

Discover:

- Results from two studies that demonstrate that green buildings outperform their peers financially—in addition to energy savings
- Detailed financials on how the desire for greener buildings drives sales in our industry
- ✓ 3 ways green building strengthens your project ROI
- ✓ Why today's wood replacements are better than ever
- ✓ 5 ways Exwood reduces total cost of building ownership
- Which wood replacement product do top global commercial developments rely on to build green AND create aesthetic impact?
- Budget thumb rules for using wood composite use for your designs in ways that thrill clients—and the budget

# Better Green Buildings Meet the Bottom Line

Understanding and using

today's better wood alternatives

to improve design, thrill clients,

satisfy budgets, and increase project ROI



A white paper by Just Organic Products, a sustainable building resource for architects, builders and engineers worldwide. <u>http://www.justorganicproducts.biz</u>

## TABLE OF CONTENTS

BETTER GREEN BUILDINGS MEET THE BOTTOM LINE	3
DEMAND FOR GREEN BUILDINGS DRIVES INDUSTRY	4
BETTER FINANCIAL OUTLOOK FOR BUILDING GREEN	5
WHY WOOD ALTERNATIVES?	6
A BETTER BOTTOM LINE: WOOD ALTERNATIVES IN GREEN BUILDINGS	8
FIVE FACTORS THAT REDUCE TOTAL COST OF OWNERSHIP	9
TODAY'S WOOD ALTERNATIVES ARE BETTER THAN EVER, BUT <u>NOT</u> CREATED EQUAL	11
THE PVC DEBATE - THE CRITICS AND THE RESEARCH	13
CONCLUSION	16
FOR MORE INFORMATION	17
ABOUT THE AUTHOR	18



# Better green buildings meet the bottom line

This paper will demystify one of the most sustainable, renewable green building products—wood replacements, such as WPCs and SPCs.

#### You'll learn about:

- The growing demand for green buildings worldwide
- The financial benefits for choosing sustainable building
- How choosing the right wood alternative reduces the total cost of ownership for your client
- · Why new advances in wood replacements are changing the face of wood alternative building

As a result, this paper will provide you a working practical knowledge of the wood alternative and replacement landscape. You will be better able to source, price and select the right building materials for your next major project.



Figure 1 - Exwood decorative screen fence, Singapore.



Talk to sustainable building experts at Exwood about your next project at 905-260-9597.

# Demand for green buildings drives industry

Five years ago, less than half of all architects were incorporating sustainable design practices into projects.

In a dramatic shift, new research from The American Institute of Architects (AIA) shows that 70% of architects report client demand is the leading driver of green building, and they are changing their businesses to meet demand.

## Building green: better financially, medically, and legally

The primary reason clients demand greener, sustainable buildings today, is the reduction of operating costs.<sup>i</sup>

Green buildings also help address the growing problems worldwide with unhealthy indoor environments. According to the World Health Organization (WHO), as many as 30% of buildings experience sick building syndrome. Similarly, the U.S. Environmental Protection Agency (EPA) discovered that the health risks associated with brining indoor air are two to five times the risks of breathing outdoor air.

Ross Spiegel, author of **Green Building Materials: A Guide to Product Selection and Specification**, says poor indoor air quality (IAQ) is a growing financial risk for business. "Estimates range from tens of "Buildings are the leading provider of greenhouse emissions, and in 2005 the AIA set a goal to reduce carbon emissions from buildings by 50 percent by 2010 and to achieve carbon neutrality by 2030,"

--AIA EVP/CEO Christine McEntee

thousands to billions of dollars annually in employee sick leave, earnings and productivity losses," he writes. The staggering body of legal battles fought over poor indoor air quality because of unhealthy building practices includes Bloomquest v. Wapello County; Flores v. Winegrad, and Uricam Corp. V. Partridge Investment.<sup>ii</sup>

## Increased demand makes material selection more difficult

Between the business demand for better operating affordability, the business demand for reduced financial, legal and health risks, and the public's general demand for greater sustainability, it's no surprise that experienced architects are responding by significantly increasing their use of sustainable elements, such as wood alternatives.

