



Sustainable Commercial Interior Design

Growing concern over environmental problems and their connection to human choices has led to people striving to preserve natural resources and valuing the meaning of “sustainability.” Sustainable management will ensure that resources will be maintained and provided for future generations. Rapidly increasing awareness of the importance of such management has led to a change in the businesses practices for many companies. These companies are providing green products, enhancing the efficiency of their supply chain and management strategies, and yes, adorning their offices with eco-friendly decorations. If your business is taking part in the green movement, you should have the interior to prove it. Fortunately, sustainable products are being developed specifically for interior design. Low-VOC paints, sustainable hardwoods, recycled carpet, and several other products are available to make your office interior not only sustainable, but healthy, durable, attractive and professional as well. This can help your business in several ways, including the improvement of employee health and productivity, reputation, and profits. This document is meant to serve as a helpful guide for products and ideas to incorporate into your office design. It provides useful and current information and resources for both design professionals and consumers so that they can more easily incorporate sustainability into their work and lives.

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Introduction

Our vision is of a life-sustaining Earth. We are committed to the achievement of a dignified, peaceful, and equitable existence. A sustainable United States will have a growing economy that provides equitable opportunities for satisfying livelihoods and a safe, healthy, high quality of life for current and future generations. Our nation will protect its environment, its natural resource base, and the functions and viability of natural ecosystems on which all life depends. – The President’s Council on Sustainable Development.¹

In the past, companies have avoided the green movement for many reasons—lack of education, denial, and the belief of an associated hefty cost being among these reasons. However, benefits of achieving sustainability are becoming more apparent, including the coupling of environmental responsibility and profit maximization. This has enhanced the green movement among organizations as well as individuals. Growing concern over greenhouse gas emissions, waste accumulation, pollution, and other contributors to environmental degradation that can have detrimental effects on human health, has caused many companies worldwide to decrease the environmental impact of their supply chain and business practices—an important component of the international movement to protect the environment. Companies are demonstrating to customers and investors their concern about environmental sustainability and making the necessary changes to reduce their impact.

1 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

The impulses behind these changes are manifold, with some companies focusing on their actual effect on the environment and others focusing on profit maximization through efficiency and improvement of their image as a responsible business.

Environmental corporate social responsibility (CSR) benefits companies by increasing benefits from societal appeal and minimizing risks and liability from environmental regulations. Benefits come from the customers’ increased willingness to pay for the differentiation of a product, improved employee retention rates, higher employee productivity, and recruitment of better quality employees.² Demonstrating evidence of environmental CSR can improve brand image, therefore increasing profits by maintaining existing customers and attracting new ones. Additionally, as an increasing number of companies begin implementing comprehensive corporate CSR programs, those companies that neglect to consider the greater impacts of their business may eventually become relics in the marketplace, shunned by consumers and investors for their narrow focus and harmful business practices. Risks are minimized by preempting regulations, increasing barriers to competition through strategic differentiation, and a greater ability to help government entities design new

2 Reinhardt, Forest L. (2005). Environmental Protection and the Social Responsibility of Firms: Perspectives from the Business Literature. Environmental Protection and the Social Responsibility of Firms: Perspectives from Law, Economics, and Business. Eds. Bruce L. Hay, Robert N. Stavins, & Richard H.K. Victor. Resources for the Future: Washington D.C.

regulatory structures.³ In order for environmental CSR to be effective and beneficial for companies, an ethical company must be able to ensure its actions are credible, transparent and visible to their target audiences.⁴ Today, evidence of going green can be seen in all different types of industries worldwide.

It is possible that your company already markets green products that can gain the business a great reputation, but it is often the behind-the-scenes, internal business practices that really make a difference. If your company goes so far as to design the interior of its office space or building to be as close to 100 percent sustainable as possible, people will know that the business really wants to make a difference, and that it is not just “greenwashing” its image. Fortunately, interior product manufacturers are supplying a myriad of basic commodities that are not only eco-friendly, but attractive and durable as well. With this resource development and eco-

entrepreneurship, coupled with your research and growing expertise in companies, materials, and designs that can successfully make your interior sustainable, you will improve the environmental, social and economic aspects of your company.

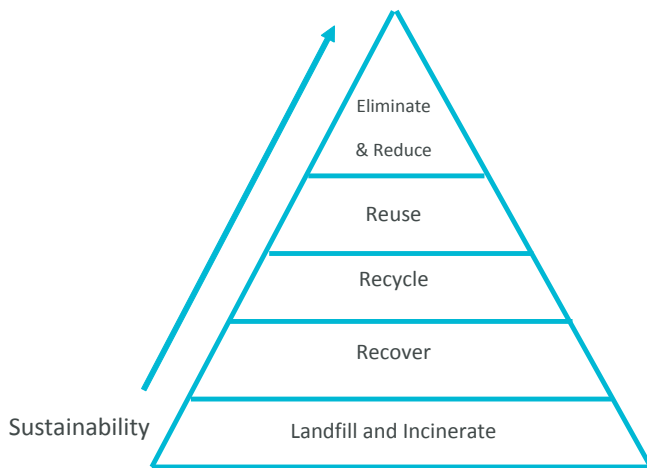
Under a single umbrella of sustainability are the individual causes of energy efficiency, recycling, indoor air quality and building health, waste management, healthy buildings, native plants, backyard habitat, dark sky initiatives, etc. Each of these has passionate advocates, and many people are motivated to action because they see the synergies. By endorsing sustainable design, one can accomplish all of this. — Sandra Mendler (2002), leader of HOK’s sustainable design initiatives.⁵

3 Libecap, Gary. “Sources of Outside Pressure.” Business and the Environment. Donald Bren School of Environmental Science and Management. University of California, Santa Barbara. October 1, 2008.

4 Hoffman, Andrew. Competitive Environmental Strategy: A Guide to the Changing Business Landscape. Island Press. Washington, D.C. 2000.

5 Sandra Mendler. “HOK reexamines the future for Sustainable Design.” Design Intelligence. August 15, 2002.

End-of-Life (Beginning-of-Life) Management Strategies



According to Penny Bonda and Katie Sosnowchik authors of *Sustainable Commercial Interiors*, a good designer understands the concepts of eliminating waste, source reduction, reuse, recycling, and recovery.⁶

THE BEST OPTION

The best option is to not invest in anything. If you already have it, use it. It doesn't matter if the product is made of leather or wood from endangered trees. The damage from the production process is complete, and because source reduction avoids the costs of recycling, municipal composting, discarding to a landfill, or incineration, it reduces waste disposal and handling costs. This in turn reduces greenhouses gases and other forms of pollution, as well as resource exploitation. An interesting example of waste reduction was the decrease of the weight of two-liter plastic soda bottles from 65 grams to 51 grams. This has kept 250 millions pounds of plastic out of the waste stream annually.⁷

⁶ United States Environmental Protection Agency. "Life Cycle Analysis: Principle and Practice." 2006.

⁷ Ibid

SECOND BEST OPTION

Reuse is believed to be the next most preferable strategy to manage waste. It calls for the reuse of items through sale, repair, or donation. Reuse does not require reprocessing before a product is used again, so it is a more effective strategy than recycling. However, reuse of a product isn't always the popular option, and many usable goods end up in landfills. Studies in Berkeley, California and Leverett, Massachusetts indicate that between 2 and 5 percent of the waste stream is potentially reusable.⁸

THIRD BEST OPTION

Recycling turns materials and products into valuable resources that would otherwise become waste. This strategy is not as effective or favorable as waste elimination/source reduction or reuse because recycling processes result in many of the same detrimental environmental impacts caused by many primary manufacturing processes. However, these impacts are significantly less and recycling is still undeniably a good end-of-life strategy. Recycling is becoming more popular as more people learn about its importance, as businesses and geographical regions/governments are obtaining better management practices, and as recycling processes become more efficient. "The EPA estimates that recycling diverted 72 million tons of material away from landfills and incinerators in 2003, up from 34 million tons in 1990—doubling in just ten years. Curbside programs, along with drop-off and buy-back centers, resulted in a diversion of about 30 percent of the nation's solid waste in

⁸ Ibid

2001. For the strategy of recycling to continue to work, however, consumers must buy products with recycled content. Doing so creates an economic incentive for recyclable materials to be collected, manufactured, and marketed”⁹.

FORTH BEST OPTION

Recovery “calls for the collection or reclamation of material input that has been diverted from the solid waste stream so that it can replace the use of new primary material for a recycling or manufacturing process.”¹⁰ Resources are becoming scarce, and it is profitable to recover materials. It is not unlikely that some day industry will be forced to mine landfills for raw materials that are essential basics today. Bonda and Sosnowchik also point out that studies are underway to examine material flows between industries, as by-products of one industry may be useful commodities to another industry. Many businesses are already taking advantage of such overlapping interests.

9 Ibid

10 Ibid



Biophilic Design

Despite our presumed ability to dominate nature, there still lives within the human psyche an evolved propensity to affiliate with living organisms and natural systems. We still feel the tug of nature, whether in backyard gardens, street trees, bird feeders, flowers, or the changing patterns of light indoors as the sun makes its pathway across the sky.

E.O. Wilson calls our inert fascination with nature “biophilia.”¹¹

Biophilic design embraces risk reduction associated with improved indoor environmental quality, including energy and resource efficiency and minimization of waste and pollution. There is also understandable and abundant evidence that a biophilic building and surrounding landscapes positively influence health, well-being, performance, emotional functioning, and sense of place. By adding simple natural elements into your design such as daylight, natural ventilation, natural building materials (wood, stone), naturalistic ornamentation (flowers, trees, grasses, water, rocks) and pattern complexity, the physical and emotional health of your building will improve.

The improvement of human health holds many benefits for your company: biophilic design can enhance employee productivity, thus increasing business profitability. Creating a working environment that is physiologically and psychologically healthy will enhance occupant comfort, well-being, performance, and hence

11 Kellert, Stephen; Heerwagen, Judith; Mador, Martin. *Biophilic Design*. John Wiley & Sons. 2008.

productivity. It is amazing how much reminders of nature, such as fresh air, sunlight or plants, can diminish the amount of stress an employee may feel and reduce the amount of toxins an employee may intake during office hours. It is likely that that employee will get sick less often, have a better attitude, and accomplish more in the workplace. *An Annual Review of Energy and the Environment* by William J. Fisk noted that improved worker performance from changes in thermal environment and lighting has the potential U.S. annual savings or productivity gain of \$20-160 billion.¹²

12 Fisk, William. “Health and Productivity Gains from Better Indoor Environments and Their Relationship with Building Energy Efficiency.” *Annual Review of Energy and the Environment*. Vol. 25: 537-566. 2000.



Materials

It often seems that just about everything that can be purchased these days ends up being bad for the environment. The clothes we are wearing, the houses we live in, and yes, our interior decoration generally turns out to be bad for Mother Earth. That is not to say that you should not buy furniture for your office. That would certainly not make for productive business meetings. Most (80-90 percent) of the problem lies in the materials that are being used to make our modern, attractive, comfortable, and professional-looking office interiors.¹³ Many of these materials tend to be far from environmentally friendly. Did you realize that the cotton used for a sofa cover may have destroyed farmland, polluted waterways, and required about 20 pounds of pesticide? Dying the fabric holds its own list of environmental grievances, including the likely incorporation of a common dye that contains heavy metals harmful to animals, the natural environment, and yourself. The synthetic polyester used in draperies is generally made from petrochemicals via a process of refining crude oil, which creates harmful pollution. A wood floor may be made of wood from a forest that no longer exists because it was overexploited for such applications. Paint on the walls often causes humans respiratory problems. What's more, once these decorations are retired from their useful lives (after they are worn out or no longer in style), they may cause further

13 Albers, Kyle; Canepa Peter; Miller, Jennifer. "Analyzing the Environmental Impacts of Simple Shoes: A life Cycle Assessment of the Supply Chain and Evaluation of End-of-Life Management Options." The Donald Bren School of Environmental Science and Management. University of California, Santa Barbara. 2008.

environmental problems when dumped in landfill because of certain materials they contained. For example, fabrics can typically take hundreds of years to break down in a landfill and the biodegrading process also releases carbon dioxide, the greenhouse gas leading to global warming.

In 1999, two colleagues and I worked out what it takes to meet a single family's annual needs. Each year, for a four-person, middle-class household, industry extracts, process, refines, manufacturers, burns, pumps and wastes four million pounds of material. That's approximately 20 times an average person's body weight per day. Of this vast flow of stuff, only 7% gets into products at all, only 1% into durable products, and only .02% into durable products that later get recycled, remanufactured, or reused. Thus, the U.S. materials flow is about 99.98% pure waste – Amory Lovins.⁵

It is still normal to be uninformed when making decisions about interior design. It is not yet typical to consider the environmental impact over the life cycle of a comfortable office chair. We are part of a society that likes to indulge, and it is beginning to become imperative that society rethinks its desire for "things".¹⁴ As an unfortunate result, eco-friendly interior design still tends to be the exception rather than the norm. That is why it is important for us, as consumers, to start looking for environmentally friendly furniture, paint, and décor. More and more often, people want to purchase eco-friendly products, and companies are responding to the demand. The more people consuming eco-friendly alternatives, the

14 Lovins, Amory. "Your Choices." Patagonia Catalog. www.patagonia.com. 2005.

more commercially viable it will be for companies to use sustainable materials in their collections.

It is no simple task to select eco-friendly fabrics, concrete, metals, floor substrates, hard-surface flooring, carpet, wood, resilient flooring, hard-surface flooring, paint and wall finishes, ceiling tiles, lighting, adhesives, and furnishings. But hopefully this document will provide helpful advice to sort out some of the confusion and help you find sustainable materials that are also healthy, comfortable, attractive, durable, and easily maintained with minimal environmental impacts throughout their life cycles. This is a guide to help you understand what makes products sustainable, what makes them harmful, and where to find some eco-friendly products. Keep in mind that only a few places providing eco-friendly lines have been included, and that additional collections are being developed. It is best to keep asking questions to determine the sustainability of a product or company.¹⁵

QUESTIONS TO ASK

Nadav Mallin, editor of Environmental Building News, advocates that one of the most important steps in sustainable interior design is to ask many questions, focusing on the environmental priorities you have identified as most crucial:

- Is the look right?
- Will it do the job?
- Does it fit the budget?

These are the questions that you probably ask about the materials and products you consider for a project. Once you start looking with a green

perspective, however, you will find whole new sets of questions to ask.

You might get started by inquiring about the materials and resources used, and how they affect the global environment. For example, you might ask:

- Where did it come from?
- What went into making it?
- Where can it go when it's no longer needed for my project?
- Can it be used safely to make something else?

You might also start thinking more broadly about the environment that you are creating—the indoor environment:

- Does it nurture the health and well being of its occupants?
- Will it be comfortable without requiring a lot of energy, heating, cooling, and lighting?

These questions can also trickle down into your product evaluations:

- What chemicals might this product release into the space, and how might the occupants be affected?
- Does it have a color or texture that can lead to reduced lighting energy or an expanded range of thermal comfort conditions?
- Can it be maintained easily without hazardous cleaning chemicals?

