



# SEEING THE LIGHT:

## Understanding Today’s Evolving Fenestration Codes – And Strategies to Achieve Compliance

August 2009

### TABLE OF CONTENTS:

Executive Summary	2
.....	
Many Codes, Many Standards, Many Questions	3
.....	
Tying It Together: What Will This Mean to Manufacturers for the future?	5
.....	
Conclusion: Strategies to Achieve Compliance Today and Tomorrow.....	8
Appendix I: Codes and Standards – A Brief Primer	
▪ “30/30” Provision: American Recovery and Reinvestment Act of 2009 (ARRA).....	11
▪ ENERGY STAR.....	13
▪ American Society of Heating, Refrigeration, Air Conditioning Engineers (ASHRAE).....	15
▪ International Code Council (ICC) / International Energy Conservation Code (IECC).....	17
▪ National Fenestration Rating Council (NFRC).....	18
Appendix II: About Technoform.....	19
Appendix III: Additional Resources.....	20
Appendix IV: Footnotes.....	20



**EXECUTIVE SUMMARY**

Today, the United States fenestration industry stands at a defining juncture in its history. The nation's housing market index has sunk to an all-time low. Housing permits are at the lowest levels ever recorded. Commercial building has also declined sharply. Not surprisingly, door and window manufacturers are feeling a heavy burden that directly impacts annual revenues.



In the midst of all this, government and some organizations have stepped up their efforts to enact more stringent energy codes, guidelines and product performance recommendations, with more revisions expected soon.

Within the past few months alone, President Obama and Congress enacted the much-publicized American Recovery and Reinvestment Act (ARRA) of 2009, which extends and modifies tax credits for windows, doors and skylights established in the Energy Policy Act of 2005. The American Society of Heating, Refrigeration, Air Conditioning Engineers (ASHRAE) has also released new guidelines in 2009 that affect window, door and skylight production. The U.S. Department of Energy (DOE) is now revising ENERGY STAR® Phase I requirements in anticipation of activating them on January 4, 2010. Phase II research will begin later this year, signaling even tighter specs to come. Many elements of the International Code Council (ICC)'s International Energy Conservation Code (IECC) also parallel ENERGY STAR requirements, including a distinct set of International Residential Code (IRC) guidelines. In June, the U.S. House of Representatives passed a landmark energy and climate bill which provides incentives for developing natural-gas powered cars and energy-efficient mobile homes, plus financial rewards for early participants in the Chicago Climate Exchange, North America's first trading center for greenhouse gas emissions. The pace of change is increasing dramatically, and our industry must keep up.



STAR requirements, including a distinct set of International Residential Code (IRC) guidelines. In June, the U.S. House of Representatives passed a landmark energy and climate bill which provides incentives for developing natural-gas powered cars and energy-efficient mobile homes, plus financial rewards for early participants in the Chicago Climate Exchange, North America's first trading center for greenhouse gas emissions. The pace of change is increasing dramatically, and our industry must keep up.

All this begs several questions: How important will highly energy-efficient products be to manufacturers and consumers in the markets of tomorrow? Will consumers be willing to pay for fenestration products that meet coming code requirements? Will future codes be too restrictive, given the current state of technology? Could windows and doors become too expensive to produce? And will manufacturers have adequate time to respond to the mandated changes in their products?

***What to do?***

At Technoform, we believe that it serves everyone's interests for manufacturers of windows, glass doors and glass curtain wall systems to be informed, understand specific elements of changing codes and standards that are relevant to their businesses, and participate in evolving code and regulatory changes. We believe that fenestration technology has taken quantum leaps recently, prompting some overseas governments, most notably in Western Europe, to mandate that energy-efficient building products and processes be integrated into the fabric of their societies. We believe that energy-efficient products support our country's energy security goals while also gaining popularity for renovation, retrofit and new construction projects. And finally, we believe that compliance with current and future codes is not only achievable, but it will help manufacturers boost revenues, create new channels of opportunity and build better products using less energy.



In the end, everyone wins – manufacturers, end users, the country – and yes, the planet.

Finally, we believe that the path to compliance is best traveled with an experienced partner. Such a partner should be steeped in global best practices. They should help you monitor outside entities and influencers and keep you informed of changes in codes, guidelines and regulations that pertain to your business. And they should be willing – even eager – to work alongside you to mitigate the risk of product mix transformation by helping you to simulate and test products that will remain viable well beyond your next sales cycle.

Change is never easy, and today's world is challenging enough without continued confusion over the basic rules of doing business. Accordingly, this resource will define elements of the most relevant and accepted fenestration codes and guidelines; it will clarify recent changes; it will identify connections and relationships among them; and it will highlight strategies designed to streamline a manufacturer's path to compliance in a fast-changing environment.

## **MANY CODES, MANY STANDARDS – MANY QUESTIONS**

Americans have long consumed energy as if there was an unlimited supply. The U.S. contains only five percent of the world's population, yet it is the largest single producer of greenhouse gases. However, recent trends, fueled in large part by a growing body of scientific evidence, signal a fundamental shift in that thinking.

From the rising cost of electricity and natural gas and movement toward a CO<sub>2</sub> cap to stricter energy codes and the emergence of green building and LEED, the U.S. has entered a new – and irreversible – phase of building construction and operation. Even commercial property values, rental rates and occupancy rates are beginning to directly reflect the degree to which a building uses energy efficiently.

