured energy improvement loans up to \$20,000 under a program designed to encourage installation of energy-saving measures, such as efficient windows.

Consumers whose utilities are sponsoring the program can request unsecured loans of up to 10 years at below market interest rates (compared to other unsecured consumer loans) for home improvements such as replacement windows and doors, new heating and cooling systems, water heaters, ductwork upgrades and insulation. Requests for a loan can be processed quickly, often within a matter of hours.

The loan program enables utilities (or others) to offer a significant consumer service while promoting a "whole house" or bundled approach to efficiency upgrades. Loans are originated and serviced by a Fannie Mae-approved third party on behalf of the utility company. Southern California Gas, for example, uses Volt/Viewtech to originate and service the loans, while Wisconsin utilities work with Wisconsin Energy Conservation Corp (WECC.)

Volt/Viewtech President James S. McLain said that new windows are easily one of the most popular measures financed in his state through Fannie Mae. In California, conservation measures financed help bring a home up to Title 24 state building standards. "Windows account for half or more of the roughly \$10 million we financed under this pro-

gram in 1999 alone," said McLain.

First Financial Funding Group (FFFG) is another organization that handles the loans for sponsoring utilities. They started with American Electric Power and recently launched a new initiative with Pacific Gas and Electric.

Windows are one of the more popular items financed . . .

Greg Sanders, FFFG's Director of Marketing, explained that his company "made a commitment" and will finance only products that meet Energy Star standards or higher. Although the program is less than a month old, 80 con-

tractors have been placed on the approved list and they are already reporting more success in marketing high efficiency products.

In one success story, the contractor told Sanders that he was able to beat out two lower bids of \$6,000 and \$6,500 to win an \$11,000 renovation job, when he was able to educate homeowners about the benefit of high performance products. Efficient windows were a major part of that contract.

Fannie Mae is in the process of expanding the energy loan program and is exploring partnerships with various state governments, trade associations, manufacturers and others. "We've been talking with each of the major window manufacturers," said David Carey of Fannie Mae.

For more information, contact David Carey at Fannie Mae (978)468.9932.

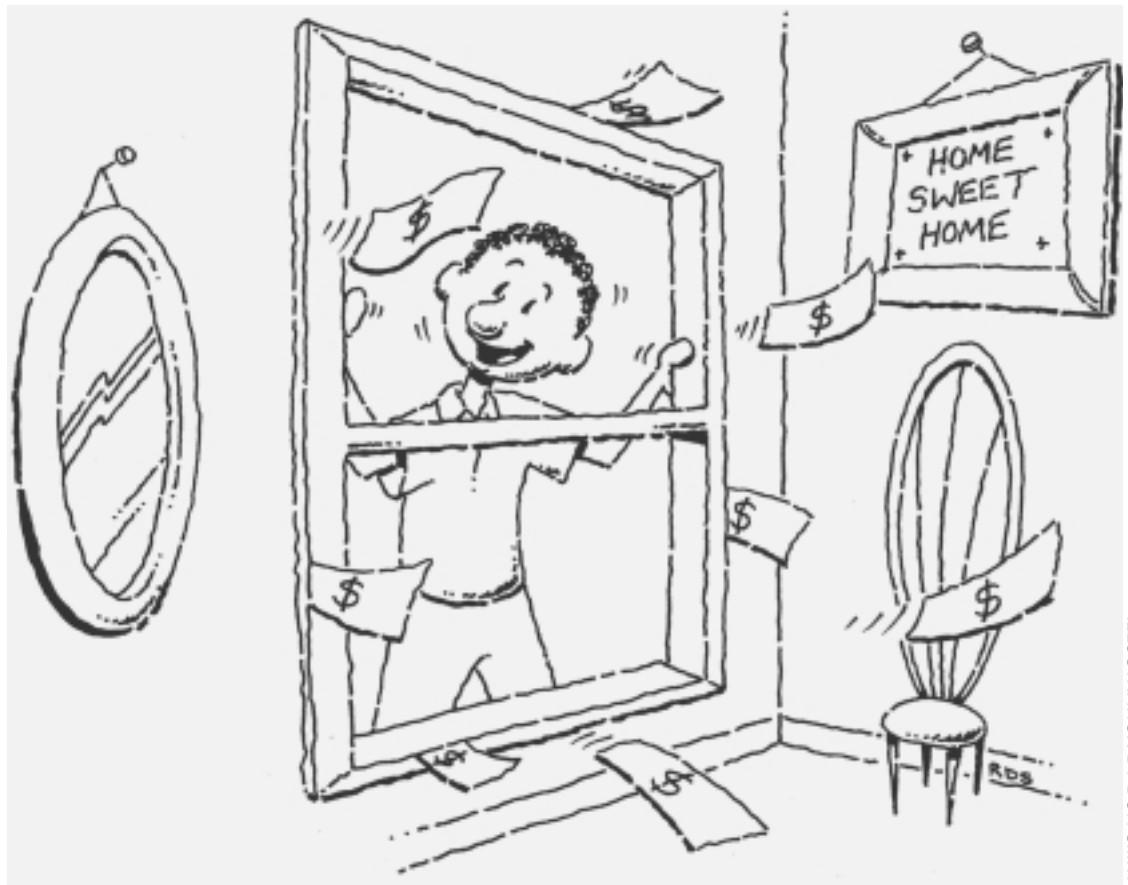


ILLUSTRATION BY DON SMITH