

A woman in a light green shirt and tan pants stands in a sunroom, looking out a large, multi-paned arched window. The view outside is a lush green forest with a wooden deck and potted plants in the foreground. The room is bright and airy, with a dark blue sofa visible in the bottom left corner.

a clear view

vinyl windows
and the **environment**

It's a simple goal in modern-day home life ...

keep cool in the summer and warm in the winter, while keeping energy costs low. The excellent thermal properties of vinyl windows make that goal attainable. The specially designed insulating airspaces in vinyl window frames – combined with their low conductivity – make them a formidable barrier to heat transfer. But their environmental performance in other areas also is impressive. This brochure will take a look at vinyl window attributes and their relationship to environmental performance.



\$125- \$340

annual savings¹ on energy bills by replacing single pane windows with ENERGY STAR[®] vinyl windows

¹Savings estimates based on regional population-weighted regional average annual energy use for a 2,000 square foot, single story, detached house with 15% glazing, gas heat and electric air conditioning. Estimates calculated using RESFEN 3.1 with default operational assumptions and window library. Estimates use state average utility rates (EIA, August 2004). Actual savings will vary by climate region and home characteristics.

Source: U.S. Department of Energy, ENERGY STAR[®] for Windows, Doors and Skylights



U-Factor* Ranges for Various Frame Materials

| FRAME MATERIAL | U-FACTOR |
|--|----------|
| aluminum (no thermal break) | 1.7-2.4 |
| aluminum (with thermal break) | 0.6-1.3 |
| aluminum-clad wood/ reinforced vinyl | 0.4-0.6 |
| wood and vinyl | 0.3-0.5 |
| insulated vinyl/ insulated fiberglass | 0.2-0.4 |

*A measure of the rate of non-solar heat loss or gain through a material or assembly. The lower the U-factor, the greater a window's resistance to heat flow and the better its insulating value.

Source: Residential Windows: A Guide to New Technologies and Energy Performance, Second Edition, J. Carmody, S. Selkowitz, L. Heschong, Oct. 2000

Designed to conserve energy

Vinyl window frames and sash corners are fusion welded for maximum strength and protection against air and water infiltration. Tests using the common measure of insulating ability, the U-factor, have shown that vinyl windows regularly outperform competitive products because of the excellent thermal performance of the frame (shown in table at left). Warm air stays inside during the winter and cool air stays inside during the summer. Energy is conserved and money is saved when the furnace and air conditioner don't have to work so hard to maintain the desired temperature.

Winning combination: high durability, low maintenance

Vinyl windows are impervious to rot, rust, corrosion, blistering, flaking and infestation by termites or other insects. Vinyl resists attacks by fungus and mildew, and scratching a vinyl window will not require any touch-up. Even better, a heavy rain or simply washing with water and a mild soap is all it takes to keep vinyl windows clean.

One billion pounds recycled in just one year

Vinyl can be reprocessed and recycled repeatedly. Scrap is routinely recycled directly back into vinyl products, making it a resource-efficient operation. In fact, 99 percent of the vinyl used by processors goes into a finished product.

A comprehensive study of vinyl recycling completed in 1999 found that more than 1 billion pounds of material were recovered in 1997 and recycled into useful products. Twenty million pounds of that were recycled at the post-consumer level.

Successful vinyl scrap buy-back programs initiated by window manufacturers have led to the diversion of more than 8 million pounds of window profile waste from landfills annually. Manufacturers also have produced window frames containing up to 25 percent recycled content.

Vinyl windows are so durable that the vast majority of them installed over the past 25 years are still in use and therefore not candidates for end-of-life or post-consumer recycling. When that time comes, however, vinyl windows – like all vinyl – can be recycled. As with any building product, the key to post-consumer vinyl window recycling is to find a cost-effective way to collect, separate, process and transport used materials to a manufacturer for use in new products.

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Piz Gloria ski lodge on Schilthorn mountain
in the Swiss Alps



Bellevue, Washington

number of vinyl windows sold to residential
market – the number one ranking

30.7 m



9.752
window profiles certified for performance
by manufacturers via the AAMA PVC Profile
Certification Program

million

Inherently fire retardant, meeting stringent fire requirements

Vinyl window products, which are based on a naturally fire retardant polymer, have excellent fire performance qualities. Vinyl is self-extinguishing when a flame source is removed.