Asking useful questions requires a lot of knowledge, as does interpreting the responses in a meaningful way. Even researchers who study these issues intensively still have more questions than answers about the complex interactions between material flows and the environment, and between indoor chemical emissions and human health.

¹⁵ Natural Environment. "What Makes a Fabric 'Eco-Friendly?'" <http://www.natural-environment.com/blog/2008/04/10/17-eco-friendly-fabrics/>. 2008.

Fortunately, an increasing number of initiatives and resources can help you make product choices without researching each question exhaustively. Once you know what is important to you and your clients, you can focus on the questions you care about most, and then lean on these emerging programs to help you answer them. How might that work? Here is an example.

I'm concerned about chemicals released to the indoor environment.

Many types of compounds can off-gas from products and contribute to the chemical soup in the air we breathe. The experts don't always agree as to which chemicals we should be concerned about, or what safe exposure levels might be. They also disagree regarding testing protocols, analyzing the data, and how much information to report. Several programs certify products as low emitters of chemicals. They are helpful in simplifying the choices, though you should keep in mind that they don't claim to guarantee healthy indoor air.

When it comes to measuring chemicals associated with products, it is important to understand what is being measured. Three different types of measurements are commonly used:

- The amount of volatile organic compounds (VOCs) in a product, measured as grams per liter or pounds per gallon.
- The rate at which chemicals off-gas, typically measured in milligrams per square meter of surface area (this rate usually drops off over time).
- The expected indoor concentration of a chemical, which is based on the off-gassing rate, the amount of the product in a space, the size of the space, and the amount of ventilation.

Green design is not something to get into unless you enjoy learning new things as your practice. Everyone in the field is still learning, and the end is nowhere in sight. But the tools for making good choices, even with limited information, are improving.

Certification and labeling programs go a long way toward simplifying the designer's job by replacing the need to interpret a lot of data with a single seal or label. They don't eliminate the need to learn about the environmental and health impacts of products, but they can certainly allow you to get by with less research. If you're going to rely on a certification program, however, you need to understand what's behind the label.

Organizations and Ratings

There are many resources available to help you get through your project knowing that you are indeed designing a sustainable commercial interior. You can look for labels, skim through guides, and check out websites until you are positive you are choosing the right product. Many organizations and rating systems are out there for your aid.

THE COLLABORATIVE FOR HIGH PERFORMANCE SCHOOLS



The mission of the Collaborative for High Performance Schools (CHPS) is to facilitate the design, construction and operation of high performance schools.

This organization wants more schools to adopt sustainability goals and achieve environments that are not only energy and resource efficient, but also healthy, comfortable, well lit, and containing the amenities for a quality education. CHPS believe that if schools adopt sustainability measures, student performance will rise with better-designed and healthier facilities, awareness of the impact and advantages of high performance schools will increase, professionals with better tools to facilitate effective design will be provided, and school energy and resource efficiency will increase.¹⁶

THE GREEN BUILDING INITIATIVE (GBI) AND GREEN GLOBES



¹⁶ The Collaborative for High Performance Schools. "About CHPS." <http://www.chps.net>. 2009.

The Green Building Initiative (GBI) is a nonprofit organization with a mission to accelerate the adoption of building practices resulting in energy-efficient, healthy and environmentally sustainable buildings by promoting credible and practical green building approaches for residential and commercial construction. It was originally conceived as a way to bring green building into the mainstream by helping local Home Builder Associations develop green building programs modeled after the National Association of Home Builders' Model Green Home Building Guidelines. While developing a partnership with the NAHB, an opportunity emerged to bring a revolutionary learning tool from Canada to commercial builders in the US. Near the end of 2004, the GBI finalized an agreement to bring the Green Globes environmental assessment and rating tool into the U.S. market.¹⁷

GREEN GUIDE FOR HEALTH CARE



Green Guide for Health Care is meant to assist the healthcare sector in becoming sustainable and creating healthy places to work and occupy. This guide provides the healthcare sector with a voluntary, self-certifying metric toolkit of best practices that designers, owners, and operators can use to guide and evaluate their progress towards high performance healing environments. As health care institutions evolve a

¹⁷ Green Building Initiative. "Our Mission." <http://www.thegbi.org/about-gbi>. 2009.

design language for their work environments, they have the opportunity to highlight the associated health-based benefits. This in turn can inspire the broader adoption of health-based design principles in other building sectors. Rather than acting as a rating system or minimum standard, the toolkit is designed to serve as a voluntary educational guide for adopters of sustainable design, construction, and operations practices.

GREENSPEC



The online GreenSpec Directory lists product descriptions for over 2,100 products that meet BuildingGreen's guidelines, which are targeted at the greenest five to ten percent of products for different applications. GreenSpec also includes product data, manufacture information, and links to additional resources. Directory listings cover more than 250 categories—from access flooring to zero-VOC paints.¹⁸

US GREEN BUILDING COUNCIL

Today, the United States Green Building Council (USGBC) dominates the green building industry and continues to grow. It is the nation's leading nonprofit coalition for advancing buildings that are environmentally responsible, profitable and healthy places to work and live. The USGBC was founded in 1993, and today it includes 15,000 member organizations. The diverse members



represents the marketplace: building owners and end-users, real estate developers, facility managers, architects, designers, engineers, general contractors, subcontractors, product and building system manufacturers, government agencies, and nonprofits.¹⁹

One of the major organizations supporting the USGBC is Leadership for Energy and Environmental Design (LEED). LEED is a voluntary, consensus-based green building rating system that has become the national standard for developing high-performance, sustainable buildings. USGBC's members, representing every sector of the building industry, developed and continue to refine LEED, ensuring that it provides a complete framework for assessing building performance and meeting sustainability goals. Using sound scientific data, LEED emphasizes strategies for sustainable site development, energy efficiency, water savings, materials selection, and indoor environmental quality. LEED recognizes achievements and promotes expertise in green building through a comprehensive system offering project certification, training, and practical resources.

Of course, LEED offers certification and useful resources specifically for interior designers. "LEED for Commercial Interiors" is the green benchmark for sustainable commercial interior design and is recognized for certifying high-performance green interiors. LEED focuses on interiors that are healthy, productive places to work, less costly to operate and maintain, and have a reduced environmental footprint. LEED for Commercial Interiors offers a reference guide that can give you the power to make sustainable choices for your office space even though you may not have control over complete building operations.²⁰

18 NextStep. "GreenSpec." http://www.nextstep.state.mn.us/res_detail.cfm?id=78, 2009.

19 U.S. Green Building Council, "Welcome to USGBC." <http://www.usgbc.org>. 2009.

20 Ibid

Product Standards and Certifications

Standards are becoming commonplace for all different kinds of products—especially when dealing with construction and design. Make sure that at a minimum the products you choose achieve at least one standard. Here are a few options to look for.

BIFMA INTERNATIONAL



In their own words, BIFMA's mission is to lead, advocate, inform and develop standards for the North American office and institutional furniture industry. BIFMA is a nonprofit organization that provides an effective forum for members collaborating on appropriate industry issues. This organization has developed voluntary product and industry standards that supports safe, healthy and sustainable environments; publish key industry statistics; advocate for legislation and government regulation that have a direct impact on the health of the industry; and facilitate meaningful dialog and education to support core services in the industry.²¹

BUILDING FOR ENVIRONMENTAL AND ECONOMIC SUSTAINABILITY (BEES)



BEES provides the Whole Building Design Guide (WBDG)—the only Web-based portal providing government and industry practitioners with access to current information on a wide range of building-related guidance, criteria and

²¹ The Business and Institutional Furniture Manufacturer's Association. "The Industry Voice for Workplace Solutions" <http://www.bifma.org>. 2009.

technologies from a 'whole buildings' perspective. Development of the WBDG is a collaborative, interdisciplinary effort among federal agencies, private sector companies, non-profit organizations and educational institutions.²²

THE CARPET AND RUG INSTITUTE



The CRI is a nonprofit trade association representing manufacturers of more than 95 percent of all carpet made in the United States, as well as their suppliers and service providers. CRI coordinates with other segments of the industry, such as distributors, retailers and installers, to help increase consumers' satisfaction with carpet and to show them how carpet creates a better environment. CRI is a source of extensive carpet information for consumers, writers, interior designers, facility managers, architects, builders, building owners and managers, installation contractors and retailers. Since there is so much information about carpet available, CRI wants you to have the right information, and continually conducts primary research and gathers data from other sources to help you make the right decisions based on facts.²³

²² National Institute of Building Sciences. "Whole Building Design Guide." <http://www.wbdg.org>. 2009.

²³ Carpet and Rug Institute. "Carpet Creates a Safe, Inviting and Comfortable Environment." <http://www.carpet-rug.org>. 2009.

CRADLE TO CRADLE (C2C) FROM MCDONOUGH BRAUNGART DESIGN CHEMISTRY (MBDC)



In its own words, MBDC is a product and process design firm dedicated to revolutionizing the design of products and services worldwide. C2C Design is a fundamental conceptual shift away from the flawed system design of the Industrial Revolution. Instead of designing products and systems based on the take-make-waste model of the last century ('cradle to grave'), MBDC's C2C design paradigm is powering the Next Industrial Revolution, in which products and services are designed based on patterns found in nature, eliminating the concept of waste entirely and creating an abundance that is healthy and sustaining. Eco-effectiveness is MBDC's design strategy for realizing these results by optimizing materials to be food either for nature's ecosystems or for humans' industrial systems—perpetually circulating in closed systems that create value and are inherently healthy and safe.²⁴

FLOORSCORE



The FloorScore program, developed by the Resilient Floor Covering Institute (RFCI) and Scientific Certification Systems (SCS), tests and certifies flooring products in California high performance schools and office buildings for compliance with indoor air quality emission requirements adopted by the state. A flooring product bearing the FloorScore seal has been

²⁴ McDonough Braungart Design Chemistry, LLC. "Cradle to Cradle." <http://www.mbdc.com>. 2009.

independently certified by SCS to comply with the volatile organic compound emissions criteria of California law, and have been recognized for contributing to good indoor air quality to protect human health²⁵

FOREST STEWARDSHIP COUNCIL (FSC)



Forest Stewardship Council (FSC) is an independent, nonprofit organization that is the only forest certification system that has the support of environmental groups worldwide. It is the only forest certification system that the USGBC recognizes as evidence of the sustainability of a wood product. If you want verification that the wood you are purchasing came from a truly well managed forest, demand FSC-certified material, and demand proper documentation. However, understand that if a company has FSC certification that does not necessarily mean that what is being sold is FSC-certified. Most FSC-certified wood products have on-product FSC labels (so look for that). Some companies will even use the FSC logo on product samples, but ship uncertified material to fill your order. To verify the FSC-certified status of a wood product that does not bare the FSC logo, demand an invoice or receipt detailing the FSC-certified status of each product on an individual line-item basis. If the invoice's line-item does not specify "FSC-certified," the material is not certified.²⁶

²⁵ FloorScore. "FloorScore: What and Way." http://www.rfci.com/int_FloorScore.htm. 2009.

²⁶ EcoTimber. "Eco Flooring Guide." <http://www.ecotimber.com/guide/eco-flooring-guide.htm>. 2009.

GREENGUARD ENVIRONMENTAL INSTITUTE



The GREENGUARD Environmental Institute (GEI) is a voluntary, industry-

independent, non-profit organization that oversees the GREENGUARD Certification Program. As an Authorized Standards Developer, GEI establishes acceptable indoor air standards for indoor products, environments, and buildings. GEI's mission is to improve public health and quality of life through programs that improve indoor air. A GEI Advisory Board consisting of independent volunteers, who are renowned experts in the areas of indoor air quality, public and environmental health, building design and construction, and public policy, provides guidance and leadership to GEI. GEI offers a GREENGUARD Online Product Guide, featuring products that are regularly tested to ensure that their chemical and particle emissions meet acceptable pollutant standards.²⁷

GREEN SEAL



Founded in 1989, Green Seal provides science-based environmental certification standards that are credible, transparent, and essential in an increasingly educated

and competitive marketplace. Its industry knowledge and standards help manufacturers, purchasers, and end users alike make responsible choices that positively impact business behavior and improve quality of life. Today, Green Seal has over 40 product categories covered by standards, and has established a significant market among large institutional purchasers, including government agencies, universities, and the lodging and architectural

²⁷ 7 Greenguard. "Certification Programs." <http://www.greenguard.org/Default.aspx?tabid=14>. 2009.

building industries. Green Seal actively advises and assists these institutions and industry sectors in their efforts to green their purchasing, operations, and facilities management functions.²⁸

INSTITUTE FOR MARKET TRANSFORMATION TO SUSTAINABILITY (MTS) AND THE SUSTAINABLE TEXTILE STANDARD



As explained by MTS Chairman Denis Darragh and Vice

Chairman, David Ford, this organization believes it is possible to transform manufacturing and retail practices worldwide so that sustainable products are available in 90 percent of the global marketplace by 2015. They argue that this is attainable because the 100 largest companies account for more than 90 percent of the world's products. This organization explains to major companies that sustainable products increase corporate profits while enhancing society as a whole, because they are cheaper to make, have fewer regulatory constraints, less liability, can be introduced to the market more quickly, and are preferred by the public. MTS brings together a powerful coalition of sustainable product manufacturers, environmental groups, and key state and local government leaders using market mechanisms increasing sales and market share of sustainable products. MTS has identified consensus protocols for sustainable products such as FSC Certified Wood, Certified Organic Products, and the Clean Car Standard. When such a consensus is reached, the next steps are to increase awareness and sales of these products until profit motives and other marketplace incentives kick in and drive the transformation.²⁹

²⁸ Green Seal. "About Green Seal: Validating environmental excellence." <http://www.greenseal.org>. 2009.

²⁹ The Institute for Market Transformation to Sustainability. <http://www.sustainableproducts.com/mts/index.htm>. 2009.

ENVIRONMENTALLY PREFERABLE PRODUCT (EPP) CERTIFICATION FROM SCIENTIFIC CERTIFICATION SYSTEMS (SCS)



The SCS Greenhouse Gas Verification Program provides third-party verification for forestry and land use projects that seek to provide climate benefits by reducing greenhouse gas emissions. Its independent verification services ensure emissions reductions claims are credible, transparent and tradable in international carbon markets. SCS serves as a third-party certifier of standards developed by others, but it also creates standards where they do not otherwise exist. Its EPP certification standard was created to fill this gap. SCS is accredited to many other industry standards and verification organizations. It also offers offset and carbon footprint verification services.³⁰

30 Scientific Certification Systems. "Greener Retailing Starts with Greater Scientific Certainty." <http://www.scs-certified.com>. 2009.