According to the DOE, today's buildings consume 39 percent – or more than a third – of the total energy produced in the U.S. As public awareness about environmental issues has grown during the past several decades, building and energy-usage codes and standards here in the U.S. have, slowly and with little fanfare, reflected that awareness by becoming more stringent. Now, that once-steady pace of change has quickened and expanded in many states to mandate energy efficiency in nearly every material element of a residential or commercial structure.

Driving that change is a revision process for fenestration performance codes and standards that is becoming streamlined with an unprecedented sense of urgency. Here's why:

Traditional code revision processes in the U.S. for products such as windows and doors begin with a code body initiating a period of public comment, then issuing a code proposal, fielding more public comments, and finally voting. While this process normally lasts one to two years, the actual time required to implement changes often takes longer.



Recently though, government officials indicated their intention to write an *overriding* federal code if each body didn't increase their building envelope efficiency by 30 percent. Until now, code bodies have been influenced to a large degree by manufacturers and the industry in general. But the power balance has shifted somewhat, and the federal government's proposed action forces their hand, compelling them to seriously rethink this time-honored process.

Concurrently, the federal government has also made economic stimulus money available to states that adopt its latest energy codes. In fact, the General Services Administration has budgeted \$4.5 billion to retrofit existing federal facilities with high-performance, energy-efficient and green building technologies. But some states don't even have energy codes, while others maintain codes that are 10 or even 15 years old.

Nearly everyone can agree that stricter codes and standards are intended largely to reduce a building's overall load, lower costs for owners and tenants, and move the U.S. toward energy independence. Already, the Energy Policy Act of 2005 requires all new federal buildings to be 30 percent more efficient than the 2004 model codes. Thus, we at Technoform see states' adoption of tougher codes as inevitable, and sooner rather than later. As this happens, fenestration products that help homeowners and other consumers meet stricter energy standards – and obtain valuable tax credits – stand to gain significant revenues and market share.

Collectively, revised codes and standards will fundamentally change the way that "high-performance" industry products are defined. Though energy efficient technologies have already been designed and implemented in societies throughout Western Europe and beyond (see Sidebar: Looking East, page 7 for more information about this), reaction here in the U.S. to recent and planned changes runs the gamut, from surprise and support to uncertainty and resistance.

Traditional economics of commercial and residential development have sought to minimize initial construction costs and meet minimal compliance with fenestration performance standards. Yet as stimulus money continues to fund initiatives across the infrastructure spectrum, builders and fenestration manufacturers alike would be wise to consider shifting their perceptions about energy efficient products and technologies accordingly. Doing so could help them make a compelling case to their customers

#### DID YOU KNOW...

**While codes are tightening, the fenestration industry has kept pace with dramatic technological improvements in recent years.**

**More are expected soon.**

**Examples include:**

**Glazing improvements for glass:** Low-E glass coatings work by reflecting or absorbing heat energy. The variety of Low-E coating and the position in the window dictate how that window will perform. Low-E spectral coatings help to reduce the amount of solar heat gain and control the amount of visible light that a building takes in. This, in turn, reduces that building's HVAC load.

Low-E continues to gain popularity, as do selective custom coatings, films and tinting applied to glass. Spectral film in particular is increasingly relied on for both its tinting and reflective qualities. Today's films and tints are much more efficient than their predecessors in reducing a building's solar load.

**Glazing improvements for multiple layers (insulated glass):**

Major advances have boosted glazing performance through the use of inert gases, laminates, warm edge spacers, diffused light panels, triple and quadruple glazing, and suspended films. More double-glazing units are being used in the Southern U.S., while triple-glazing is gaining popularity in the far Northern U.S.



About the broader value of the products they are buying. Energy efficiency may be a socially responsible value; but it can also yield higher product performance, increased user comfort and productivity, reduce operating costs and potentially generate higher resale prices.

## TYING IT TOGETHER: WHAT WILL THIS MEAN TO MANUFACTURERS FOR THE FUTURE?

Broader implications aside, the enactment of ARRA mandates that eligible windows, skylights, glass doors and glass curtain wall systems must have a U-factor of  $<0.30$  BTU/hr-ft<sup>2</sup>-°F and a SHGC of  $<0.30$  in order for buyers to qualify for tax credits. Arguments can be made about the validity of these numbers in different geographical regions and climates; but officials didn't base requirements on what is necessarily easy to achieve. Ultimately, we believe that the goal of this incentive is to help cut ownership and occupancy costs, reduce energy usage and promote greater energy independence. Initial costs may still be slightly higher for energy efficient products, but the payback gap is narrowing, and at this stage, there's no turning back.

Beyond the base numerical requirements of ARRA and its namesake 30/30 provision lie deeper truths for today's window, door and skylight manufacturers. Early on, government officials and regulators identified residential windows as one of the most effective ways to begin down the path of energy independence. ENERGY STAR was widely embraced by home builders and window manufacturers for its ability to generate energy savings for homeowners and utilities alike. As a result, DOE's Richard Karney states that approximately 60 percent of new construction windows qualify for ENERGY STAR, while 90 percent qualify on the remodeling side<sup>A</sup>. Unfortunately, non-residential window manufacturers have been slow to adopt similar standards, partly because ENERGY STAR was not promoted for non-residential products.

That will change as federal, state and local governments begin to enforce requirements that were long unenforced, and often did not exist. In fact, enforcement will likely become mandatory as the recent federal stimulus package demands it in order to qualify for funds. Now, for states to receive stimulus funds for energy efficient projects, they must adopt recent energy codes *and* develop a program to ensure that those codes are enforced.