By 2012, AIA expects that that 90 percent of architects will incorporate sustainable elements into new projects.<sup>iii</sup> As demand grows, architects and engineers are increasingly finding it difficult to separate the claims about green supplies from the facts. In addition, the demand for greener, healthier materials has made some of them pricier than project budgets allow.

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# Better financial outlook for building green

Before we dive into a primer on recent developments in the wood replacement product landscape, let's quickly review the latest financial case behind selecting green elements for your project. In a recent study by CoStar, green buildings have higher occupancy rates, stronger rents and better sales prices.

Using CoStar's commercial property database of roughly 44 billion square feet, the study analyzed over 1,300 LEED Certified and ENERGY STAR buildings that totaled about 351 million sq ft. These were compared with nongreen properties with similar size, location, class, tenancy and year-built characteristics to generate the results.

The study was funded by USGBC with support from the U.S. Environmental Protection Agency.<sup>iv</sup>

Buildings are poised to become a big target for consumption saving initiatives, in much the same way that motor vehicles have been in the last 30 years. -- BOMA, the U.S. Builders and Owners Management

# The Green Premium

Here's how two standards programs cut the energy use and enhanced the ROI of new commercial buildings.

	Energy savings	Rent premium, per sq. ft.	Increase in occupancy rates	Sales premium, per sq. ft.
LEED certified	25-30%*	\$11.24	3.8%	\$171
Energy star certified	~40%	\$2.38	3.6%	\$61

\* 25-30% for all LEED buildings, including certified, silver, gold and platinum grades. For gold and platinum, the savings approach 50%.  $^{\circ}$ 

## Three reasons green building elements strengthen project ROI

What this means for builders and architects is that implementing green building elements in each project can lead to:

- ✓ Better ROI for the client
- ✓ Long term savings for the client
- ✓ Higher initial project budgets (justified by long term financial gains thanks to a more sustainable building)

The case for building and designing greener buildings is clear. The challenge is also clear: finding approaches, systems, and materials to support the growing need to build green.

In this challenge, wood replacement products, including SPCs and WPCs, are gaining ground as a responsible alternative to wood.



# Why wood alternatives?

In the last decade, wood alternative products have emerged as the best option to substitute for wood, due to their many advantages regarding durability, safety, and sustainability. Many wood alternatives, in fact, do not contain wood at all, and rather extrapolate cellulose or silicon from other materials and incorporate it in the final mix.

Wood alternatives fall into two main categories, WPCs (wood plastic composites that incorporate only

cellulose) and SPCs (silicon plastic composites). These alternatives to wood differ significantly from brand to brand, with most offering safer, more flexible building. Broadly speaking, wood alternatives, like WPCs and SPCs are ideal resources to utilize in pursuit of greener buildings, for three main reasons.

## 1. Flexibility in Construction, Ease of Use

Aside from their myriad environmental benefits, many wood alternative products have significant benefits when compared to wood from a design and form perspective. Since most wood alternatives are ideal for injection molding and extrusion, there is no need for costly and/or specialized milling processes as there would be with a wood product. In fact, many no longer require specialized equipment to work, and can be cut and installed with conventional woodworking tools.

**WPCs**: Due to the flexibility of WPCs on the market, special designs, shapes, and curves can be achieved with relatively little difficulty. This allows the architect to work without the constraints normally inherent in construction with wood, enabling a significantly more artful, free-form palette.

#### WPC vs. SPC

Wood-plastic composites, or WPCs typically combine plastics--like highdensity polyethylene, PVC, PP, ABS, PS, and PLA--with organic or recovered materials, including sawdust, pulp fibers, bamboo straw, and digestate. The resulting composite is high in cellulose, from the wood product itself. WPCs are first-generation wood alternatives, and make up the bulk of available products on the market today.

Silicon plastic composites, or SPCs, incorporate non-wood products, such as rice husks, in the final composite. Rice husk, on average contains some cellulose and an additional 15% silicon, so it is an ideal source for the material.

**SPCs**: Most wood alternatives on the market today are WPCs, that is, they are a combination of wood product—like sawdust or pulp fibers—and are used in decking and façades. However, SPCs, a composite by Exwood and Just Organic Products, Inc., are quite literally the next step in the wood alternative product evolution. Exwood performs beyond current wood alternatives, and can be used as a viable wood *replacement* for a variety of applications. Exwood has also been used as a replacement for metal and other building materials.