SUSTAINABLE FORESTRY INITIATIVE (SFI)



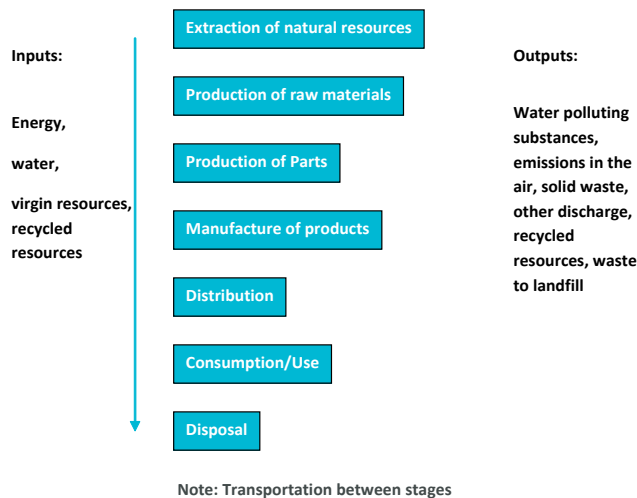
In its own words, SFI Inc. is a fully independent, charitable organization dedicated to promoting sustainable forest

management that works with conservation groups, local communities, resource professionals, landowners, and countless other organizations and individuals with a passion for responsible forest management. The SFI forest certification standard is based on principles that promote sustainable forest management, including measures to protect water quality, biodiversity, wildlife habitat, species at risk, and forests with exceptional conservation value. The standard is used widely across North America, and has strong acceptance in the global marketplace so SFI can deliver a steady supply of third-party certified wood from well-managed forests.³¹

31 Sustainable Forestry Initiative. "Basics of SFI." <http://www.sfiprogram.org/standard/index.php>. 2009.

Life Cycle Assessment (LCA)

It is becoming obvious that there are numerous threats to consider when purchasing any product. Every stage of that product's life (extraction of raw materials, primary manufacturing, secondary manufacturing/assembly, packaging, transport/distribution, installation/use/maintenance, and end of life (EoL) management scenarios) can have various threats to the environment and to human health. The most thorough way to comprehend such affects is to understand LCA.³²



LCA is a process used to analyze the economic and environmental tradeoffs of a product or technology.³³ As the name suggests, the environmental impact of a product or technology is tracked along its entire life cycle, ranging from raw material production

to EoL disposal in what is called a cradle-to-grave approach.³⁴ Typically, a comprehensive LCA would account for all inputs of raw material and energy required for the duration of a product's lifespan from manufacture, use and maintenance phase, to EoL³⁵. Depending on the type and volume of input required, outputs to the environment, such as carbon dioxide, are tracked throughout the life cycle.

According to the EPA, a comprehensive LCA consists of four stages: goal definition and scoping, inventory analysis, impact assessment, and interpretation.³⁶ In the goal definition and scoping phase, the type and accuracy of information and method needed for meaningful interpretation are determined. During the second phase, the inventory phase, all the necessary input data are collected. In the impact assessment, the data are evaluated for its impact on the environment and human health. This is typically completed using professional, state-of-the-art software such as GaBi by PE Americas, the industry standard for LCA. Finally, the interpretation phase is the conclusion and recommendation stage of LCA.³⁷

Bonda and Sosnowchik compiled three LCA summaries that could be relevant to your interior

32 Arcenas, Ariana; Holst, Julie; Ono, Takuma; Valdin, Matt. "The Development of a Standard Tool to Predict the Environmental Impact of Footwear." The Donald Bren School of Environmental Science and Management. University of California, Santa Barbara. 2009.

33 UNEP. "Why Take a Life Cycle Approach?" http://jp1.estis.net/sites/lcinit/default.asp?site=lcinit&page_id=138F5949-6997-4BE6-A553-585E92C22EE4. 2004.

34 United States Environmental Protection Agency. "Life Cycle Analysis: Principle and Practice." 2006.

35 Ibid

36 Ibid

37 Arcenas, Ariana; Holst, Julie; Ono, Takuma; Valdin, Matt. "The Development of a Standard Tool to Predict the Environmental Impact of Footwear." The Donald Bren School of Environmental Science and Management. University of California, Santa Barbara. 2009.

design.³⁸ The LCAs were completed in a study called “Resilient Flooring: A Comparison of Vinyl, Linoleum, and Cork” by Sheila Bosch at the Georgia Tech Research Institute in 1999. It evaluates the life cycles of vinyl, linoleum, and cork with a focus on the environmental impacts of production, installation, maintenance, and end-of-life issues.

VINYL LCA

Bosch reported that vinyl flooring is a durable solution with a long service life. Vinyl is typically available in many attractive colors and patterns and is often very inexpensive. However, the production of PVC requires petroleum and releases known carcinogens during the manufacturing process requiring careful regulations to protect employees from the dangers of exposure. Individual compounds in vinyl flooring typically do not have high VOC emissions, but the choice of adhesives is important in reducing risks to occupants from off-gassing. Vinyl is seldom recycled because of the non-vinyl backings usually found on them make recycling difficult. Therefore, vinyl more commonly ends up in a landfill, creating a rather large solid waste stream.

LINOLEUM LCA

Bosch also reported that all of the materials used in the production of linoleum flooring (cork flour, pigments, rosin, linseed oil, wood flour, limestone, and jute) along with its backing, are natural and abundant resources. When incinerated, linoleum provides a source of energy without producing toxic emissions of its own. Linoleum flooring is low-maintenance and its materials are durable and harden with age, giving it a lifespan of 30 to 40 years. Linoleum is generally more expensive than vinyl and typically produced in Europe, adding an embodied energy impact. Because linoleum

is composed of natural materials, it is biodegradable. However, the length of time for degradation under anaerobic conditions in a landfill is rather long.

CORK LCA

Cork is another natural material that comes from the bark of a cork tree. Therefore, cork flooring is relatively environmentally benign. Fertilizers or pesticides are unnecessary to promote tree health. “Cork forests are managed carefully and most countries tightly regulate how often cork can be harvested, usually every nine years. The off-gassing of the binders used to agglomerate cork, however, may have negative effects on indoor air quality. Although it is more expensive than vinyl or linoleum, cork is compressible, strong, insulating, acoustical, and resistant to moisture damage, making it an attractive floor covering solution. It is susceptible to abrasion damage but is otherwise very durable, and it is biodegradable and potentially recyclable. Waste cork is often burned to produce energy for the factories. Because of its popularity, cork is not always readily available in the United States.”³⁹

After Bosch accounted for cost and maintenance of the flooring options, the study concluded that linoleum flooring appears to be the most sustainable choice when compared to vinyl and cork, with vinyl being the least sustainable. Linoleum flooring also has low maintenance expenses and a long service life despite its higher up-front capital costs. It is obvious that the life cycle assessments and their comparisons are a valuable and informative resource, however they may not be reliably conclusive. Along with critically examining all of the environmental impacts, you must ask key questions about the product and about the reliability of the data and its source.⁴⁰

38 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

39 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

40 Ibid

Natural or Synthetic

Selecting the appropriate sustainable materials is extremely complex. This is illustrated by the debate on whether natural or synthetic materials are better for the environment. I always assumed that natural was better. After all, as Bonda and Sosnowchik point out, “nearly 70,000 new synthetic chemicals and materials were introduced in the twentieth century, and less than 2 percent of them have been tested for their effects on human health, while more than 70 percent have not been tested at all.”⁴¹ However, these authors continue with the argument that “the same technological know-how that made possible the development of these 70,000 new synthetic chemicals has also contributed to cleaner production processes for them, thus adding to the confusion over which products are good, which are better, and which are best.” Are natural fibers such as jute, cotton, wool silk, hemp, or linen, more environmentally benign than their man-made counterparts such as nylon or polyester that are manufactured with petroleum? Depending on the manufacturing conditions, the answer may be no.



Organically grown fibers present their own inherent problems. They are expensive, in large part because the production process is so labor-intensive. Farmers must work in fields constantly, and weeding,

composting, and defoliation must be done naturally, without the use of toxic chemicals. Like conventional counterparts, organic fibers also use extremely high quantities of water and cannot be grown for many consecutive years without permanently depleting the soil.



CONVENTIONAL COTTON

Conventional cotton has been used around the globe as a textile for nearly 6,000 years. It is referred to in the Bible, eastern religions, and has a contentious history in the United States with its connection to slavery.⁴² Cotton is the dominant fiber used in apparel, making up approximately 66 percent of this market.⁴³ Cotton is also prominently used in

42 United Nations Conference on Trade and Development. “Market Information in the Commodities Area – Cotton.” <http://r0.unctad.org/infocomm/anglais/cotton/sitemap.htm>. 2009.

43 Albers, Kyle; Canepa Peter; Miller, Jennifer. “Analyzing the Environmental Impacts of Simple Shoes: A life Cycle Assessment of the Supply Chain and Evaluation of End-of-Life Management Options.” The Donald Bren School of Environmental Science and Management. University of California, Santa Barbara. 2008.

41 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006

other industries such as in industrial settings, and of course home furnishing⁴⁴ Cotton, a chemical-heavy crop, accounting for approximately 25 percent of the world's insecticide use and 10 percent of the world's pesticide use.⁴⁵ Cotton bolls are ginned to remove any seeds or impurities and then be spun into fine yarn. This yarn can subsequently be woven into a wide variety of cotton products.

ORGANIC COTTON

Organic cotton is processed identically to its conventionally grown counterpart.⁴⁶ Cotton bolls are ginned to remove any seeds or impurities and then be spun into fine yarn. However this cleaner, organic cotton is grown and harvested using neither fertilizers nor pesticides. According to some agricultural scientists,⁴⁷ “the lack of applied fertilizers and pesticides may result in lower organic yields compared to conventional cotton yields, but that this gap could be closed with more effective weed control techniques.”

The principle goal of organic agriculture is to optimize productivity and health of the interdependent communities of soil life, plants, animals, and people.⁴⁸ However, the

44 Ibid

45 Allen Woodburn Associates Ltd./Managing Resources Ltd. “Cotton: The Crop and its Agrochemicals Market.” Pesticide News. No. 30. pg 11. 1995.

46 Organic Trade Association. “The National Organic Standards Board Definition of Organic.” <http://www.ota.com/definition/nosb.html>. 2007.

47 Brown, Martha. “Study comparing the Yield and Quantity Potential of Organic Cotton.” Center for Agroecology & Sustainable Food Systems. <http://www.sustainablecotton.org/html/resources/articles06.html>. 2006.

48 Organic Trade Association. “The National Organic Standards Board Definition of Organic.” <http://www.ota.com/definition/nosb.html>. 2007.

National Organic Standards Board cautions that implementation of organic agriculture practices does not definitely indicate that a product is completely free of residues especially from rogue air, soils, and water pollution sources. I am not trying to indicate that organic cotton is completely environmentally benign, rather that it is much more amenable to the earth than its conventional substitute.⁴⁹

New plastics made from plants rather than petroleum have recently been introduced, further complicating the natural versus synthetic debate. These bio-based fibers are derived from agricultural products such as beets, corn and rice. The starch portion of these crops are converted into sugar and fermented to produce lactic acid, which is then processed and polymerized to form polylactic acid (PLA) and spun into fibers.⁵⁰ Supposedly these biopolymers reduce resilience on mineral resources, use no antimony, and are completely biodegradable back into lactic acid at the end of their service lives. However, concerns have been raised about whether the chemicals and dyes used on the fibers subsequently by textile manufacturers are suitable for recycling. This could negate any environmental benefits. These textiles are also controversial because many argue that it is not appropriate to use food products for such purposes when there is worldwide suffering from malnutrition.

For all products and their materials, natural or synthetic, there are end of life scenarios to consider.

49 Albers, Kyle; Canepa Peter; Miller, Jennifer. “Analyzing the Environmental Impacts of Simple Shoes: A life Cycle Assessment of the Supply Chain and Evaluation of End-of-Life Management Options.” The Donald Bren School of Environmental Science and Management. University of California, Santa Barbara. 2008.

50 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006

What happens to the material once it has served a useful life? An answer lies in synthetic fiber design and if it allows the fibers to continuously circulate in a closed-loop production/use/recovery cycle. Petroleum-based synthetics may be recyclable perpetually and safely, and plant-based fibers can safely return to the soil to nourish new plant growth.⁵¹ As a designer, you must possess a vast amount of data before you can make informed decisions about the materials you select.

HEMP

Known to be a widely used “alternative” fiber, hemp fell just behind flax as most widely used textile “from the Middle Ages to the end of the nineteenth century.”⁵² Hemp fiber is derived from the stem of hemp plants, as opposed to seed fibers like cotton.⁵³ Hemp can be harvested by hand, greatly diminishing greenhouse gases generated through alternative harvesting practices.⁵⁴

To process a hemp plant and create a usable textile, fibers are removed from the woody stalks of the plant stem. This removal is accomplished through a chemical decomposition of the stem called “retting.” Retting can also be completed biologically through a process involving the placement of hemp plants in pools or
51 McDonough, William; Braungart, Michael. *Cradle to Cradle: Remaking the Way We Make Things*. North Point Press. 2002.

52 Bonneville, Françoise de. “The Book of Fine Linens.” Flammarion. Paris. Pg. 70. 1994.

53 Slater, Keith. *Environmental Impact of Textiles: Production, Processes, and Protection*. CRC Publishing, 2003.

54 Albers, Kyle; Canepa Peter; Miller, Jennifer. “Analyzing the Environmental Impacts of Simple Shoes: A life Cycle Assessment of the Supply Chain and Evaluation of End-of-Life Management Options.” The Donald Bren School of Environmental Science and Management. University of California, Santa Barbara. 2008.

ditches and letting the natural acidity of the surface water decompose the stem of the plant and release fibers. This process is preferred, as it results in miniscule environmental impact. Once hemp fibers are separated from the stem, they can be spun into yarn and woven into textiles. Hemp is an extremely durable fabric that has almost eight times the strength of cotton.⁵⁵

COMPARISON OF FIBERS⁵⁶

NATURAL FIBERS

- Biodegradable.
- Manufactured from natural resources. Often produced, however by agricultural processes in which petroleum derived pesticides and fertilizers harmful to the environment are widely used. Conventional farming processes also can result in soil erosion and salinization, aquifer depletion, nutrient loading, and toxic chemical runoff.
- Many natural fibers, especially cotton, require cleaning, transporting and extensive dyeing and finishing, resulting in water pollution hazards.

MAN-MADE FIBERS

- Not biodegradable, but often can be recycled.
- Manufactured using petroleum, a depletable resource; however, relatively little petroleum is used to manufacture synthetics. A problematic heavy metal called antimony, needed as a catalyst in making most polyester, creates environmental and human health risks, particularly during production, disposal, and recycling.
- Water and energy are used in all the processing stages of all fibers, most extensively in man-made fibers. The production process for most man-made fibers is essentially clean.

55 Ibid

56 Bonda, Penny; Sosnowchik, Katie. *Sustainable Commercial Interiors*. Wiley Publishing, Inc. New Jersey. 2006



Toxins

Arguably, one of the most important problems to consider is the harm certain materials can cause to human health. Many materials can be too harmful to humans as well as ecological health in excessive quantities, but there are an important few that may be too harmful for use under any circumstances. Unfortunately, many of these toxins have proven outstanding performance for what they are meant to accomplish. For example, asbestos has outstanding insulation characteristics but has been declared an extremely dangerous toxin. It is important that some toxins, not matter how effective in certain applications, are never to be incorporated into your design⁵⁷.

