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WHITE PAPER

Why Fiberglass for Windows and Doors

Similar to boats sitting in the marina, windows and doors have to withstand some of the most extreme weather conditions.

While market demand for windows decreased a staggering 44.8 percent during the 2005-2009 economic downturn, market share for fiberglass window units nearly doubled from 1.6 percent to 3.1 percent¹. Today, as the market continues to recover, the market share for fiberglass is reported at 5 percent². This trend is expected to continue as more industry professionals become acquainted with fiberglass windows and doors.

Development of a Revolutionary Design

Fiberglass windows and doors were first developed in Europe during the late 1980s. The revolutionary design addressed the demand for a strong, durable and low-maintenance frame type that would be more sustainable and environmentally-friendly than vinyl, wood and aluminum frames.



When first introduced into the industry, fiberglass window profiles were 'all fiberglass' and either pigmented or painted by the manufacturer. As fiberglass

evolved and became a trusted substrate for windows and doors, most manufacturers started offering acrylic-enamel or dry-powder coat options for longer lasting color. Powder-coated exterior finish or acrylic enamel based painted exteriors and interiors increase design options.

The tensile strength of fiberglass profiles is similar to steel frames. Testing has shown fiberglass profiles are three times stronger than aluminum and nine times stronger than vinyl. Fiberglass is the strongest frame for residential and commercial projects. The strength of fiberglass enables manufacturers to offer large sizes, accommodating large expanses of glass without requiring added support or reinforcement.

Market Demand for Sustainable Materials

The global green building movement is spurring demand for sustainable products with low lifecycle costs—and more mainstream window and door manufacturers are introducing fiberglass profiles to meet these demands.

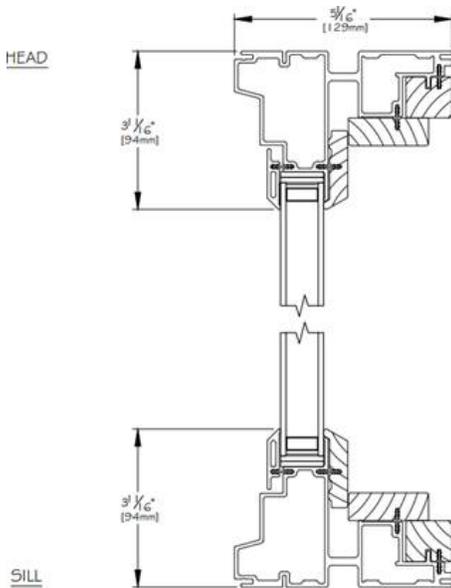
The energy performance rating of a fiberglass frame is similar to that of vinyl windows, especially with high-performance glass such as Low-E and with adding argon or krypton gas between the glass panes.

Fiberglass Strength

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The window frame is an important consideration for overall energy efficiency of the window unit as well as its life expectancy and aesthetic potential. Most frames are designed with hollows in the design that creates a convection of air flow to improve thermal performance. Aluminum is a naturally conducive material and therefore does not perform as efficiently as vinyl, fiberglass and other substrates. Even manufacturers that offer a thermal barrier between the exterior exposed aluminum and interior will not achieve test results to compare with the efficiency of vinyl, fiberglass and wood windows.

Because fiberglass profiles are made with silica sand, just like the glass, if there is any expansion and contraction, the components expand and contract similar to each other.

This is vastly different from most window and door frames which have an interface of different materials: glass on wood, glass on aluminum or glass on vinyl. Aluminum expands and contracts three times as much as fiberglass while vinyl over seven times more than fiberglass.

Minimal expansion and contraction puts less stress on seals and frame-to-seal connection, thereby reducing the potential for air infiltration, which is a major cause of a building's loss of energy efficiency. Engineers have developed built-in drainage systems to increase both energy efficiency and window longevity by keeping the harsh elements of wind, rain and cold to the outdoors while protecting the indoors.



Sustainability of Fiberglass

As a thermally set, inert material, fiberglass is non-polluting and does not out-gas or emit any volatile organic compounds over its entire lifespan.

Unlike vinyl or aluminum in a landfill, fiberglass does not leech chemicals into the ground or water. Quality fiberglass frames are composed of at least 60 percent glass and have a long life expectancy.

Manufacturers of fiberglass windows are beginning to adopt the newest advances in coatings technologies. Acrylic enamel paints have performed very well and in recent years, new coating technology such as powder coating is available for fiberglass profiles. Powder coating is not only considered more durable but is also considered a sustainable design choice for projects because of minimal waste. Powder coat processes have as little as 5% waste compared to acrylic enamel which can be well over 10% waste.

The Fiberglass Pultrusion Process

Manufacturers of fiberglass components develop recipes as individual as their own brand. The one common ingredient is silica sand, which generally makes up over 50% of the

Fiberglass Longevity

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fiberglass frame.

A combination of fiberglass strands, named rovings, held on spools along with fiberglass mats are fed through a synthetic resin bath that saturates the fiberglass materials.

When saturated, fiberglass materials catalyze; when heated to about 250 degrees F, the materials are then pulled through steel dies that will form the materials into various profiles design with exact standards for window and door manufacturing.

The pultrusion process is different from the extrusion process of aluminum or vinyl frames since fiberglass ingredients are “pulled through the shaping dies” whereas in the aluminum or vinyl extrusion process, ingredients are “pushed” through at higher speeds and temperatures.

Fiberglass and Wood

Wood is a readily available frame material, and for many years was the most common choice for homes. Wood windows have always been very popular not only for the beauty and elegance but also for the flexibility to shape, bend and size. While wood windows are strong and considered thermally efficient, they require maintenance. If not properly cared for over time, wood windows could be a source of heat loss due to expansion and contraction and lack of drainage at the sill in highly exposed projects.

The fiberglass pultrusion process can produce frames to take on complex profiles required for the look of painted wood windows. Fiberglass frames can also be designed with wood interiors and trim. Recent fenestration innovations have paired fiberglass with wood for the stability of a fiberglass exterior and a low-thermally conductive natural wood interior option.

Resources

¹ 2012 market study by American Architectural Manufacturers Association/
Window and Door Manufacturers Association

² Window Door Magazine January 2015 <http://www.windowanddoordigital.com/publication/?m=16633&l=1>

About Milgard Windows & Doors

Milgard Windows & Doors, a Masco company based in Tacoma, Wash., offers a full line of wood, aluminum, vinyl and fiberglass windows and patio doors for trade professionals and homeowners. The company has been recognized for manufacturing the nation’s highest quality vinyl windows six times in a yearly survey sponsored by Hanley-Wood Inc., publishers of Builder magazine. Milgard employs approximately 3,500 people nationwide. For more information, [visit milgard.com](http://milgard.com).