## 2. Attractive and aesthetic

One of the most challenging hurtles wood alternative manufactures have faced is engineering a product that looks and feels like wood. Many WPCs achieve a uniform finish, lacking the depth and beauty of natural wood. While some builders use this to their advantage, by applying the WPC products in decking and other applications, these wood alternatives can be easily distinguished from wood.



✓ As you consider which wood alternative to use, demand samples. Different manufacturing processes, components, and designs make for a variety of qualities, textures, and looks.

**WPCs**: Since WPCs vary so much in regards to composition and formula, the final product's appearance is significantly different from product to product. While some offer wood grain textures, none can viably replace wood as far as look and feel are concerned. As such, many firms have strayed from incorporating WPCs in their designs

SPCs: Exwood from Just Organics, Inc., often surprises builders and architects alike with its resemblance to natural timbers. Made of 50% organic rice husks by weight, the product is also comprised of postconsumer PVC, and the end-product is fully recyclable. This combination, along with other components in the company's recipe, is the result of nearly a decade of research and development to achieve a product that truly replaces wood, and doesn't simply offer an alternative.

## 3. Available and affordable

While many cutting-edge green building products are developed in small supplies and can't be relied upon for large or long-term projects, wood alternative manufacturers and others rely on sustainable, enormous bulk processing methods.

WPCs: The majority of WPCs on the market today are plentiful and available. Though no two products are alike regarding their cellulose component-sawdust, digestate, etc-they are all readily available for large-scale projects. Some are recyclable.

SPCs: Exwood SPC goes a step further than WPCs on the market, since its composition incorporates discarded Asian rice husks, by-products of rice milling, a widely available resource. Additionally, Exwood is 100% recyclable after use with virtually no deterioration in the product. So, instead of starting from scratch with new trees, as would be required to replace a wooden structure, the cycle simply starts again.



Figure 2 - Exwood waved trellis, at the Peak in Hong Kong



# A Better Bottom Line: Wood Alternatives In Green Buildings

Yes, it costs more—at least initially.

As you plan your overall project for maximum overall client satisfaction, expect that by recommending a wood replacement, some initial out-of-pocket cost will be higher than with wood.

However, the average cost of upkeep for wood structures—including the need to seal, stain, clean and repair—runs approximately \$1 per square foot per year. Top quality wood replacements like SPC have virtually no upkeep. This information can help you calculate the differential between initial cost and maintenance cost.

#### **Budget Modeling For Wood Replacements**

For example, let's suppose the cost for wood replacement product is TWICE as high in material cost. On a project with 100,000 square feet of wood you're trying to replace, you can help your client consider the value of wood replacement like this:

Cost Factors	Wood	Wood Replacement
Initial Cost	\$50,000	\$100,000
Maintenance cost over 50 year life of building	100,000 square feet x 50 years x \$1 per square foot = \$5 Million	0
TOTAL COST:	\$5,050,000	\$100,000

Naturally, this is a simplistic model, but you can adapt it for your own specific project needs.

When you factor in other building risk and cost factors, such as air quality, safety and sustainability, the overall advantage of using quality wood replacement products like Exwood is clear.



# Five factors that reduce total cost of ownership

Wood alternatives in general offer a wealth of benefits in the areas of safety and durability when compared to wood. These advances mean that, in the long term, structures made with WPCs or SPCs, on average, have a longer lifespan than wood while offering resistance from the main concerns regarding wooden structures: rot, fire, and splintering.

#### 1. Non flammable

Safety is a great concern for builders, and especially in regards to flammability. How a wood alternative performs in fire tests makes a huge impression on backers and firms looking to tout the safety and sustainability of a building. Of course, wood is extremely flammable; many wood alternatives can outperform wood.

- **WPC**: In general, wood alternative products perform very well in fire-retardant tests. However, some have a very high combustion factor.
- **SPC**: Unlike composite products, Exwood SPC, due to the quality of its unique formulation, does not support combustion.