Endocrine disruptors and polyvinyl chloride (PVC) are a category of chemicals to be considered when choosing materials. An example of endocrine disruptors is phthalates, which can be found in flooring, wall covering, upholstery, and shower curtains as the additive that gives these products their flexibility. Phthalates become dangerous when they leach out of plastics. These chemicals mimic the hormones that control the functions of our bodies, and are especially hazardous to fetuses and children. Manufacturers have begun to phase phthalates out of their products due to attack in recent years. They are also one of the components of PVC. Created during the production and disposal of PVC, dioxin is believed to be one of the most environmentally harmful substances known. Vinyl chloride, a deadly gas, is also a by-product of the PVC manufacturing process. Because of PVC's inability to biodegrade or be recycled, many companies are phasing it out as well.⁵⁸

57 Bonda, Penny; Sosnowchik, Katie. *Sustainable Commercial Interiors*. Wiley Publishing, Inc. New Jersey. 2006

58 Ibid

Flame retardants, which play important roles in fire prevention, are harmful as well because they contain PCBs and PBBs. These substances were banned in the 1970s after they were found to be carcinogenic as well as persistent bioaccumulative toxins (PBTs). PBTs are substances that build up in the food chain and do not break down easily. Although the use of PCBs has been illegal for over thirty years, they can still be found in soil and water samples around the globe. The Healthy Building Network reported that PCB, which cause harm to nervous and reproductive systems as well as child development, "releases increased from 2 million pounds in 2002 to 22 million in 2003, only from PCB waste sent to landfills."⁵⁹ Unfortunately, manufacturers are not required to divulge the use of flame retardants in their products. However, some manufacturers such as Herman Miller and Interface are upfront about the efforts to eliminate flame retardants, and non-halogenated flame retardants are available. These substitutes will become more widely available when consumers begin demanding them or when regulatory action prohibits the use of the conventional flame retardants. Designers, be persistent when asking questions. It is likely that if companies are making progress with the elimination of these substances, they will be willing to give you such information.⁶⁰

Formaldehyde is a colorless gas that is a useful preservative, disinfectant, and resin in numerous

59 Walsh, Bill. "Dioxin, Lead, and Mercury Emissions Rise According to Latest EPA Toxics Release Data." *Healthy Building Network*. 2005.

60 Bonda, Penny; Sosnowchik, Katie. *Sustainable Commercial Interiors*. Wiley Publishing, Inc. New Jersey. 2006

products like paints, sealants, and molded plastic products. However useful, it has clear ill effects: this pungent gas holds many irritant properties that will irritate skin, eyes and the upper respiratory tract. The EPA has classified formaldehyde as a potential carcinogen that is lethal in high levels of exposure. Bonda and Sosnowchik inform their readers that items containing formaldehyde will off-gas appreciable amounts of formaldehyde for years post manufacture and installation. These released fumes are absorbed by large interior surfaces only to be re-released over time. Wheatboard serves as a great alternative for conventional plywood and particleboard, which is typically laden with formaldehyde. Wheatboard is manufactured using agricultural waste from wheat straw bound together with formaldehyde-free polymeric diphenylmethane diisocyanate (MDI) resins and is comparable in both performance and cost.⁶¹

61 Ibid

Liquid Mercury can be found in items such as fluorescent and HID lamps, thermostats and certain kinds of switches. Mercury is highly toxic to humans when exposed to the air. However, there are conflicting choices facing you as a designer. For example, although incandescent bulbs contain no mercury, they are far less energy efficient and therefore a less desirable environmental choice. Newer long-life fluorescent lamps are available that contain such a small amount of mercury (10 mg or less) that they are no longer considered a hazardous waste. Mercury-free HID lamps have also become available. Additionally, electronic versions of thermostats and switches are great alternatives to the mercury-containing models.⁶²

62 Ibid

WHAT MAKES A FABRIC “ECO-FRIENDLY”?

*By Natural Environment*⁶³

Eco-friendly fabrics generally have the following characteristics:

- *Minimum use of chemicals and pesticides*
- *Best land management practices*
- *Sustainable farming practices*
- *Eco-friendly certification (i.e., EU-Eco label certification)*
- *Animal friendly*
- *Production adheres to fair trade practices*

ARC|COM FABRICS

Arc|Com Fabrics has also taken on the challenge of developing high-performance, stylish, high-quality, and sustainable textiles using materials that are safe and manufacturing processes with low levels of pollution, waste, energy, and water consumption.⁶⁴ This company offers their Eco-Text line of sustainable upholstery and



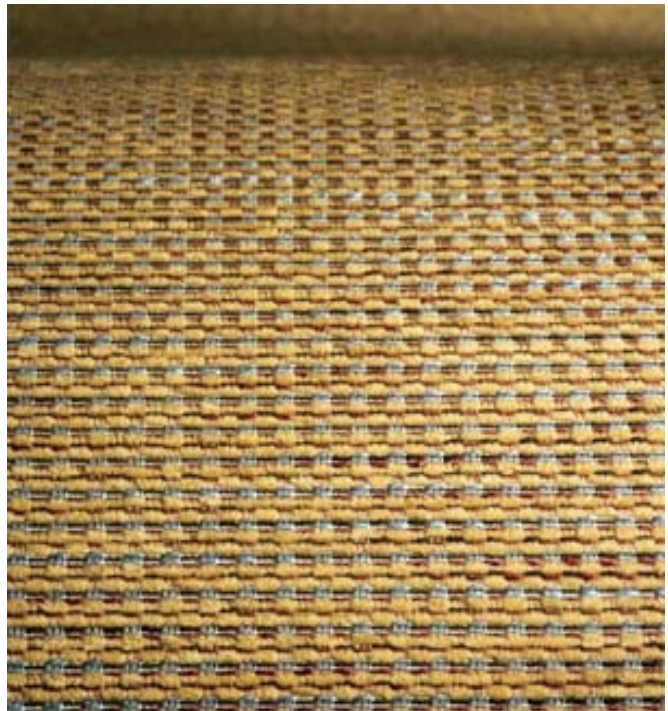
Upholstery patterns Hydro, Élan, Flora, Terra, Link - Designed in collaboration with Glenn Peckman

panel fabrics. These textiles are 100 percent recyclable because they are made from 100 percent recycled polyester and woven from a single fiber type with a recyclable backing or no backing.⁶⁵

63 Natural Environment. “What Makes a Fabric ‘Eco-Friendly?’” <http://www.natural-environment.com/blog/2008/04/10/17-eco-friendly-fabrics/>. 2008.

64 Arc|Com. “Arc|Com Green Initiative.” <http://www.arc-com.com/>. 2009.

65 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.



Upholstery pattern Palatine

CARNEGIE FABRICS

Carnegie Fabrics is thinking critically about designing and using sustainable materials. From seating, to windows, to walls Carnegie Fabrics offers and continues to develop new protocols and products that address raw material usage, energy use, indoor air quality and end of life consequences. Carnegie Fabrics has developed its own eco-friendly line, Xerol Fabrics. Xerol is fabric woven from polyethylene, is chlorine-free, plasticizer-free, and is often used as an environmentally friendly alternative to vinyl. Carnegie Fabrics has announced that Xerol and Surface IQ wall coverings have achieved MBDC Cradle to Cradle certification.⁶⁶

66 Carnegie Fabrics. “Our Products.” http://www.carnegiefabrics.com/the_environment/our_products.htm.

2009.

TERRATEX

Terratex works to conserve petroleum resources. That is why it is made from 100 percent recycled polyester (most of which is post-consumer plastic soda pop bottles) or renewable materials (like PLA derived from corn).⁶⁷ Terratex was also first to launch a line of commercial fabrics made from Ingeo bio-based synthetic fibers. Bio-based fibers are derived from organic, rapidly renewable resources.⁶⁸ Eco-advantages from Terratex production processes derive from a reduction in the use of fossil fuels and hence greenhouse gasses. This is possible with the assistance of renewable energy (wind and solar) to power the company's production plants. Terratex developed the TerraCHECK system to minimize the amount the dyes and chemicals used and specifies that only dyes meeting the highest environmental standards can go into Terratex. Finally, all Terratex fabrics are developed to ultimately be recycled or composted at the end of their useful lives, rather than entering a landfill. True Textiles, the company that makes Terratex, is going the next step by developing programs like ReSKU, a program that takes waste fabrics and turns them into materials that will continue to be implemented into diverse applications.⁶⁹

INGEO

Ingeoc is an innovative man-made fiber made from corn. Natureworks claims that Ingeo is the world's first man-made fiber derived from 100 percent

annually renewable resources.⁷⁰ Natureworks describes Ingeo as follows:

Ingeo fiber combines the qualities of natural and synthetic fibers in a new way. Strength and resilience are balanced with comfort, softness and drape in textiles. In addition, Ingeo fiber has good moisture management characteristics. This means that Ingeo fiber is ideally suited for fabrics from fashion to furnishings.

- *Ingeo fabric's color fast (i.e. does not fade).*
- *Is wrinkle-free.*
- *Is resilient—it doesn't shrink.*
- *Doesn't absorb odors.*
- *Has excellent soil release and stain resistance.*
- *Has excellent performance when compared to other fibers.*
- *Is hypoallergenic. Ingeo has never caused an allergic reaction in independent testing.*
- *Has excellent UV resistance.*
- *Will not retain moisture.*

Because Ingeo is made from corn, it is renewable and sustainable. The main impacts to consider are the current and future demand for corn as food and ethanol. This could lead to unsustainable management practices, as well as abundant pesticide and water use. But all in all, it is a great alternative to cotton and polyester.⁷¹

VICTOR INNOVATEX, INC.

Victor Innovatex has developed a line of Eco Intelligent Polyester (EIP) fabrics designed for office furniture seating and panels. It has comparable aesthetics to that of traditional polyester but is made from an optimized fiber that replaces the heavy

⁷⁰ Natureworks LLC. "Ingenious Materials." www.natureworkslc.com. 2009.

⁷¹ Ibid

⁶⁷ Terratex. "ReSKU." <http://www.truetextiles.com/sustainability/resku>. 2009.

⁶⁸ Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

⁶⁹ Terratex. "ReSKU." <http://www.truetextiles.com/sustainability/resku>. 2009.

metal, Antimony. It is also chlorine-free, PBT-free, chlorinated dye-free, and auxiliary-free. EIP remains in a closed-loop system of manufacture, reuse, and recovery, and maintains its value through many life cycles.⁷² In 2006, EIP achieved MBDC Cradle to Cradle certification, setting a new standard for sustainability while offering leading-edge design with various colors for office panels, seating, and cubicle curtains. That is one reason why today most major office furniture manufacturers and textile distributors contain EIP in their product lines.⁷³

OTHER POTENTIALLY HARMFUL INGREDIENTS

It must be understood that more than just fibers makes up a textile. Dyes, additives, and residues of process chemicals are other important components. Textile production's most harmful procedure is the finishing process: dyeing, sizing, treating for stain and wrinkle resistance, as well as the application of mildew, fire, and moth damage retardants. Formaldehyde, latex polymers, and other harmful chemicals are used in these treatments and can cause respiratory problems and skin rashes. Natural dyes, still not completely pollution free and often requiring toxic metallic compounds, can only be used on natural fabrics, and often do not compare to the performance and finished appearance of synthetic dyes.⁷⁴

Chemicals from dyes can be extremely harmful and even enter your liver, kidney, bones, heart and brain.

72 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

73 Victor Innovatex, Inc. "Creating Fabrics We Can All Live With." <http://www.victor-innovatex.com/en/ecoIntelligence.php>. 2009.

74 Ibid

Most people have some sort of chemical sensitivity, and some are more sensitive to chemicals than others. Those who are more sensitive will notice the impact of clothing dyes more than others. Those who aren't as sensitive may still experience some symptoms but not realize it.

The most pressing environmental problem with fabric dyes is its effect on our waterways (rivers, creeks, oceans, drinking water, etc.). Large amounts of water are necessary to flush dyes from garments. Because conventional synthetic dyes contain chemicals, these chemicals are washed away with the water. In theory, the heavy metals and toxins should be removed from the water before it's returned to the water systems. In practice, this is rarely the case - especially in developing countries where pollution laws/standards are often non-existent, resulting in polluted water going straight into rivers, creeks, and oceans. Not good for the environment or human health.⁷⁵

There is a range of healthier and eco-friendly alternatives when it comes to dyeing fabrics. Look for undyed fabrics, clay or dirt dyes, low-impact fiber-reactive dyes, and natural dyes. These avoid chemicals that are harmful to human health and the environment. Be sure to ask about the type of dye used in a textile of interest, and any possible affect it might have on human and environmental health.⁷⁶

75 Natural Environment. "The Health and Environmental Problems with Clothes Dyes." <http://www.natural-environment.com/blog/2008/04/07/the-health-and-environmental-problems-with-clothes-dyes>. 2008.

76 Ibid



Fibers

Fiber are a class of materials that is continuous filaments or discrete elongated pieces, similar to lengths of tread. They are what hold a plant together. Fibers can be spun into rope, string, or filaments to be used as a component of composite materials. Fibers can also be matted into sheets to make products such as paper, felt or even decorating products like wall coverings, rugs, carpets, or drapery textiles. Synthetic fibers can be produced very cheaply and in large amounts compared to natural fibers, but natural fibers enjoy some benefits, such as comfort, over their man-made counterparts. Many natural fiber products are also made to be attractive, durable, and if grown and harvested in a sustainable manner, the environmental choice.⁷⁷

ANTRON

Antron by Invista “is a type 6,6 nylon polymer that combines fiber engineering technology, a patented soil resistant treatment for dry soil and liquid stains, pile height retention, and resistance to matting, crushing, and abrasive wear.”⁷⁸ It is a carpet fiber that is available with bio-based and post-consumer recycled content, and has been certified as an Environmentally Preferable Product (EPP).⁷⁹ Antron has reduced the need for fiber finished in the manufacturing process by nearly 50 percent, and has reduced nylon manufacturing waste to zero. Additionally, Invista uses co-generation (using heat

77 Kalpakjian, Serope; Schmid, Steven. “Manufacturing Engineering and Technology.” Prentice Hall, Inc. 2001.

78 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

79 Antron. “Sustainable Carpet Choices.” <http://antron.net/content/sustainability/ant08.shtml>. 2009.

generated in the manufacturing process to heat a facility) and waste-to-energy (using wastes to power a plant) to produce nearly half of its energy use. Antron Bio Legacy nylon is the first dyeable carpet fiber with bio-based content.⁸⁰ Antron Lumena solution dyed nylon is now available with 25 percent pre- and post-consumer content to help you meet your sustainability goals. Additionally, Antron takes advantage of opportunities to reduce waste with its post-industrial nylon recycling efforts and Invista Carpet Reclamation Program.⁸¹

NATUREWORKS LLC

NatureWorks sells Ingeo bio-based fibers made from 100 percent annually renewable plants rather than oil. The company harvests carbon stored in the sugars of corn plants to make a polylactic acid resin called NatureWorks PLA that can be spun into Ingeo fiber for use in a variety of products.⁸² Such products include carpets, rugs, upholstery, wall coverings, and drapery textiles. This cradle to resin life cycle of the production of Ingeo fiber uses 68 percent less fossil fuel than resins for traditional synthetic fibers. In addition to being produced from renewable resources, Ingeo fibers are flame resistant, ultraviolet resistant, stain resistant, and compostable. NatureWorks PLA is also the world’s first greenhouse gas-neutral polymer.⁸³