Accordingly, manufacturers of non-residential windows are best served by developing products now that conform to ARRA provisions – or products that conform to applicable codes in specified areas. Likewise, manufacturers that anticipate

### DID YOU KNOW...

#### Today's Highest-Performing Structural Insulating Struts Provide Unprecedented Advantages:

- New depths in thermal performance for lower U-factors/improved condensation resistance
- Dimensional stability and tight tolerances
- Custom design and prototyping capabilities, C and T shapes, gasket holders, screw bosses, multiple hollows, parting stops
- Two-tone finishes to save time-consuming masking and re-painting
- High melting temperature and superior heat resistance upholds structural integrity
- Chemical resistance
- Material quality



tomorrow's codes and plan their product cycles accordingly can position themselves to meet evolving consumer tastes and profit well into the future.

### **RESIDENTIAL CONNECTIONS**

"Residential" codes cover homes, apartments, dorms and assisted care facilities that are three stories or less. The IRC only covers detached one and two-family dwellings that are three stories or less.

For residential construction, the IRC and IECC have emerged as the most widely used national codes. In fact, about 70 percent of states have adopted IRC, IECC or the equivalent. Today, 35 states have adopted IECC or equivalent. Currently, two states use IECC 2001, while six states use IECC 2003, 24 states use IECC 2006 and three states use ASHRAE 90.1-2007.

The 2006 IECC commercial U-factors feature a curtain wall range of 0.45 BTU/hr-ft<sup>2</sup>-°F (Climate Zones (CZ) 5-8) to 1.20° BTU/hr-ft<sup>2</sup>-°F (CZ 1) and a windows range of 0.50 BTU/hr-ft<sup>2</sup>-°F (CZ 7-8) to 1.20 BTU/hr-ft<sup>2</sup>-°F (CZ 1). Concurrently, the DOE and others are calling for tougher codes. *In fact, the DOE is contemplating a goal of 0.10 BTU/hr-ft<sup>2</sup>-°F by approximately 2016.*

### **COMMERCIAL CONNECTIONS**

"Commercial" codes cover everything not covered by residential codes. This includes high-rise residential structures four stories and higher, hotels, motels, institutional living facilities and anything non-residential.

On the commercial side, ASHRAE 90.1 and the IECC Chapter 5 remain the most widely used national codes. ASHRAE 90.1 is the energy standard for buildings except low-rise residential buildings. Specifically, 25 percent of states accept only ASHRAE 90.1, while 55 percent accept either ASHRAE 90.1 or IECC. 20 percent use neither. Although IECC has increased from 18 percent in 2004 to its present level of 55 percent, it still references ASHRAE 90.1.



## LOOKING EAST: Europe’s Green Road to Energy Efficiency

As the saying goes, necessity is often the mother of invention. This certainly holds true in regard to designing energy efficient solutions to meet pressing societal challenges. And nowhere are the results more dramatically illustrated than across the Atlantic.

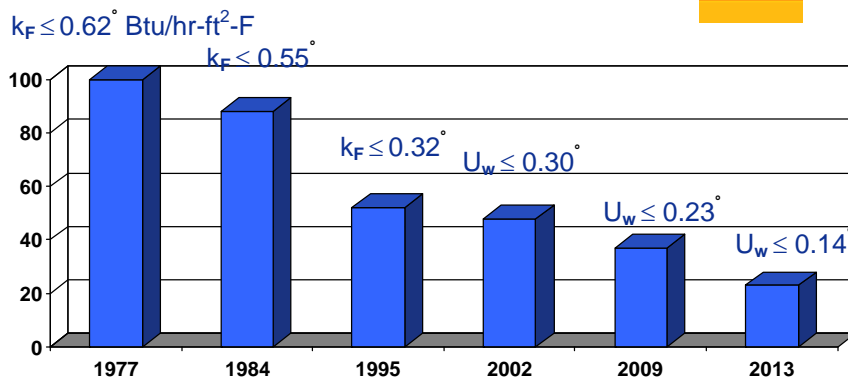
As the U.S. integrates more energy-efficient products and practices into the fabric of our society, it’s instructive to know that this path already has been traveled by others. In fact, several European countries have made energy efficiency a top-down mandate for decades. The result: Buildings use less energy, mitigate their environmental impact and incorporate new technologies that help companies there reap better profits and higher margins. Additionally, these countries experience an improved balance of payments since they pay less for imported petroleum-based energy. The structural costs and carbon footprint of a society due to energy are also lower. Countries throughout the world, including ours, would be wise to heed their example.

Today, reducing energy consumption and eliminating energy waste are among the primary goals of the European Union (EU). In 2006, the EU pledged to cut its annual consumption of primary energy 20 percent by 2020. To achieve this goal, it is now working to set minimum energy efficiency standards and rules on labeling for products, services and infrastructure.

Countries such as Germany now maintain one of the most stringent requirements for building energy usage anywhere by mandating U-factors as low as 0.20 BTU/hr-ft<sup>2</sup>-°F. As with their U.S. counterparts, many manufacturers there believed that number was unattainable. Yet there remains a higher level of awareness about energy usage in relation to comfort levels in Europe than the U.S.