#### 2. Splinter-safe

Because SPCs and WPCs are comprised of small fibers, unlike the long fibers common in wood, they are ideal for applications where children are involved, as in playgrounds and parks. Many WPCs are dimensionally stable and reduce the risks of thermal contraction and expansion.

- WPC: Nearly all WPCs on the market are splinter safe, regardless of composition.
- **SPC**: Exwood is completely splinter-safe.

#### 3. Pest resistant

As a building ages, it becomes prey to the many vermin and pests that live nearby. The resources needed to combat the destruction of buildings from the inside out can be exhausting and expensive. But, unlike wood, some wood alternatives offer an easier way.

- **WPC**: Not all WPCs are equal; some contain sawdust and other materials that are still susceptible to pest invasion.
- **SPC**: Exwood does not support termites, carpenter bees, rats, or other pests as wood products do.

#### 4. Water resistant

Because organic fibers are sealed in a plastic resin, many wood alternatives are water resistant and will not rot or decay. In addition, water resistance is a natural property of the product—unlike treated woods, which have toxic properties that are of increasing concern to responsible developers.

- WPC: Many WPCs are relatively water-resistant. But some, especially those containing high levels of sawdust and bamboo, are subject to slippery conditions, and in some cases, mold and mildew.
- **SPC**: Due to the inherent qualities of the rice husk component in Exwood SPCs, the final product is completely water resistant. It is an ideal choice for maritime construction, and outlasts wood and cellulose-based WPCs.



## 5. Indoor air quality assurance

Additionally, because quality wood replacements are often inert—not flammable, not prone to rot, not prone to degradation by pests, not needing painting or other regular maintenance—their impact on air quality is excellent.

- **WPC**: Most WPC products on the market have a high IAQ rating, but not all. Individual manufacturers can illustrate the air impact of their products.
- **SPC**: Since IAQ is a top concern for many managers of older buildings, responsible building planners will welcome the reassurance of knowing Exwood can help employees and visitors to enjoy the best possible interior environment. The positive impact of SPCs on air quality is due to the unique formula of the product.

Characteristics	Exwood	Pressure-treated Pine	Cedar
Type or Classification	Cellular thermoplastic wood composite.	Softwood	Hardwood
Treatment Recommended	None	Chromate copper arsenate & sealer.	Water repellent sealer.
Maintenance	Low	High	Medium
Fire Rating Class (IBC)	1	3	2
Resistance to decay	High	Medium	Medium
Resistance to infestation	High	Varies with level of treatment.	Low
Resistance to marine borers	High	Varies with level of treatment.	Low
Resistance to UV rays	High	Low	Low

Figure 3 - Comparison Chart of Exwood vs. Traditional Wood Products



Figure 4 – Exwood curved deck, private residence in Singapore



# Today's wood alternatives are better than ever, but <u>not</u> created equal

The latest wood alternatives are no longer the plasticky materials that first appeared when the market was new and immature. One of the reasons is, today's scientific formulations are based on better materials, including rice husks, sawdust and bamboo.

As you consider which wood alternative to spec in your next project, also consider that not all wood replacements are created equal. Let's explore.

### Sawdust

Sawdust is readily available, and a byproduct of mills around the world; but because of its flammability, sawdust has long been considered a hazardous byproduct, especially when some sawmills store extremely large amounts of wood residues in one place.

There is also concern that substances like lignins and fatty acids within the wood can leach out into the ecosystem through runoff, and therefore cause toxicity.

Due to its ability to absorb moisture, composites made with sawdust are not immune to mold and mildew; upkeep is necessary to prevent rot, and the final project can be a slipping hazard in wet environments.

#### Bamboo

Bamboo, a grass, has long been hailed as an idea building material, since it is one of the fastest growing plants on earth, growing as high as 121cm in a 24-hour period. Typically bamboo powder is combined with plastic resins to create a largely water resistant composite.

However, because of the powder basis for this type of building material, it doesn't achieve the classic look of wood so appreciated by many clients. While the green building phenomenon looks great on the books, the final building also needs to look great—and many clients still prefer the classic look and feel of wood. Bamboo has yet to meet this criterion.