80 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

81 Antron. “Sustainable Carpet Choices.” <http://antron.net/content/sustainability/ant08.shtml>. 2009.

82 Natureworks LLC. “Ingenious Materials.” www.natureworkslc.com. 2009.

83 Bonda, Penny; Sosnowchik, Katie. Sustainable

SOLUTIA

Solutia offers Ultron Renew, premium nylon 6,6 carpet fiber composed of postindustrial fiber and recycled polymer products created during the nylon manufacturing process before they enter the waste stream. Nylon 6,6 is available in a variety of fiber types, solution dyed, and with a minimum of 25 percent and maximum of 100 percent recycled content. Solutia Ultron holds third party certification from the MBDC Cradle to Cradle program. Solutia is a founding member of Carpet America Recovery Effort (CARE), an independent third party organization dedicated to fostering and facilitating recovery of used carpet. CARE plays a vital role in helping companies find viable economic solutions to collecting, sorting, converting, processing and finally marketing recycled products. The long-term goal of CARE is to achieve a landfill diversion of 40 percent by 2012.⁸⁴

ZEFTRON NYLON

Zeftron Nylon has been supplying premium branded yarn systems to the commercial interiors marketplace for over 35 years. Carpets containing these yarn systems are backed by lifetime warranties covering carpet wear, stain removal, colorfastness and static protection. Zeftron nylon has also received MBDC's Cradle to Cradle certification for the use of environmentally safe and healthy materials, its design for material reutilization, the use of renewable energy and energy efficiency, efficient use of water and maximum water quality associated with production, and instituting strategies for social responsibility. All colors of Zeftron nylon has been

Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.
84 Ultron. "Social Responsibility." <http://www.ultron.com/socialResponsibility.aspx>. 2009.

designated enviro6ix[®] which guarantees a minimum of 25 percent recycled content in all yarns. In addition, Zeftron launched the 6ix Again program, the first nationwide carpet recycling program for commercial carpet. This program provides an easy to use alternative for the landfill disposal of used carpet at the end of its useful life.⁸⁵



Nylon is a synthetic material that is derived from hydrocarbons; and it is often referred to as a thermoplastic or polyamide. Nylon is produced in many forms and can be applied for a variety of purposes.

Nylon is inherently unsustainable because it is derived from synthesized petrochemicals, a non-renewable resource. Furthermore, the production of nylon leads to the emission of nitrous oxide, an EPA-regulated greenhouse gas with a climate warming potential almost 300 times that of carbon

85 Zeftron. "6ix Again." <http://www.zeftronnylon.com/mainv3/recycle/6ixagain.cfm>. 2009.

dioxide.⁸⁶ Another negative impact of the use of nylon is the associated use of formaldehyde, a toxic chemical with documented carcinogenicity, and acute toxicity.⁸⁷

Nylon 6,6, also referred to as nylon 6-6, is a type of nylon that has a long molecular chain resulting in more sites for hydrogen bonds. This creates chemical “springs,” making it very resilient and qualifying it as a premium fiber. This structure also means that nylon 6,6 is difficult to dye, but once dyed it has superior colorfastness and is less susceptible to fading from sunlight and ozone and to yellowing from nitrous oxide. Nylon 6,6 is most often used by professional architects and designers for commercial settings like offices, airports, and other places that get a lot of wear and tear.⁸⁸ Because it is so durable, nylon 6,6 is thought to be more environmentally preferred.

86 UNEP. “Climate Change 2001.” Intergovernmental Panel of Climate Change. http://www.grida.no/publications/other/ipcc%5Ftar/?src=/climate/ipcc_tar/wg1/248.htm. 2001.

87 Kegley, S.E; Hill, B.R; Orme S; Choi A.H. “Pesticide Database – Chemicals.” PAN Pesticide Database. <http://www.pesticideinfo.org>. 2008.

88 Aramid Fiber. “Kevlar Technical Guide.” Du Pont. [www2.dupont.com/Kevlar/en_US/.../KEVLAR_Technical_Guide.pdf](http://www.dupont.com/Kevlar/en_US/.../KEVLAR_Technical_Guide.pdf). 2007.



Carpet

Carpet is a very durable product that is made to last lifetimes. However, it is usually thrown out long before its useful life is over because it is dirty, matted, or out of style. Five billion pounds of carpet enter a landfill each year, and this is expected to increase with the rise of global population and demand for carpet. Unfortunately, this carpet is piled up in landfills where it may take 20,000 years to decompose. Inevitably, environmental groups target fiber and carpet manufacturers, blaming these companies for the harm they cause on the environment, however indirectly. Manufacturers responded to this scrutiny by beginning to develop efficient ways to recycle and reuse useful carpet.⁸⁹

INTERFACE

Interface and its product line InterfaceFlor are leaders in the carpet industry. This company has focused on diminishing the environmental impact of their carpet throughout all life cycle stages including production, use, and disposal.⁹⁰ However, the most impressive progress made has been from Interface's carpet end-of-life strategies. For example, Interface launched its ReEntry Carpet Reclamation Program to recover used and discarded products to use in recycling or reuse processes.⁹¹ Since ReEntry's formation in 1994, more than 100 million pounds of carpet has been diverted from landfills. Interface can separate the face fiber and backing of nearly any carpet type using new

89 Carpet America Recovery Effort. "About Care." www.carpetrecovery.org. 2009.

90 Interface."Flor." <http://www.interfaceglobal.com/Products/Flor.aspx>. 2009.

91 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006

technology. Separated type 6,6 nylon fiber is recycled into new 6,6 nylon, while separated vinyl backing is recycled into new vinyl backing. This process requires less energy than typical recycling processes.⁹²

TANDUS

Tandus is a carpet company that has made great strides toward becoming sustainable. This company has engineered a process that uses 25 percent less yarn than the industry average to make superior performing carpet. This translates into 5 million pounds of virgin yarn avoided each year. But Tandus is not just simply removing carpet from the waste stream—it has created a closed-loop recycle program with C&A Floorcoverings that has introduced an innovative buy-back program called FLOORE.⁹³ The FLOORE program offers customers financial incentives to return and recycle their old vinyl-backed carpet because old vinyl-backed carpet and vinyl waste is the only feedstock for its C&A's ER3 backings. C&A guarantees that the returned carpet will be completely recycled. C&A also introduced Ethos in 2004, a PVC-alternative carpet backing that is made from polyvinyl butyral film that is recovered when automotive windshields are recycled. This backing is durable, 100 percent recyclable, and diverts millions of pound of film waste from landfills.⁹⁴ In addition, Tandus has achieved multiple third-party certifications.⁹⁵

92 Carpetology."Ultron Color Trends – Designer Insights Summary." <http://carpetology.blogspot.com>. 2009.

93 Tandus. "Leave No Trace." <http://www.tandus.com/sustainability>. 2009.

94 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006

95 Tandus. "Leave No Trace." <http://www.tandus.com/>

WOOL

Natural Environment gives good insight to the pros and cons of wool and organic wool:

Wool is a natural fiber, so it does have a head start in the eco-friendly game (compared to synthetic fibers such as polyester). However, the typical production of wool is far from eco-friendly. Production of wool requires arable land and sheep. Sheep create carbon dioxide and they degrade the land. Also, wool contains grease and oil that needs to be scoured. This in turn, pollutes run-off. Typically, 500,000 liters of water is used for each ton of wool processed. It has been estimated that 685,000 liters of water is required to produce a single pure woolen suit!

Despite the negatives, there are positives too though. Woolen products are usually very durable and will usually last a lot longer than many products made from other fibers. This means it's less likely to end up as landfill within a couple of years of purchase.⁹⁶

ORGANIC WOOL

Organic wool is produced using more environmentally benign production methods than its non-organic counterpart. During the production of organic wool, sheep are raised and treated differently than those producing non-organic wool (often subject to synthetic pesticides, non-organic feed, possibly synthetic hormones and genetic engineering, and possibly substandard health management and living conditions). If you intend to purchase products made of wool, try to make sure the wool is organic. Check that the wool producer has organic certification.⁹⁷

sustainability. 2009.

96 Natural Environment. "What is Organic Wool?" <http://www.natural-environment.com/blog/2008/01/25/what-is-organic-wool/> 2008.

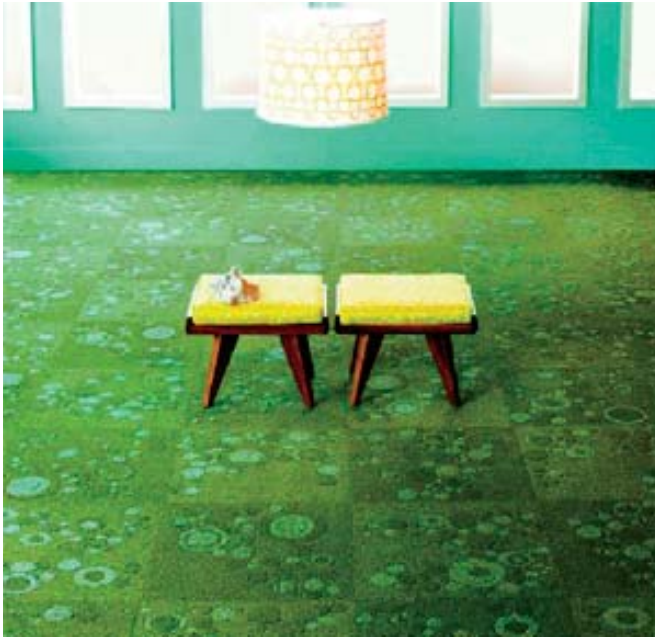
97 Ibid

SHAW FLOORS

Shaw Floors has incorporated the MBDC Cradle to Cradle program for its end-of-life management strategies, which suggests that carpets should be designed as waste that industries have use for. This is called a "technical nutrient." Technical nutrients must be able to be used again and again, never facing the fate of landfill. To achieve that kind of reuse and recyclability, Shaw designed its EcoSolution Q fiber to be recycled at Evergreen Nylon Recycling. The Shaw Company also introduced EcoWorx non-PVC carpet backing, which earned Shaw a Presidential Green Chemistry Award. This backing is 40 percent lighter, and considerably more durable than traditional PVC backings. Like EcoSolution Q, EcoWorx can be broken down at the end of its useful live and reassembled into carpet products that are indistinguishable from carpeting made from primary materials.⁹⁸



98 Shaw Floors. "Environmentally Friendly Products by Shaw ." (<http://www.shawfloors.com/Environmental/EnvironmentallyFriendlyDetail>). 2009.



LEES CARPETS UNIBOND

Lees Carpets Unibond has created Unibond RE, a remarkable backing that protects the environment while also protecting end users with its moisture barrier and full lifetime warranty. It is made of 20 percent post-consumer recycled content. This means that every square yard of Unibond RE carpet backing uses one-fifth fewer raw materials in production—preserving more natural resources (10 million pounds annually) and protecting large, used quantities of processed materials from the landfill. Instead, this material is put to good use in additional Lees Carpets’ backings. To further reduce the environmental impact of Unibond RE, Lees completely eliminated the use of water from this product’s manufacturing process.⁹⁹ Unibond RE’s production also does not incorporate toxic seam welds or sealers, yet this backing provides a bond estimated to be three times stronger than

⁹⁹ Greenworks. “Unibond RE.” http://www.mohawkgreenworks.com/products/backing/unibond_re.html. 2009.

conventional latex-backed carpets.¹⁰⁰ These backing systems also have fantastic operational performance and indoor environmental quality once installed. Today Unibond RE is third-party certified as an Environmentally Preferred Product.¹⁰¹

MILLIKEN FLOOR COVERING

Milliken has a program called Earth Square that renews existing modular carpet for another installation life—a different end-of-life management tactic. This strategy incorporates a step-by-step process: once old carpet squares are returned to Milliken, they are super-cleaned, retextured, redesigned, colored and then reinstalled either in the same location or in another for about half the cost of new carpeting. In addition, Milliken’s backing system is PVC-free and contains up to 35 percent recycled content. The Earth Square program produces less waste and pollution than primary production of carpet as well as other recycling programs.¹⁰² Milliken has also tackled the challenge of reducing the impact of its manufacturing operations. Since 1990, Milliken has reduced its environmental footprint by more than 85 percent. Even though production has been increasing, all Milliken manufacturing plants have recorded zero waste to landfill since 1999, reduced energy and water consumption by 50 percent since 1995, replaced more than 30 percent natural gas consumption with alternative energy, and planted more than 138,000 acres of company-owned forests

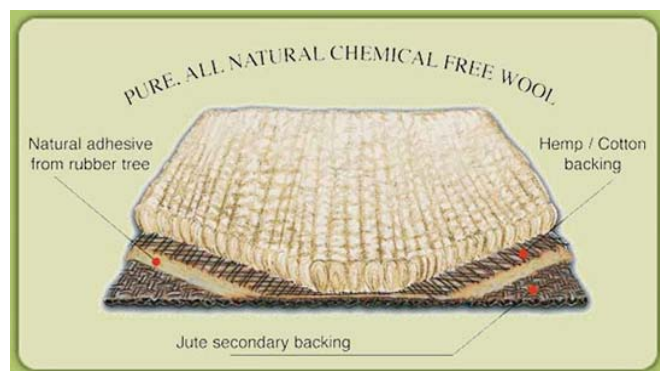
¹⁰⁰ Bonda, Penny; Sosnowchik, Katie. *Sustainable Commercial Interiors*. Wiley Publishing, Inc. New Jersey. 2006
¹⁰¹ Greenworks. “Unibond RE.” http://www.mohawkgreenworks.com/products/backing/unibond_re.html. 2009.

¹⁰² Bonda, Penny; Sosnowchik, Katie. *Sustainable Commercial Interiors*. Wiley Publishing, Inc. New Jersey. 2006

allowing Milliken to claim the status of the only carbon negative manufacturer in the industry.¹⁰³

EARTH WEAVE CARPET MILLS

Earth Weave Carpet Mills offers its Bio-Floor collection made of natural materials like hemp and wool in its broadloom carpets and area rugs rather than traditional synthetic materials. The primary benefit of using natural materials for carpets and rugs is that they are completely biodegradable, thus avoiding the problems conventional carpets face in landfills. Earth Weave's carpet adhesive is made of natural rubber and the back of the carpet is made of jute. The padding is naturally pigmented wool mechanically needled (not glued) into a cotton scrim. When the carpet needs to be replaced, customers can recycle it directly into a garden, where it will biodegrade for two to three seasons while serving as an effective weed barrier, nutrient provider, and mulch.¹⁰⁴



JUTE

To process jute to fiber, the plant stalks are harvested and defoliated, then retted chemically to remove the fibrous material from the woody stalk. The revealed

¹⁰³ Milliken. "Notes on the Journey to Sustainability." <http://www.millikencarpet.com/Americas/Contract/Corporate/Sustainability/Pages/default.aspx>. 2009.