In response, countries such as Germany and Great Britain have developed technologies to maximize fenestration performance for residential and non-residential buildings. Great Britain has moved from U=0.63 BTU/hr-ft<sup>2</sup>-°F to 0.32 BTU/hr-ft<sup>2</sup>-°F in four years. And as the chart below illustrates, U-factors in Germany have steadily declined for more than 30 years, with additional reductions predicted over the next four years.

### Evolution of U-Factors in Germany





## CONCLUSION – STRATEGIES TO ACHIEVE COMPLIANCE TODAY AND TOMORROW

**Be informed. Be involved. Be prepared.**

In 1973, the typical residential window in the U.S. was clear and single-glazed, with double-paned and storm windows predominant in northern states. The average U-factor was 0.85 BTU/hr-ft<sup>2</sup>-°F. In 2003, 95 percent of typical residential windows were double-glazed, and half had a low-E coating. These windows yielded a 30-65 percent energy savings over their 1973 counterparts, with an average U-factor of 0.45 BTU/hr-ft<sup>2</sup>-°F.

By 2030, typical residential windows in the U.S. are expected to feature zero net energy transfers and winter energy gains while offering an 80 percent savings in cooling costs. Average U-factors are expected to be 0.10 BTU/hr-ft<sup>2</sup>-°F.<sup>B</sup>

Change is upon us, and manufacturers of windows, glass doors and glass curtain wall systems should prepare for more. With a new Congress and a new Administration in Washington come different priorities than those of the recent past. Addressing climate change and creating an energy efficient economy are but a few of these.

Therefore, the argument that revised codes and guidelines are too stringent won't likely resonate with legislators and regulators. The DOE's ENERGY STAR requirements alone are supported by ASHRAE, the American Institute of Architects, the U.S. Conference of Mayors, several environmental groups and 15 other U.S. federal agencies. Additionally, initiatives to construct green buildings are forecast to grow by 400 percent over the next two years alone – to a whopping \$60 billion. Manufacturers that do not embrace change will likely place themselves in positions of weakness relative to competitors who leverage revised guidelines as opportunities to innovate.

External change invariably creates challenges for manufacturers, and now is no exception. Not only have energy codes become more aggressive, but the federal government will require states and municipalities to improve their enforcement of these codes. And despite a great deal of talk in fenestration circles regarding new codes, there's little mention of the sheer volume of recent projects that don't meet even current energy codes. A new wave of enforcement, coupled with stricter codes of tomorrow, could cause a "double whammy" for fenestration manufacturers that have not kept pace.

### DID YOU KNOW...

#### High-Performance Warm Edge IG Spacers

#### Offer Distinct Benefits:

- Tangible energy savings
- Improved overall system U-factor
- Higher sightline temperatures / Improved condensation resistance
- Prevention of moisture and mold
- Better indoor air quality
- Reduced carbon footprint / Positive environmental impact
- Key component in drive to achieve energy independence



Manufacturers could also make a strong case that NFRC model sizes are too restrictive for non-residential or for some materials in order to achieve performance levels that are now – or could be – required. They may argue that requirements are more easily met by producing larger-sized products or based on a project-specific basis.

At Technoform, we believe it's necessary to find a balance between aggressive energy savings targets, cost-effective payback to consumers and building owners, and job creation. During tough recessionary times, investing in product development can be difficult. The good news: Fenestration technology has made great strides recently, and these advances make compliance with stricter codes and standards imminently achievable. Some companies will only need to make minor modifications to their current designs in order to comply with 30/30 and other revised codes and guidelines. Others may need to redesign their products. But whatever the case, staying put is not an option in an environment where \$1,500 residential tax credits remain key selling points.

**THE BOTTOM LINE:**

Once, there were wide variations in the requirements for compliance with these bodies. Today, such variation in performance requirements is negligible. Therefore, a manufacturer can simplify the process by complying with the lowest of these requirements.

**WHAT MANUFACTURERS OF RESIDENTIAL PRODUCTS NEED TO KNOW:**

Designing and marketing products that comply with ENERGY STAR guidelines has helped many U.S.-based residential manufacturers boost sales during the past several years. Likewise, the DOE has effectively marketed ENERGY STAR to homeowners and builders alike. Therefore, residential manufacturers of all sizes should continue to keep their market focus on ENERGY STAR in conjunction with IECC code compliance, if they choose to participate in that segment of the market. Future government incentives for energy-efficient windows may require ENERGY STAR compliance in order to qualify.

**WHAT MANUFACTURERS OF NON-RESIDENTIAL PRODUCTS NEED TO KNOW:**

Focus primarily on local and state codes applicable in your given market or markets, as well as IECC and ARRA guidelines where applicable for government contracts. For example, in California, be cognizant of California Title 24. In Colorado, consider only the IECC code requirements in Colorado. Most non-residential projects are based on architectural plans and specifications listing many or all of the above requirements. Most specifications also reference NFRC 100 and 200. It is important for non-residential manufacturers to remain aware of these requirements – or pick a partner who can help them understand it. Additionally, it's wise to keep an eye on current and planned developments within the code arena.

**THE LARGER MESSAGE:**

**Focus on what's important to you.  
Don't get caught up in the minutia of every code, regulation and guideline.**



**CONSIDER THE VALUE OFFERED BY AN OUTSIDE PARTNER**

Many factors push fenestration performance higher. Enhanced glass coatings, high-performance thermally broken frames and better warm edge IG spacers all provide substantial economic and environmental benefits. Sustainability will also be a driving force in building design and performance specifications.