In addition, vinyl windows are able to meet building codes for ignitability, flammability, heat release, burning rate, flame spread and smoke density, according to John A. Sharry, former fire chief and past chairman of the National Fire Protection Association Committee on Fire Fighter Occupational Safety and Health. Certain vinyl formulations are able to meet the stringent National Electrical Code of the National Fire Protection Association for insulating electrical and data cables.

Most fire scientists recognize that the largest hazards in a fire are heat and carbon monoxide, an odorless asphyxiant gas produced in abundance by all organic materials, natural and synthetic. The contribution of the combustion products from vinyl windows to the overall toxic threat of fires containing many types of combustibles is insignificant.

Made of plentiful natural resources

The leading component in the production of vinyl is common salt, an abundant and inert natural resource. More than half of vinyl resin is derived from salt, and natural gas or petroleum makes up the balance. Worldwide, vinyl production accounts for less than 0.3 percent of all annual oil and gas consumption and about 10 percent of annual salt consumption.

Environmental benefits across product life cycle

A study by life cycle assessment experts Greg Norris and Peter Yost² shows the use phase is the most important in terms of a material's life cycle impact, and counterbalances over time the environmental impact stemming from a product's manufacture. The material vinyl, because of energy efficiency, thermal-insulating value, low contribution to greenhouse gases, easy maintenance and superior durability of products made from it, provides excellent life cycle benefits.

A study conducted by Franklin Associates shows that vinyl windows require only one-third as much energy to manufacture as aluminum windows. That study also found that using vinyl over aluminum or steel window frames saves the United States nearly 2 trillion BTUs of energy per year – enough to meet the yearly electrical needs of 20,000 single-family homes.

²Gregory A. Norris and Peter Yost, "A Transparent, Interactive Software Environment for Communicating Life-Cycle Assessment Results: An Application to Residential Windows," Massachusetts Institute of Technology and Yale University, 2002.

Puget Sound, Washington



100%

amount of manufacturing
scrap that is recyclable

An industry focused on environmental health and safety

Vinyl can be formulated into products that meet health, safety and other requirements set forth by such agencies as the U.S. Food and Drug Administration, the U.S. Environmental Protection Agency, National Sanitation Foundation and Consumer Product Safety Commission, as well as model building codes.

The vinyl industry has subjected its products to extensive testing to demonstrate that they are safe to use. It maintains an active testing program to address new standards, as well as new concerns, as they develop.

Some concern has been expressed over formation of dioxin during vinyl manufacture or incineration since vinyl contains chlorine. Dioxin is not produced intentionally; it can occur when anything containing chlorine burns. Because chlorine is so pervasive in the environment, dioxin is a byproduct of natural events like forest fires, lightning and volcanoes, as well as manmade activities such as burning wood and backyard trash, diesel vehicle emissions and various manufacturing processes.

In fact, the biggest manmade source of dioxin today by far is backyard burning. Vinyl manufacturing today accounts for less than one percent of dioxin releases to the environment – less than many other manufacturing operations and building products.³ The good news, according to the U.S. EPA, is that dioxin emissions from human sources have declined by more than 90 percent in recent decades, and further declines continue to be documented.

Over the last 25 years, residential vinyl windows have shown an impressive growth history in North America. In the United States alone, more than 25 million residential vinyl window units were installed in 2002, 46 percent of all residential windows sold. This growth is the result of vinyl windows' ability to provide consumers with both environmental and economic benefits – energy efficiency, low maintenance and exceptional durability.

When installed correctly and maintained properly, vinyl window products will deliver long and reliable service and energy savings. The InstallationMasters™ Installer Training and Certification program for windows and glass doors, originally developed by AAMA, provides an avenue for installers to learn the techniques that have been adopted by the fenestration industry to ensure that long and reliable service.

a clear
view

³U.S. EPA Inventory of Sources of Dioxin and Dioxin-Like Compounds

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