¹⁰⁴ Earth Weave Carpet Mills. "Bio-Floor Collection - Bio-Degradable Hemp and Wool Carpet." <http://www.earthweave.com/bio-floor.html>. 2009.

fibers are woven into a yarn to be used in textiles. The current growing regions for jute include China, Thailand, Myanmar, Bangladesh, and Nepal,¹⁰⁵ and the availability of jute in these regions makes a likely textile fiber choice for furniture manufacturing facilities in Asia (ix).

The IJSG states that "jute is the second most important textile fiber, with cotton being the first." A renewable material, jute is extremely durable and the fibers tend to be finer than other natural alternatives, such as hemp. According to a study completed by the IJSG, "jute's ability to rapidly assimilate and metabolize carbon dioxide quicker than trees increase its role in carbon sequestration."¹⁰⁶ It is believed that within one growing season (100 days) one hectare of jute plants can consume about fifteen tons of carbon dioxide from the atmosphere and convert this into approximately eleven tons of oxygen.¹⁰⁷ It is easy to say that jute is a good choice when going green.

It is often desirable to blend jute fibers with softer counterparts for furniture coverings. Therefore to understand the complete environmental affects of your chosen jute-blended fabric, the environmental impacts associated with all component fibers would need to be considered as well.

¹⁰⁵ International Jute Study Group. "Jute, Kenaf & Roselle Plants." <http://www.jute.org/plant.htm>. 2009.

¹⁰⁶ Albers, Kyle; Canepa Peter; Miller, Jennifer. "Analyzing the Environmental Impacts of Simple Shoes: A life Cycle Assessment of the Supply Chain and Evaluation of End-of-Life Management Options." The Donald Bren School of Environmental Science and Management. University of California, Santa Barbara. 2008.

¹⁰⁷ International Jute Study Group. "Jute, Kenaf & Roselle Plants." <http://www.jute.org/plant.htm>. 2009.

Resilient Flooring

There are many companies that produce resilient flooring, primarily composed of cork, rubber, linoleum, and vinyl that are also embracing the concepts of sustainability. Responding to consumer demand and increasing awareness of the benefits of going green, many manufacturers have developed resilient floor coverings that feature naturally renewable ingredients and/or recycled content.

RUBBER FLOORING

Rubber flooring is generally considered an environmentally friendly material throughout the manufacture, use, and disposal stages of its life cycle. Virgin rubber is derived from trees and is manufactured using low-impact production processes. Flooring that contains recycled rubber has a smaller impact on the environment and is actually cheaper than synthetic or virgin rubber.¹⁰⁸

A few companies offering rubber flooring include: ECOsurfaces, Artigo, Bengard, Burke Flooring Products, Dodge-Regupol Inc., Johnsonite, Nora Rubber Flooring, R.C.A. Rubber Company, Roppe, and EarthShapes.

AMTICO INTERNATIONAL

Amtico International offers Stratica, an eco-polymeric flooring that has been used in many different types of commercial projects, and have a realistic array of replica woods, granites, stones, and marbles. Stratica is FloorScore and Greenguard 108 Lent, Tom; Silas, Julie; Vallette, Jim. "Resilient Flooring & Chemical Hazards: A Comparative Analysis of Vinyl and Other Alternatives for Health Care." Healthy Building Network. http://www.cleanmed.org/2009/downloads/presentations/C8/Julie_Silas.pdf. 2009.

certified, as it is made with Surlyn, a durable plastic that is recommended by Greenpeace as an alternative to PVC.¹⁰⁹ Stratica is also chlorine free, contains no plasticizers, emits virtually no VOCs, and does not require cleaning with caustic chemicals (minimizing its lifetime cost as well as environmental impact). In addition, Stratica reduces foot fatigue and noise levels promoting the well being of users.¹¹⁰

ECOSURFACES

ECOsURfaces flooring is comprised of post-consumer tire rubber and ColorMill EPDM (ethylene propylene diene monomer) rubber made from pre-consumer waste and organic fillers. These materials are bound together using a water-based polyurethane polymer. The entire product line is produced using a low embodied energy manufacturing process that requires minimal water, avoids heat and reuses in-line scrap to decrease waste. Available in both tile



109 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006
110 McGraw Hill Construction. "Amtico International Overview." <http://products.construction.com/Manufacturer/AMTICO-INTERNATIONAL-NST151265/products/Stratica-Eco-Polymeric-Flooring-NST31715->. 2009.

and roll forms, the resulting flooring is beautiful, recyclable, and passes tests for indoor air quality.¹¹¹



DON'T GET CONFUSED: A TONGUE TWISTER

LINOLEUM

Linoleum, a popular product in the 1960s and 1970s, has made a dramatic comeback in the past decade due to its incorporation of natural, renewable materials along with its durability and strength. Its natural materials often include linseed oil, pine rosin, ground cork, dust, wood flour, and mineral fillers such as calcium carbonate, most commonly on a burlap or canvas backing. Pigments are often added to the materials.¹¹²

111 ECOsurfaces. "Our Green Story." <http://www.ecosurfaces.com/sustainability.php>. 2009.

112 Powell, Jane; Linda Svendsen. *Linoleum*. Gibbs Smith Publishing. 2003.

MARMOLEUM

Marmoleum (natural linoleum), like linoleum, is one of the few products made from primarily natural raw materials such as linseed oil, rosins, and wood flour, and a natural jute backing. The Marmoleum Store states that marmoleum "is a tough yet visually striking floor covering, highly resistant to heavy rolling loads and foot traffic. Because Marmoleum is a natural organic product, its performance is enhanced by time, as exposure to air serves to harden and increase its durability. Although Marmoleum continues to harden over time, the floor remains quiet and comfortable under foot."¹¹³

CORKOLEUM

Corkoleum is another product similar to linoleum that is becoming commonly available. It is "made from all-natural materials including linseed oil, cork and wood flour (post-industrial dust), rosin and limestone. Organic pigments are used to color the product. These ingredients are mixed and heated, then applied to a jute backing to form the surface wear layer. The wear layer is then attached to a premium exterior grade high density fiberboard (HDF) made from recycled composite wood. The attached cork backing is produced using the by-product material from the cork bottle stopper industry."¹¹⁴

ARTOLEUM

Artoleum (by Forbo) is another kind of linoleum that is visually striking, highly textured, and designed to hide daily dirt in heavy-traffic areas where a low-maintenance floor is desired.¹¹⁵

113 Forbo Flooring Systems. "Commercial Products." <http://www.forboflooringna.com/default.aspx?menuid=5>. 2009.

114 US Floors LLC. "Why Natural Cork?" <http://www.usfloorsllc.com/products/natural-cork-collection/cork-maintenance/why-natural-cork>. 2009.

115 Bonda, Penny; Sosnowchik, Katie. *Sustainable*

Forbo provides two collections of linoleum, Marmoleum and Artoleum. Life cycle assessments of these flooring options have shown that they are ecologically preferred floor coverings. Both very long lasting, these products are made from renewable materials including linseed oil, rosins, jute, wood flour, and ecologically responsible pigments.¹¹⁶ Forbo reports that their linoleum is a closed-loop system because the energy obtained from incinerating the linoleum is about equivalent to that used in production. Forbo's marmoleum and artoleum have a water-based finish, are solvent-free, meet low-VOC requirements, and use no heavy metals in the manufacturing process. If the linoleum enters a landfill, it will naturally decompose and release no harmful substances to the environment.¹¹⁷

NORA RUBBER FLOORING

Nora Rubber Flooring offers a number of rubber flooring alternatives, including Noraplan Fossil, containing colors that resemble fossil inclusions found in nature. This "natural" look is aided with multi-colored granules embedded in one of 16 base colors and a smooth, non-glare finish.¹¹⁸ Like all Nora products, Noraplan Fossil is PVC-free and contains environmentally compatible color pigments. Bonda and Sosnowchik note that "Noraplan Fossil is also made using the Nora Cleanguard manufacturing process, which eliminates the need for waxing or sealing, thus contributing to

healthier indoor air and easy, less expensive cleaning with lower maintenance costs."¹¹⁹

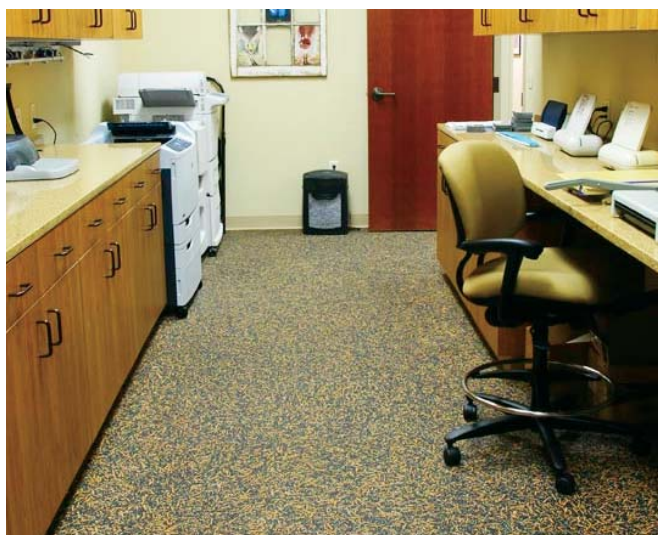


TO MARKET

To Market offers Atmosphere recycled rubber flooring series, created from reclaimed car tires, available as straight edge of interlocking tiles. To Market reports that their "Interlocking tiles are easy-to-install and can be removed, replaced or flipped over for double life of the mats. Atmosphere is easy to maintain and provides unlimited design flexibility for end-use applications in office, educational, institutional, health care and retail environments. No adhesive is required for interlocking tiles, allowing¹¹⁹ Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.
 116 Forbo Flooring Systems. "Commercial Products." <http://www.forboflooringna.com/default.aspx?menuid=5>. 2009.
 117 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.
 118 Mass Transit. "Noraplan Fossil." http://directory.masstransitmag.com/product/39723/Nora_Rubber_Flooring_Noraplan_Fossil. 2009.

for a green installation and providing substantial savings in adhesive and labor installation costs.” Environmental benefits include excellent indoor air quality because the product contains little to no VOCs, a clean manufacturing process through the use of environmental technologies, development from up to 87.5 percent post-consumer recycled tire rubber, and an end result of a recyclable product. To Market offers an excellent recycling program through which up to 7.5 tires are saved from landfill for every 100 square feet of Atmosphere sold.¹²⁰



CORK

120 To Market. “Atmosphere Recycled Rubber Flooring.” http://www.tomkt.com/atmosphere/pdf/Atmosphere_3.pdf. 2009.

Cork is considered a renewable material, and therefore an eco-friendly alternative, because it comes from the bark of a cork tree. However, cork can typically only be harvested from mature trees every six to nine years.¹²¹ Cork trees are not harmed during the harvesting process, and typically live from 150 to 500 years. The harvesting process is relatively straightforward, requiring the bark be stripped from the tree using hand tools and the suberin material be removed.¹²² “Cork flooring is made by grinding the bark into small pieces, which are coated with a non-toxic resin binder, and then manufactured as tiles or planks in various thickness.”¹²³ Cork is an excellent natural cushioning material, antimicrobial, virtually impermeable to liquid and resilient.¹²⁴ It absorbs sound and provides acoustical excellence. Its noise abatement, long-term aesthetics, and abrasion resistance alone makes it a good choice for an office.¹²⁵

Some cork flooring manufacturers include: American Cork Products, LLC., Capri Cork, Duro-Design, Expanko, Globus Cork, Natural Cork, LLC., Jelinek Cork, Wicanders (from the Amorium Group), We Cork, and Unicork Naturals (from To Market).¹²⁶

121 Amorium, “Natural Cork Protection.” <http://corkfacts.com/natlcrk11.htm>. 2006.

122 Albers, Kyle; Canepa Peter; Miller, Jennifer. “Analyzing the Environmental Impacts of Simple Shoes: A life Cycle Assessment of the Supply Chain and Evaluation of End-of-Life Management Options.” The Donald Bren School of Environmental Science and Management. University of California, Santa Barbara. 2008.

123 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

124 Amorium, “Natural Cork Protection.” <http://corkfacts.com/natlcrk11.htm>. 2006.

125 Jelinek Cork Group. “Cork Flooring.” <http://www.corkandfloor.com/>. 2009.

126 Floor Facts. “Cork Flooring Manufacturers.” <http://www.floorfacts.com/corkfloors.asp>. 2009.

TO MARKET

To Market also offers cork flooring in its Unicork Naturals product line, a collection of nine flooring patterns featuring organic and geometric styles available in rich neutral tones. Unicork Naturals is designed and engineered from the bark of cork trees and engineered by hand, so no trees are destroyed during the manufacturing process.¹²⁷



WICANDERS

Wicanders, a brand name from the Amorium Group, is another leading cork supplier. This company has developed a long established line of products for supplying high quality natural floors, including Portuguese cork tiles and planks. Wicanders also incorporates glueless flooring systems into their manufacturing.¹²⁸ This company offers several cork flooring collections: Motion combines cork with rubber for a bolder look and Xtreme WRT has a matte finish that's "based on a compound of tiny ceramic microbeads to protect the floor against abrasion and scratches. Wicanders notes that Xtreme WRT enhances the natural features of wood and cork while considerably improving UV protection."¹²⁹

127 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

128 Floor Facts. "Cork Flooring Manufacturers." <http://www.floorfacts.com/corkfloors.asp>. 2009.

129 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

Hard Flooring

CONCRETE

Concrete is composed of water, stone, cement, gravel, and sand—all ingredients that can be 100 percent recycled indefinitely. This means that old concrete can be crushed and used for new concrete or as road-building material. Concrete is also used for contemporary flooring applications with the inclusion of minimal additives to improve its characteristics. An example is polished concrete, which is “ground, densified (with a silicate compound considered environmentally benign), and polished to produce a durable, reflective surface.”¹³⁰ Little energy is required for manufacturing concrete, and the finished product is considered chemical-free and VOC-free. Polished concrete flooring can be stained to produce an attractive surface with a color of your choice. A polished concrete floor generally obtains a life cycle of over ten years, and typically requires only stone soap and water for cleaning.¹³¹

AMERICAN BILTRITE CANADA LTD.

American Biltrite Canada Ltd. created a division called Estrie Products International that offers Stonescape, a flooring alternative made from a blend of naturally abundant resources such as limestone and ethylene acrylic polymers. Estrie believes that Stonescapes offers the perfect balance of ecological responsibility and performance. It is free of PVCs, halogens, plasticizers, chlorines, VOCs, and asbestos.¹³² Beyond its environmental benefits,

130 Bonda, Penny; Sosnowchik, Katie. *Sustainable Commercial Interiors*. Wiley Publishing, Inc. New Jersey. 2006.

131 Ibid

132 1 American Biltrite Canada Ltd. “Estrie.” <http://www.american-biltrite.com/Flooring/estrie/stonescape.php>. 2009.