Thankfully, affordable technology exists today to meet coming performance requirements for fenestration. Companies that embrace change will position themselves well within tomorrow’s value-added and growing market segments; those that don’t – won’t.

Can an outside partner help? Yes – and significantly. Such a partner will help you strategize your product development process in order to meet new performance values. That partner will help you get where you need to be in order to meet future market expectations. Experienced, credible and unbiased advice provided by an outside partner, combined with assistance in simulating and testing product designs, offer tremendous benefits. In fact, we believe it’s nothing short of research and development counsel – at no cost to you.

**HOW CAN AN OUTSIDE PARTNER HELP YOU ACHIEVE COMPLIANCE?**

As the industry’s leading global supplier of high-performance warm edge IG spacers and structural insulating struts, Technoform offers a comprehensive network of industry specialists that assist customers in the full range of challenges they encounter, including product concept, thermal simulation and testing support, rapid prototyping of custom insulating strut profiles, production layout and equipment specification, start-up assistance and establishing and monitoring quality control – all at no additional cost.

Technoform’s sales engineers, technical support staff and customer service representatives understand the challenges that manufacturers face to complete projects on time and on budget. They are knowledgeable, responsive, customer-focused and committed to providing fast turnaround to meet your needs. Additionally, state-of-the-art manufacturing processes at the company’s Twinsburg facility comply with Technoform’s worldwide production quality; ensure product quality, order accuracy and on-time completion.

As you move forward with refinements and designs for tomorrow’s marketplace, Technoform can help you manage a universe of outside information by monitoring governmental and industry entities and influencers on your behalf; *keeping you informed* about changes in codes and guidelines outside your direct sphere of concern; enabling you to reduce risk while developing market-driven products efficiently; counseling in lean manufacturing strategies; and helping you down the path to compliance.

*“Technoform offers its North American customers more than just a product – we are a total solutions provider. We first help customers understand the performance advantages that the TGI warm edge IG spacer and Bautec structural insulating strut provide. We then offer the technical expertise and support they need to integrate them cost-effectively into their operation and meet any structural specification.”*

**Mark Silverberg, President of Technoform North America**



## APPENDIX I: CODES AND STANDARDS – A BRIEF PRIMER

### ***“30/30” PROVISION: AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009 (ARRA) ([www.recovery.gov](http://www.recovery.gov))***

#### **BACKGROUND**

On February 17, 2009, President Obama signed into law the American Recovery and Reinvestment Act of 2009 (ARRA) which, among its many provisions, extends and revises existing tax credits for windows, doors and skylights established in the Energy Policy Act of 2005.

ARRA provides a substantial tax incentive for consumers to upgrade the energy efficiency of their homes. Manufacturers and dealers are already reporting increased demand<sup>C</sup> – a welcome change for residential fenestration manufacturers given tough economic conditions in both the housing and remodeling markets since 2007.

ARRA’s 30/30 provision includes a homeowner tax credit incentive of 30 percent of the cost of qualifying products, including energy efficient windows and doors, to a maximum of \$1,500 per household for 2009 and 2010. Homeowners that previously claimed tax credits in 2006 or 2007 are still eligible for the full \$1,500 limit. Note that the Internal Revenue Service has released stringent guidelines that extend beyond the ENERGY STAR label.

Qualification guidelines include the following restrictions:

- The tax credit for energy efficient windows and doors is only available for existing homes;
- Windows purchased must have a U-factor  $\leq 0.30$  BTU/hr-ft<sup>2</sup>-°F **and** a solar heat gain coefficient (SHGC) of  $\leq 0.30$ , regardless of the climate zone in which they are purchased;
- The Stimulus Law does not specify whether the qualification criteria are for center of glass (COG) or total window performance, but there is broad industry endorsement of total window performance as the appropriate measure of window U-factor and SHGC;
- ARRA mandates that the 30/30 performance criteria must apply throughout the country, regardless of climate zones;
- Homeowners are required to maintain records that the windows meet the qualification requirements. These records are to include receipts and the Manufacturer Certification Statement.

#### **WHAT’S NEW**

Previous tax credits had been limited to \$200 for windows and \$500 for exterior doors. Additionally, windows and doors needed only to be ENERGY STAR rated for homeowners to receive credits. Now, window and door performance must be equal to or below a U-factor and a solar heat gain coefficient of 0.30 BTU/hr-ft<sup>2</sup>-°F. Accordingly, the new law increases that maximum to \$1,500 for a household for 2009 and 2010.

#### **THE BOTTOM LINE**

Some manufacturers and insiders already have made a ‘one-size-doesn’t-fit-all’ argument in relation to different U.S. climate zones. Though we can’t predict how or whether 30/30 values might ultimately change,



we do believe that they will remain a popular incentive for 2009 and 2010. Equally important, we believe that compliance with these values is achievable, and will benefit everyone in the long run.

Moving forward, Technoform strongly supports the ideas of Paul R. Gary, Principal of the Portland, OR-based Gary Law Group who recommends common-sense guidelines with regard to ARRA in the May 2009 edition of *Window & Door Magazine*:

**“1. Confirm records and testing.** Ensuring that records contain recent testing data and performance measures allow manufacturers and distributors to rest on a foundation of proven data. Whatever representations you make – rating, performance or warranty – must be supported by testing and hard data.

**“2. Establish a plan to avoid misrepresentation.** Clearly establishing for distributors what products meet ARRA guidelines will help your sales force to avoid overselling and helps distributors to avoid misrepresenting characteristics to homeowners.

