Advantages of Fiberglass Windows

The cutting-edge fiberglass framing systems of Alpen HPP offer superior performance to conventional fenestration materials in a number of ways: durability, stability and efficiency. Over the past 10 years, fiberglass has been used more and more in residential and commercial construction. It is becoming the preferred material for window frames and door panels

Advantages of Fiberglass

Fiberglass-framed commercial windows offer significant advantages, both thermal and structural, over traditional aluminum, vinyl, or wood framing materials. These benefits include super-insulation, structural performance, lower embodied energy, and new design choice. According to the American Composites Manufacturers Association (ACMA) Pultrusion Industry Council and the American Architectural Manufacturers Association (AAMA) Fiberglass Material Council:

- Fiberglass' thermal conductivity is 800 times less than aluminum, making it the optimum material for super-insulating windows and preserving overall performance for the life of a window.
- Low thermal expansion maintains the windows' structural integrity and minimizes warping or leakage, making fiberglass the most durable framing material that will not compromise the performance of the full window over time.
- Fiberglass particularly resists environmental damage caused by corrosive salt air or high temperatures.
- Comparing U-factor of materials, fiberglass offers 89% better insulation than aluminum (fiberglass U-factor is 0.2 – 0.3 compared to aluminum thermally broken of U-factor 1.0).
- Superior strength to weight ratios making Alpen Windows ideal for large window openings – 86% of the yield strength of aluminum and, pound-for-pound, stronger than aluminum in the lengthwise direction.
- Pultruded fiberglass distributes impact load to prevent surface damage even in sub-zero temperatures.

Unique Properties if Fiberglass:

- Dimensional stability with a coefficient of thermal expansion similar to glass
- Low thermal conductivity
- Low environmental impact – made of readily available silica sand
- Rot and corrosion resistant
- High strength-to-weight ratio and resists warping
- Chemically inert
- Easily paintable and re-paintable with minimum preparation

Benefits of Fiberglass – The fiberglass framing system of Alpen High Performance Products are dimensionally stable having low coefficient of thermal expansion, which maintains seal integrity and minimizes warping or leakage in high inside/outside temperature differentials.

- Performs well in humidity extremes and hot and cold environments.
- High condensation resistance reduces the growth of mold and mildew
- Very low coefficient of thermal expansion and contraction (CTE)
- Minimized stresses on seals, caulks and joints contribute to greater window efficiency
- Tight seals resist air leakage and water penetration
- Minimize maintenance
- Dimensional stability with extreme thermal cycling

Frame Materials – U-value Comparison

Frame Material	U-value
Aluminum (no thermal break)	**1.9 – 2.2**
Aluminum (with thermal break)	**1.0**
Aluminum-clad wood/reinforced vinyl	**0.4 – 0.6**
Wood and Vinyl	**0.3 – 0.5**
Fiberglass	**0.2 – 0.3**

Material Comparison

The following chart compares general structural, thermal, and other characteristics of fiberglass, aluminum and wood, demonstrating the higher overall performance of fiberglass according to information from the Pultrusion Industry Council.

	Fiberglass	Aluminum	Wood
Corrosion Resistance	Superior weatherability and resistance to a broad range of chemicals.	Can cause galvanic corrosion.	Can warp, rot and decay from exposure to moisture, water and chemicals. Coatings or preservatives required to increase corrosion or rot resistance can create hazardous waste and/or high maintenance.
Weight	Very lightweight - about 70% the weight of aluminum on a density basis. Specific gravity = 1.7	Lightweight - about 1/3 that of copper or steel.	Specific gravity = .51 (oven dried).
Electric Conductivity	Non-conductive - high dielectric capability.	Conducts electricity - grounding potential.	Can be conductive when it is wet.

	Fiberglass	Aluminum	Wood
Thermal Conductivity	Insulates - low thermal conductivity. 0.17 BTU/h-ft-F 5.0 x 10-6 in/in/°F 100 in. sample at a temperature change of 100°F = 0.05	Heat conductor - high thermal conductivity. Pure Aluminum – 136.9 BTU/h-ft-F Alloyed Aluminum – 92.4 BTU/h-ft-F Thermal coefficient of expansion 11-13 (IN/IN/Fo)106.	Insulates - low thermal conductivity. Pine/Spruce/Fir/Larch/Mahogany (softwoods) – 0.08 BTU/h-ft-F Oak/Maple (hardwoods) – 0.09 BTU/h-ft-F Low thermal coefficient of expansion 2.5 (IN/IN/Fo)106.
Strength	Ultimate flexural strength (Fu) LW = 30 ksi CW = 10 ksi. Compression strength is 30,000 psi. Tensile Strength (KSI) 60.0 Modulus of elasticity LW = 2.5 x 106 psi, CW = .8 x 106 psi. Stiffness: Pultruded fiberglass is approximately 1-1/2 times as rigid as wood. -Pultruded fiberglass has significantly higher strength-to-weight ratio compared to both wood and aluminum. -Pultruded fiberglass has 86% of the yield strength of aluminum and, pound-for-pound's, stronger than aluminum in the lengthwise direction.	Flexural strength (Fu) = 35 ksi.	Extreme fiber bending = up to 2800 psi.* Compression parallel to grain = up to 1800 psi.* Stiffness: Modulus of elasticity = up to 1.8 x 106 psi.* Deteriorates with age
Finishing	Special colors available. Composite design can be customized for required finishes.	Silver color. Other colors require pre-finishes, anodic coatings and paints.	Must be primed and painted for colors. To maintain color, repainting and refinishing may be required.
Impact Resistance	Glass mat in pultruded fiberglass distributes impact load to prevent surface damage even in sub-zero temperatures. Will not permanently deform under impact.	Easily deforms under impact.	Permanently deforms or breaks under impact
Life expectancy	80+ years without any maintenance.	30 to 40 years less if exposed to a corrosive environment such as coastal environments and acidic rain.	15 to 20 years if properly maintained, sanded, sealed and refinished every year. Less if not properly maintained