Stonescapes is dimensionally stable, smoke-resistant, flame-resistant, and sound-deadening.¹³³

INTERFACE

Interface created their i2 tile product line. No two tiles are alike, however once the modules are laid out (or when tiles are replaced), they all coordinate with one another. Interface reports that installations are averaging less than two percent waste, which is almost twenty percent less than other companies and strategies.¹³⁴

RETROPLATE

RetroPlate is one company that offers polished concrete systems. The RetroPlate Concrete Polishing System revitalizes concrete floors, transforming new or old concrete into strong, durable, shiny surfaces through use of its patented process of diamond grinding and polishing in conjunction with the special RetroPlate formula. Environmental Building News and GreenSpec name RetroPlate a Top-10 Green Building Product. RetroPlate earned this recognition for its release of minimal pollutants, no VOCs, exceptional durability and low maintenance. In addition, RetroPlate’s shiny, reflective floors will reduce your company’s utilities cost by 30%!¹³⁵

133 Bonda, Penny; Sosnowchik, Katie. *Sustainable Commercial Interiors*. Wiley Publishing, Inc. New Jersey. 2006.

134 Interface.”Flor.” <http://www.interfaceglobal.com/Products/Flor.aspx>. 2009.

135 RetroPlate. “Concrete Polishing Systems.” <http://www.retroplatesystem.com/>. 2009.



Upholstery patterns Hydro, Élan, Flora, Terra, Link -
Designed in collaboration with Glenn Peckman

TOUCHSTONE

Touchstone large-format tiles are composed of natural materials such as limestone, silica sand, and white cement, all of which is sourced locally, and 50 percent of which is post-industrial. The slabs cure naturally, continuing to strengthen over many years. Also because they cure naturally, the slabs are not heated, resulting in relatively low energy consumption during the manufacturing process. In addition, all waste material and recovered product can be recycled.¹³⁶

136 Touchstone Tiles. "A collection of earth friendly surface coverings made out of natural materials: environmentally-sound flooring." <http://www.touchstonetiles.com/Environmental.pdf>. 2009.



Wood Flooring

Wood flooring is becoming commonly found in personal as well as commercial spaces as the introduction of high-performance finishes make the product increasingly durable and easily maintained. Much of wood's reviving popularity is due to the warmth and comfort it brings to a space. Most wood floors today are manufactured using North American hardwoods that can take anywhere from three decades to beyond 100 years to mature.¹³⁷

Logging has destroyed forests in the past and continues to do so today. But wood can be a truly sustainable resource if it is sourced and produced responsibly. Eco-friendly wood can come from salvaged, reclaimed and recycled sources, or it can come from ecologically well-managed forests and plantations. Most recycled wood incorporates by-products of another manufacturing process (such as sawdust) or is taken from existing structures or products and re-used. Reclaimed and salvaged woods refer to already manufactured wood products that are remanufactured into new ones (such as timbers from the deconstruction of old buildings that are re-milled, old crates and pallets), or to the direct reuse of wood products or logs salvaged from a variety of sources (such as street trees, river and lake bottoms, orchards, and even forests).¹³⁸ If your wood selection is new and unused, make sure it is from hardwoods managed in a sustainable manner that ensures long-term productivity. Remember that trees are an important attribute to local economies, wildlife, recreation, and other uses.

137 EcoTimber. "Eco Flooring Guide." <http://www.ecotimber.com/guide/eco-flooring-guide.htm>. 2009.

138 Ibid

BAMBOO

If you are looking for a renewable material, bamboo is it. Bamboo is known to grow up to five feet per day with little water and without the use of fertilizers or pesticides, and can reach maturity at heights well over 50 feet in about five years. Bamboo is a very strong plant and can survive both drought and flood conditions. Additionally, since bamboo is a grass, it is harvested again and again from the same plants, which happen to release a lot of oxygen into the air. A grove of bamboo releases 35 percent more oxygen than an equivalent stand of trees. It can reduce soil erosion and desertification, and actually improve soil quality in degraded and eroded areas. And of course, bamboo is 100 percent biodegradable, so you know your old bamboo flooring is not going to end up in landfill for hundreds of years.¹³⁹ As Lloyd Alter pointed out to the TreeHugger Group, "From a social perspective, 6 million people in China work in bamboo and 600 million people worldwide rely on income from it."¹⁴⁰

However, on the other side of the environmental coin lies the fact that most bamboo is grown in Asia, Central America, and South America and thus necessitates overseas transportation and its attendant environmental impacts. However, experiments are proving that some bamboo species can thrive in North American climates.¹⁴¹

139 Natural Environment. "The Benefits of Bamboo Clothing." <http://www.natural-environment.com/blog/2008/01/26/the-benefits-of-bamboo-clothing/>. 2008.

140 Lloyd Alter. "Bamboo Flooring – Is it Really Treehugger Green?" TreeHugger. http://www.treehugger.com/files/2005/09/bamboo_flooring.php. 2005.

141 Ibid

In addition, environmental benefits could potentially be negated because of deforestation taking place to clear space for bamboo growth in response to high consumer demand. The Treehugger group stated:

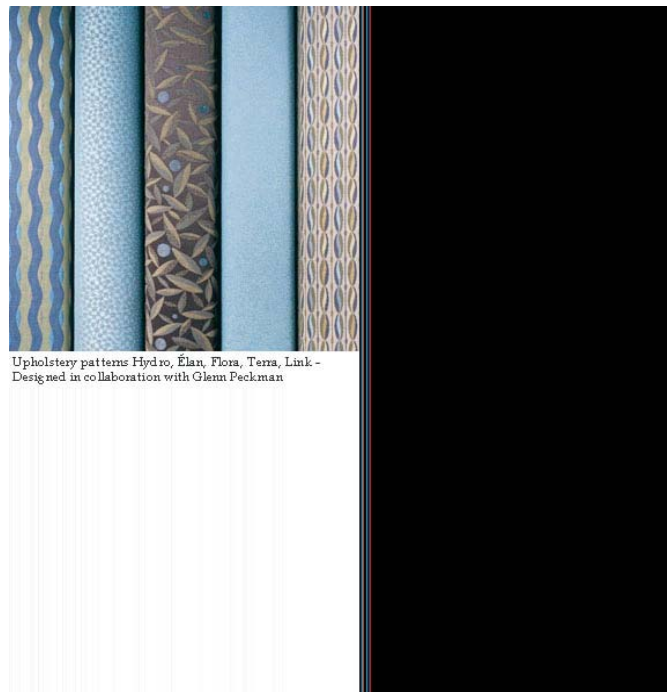
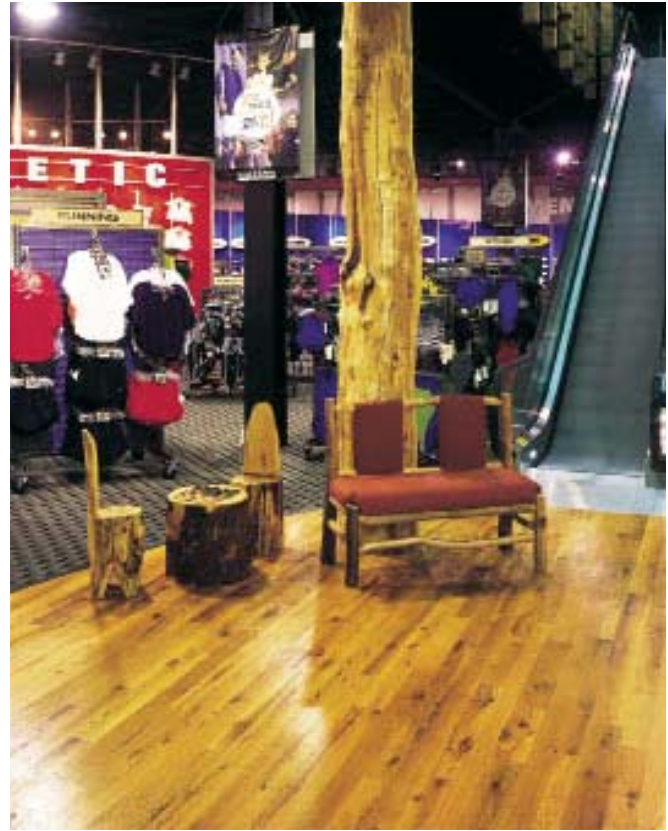
Recently, bamboo expansion has come at the expense of natural forests, shrubs, and low-yield mixed plantations . . . It is common practice to cut down existing trees and replace them with bamboo...As forestlands tend to be in hilly and mountainous areas with steep slopes, clear-cutting has resulted in an increase in erosion until the bamboo becomes fully established. This process has also had a negative impact on biodiversity... The intensive management practices employed involve manual or chemical weeding and periodic tilling of the land to keep the soil clear of undergrowth. These practices increase erosion and result in single-species plantations over large areas... The intensive use of chemicals (pesticides, weed killers and fertilizers) [associated with growing bamboo] also affects the environment (which may need to be excessively used to meet demand)...¹⁴²

Therefore, it is a good idea to learn about the management practices your bamboo flooring underwent in its earlier days. Find out where it came from or refer to this list of sustainable bamboo sources.

AGED WOODS

Aged Woods flooring is milled from old (75-200 years) barn wood that could be mistaken for firewood or something that belongs in a dump. Once this wood is collected, Aged Woods turns it into natural-looking, stylish planks with proper kiln drying before milling to ensure a stable, bug-free floor. “The look of these antique woods is natural, resulting from many decades of weathering the wind, rain, and sun, contributing to the rugged,

rustic feel of Early Americana.”¹⁴³ Aged Woods recommends using low-VOC finishes from the Bona Environmental Choice System (ECS).



142 Ibid

143 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

ECOTIMBER

EcoTimber stresses the importance of choosing a bamboo flooring option from a plantation rather than from a wild habitat. If it is from the latter, too early or unsustainable harvesting practices could cause harm to that habitat. Furthermore, you could end up with an inferior finished product. EcoTimber also recommends considering “raw materials, adhesives, milling equipment, board lengths, and finishes” to determine the environmental and performance quality of your choice.¹⁴⁴ EcoTimber offers Solid Bamboo flooring that can be nailed to plywood or glued to concrete subfloors. This company also offers engineered bamboo flooring, consisting of a sandable wear layer of bamboo on a backing made of plantation pine and fir that can be nailed to plywood, glued to concrete, or floated. EcoTimber Solid Bamboo flooring is made with a formaldehyde-free adhesive, and its EcoTimber Engineered Bamboo Flooring is made with a low-VOC adhesive that falls far below strict standards for indoor air quality.¹⁴⁵ EcoTimber also provides several other types of wood flooring as well as an Eco Friendly Flooring Guide.

GOODWIN HEART PINE

Goodwin Heart Pine reclaims 100- to 200-year-old heart pine and heart cypress woods from rivers in the southern United States that were used in timber operations to raft logs to nearby sawmills. The company explains that some of the densest, heaviest logs rolled off the rafts during the float trip to the mills. Today, Goodwin recovers these abandoned

antique logs from the waters, where they have been well preserved due to oxygen-free conditions. Once recovered, these logs are processed into antique woods for flooring, millwork, and stair parts.¹⁴⁶



TERAGREN

Teragren is another leading bamboo flooring manufacturer. This company uses the Moso species of bamboo, which is harvested from a plantation in managed agricultural plots by independent farmers in China. The company recently introduced Synergy, a compressed-strand bamboo flooring product that is 43 percent harder than traditional bamboo. Teragren also offers Signature colors, a collection featuring machine-applied water-based stains applied to the flat grain for interesting colors.¹⁴⁷ All Teragren coating materials are water-based, solvent-free, and non off-gassing.¹⁴⁸

144 Bonda, Penny; Sosnowchik, Katie. *Sustainable Commercial Interiors*. Wiley Publishing, Inc. New Jersey. 2006.
145 EcoTimber. “Not All Solid Bamboo Flooring Is The Same.” http://www.ecotimber.com/bamboo_info.php. 2009.

146 Goodwin Heart Pine. “Products.” <http://www.heartpine.com/products>. 2009.

147 EcoTimber. “Not All Solid Bamboo Flooring Is The Same.” http://www.ecotimber.com/bamboo_info.php. 2009.

148 Bonda, Penny; Sosnowchik, Katie. *Sustainable Commercial Interiors*. Wiley Publishing, Inc. New Jersey. 2006.



Bamboo or Wood?

Excerpt from Eco Flooring Guide by Eco Timber¹⁴⁹

Because it grows much faster than trees, bamboo is an excellent flooring choice for those looking for more sustainable flooring options. However, the idea that bamboo flooring is a more environmentally-friendly choice than wood is an oversimplification. Buying sustainably-harvested wood pushes the timber industry in a more responsible direction, discourages illegal logging, and helps create economic value for a forest ecosystem that might otherwise be cleared for agriculture or development. For these reasons, we believe that sustainably-harvested wood is a more proactive environmental choice than agricultural products like bamboo.

¹⁴⁹ Eco Timber. "Eco Flooring Guide." <http://www.ecotimber.com/guide/eco-flooring-guide.htm>. 2009.



Other Wood and Millwork

Particleboard and medium-density fiberboard (MDF) are used in almost every building, whether in be in floors, walls, or cabinets. In fact, particleboard has become one of the nation's leading building materials because it is a more affordable alternative to solid woods. However, an even more environmentally benign alternative is agriboard, or "tree-free particleboard," which manufacturers are producing in response to increasing concern over deforestation. Agriboard is agricultural-based products such as wheatboard or strawboard. These products are formaldehyde-free, which is not true for most particleboard, yet they are just as durable as particleboard.¹⁵⁰

COLUMBIA FOREST PRODUCTS

Columbia Forest Products is mitigating its environmental impact through innovation. Using a patented, soy-based adhesive called PureBond, this company is converting all its veneer-core hardwood and plywood plants to formaldehyde-free manufacturing process. The new binder is 87 percent soy protein, with the remainder a proprietary petrochemical-based polyamide resin. It is water-based, nontoxic, and nonflammable, releasing only water vapor during curing. Straw, an agricultural waste product, makes up the company's agrifiber-core panels.¹⁵¹

150 Bonda, Penny; Sosnowchik, Katie. *Sustainable Commercial Interiors*. Wiley Publishing, Inc. New Jersey. 2006.

151 Columbia Forest Products. "PureBond: Formaldehyde-free Hardwood Plywood." <http://www.columbiaforestproducts.com>

PRIMEBOARD

PrimeBoard is one supplier of agriboard made of fiber from wheat and sunflowers, both of which are annually renewable. PrimeBoard reports that "Because PrimeBoard panels utilize emissions-free synthetic resins in place of traditional resins formaldehyde-containing, this material produces no VOCs, creating a healthier environment."¹⁵² Bonda and Sosnowchik point out, "the company's PrimeBoard Premium Wheat line is an interior-grade engineered panel commonly specified for work surfaces, high-end cabinetry and case goods, furniture, store fixtures, and any other type of particleboard or laminated products. PrimeBoard Supreme Wheat offers the same properties but with increased moisture resistance."¹⁵³

SIERRAPINE

SierraPine offers a Sustainable Design Fiberboard product line, which includes Medite II, a 100 percent recycled wood fiber utilizing a formaldehyde-free adhesive. This system is third-party certified by SCS and EPP. Another option available from SierraPine is Medite FR, an option that gets fire-retardant properties through an additive that is blended with the wood. Sierra Pine's Medex is an SCS certified, no-added-formaldehyde, moisture-

www.purebond.com/PureBond.aspx. 2009.