**“3. Avoid committing to the question of “Will I get a tax credit?”** Manufacturers and distributors of window products can control and represent what result has been obtained when their products were tested. They cannot give advice as to how the law will apply to third parties. Your representation that a product “has been tested and achieves results that meet the 30/30 standard” for a tax credit is wholly different than committing to the credit itself.”<sup>D</sup>

*(Paul Gary’s column appears in full on p. 14 of the May 2009 edition of Window & Door)*

For more information on ARRA, go to [www.recovery.gov](http://www.recovery.gov).

For more information on the Energy Policy Act of 2005, go to [www.irs.gov/pub/irs-drop/n-06-26.pdf](http://www.irs.gov/pub/irs-drop/n-06-26.pdf) .

**DID YOU KNOW...**

**Energy Savings from High Performing Fenestration Really Adds Up**

- The U.S. non-residential construction market alone in 2007 used 530 million square feet of glazing.
- The DOE’s goal for annual energy savings from all U.S. buildings is 5 quads of energy (5,000,000,000,000,000 BTUs) by 2020 – or the equivalent of 862 million barrels of oil. Ultimately, this will help to achieve zero-energy buildings in which no net energy gain or loss results from a building’s operation.

**Enormous potential energy savings can be achieved using existing technology...**

- Moving from single glass, non-thermal to thermal break frames using struts and high-performing, hybrid warm edge IG spacer can result in an annual savings of .75 quads of energy, based on the above-stated usage.
- 10,000 square feet of glazing can save 1.3 billion BTUs in one year (or about \$52,000), and reduce greenhouse gases by 57,000 pounds.



## ENERGY STAR ([www.energystar.gov](http://www.energystar.gov))

### BACKGROUND

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the DOE designed to save consumers and governments money and protect the environment through energy-efficient products and practices. Since its inception in 1992, it has become one of the most successful and widely used programs in the fenestration industry.



### WHAT'S NEW

The program's initial requirements established a U-factor of 0.35 BTU/hr-ft<sup>2</sup>-°F and a SHGC of 0.40 for residential products, depending on the climate zone. In March 2009, the DOE released new criteria proposals for ENERGY STAR windows, doors and skylights program which are scheduled to take effect in 2010. The proposed Phase I for 2009 lowers the U-factor to 0.30 BTU/hr-ft<sup>2</sup>-°F and the SHGC to as low as 0.25 depending on the climate zone.

Another notable change in the revised proposal includes a reduction in the number of climate zones in the ENERGY STAR map. The DOE previously proposed five climate zones, but elected to continue with four and keep the geographic names used in the present ENERGY STAR guidelines. Industry stakeholders had argued that the additional zones and nomenclature would create too much confusion.

Other major changes concern the window criteria for the Northern zone. The DOE tightened the U-factor criterion to the 0.30 BTU/hr-ft<sup>2</sup>-°F level set by ARRA to ensure that ENERGY STAR meets ARRA's threshold. To maximize the number of products qualifying in the zone, the DOE chose not to set an SHGC maximum.

The DOE's proposed ENERGY STAR Phase II may lower the U-factor to 0.25 BTU/hr-ft<sup>2</sup>-°F or below. Although the Energy Star label only currently applies to residential structures of three stories or less, the DOE is now considering the creation of an ENERGY STAR program for commercial fenestration.

### WHAT'S NEXT?: A Glimpse Into ENERGY STAR Phase II

- Richard Karney, Program Manager for the DOE's ENERGY STAR program, recently offered insights regarding ENERGY STAR including a few hints at what the program may look at for the yet-to-be-finalized Phase II.
- New ENERGY STAR Phase I criteria go into effect on January 4, 2010, and the transition period ends March 31, 2010. Phase II of ENERGY STAR has not yet been finalized, and the DOE won't consider that phase until later this fall.

Karney remarked that Phase II objectives include addressing issues raised during Phase I. This includes considering exceptions for products installed in high-altitude areas.

- Some manufacturers also requested that the DOE consider life cycle analysis, as well as credits for recycling. Additionally, a commercial program for ENERGY STAR is a possibility for the future should additional funds become available.<sup>F</sup>

### THE BOTTOM LINE

Results from the ENERGY STAR program really add up. Americans, with the help of ENERGY STAR products such as appliances, computers and windows, saved enough energy in 2008 alone to avoid greenhouse gas emissions equivalent to those from 29 million cars — all while saving \$19 billion on their utility bills.<sup>E</sup>



At Technoform, we believe that the DOE has, and will continue, to aggressively lead the charge toward enhancing the performance of building envelopes through revised codes and legislation. It appears that DOE officials have reviewed proposed standards by ASHRAE, ICC, ARRA and others. Additionally, IECC officials already have finalized and published IECC 2009 standards. Accordingly, these officials seem to have set proposed base requirements in conjunction with bodies that lead toward an energy savings goal of 30 percent. This bodes well for both manufacturers of windows, doors and skylights and consumers.



## AMERICAN SOCIETY OF HEATING, REFRIGERATION, AIR CONDITIONING ENGINEERS (ASHRAE) ([www.ashrae.org](http://www.ashrae.org))

### BACKGROUND

ASHRAE, founded in 1894, is an international organization of 51,000 professionals dedicated to advancing heating, ventilation, air conditioning and refrigeration through research, standards writing, publishing and continuing education.