## **Rice Husks**

Why rice? Rice is one of the largest and most plentiful crops in the world, and its production requires the milling of the outer hull or husk, leaving tremendous amounts of rice husk byproduct. Often this product is used to fuel steam engines, sometimes directly by the rice plant itself. Relying on rice husks is completely sustainable as a byproduct of a huge industry, and this greatly decreases the end-user carbon footprint.

In building applications, rice husk has significant advantages even over pressure treated pine and cedar, including:

- 1. deterring mold and mildew
- 2. resisting bugs and pests
- achieving a grain and texture remarkably similar to wood
- 4. insulating well
- 5. retarding flammability, making it ideal in construction.

#### Top Developers Choose Exwood

Exwood in particular has seen success in a number of large-scale projects, most recently the Shangri-La hotel in Vancouver, BC.

The Living Shangri-La is a venture by the five-star Shangri-La Hotels and results, and the first of its kind in North America.

With a projected opening of 2009, the hotel will be the tallest building in Vancouver, and will feature a 44foot wide aerofin ceiling, and 1,500 square foot open-air terrace/bar deck all made from Just Organic Inc.'s Exwood SPC.



Rather than incorporating sawdust or bamboo, Exwood utilizes rice husks for superior performance and presentation. This combination allows for a significant number of advantages with no compromises to speak of. While some wood replacement products are splinter-proof, they remain flammable and/or moisture absorbent; others are non-flammable and water resistant, like bamboo, but don't offer the look and feel of wood.



# The PVC Debate - The Critics and the Research

All WPCs and SPCs on the market contain plastic in some capacity. But not all plastics are equal as far as performance and environmental standards. Three of the most common plastics used in WPCs are HDP (high-density polyethylene), PVC (polyvinyl chloride), and PP (polypropylene).

**HDP** - High-density polyethylene is a kind of polyethylene used in consumer products to the tune of over 60 million tons of material a year. This familiar plastic is used in everything from grocery bags to milk jugs, garbage containers, and water pipes. HDC is particularly well suited to injection molding. Chemically speaking, HDC is preferred by some wood alternative manufacturers due to its tensile strength and stronger intermolecular forces. It also can withstand higher temperatures than standard polyethylene. It is fully recyclable.

**PVC** - Polyvinyl chloride is a thermoplastic polymer; that is, it melts to a liquid when heated and freezes to a brittle, glass state when cooled. Thermoplastics can be reheated after they are set, and become soft and re-moldable. This thermoplastic feature is especially important when reuse and recyclability is concerned. Because of PVC's inherent flexibility, it is the plastic of choice worldwide for construction, making up 50% of the market. PVC is touted for its strength, durability, and superior performance in a wide variety of applications including piping, conduit fixtures, and vinyl siding, not to mention it being so well suited to recycling.

**PP** - Polypropylene is also a thermoplastic polymer, and is most frequently used in packaging, textiles, and reusable containers. PP is considered a more rugged plastic because it is resistant to chemical solvents, bases, and acids. Frequently used in injection molding, polypropylene is the main component in items from household cups and bowls to batteries. One of the drawbacks of PP is its degradation in UV radiation, including sunlight, and oxidation at high temperatures. For this reason, both UV-absorbing additives and anti-oxidants are added for longevity of the polymer.

## **PVC-Free - The Hard Research**

Over the last few years, concerns over various plastics have arisen, most notably the "PVC-Free" movement. Some WPC manufacturers, like CorrectDeck, have gone to great lengths to eliminate any use of PVC in their products, citing high dioxin levels, the release of carcinogens during incineration, and difficulties in recycling.

However, these claims have been tested again and again, and, as research has continued to demonstrate, proved wrong. Here we examine three of the most common claims against the use of PVC.