ASHRAE has remained on the forefront of energy efficiency for more than 20 years. Though it seeks to maximize efficiency of HVAC systems and components, ASHRAE's guidelines are very similar to those of the DOE and ICC.

### WHAT'S NEW

Technically, ASHRAE produces standards; yet many states have adopted these standards as their code. Specifically, ASHRAE Standard 90.1 is a code-language document that has been adopted as state or local energy code in many jurisdictions. Alternatively, a jurisdiction may choose to adopt the IECC, which allows ASHRAE 90.1 as a compliance path. Standard 90.1 is updated by addenda that are compiled every 18 months, and is published in full every three years. ASHRAE 90.1 is not tied to a specific development schedule, other than publishing a new edition every three years. The next version is due by the middle of 2010 and will likely represent the most far-reaching improvement in commercial window energy codes in years.

### THE BOTTOM LINE

Recently, ASHRAE posted Standard 189.1P, "*Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*" for a second public review. This standard, developed jointly by ASHRAE, IESNA and the U.S. Green Building Council, will provide minimum requirements for the design of high-performance commercial buildings, addressing energy efficiency, sustainable sites, water use, materials and resources,

### GAZING FORWARD: What are ASHRAE's Future Priorities?

Several proposals of interest are currently in the ASHRAE 90.1 review process. These include:

- **Daylighting:** One proposal includes a SHGC exemption for skylights when used in conjunction with daylighting photo controls. This will ensure that low SHGC requirements don't also reduce the VT. Skylights must meet certain haze and VT requirements. This proposal also requires minimum skylight areas in large open spaces like big box retail stores and warehouses. In these cases photo controls must be used, and skylights must meet certain haze and VT requirements.
- **Air Leakage:** This will mandate tighter air leakage requirements for curtain wall and windows. Test standards will also be updated.
- **New Prescriptive Requirements:** ASHRAE plans to release a large proposal that completely revises all building envelope criteria.
- **Vertical Fenestration:** ASHRAE plans very aggressive changes in U-factor requirements. Officials are also planning to lower SHGC in an expanded territory in the Northern U.S. Additionally, new VT / SHGC requirements are being considered.
- **Skylights:** Criteria are being updated to match the 2009 IECC (although there is no distinction between plastic and glass). If the user meets daylighting requirements (controls, haze, high VT), then the revised code may allow a higher skylight area (6 percent), higher U-factor, and no SHGC requirement.



and indoor environmental quality. This is an attempt to create a building code for states or municipalities that is based on the optional LEED certification approach.

Overall, the proposed Standard 90.1 that will be finalized and released in 2010 appears now to be far more aggressive for window performance than past versions. This, in turn, may cause a significant shift in how commercial window manufacturers will produce and market their products. Residential programs and guidelines such as ENERGY STAR have become progressively tighter over the past several years; but ASHRAE 90.1 is the first indication that things are beginning to change significantly on the commercial side. Stay tuned....



***INTERNATIONAL CODE COUNCIL (ICC) / INTERNATIONAL ENERGY CONSERVATION CODE (IECC) ([www.iccsafe.org](http://www.iccsafe.org) / [www.buildingsafetyweek.org](http://www.buildingsafetyweek.org))***

**BACKGROUND**

The International Code Council (ICC), a membership association dedicated to building safety and fire prevention, and developing codes used to construct residential and commercial buildings, including homes and schools.



The ICC was established in 1994 as a non-profit organization dedicated to developing a single set of comprehensive and coordinated national model construction codes for residential and commercial construction. Though the ICC does not specifically set standards, most U.S. cities, counties and states that adopt codes choose the IECC codes developed by the ICC.

**WHAT'S NEW**

In September 2008, the ICC finalized the 2009 IECC, whose levels exceed those of current ENERGY STAR in several regions. It also features several changes from the 2006 version.

For many states, IECC Chapter 4 is the most widely recognized, adopted and mandated model energy code for residential use. However, it shouldn't be confused with the likes of IRC (International Residential Code) Chapter 11 and IBC (International Building Code). These two codes are designed for residential and non-residential buildings and may reference IECC criteria based on specified state requirements.

**THE BOTTOM LINE**

Local codes vary. About 70 percent of U.S. states have adopted IRC Chapter 11, IECC Chapter 4 or the equivalent. Several states are also "home rule" states and leave code adoption to individual towns and counties. Yet geographical areas can adopt different codes or different versions – or use unique codes specifically designed for that location. They can also make local amendments, or have no code at all.

A good resource is the Building Codes Assistance Project: [www.bcap-energy.org](http://www.bcap-energy.org). Because the law requires states to adopt the most recent code and enforce it to receive additional state energy grants, states are likely to adopt the 2009 IECC more quickly than they might have otherwise.



## **NATIONAL FENESTRATION RATING COUNCIL (NFRC)**

***www.nfrc.org***



The NFRC is a non-profit organization that administers a uniform, independent rating and labeling system for the energy performance of windows, doors, skylights, and attachment products. The NFRC strives to provide fair, accurate, and reliable energy performance ratings so that architects, builders, code officials, contractors, homeowners, and others can compare different products and make informed product choices. The NFRC also helps building officials, state government employees, and others involved in code development and enforcement determine if products meet local codes, while NFRC systems assist government- and utility-run energy efficiency programs in establishing performance requirements and standards.

Through the NFRC, manufacturers have a fair and level playing field to compare products and an accurate method of showing the energy benefits of new designs or technology.