#### **Claim One: Dioxins**

As far as dioxins are concerned, the PVC industry is often cited as a culprit in rising levels. Extensive research in the UK has shown that this is not the case. As many environmentalists behind the "PVC-Free" movement fail to recognize, dioxins are not strictly produced synthetically; in fact, dioxins

can be produced both naturally and inadvertently as a consequence of a wide range of human activities... A variety of processes including the incineration of wood, volcanic eruptions, forest fires, metal production, vehicle exhausts, even composting and sewage, can all lead to the formation of dioxins<sup>vi</sup>



Further, a study by the Swedish Environmental Protection Agency confirmed that all heavy metal stabilizers used in the production of PVC do not, in fact, leach out dioxin at all. They remain firmly bonded to the PVC material.<sup>vii</sup> Any concerns regarding lead, as well, are unfounded as the metal is quickly being eliminated from PVC production. Exwood from Just Organic Products, Inc. does not include lead as a stabilizer.

#### **Claim Two: Incineration Dangers**

Multiple studies have been conducted to decipher the impact of incinerating PVC and the release of dioxins into the environment. In spite of claims to the contrary, research has proven that "the presence or absence of PVC in the municipal solid waste system makes no difference on the quantities of any dioxins produced upon incineration"<sup>viii</sup>. In fact, according to Professor C. Rappe of the University of Umea in Sweden, dioxin formation from PVC is no different than from sodium chloride (table salt).

Further consequent studies, including by the American Society of Mechanical Engineers, reported that the dioxin rate in a given incineration plant had less to do with the quantity of chlorine in the plant and more to do with the actual operating conditions within the plant.<sup>ix</sup>

#### **Claim Three: Recycling**

The most unfounded claim regarding the purported dangers of PVC is that it cannot be recycled, or is too difficult to recycle.

PVC is, however, easily recyclable, as are all other thermoplastic polymers. In fact, products like Exwood contain up to 12% recycled material and, further, can be completely recycled and reshaped into planks again. This is a tremendous change in the lifecycle of building materials. Due to the durability of Exwood SPC, the material is not damaged and incinerated, like pressure treated wood often is.

Many wood alternative products are also treated with preservatives, and do not run the same risks as pressure treated wood, or wood grown with pesticides. Countless studies have linked the leeching of arsenic to the chemicals and preservatives used in pressure-treated wood, and have been a cause for alarm in many communities<sup>x</sup>. The Exwood brand SPC eliminates this concern entirely.



Better Green Buildings Meet the Bottom Line 15



# Conclusion

- ✓ Building firms are continually looking for better, greener, more sustainable building materials as demand increases worldwide.
- ✓ Wood plastic composites (WPCs) and silicon plastic compounds (SPCs) are at the forefront of sustainable building as viable wood alternatives.
- ✓ WPCs, the first wave of wood alternative products, offer benefits unmatched by wood, but some brands are flammable, rot-prone, and simply do not look, feel, and act like wood.
- ✓ Because there is no standard recipe for WPCs, available brands on the market perform to different ends and include a variety of components including sawdust and digestate.
- ✓ Exwood, a SPC, incorporates rice husks as a main component, which is not only widely available but gives the final product a remarkably wood-like appearance without compromising resistance to moisture, rot, or pests.
- ✓ PVC, the plastic used in SPC, has is extremely safe to use, and completely recyclable.
- ✓ Using SPCs in your next project means you can benefit from a sustainable, attractive, durable, and safe complete wood replacement.



# For More Information

For more information on using renewable, sustainable wood replacements for your next project, please contact the experts at Just Organic. We can share similar projects, advise on engineering specifications, provide samples, and share case histories of Exwood in use at major construction projects across the globe.

www.justorganicproducts.biz 905-260-9597.



Figure 5 - Exwood Special Project - Bird Sculpture on Peak Island





# **About The Author**

Anthony Canavan is the founder and CEO of Just Organic Products, Inc., a company whose mission is conservation and recycling through earth-friendly innovations and solutions.

The company's first endeavor was the introduction of a successful organic fertilizer, which is now being marketed in the United States. In 2007 Anthony began marketing the composite product Exwood, produced in Malaysia. Exwood has already seen great acceptance in North America and Europe.

Anthony has 26 years of experience in the investment industry, providing sound advice as a business consultant, financial strategist and investment banker. His diverse business background makes him a much-sought-after professional worldwide, from Southeast Asia, Europe, Africa and North America.

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<sup>&</sup>lt;sup>ii</sup> Spiegel, Ross. Green Building Materials: A Guide to Product Selection and Specification

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