Performance values proposed by the DOE, IECC, ASHRAE and local code bodies must be tested under NFRC test criteria and certification using specific window types and model sizes as listed in Table 4-3 of NFRC 100-2004 [see [nfrc.org](http://nfrc.org) for more information]. This is a critical step that must be taken in order to meet performance criteria since performance is based on small model sizes. It is many times easier to meet energy code criteria for a specific project – but it is much harder, and at times more expensive, to meet criteria based on small model sizes.

Throughout this paper we have not overlooked the NFRC criteria; rather, we have not referenced it extensively in order to avoid repetition.



## APPENDIX II: ABOUT TECHNOFORM

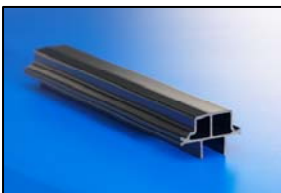
With its North American headquarters in Twinsburg, Ohio, Technoform is a global leader in the design, production and distribution of high-performance warm edge insulating glass spacers and structural insulating struts. Founded in 1969, Technoform holds 120 national and international patent registrations and maintains manufacturing and distribution facilities throughout Europe, Asia and North America. Technoform is a subsidiary of Kassel, Germany-based Technoform Holding.

### TECHNOFORM GLASS INSULATION TGI® WARM EDGE IG SPACER



As insulated glass and window manufacturers prepare for significantly tighter energy codes, they increasingly call upon Technoform's TGI® warm edge spacer to provide exceptional thermal performance, condensation resistance, structural rigidity and aesthetic appeal for residential and commercial applications. Backed by nearly three decades of global leadership and innovation, the TGI warm edge spacer features a unique hybrid design and offers superior warm-edge performance as measured by independent laboratory testing. Additional performance benefits include: exceptional argon retention; easy integration with current IG manufacturing equipment; machine-controlled muntin locations; corner connectors that incorporate argon-filling holes; and aesthetically pleasing sightlines. Several color options are available for a variety of market needs.

### TECHNOFORM BAUTEC STRUCTURAL INSULATING STRUT



Constructed of sturdy polyamide 6.6 with 25% glass fiber content, the Bautech structural insulating strut from Technoform enables aluminum fenestration and curtain wall manufacturers to provide the highest degree of thermal performance and structural integrity available today. It features an expansion/contraction rate equal to that of aluminum, thermal conductivity rates 700 times better than aluminum alone, and structural properties that exceed those of virtually every other thermoplastic available. The Bautech structural insulating strut is installed in millions of windows annually throughout the world and is backed by more than 25 years of success.

### CONTACTS:

#### Greg Decker, Bautech Market Team Manager

Technoform Bautech NA, Inc., 1755 Enterprise Parkway, Twinsburg, OH 44087  
Office: 330-487-6605. Cell: 216-544-3426. Fax: 330-487-6695 / gdecker@technoform.us

#### Milind Jhaveri, TGI Residential Market Manager

Technoform Glass Insulation NA, Inc., 1755 Enterprise Parkway, Suite 300, Twinsburg, OH 44087  
Office: 330-487-6663. Cell: 216-401-1157. Fax: 330-487-6691 / mjhaveri@technoform.us



## APPENDIX III: ADDITIONAL RESOURCES

- **R. C. Goyal, Technoform Consultant, Goyal & Associates, Temecula, Ca.,** contributed to the development of this white paper. He can be reached at (951) 972-2428.
- **American Architectural Manufacturers Association (AAMA):**  
www.aama.org
- **American Recovery and Reinvestment Act of 2009:**  
www.recovery.org
- **ASHRAE:**  
www.ashrae.org
- **Building Codes Assistance Project:**  
www.bcap-energy.org
- **Commercial Windows Web Site:**  
www.commercialwindows.umn.edu
- **Facade Design Tool** (allows users to compare window performance options using criteria including orientation, window area, daylight controls, interior and exterior shades and window type):  
www.commercialwindows.umn.edu
- **High-Performance Buildings Facades:**  
www.gaia.lbl.gov/hpbf
- **ICC/IECC/IRC/IBC**  
www.iccsafe.org  
www.buildingsafetyweek.org
- **IEA Daylight in Buildings Source Book:**  
www.gaia.lbl.gov/iea21
- **National Fenestration Rating Council (NFRC)**  
www.nfrc.org
- **U.S. Department of Energy ENERGY STAR Program:**  
/ <http://www.energy.gov/> [www.energystar.gov](http://www.energystar.gov/) / [www.energycodes.gov](http://www.energycodes.gov/)
- **U.S. Green Building Council**  
www.usgbc.org
- **Selective Glazings Application Guide:**  
www.windows.lbl.gov
- **Tips for Daylighting Guide:**  
www.windows.lbl.gov

## APPENDIX IV: FOOTNOTES

- A April 23 speech at Northeast Window and Door Association (NWDA) Educational Seminar and Fly-In, Washington, D.C.
- B Steve Selkowitz, Window and Daylighting Research Group, Lawrence Berkeley National Laboratory, from Window and Daylighting Research, Building Envelope Industry Executive Forum, Washington, D.C., October 15, 2008
- C John Swanson, Editor, *Window & Door*, Vol. 17, Number 4, May 2008
- D Paul R. Gary, Principal, The Gary Law Group, appearing in The Legal Department, *Window & Door Magazine*, May 2009.
- E [EnergyStar.gov](http://www.energystar.gov).
- F *Door & Window Manufacturer Magazine*, April 24, 2009