152 PrimeBoard. "PrimeBoard Melamine Panels." <http://www.primeboard.com/pdfs/PrimeCoreMelamine.pdf>. 2009.

153 Bonda, Penny; Sosnowchik, Katie. *Sustainable Commercial Interiors*. Wiley Publishing, Inc. New Jersey. 2006.



resistant MDF panel engineered specifically for interiors in high-moisture areas.¹⁵⁴

154 SierraPine. "Sustainable Products." <http://www.sierrapine.com/index.php?pid=14>. 2009.



Furniture

General guidelines when selecting interior furnishings or furnishes according to Bonda and Sosnowchik:¹⁵⁵

- “Select products with low or no VOC content, and choose water-based finishes whenever possible, to address indoor air quality issues.
- Use precious materials, such as tropical hardwoods, sparingly and only when certified to be from a sustainably managed forest. Specify wood harvested from sustainably managed forests as well.
- Choose products based on their total life cycle cost, including maintenance, durability, and embodied energy.
- Use products with a high recycled material content, or products that can be recycled, salvaged, or reused, to address end-of-life issues.
- If possible, use products that consist of naturally renewable resources, which can be more easily recycled at the end of their useful life or are biodegradable if landfilled.
- Be familiar with the various third-party certification programs in place to fully evaluate the specific benefits each environmental claim offers to the project.

The furniture industry has been scrutinized for negative environmental impacts like wood, VOC emissions from manufacturing and installation, and end-of-life strategies generally consisting of landfills. In response to this criticism, furniture manufacturers are making new, stylish products to remain competitive in the market. As a result, consumers are

¹⁵⁵ Bonda, Penny; Sosnowchik, Katie. *Sustainable Commercial Interiors*. Wiley Publishing, Inc. New Jersey. 2006.

finding it easier to find low-impact furniture on a regular basis. Many well-known manufacturers have begun offering sustainable product lines.¹⁵⁶

BALTIX FURNITURE

Baltix Furniture has created the Ecosystem collection, which sets the standard for modular systems and free-standing office furniture built from durable, ecologically sensitive materials.¹⁵⁷ Ecosystems provides desk components, partitions, storage elements, and a complete table program, all manufactured using recycled and biocomposite materials such as recyclable aluminum specified at 75 percent post-industrial content, linoleum components, ecowheat (an alternative to MDF for panels and cores); ecosunflower (from sunflower husks, which gives panels a burl-wood look), and ecowood (harvested from sustainable forests).¹⁵⁸

ENVIRONMENTAL LANGUAGE (EL)

Environmental Language (el) is proof that furniture can be both elegant and eco-friendly. The woods used by Environmental Language are locally reclaimed from woods harvested in a sustainable manner and are FSC-certified. Natural latex foam, organic cotton, and non-toxic glues are used for upholstered items. Finishes are derived from tree sap and are available in dark ebony, ebony wash, or clear.¹⁵⁹

¹⁵⁶ Ibid

¹⁵⁷ Baltix Furniture. “Sustainable Green Furniture.” <http://www.bmsrentals.com/sustainable-green-furniture.html>. 2009.

¹⁵⁸ Bonda, Penny; Sosnowchik, Katie. *Sustainable Commercial Interiors*. Wiley Publishing, Inc. New Jersey. 2006.

¹⁵⁹ Environmental Language. “Essence of el.” <http://www.el-furniture.com/about/index.html>. 2009.



HAWORTH

Haworth's Zody task chair features an asymmetrical lumbar adjustment, 4-D arms, and an optional gel foam seat. It is made with 51 percent recycled content and up to 98 percent recyclable materials. This chair is PVC-free, chromium-free, CFC-free, and has earned Gold Cradle to Cradle certification from MBDC. To top it all off, the Zody task chair is manufactured using 100 percent Green-e wind-power.¹⁶⁰

HERMAN MILLER

Herman Miller offers Mirra Chain, a task chair designed according to the company's internal Design for the Environment protocols regarding material chemistry, manufacturing, packaging, ease of disassembly, and recyclability. Up to 96 percent of Mirra's materials can be recycled once the chair has served its useful life. Latitude Fabric, which is 100 percent recycled polyester, is used in the upholstered version of the chair.¹⁶¹

INTEGRA

Integra's seating lines are designed for modularity and sustainability. If something is damaged, that individual component can be replaced rather than the entire chair, increasing life span while reducing waste and cost. Approximately 80 percent of Integra's upholstered frames are made with Sierra Pine's Medite II, an eco-friendly material that is SCS and EPP certified for 100

160 Cangeloso, Sal. "Review: Haworth Zody Chair." <http://www.geek.com/articles/gadgets/review-haworth-zody-chair-20080326>. 2008.

161 Herman Miller. "Mirra Chair." http://www.hermanmillerseating.com/cominc/toolbox/landing_pages/hermanmiller/Mirrachair.asp. 2009.

percent recovered or recycled wood fiber and no added formaldehyde. The other 20 percent of Integra's wood applications use plentiful woods from well-managed forests. Integra's steel tubing is made from at least 70 percent recycled steel, and their connector plugs are made from scraps leftover from a main manufacturing process that is generated in a factory one block away.¹⁶² All of Integra's foam and filling materials are CFC-free and CA 117 approved, assuring they are low in toxins and flammable content. Integra uses a water-based glue which is non-toxic for foam adhesive. As far as recycling, all of Integra's scrap steel pieces are taken to a steel recycling facility, all excess cardboard is recycled, all scrap foam pieces are recycled for use in the craft industry or made into carpet padding, all unused scrap or bolt fabric is available to the employees for various uses, and all factory pallets are 100 percent recycled wood product returned for recycle after use. Integra furniture is set-up in the factory and shipped blanket-wrapped creating no cardboard waste. The blankets go back onto the truck and are reused shipment after shipment.¹⁶³



(Integra's Rendezvous chair)

162 Interior Design. "Integra – Rendezvous." <http://www.interiordesign.net/newproductdetail/2140193590.html>. 2009.

163 Integra. "Sustainability Overview." www.rkwitt.com/Integra_Sustainability_Overview.pdf. 2009.

KNOLL

Knoll's Currents line contains 20-30 percent recycled-content steel, 70-100 percent recycled-content aluminum, 100 percent recycled-content particleboard, and even recyclable steel and aluminum components. Knoll offers FSC-certified materials as well as 100 percent recycled content fabric for upholstery. Knoll reports that "powder coatings on metal and wood components are virtually 100 percent VOC-free, as are the water-based adhesives used to adhere laminate to substrate."¹⁶⁴ Additionally, the powder coating on metal components has a resin usage rate of up to 95 percent.¹⁶⁵ Knoll also offers the Dividends frame and tile system, which is 15-30 percent recycled-content steel, 20 percent recycled-content aluminum, 100 percent recycled-content, particleboard, recyclable steel and aluminum components, and is available with 100 percent recycled-content fabric. Hardwoods and reconstituted veneers come from FSC-certified, well-managed forests in North America. There is also a lease program available that provides for the product to be returned to Knoll for recycling or refurbishing for a second life.¹⁶⁶



164 Knoll. "Systems." http://www.knoll.com/environment/env_pro_systems.jsp. 2009.

165 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

166 Ibid



OLIVE

Olive Designs incorporates organic or recycled materials into its contemporary seating and table applications. It uses recycled textiles such as 100 percent recycled polyester and hemp. Colored tops are made from discarded glass bottles or discarded clear plate glass. The use of postindustrial foam ensures that no off-gassing occurs during the recycling process, which can occur with the use of virgin foams. Other recycled components include a 99 percent recycled rubber-surface top made from postindustrial tires and a recycled durable nylon composite made from 100 percent postindustrial scrap (nylon and tires generally have low recycling rates). Formaldehyde-free glue is used in the wood lamination process for seating, and a water-based adhesive is used in the upholstery process to bond foam and plywood. Finally, the water-based, powder-coat, and nickel-plated finishes used by Olive Designs minimize the environmental impacts associated with finishing and meet stringent EPA standards.¹⁶⁷

167 Olive Designs. "About Olive Designs." <http://www.olivedesigns.net/index1.html>. 2009.



STEELCASE

Steelcase offers the Think task chair, which is made of 41 percent recycled material, and is 99 percent recyclable by weight. MBDC has verified that, according to their materials classification protocol, the Think chair uses only materials deemed safe for the environment. These chairs are coated with VOC-free and heavy metal-free powder-coat paint. The manufacturing process used for the chair incorporates water-based urethane foam, and the



assembly incorporates no gluing. The Think chair's seat and back cushions, arms, headrest, and lumbar support can be added or replaced to increase the chair's lifetime. Disassembly for recycling is very simple,

and lightweight chairs are manufactured in close proximity to customers in North America, Europe, and Asia to reduce shipping impacts.¹⁶⁸

TEKNION

Teknion's Origami "features a unique application of wrapping surfaces emphasized by the interplay of different materials. A vertical fold is created by the wrap of storage case sides and back; a horizontal fold by the wrap of storage fronts and top."¹⁶⁹ Origami includes the bulk of the company's sustainability efforts. Teknion's environmental parameters include FSC-certified wood, and design with special attention to sustainability principles.¹⁷⁰ Water-based and powder-coat finishing are used to reduce VOC emissions from this line, which earned Teknion a Greenguard certification for meeting air quality standards. Also, the use of software automatically configures part programs to optimize the raw material usage, energy consumption, and waste of production scrap.¹⁷¹

168 Steelcase. "Environmental." http://www.steelcase.com/na/environmental_think_products.aspx?f=11845&c=17820. 2009.

169 Teknion. "Origami." http://www.teknion.com/products/filing-storage_origami/default.asp?country=canada, 2009.

170 Ibid

171 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

Wall Coverings and Paint

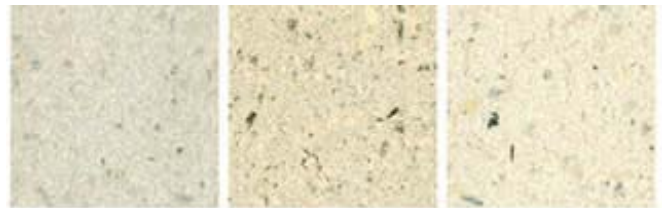
WALL COVERINGS

Most of the environmental impacts associated with wall coverings occur during the production process. Gaseous emissions and effluent discharges from printing and coating processes are of particular concern because they may be severely harmful to human health in addition to the environment. Another important issue is off-gassing during and after a wall covering or finish is installed that is a result of the adhesives and solvents used. Many products continue to release VOCs during their useful lives, decreasing the quality of the surrounding air. Gaseous and toxic chemicals may be required for cleaning during this life cycle phase as well. Final considerations involve durability and disposal, which are important for assessing environmental impacts during the end-of-life stage of the wall covering or finish. Many manufacturers are learning of such affects of these products, as well as consumer demand for more environmentally sensitive products, and beginning to offer healthier options. Today's eco-friendly wall covering options vary in texture, pattern, and hue that are suitable for wide range of applications.

PALLAS TEXTILES

Pallas Textiles offers the Dial Tones collection—an ecologically conscious design made of 50-70 percent recycled Japanese telephone book paper. Mixed with paper pulp, six colors bloom from tints found in diverse natural elements. The DialTones collection is made in Japan under strict pollution laws and incorporates a minimum amount of dye. It has an easy-care finish and a Class A fire rating. Pallas

Textiles also offers Earth Paper, a densely textured wall covering with a soft, stucco-like appearance (like Japanese mudpapers that absorb the impression of the calligrapher's brushstrokes). It consists of 65 percent pulp, 25 percent stone powder, 8 percent straw, and 2 percent polyvinyl alcohol.¹⁷²

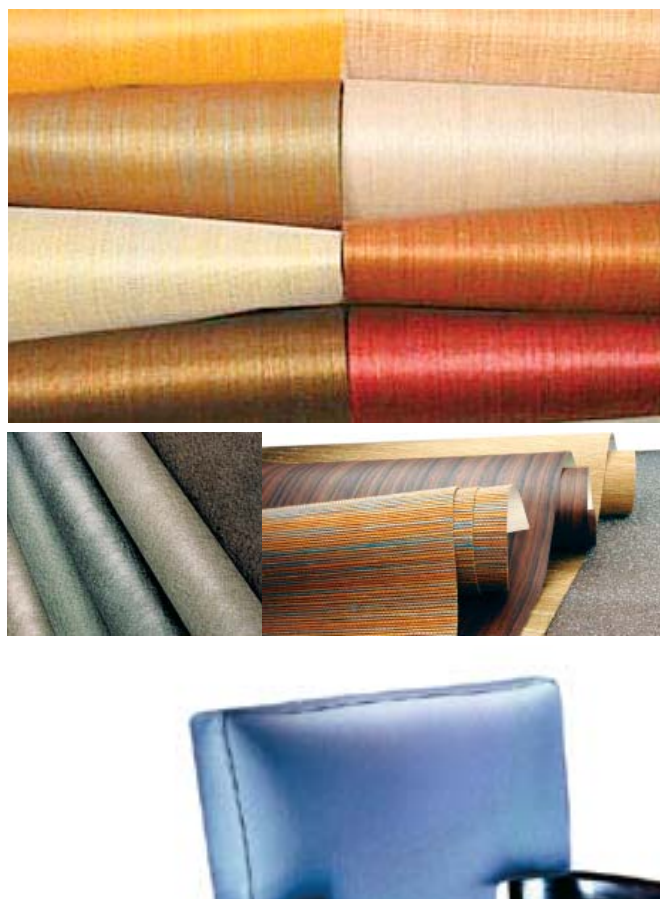


INNOVATIONS IN WALLCOVERINGS

Innovations in Wallcoverings claims it was the first company to develop a comprehensive line of commercially viable earth-friendly wallcoverings. In spite of initial concerns about the durability of earth-friendly wallcoverings, Innovations pioneered sustainable products that are as tough as they are beautiful. Ten years ago, the Innvironments line was developed and has since proven its strength in high-traffic installations such as hotels and hospitals around the world. This line of wall coverings is composed of either natural and renewable or recyclable materials, using water-based inks that contain neither heavy metals nor off-gas harmful pollutants. All wood products are harvested in managed forests, and all polyester components have a recyclable quality. Additionally, Innovations has implemented a number of environmentally responsible manufacturing processes, including techniques that reduce waste at the company's mills

¹⁷² Pallas Textiles. "Dial Tones." <http://www.pallastextiles.com/patterns/pattern.aspx?pnid=139&cat=8>. 2009.

by more than 30 percent and a closed cooling system that reduces water consumption. Murano, a recent addition to the Innvironments line, is a glass-beaded wall covering from Italy. Refined glass beads are applied to flexible non-woven backing, enabling it to be used on the inside and outside of right angles. Available in multiple colors, Murano captures the interplay of light and color.¹⁷³



WOLF-GORDON, INC.

Wolf-Gordon, Inc. offers an Ecological Reclamation Program for its EarthSafe Strata collection of wall coverings. At the end of the product's useful life, the wall coverings can be returned (for credit)

¹⁷³ Green Home. "Innovations In Wallcoverings Innvironments Collection." <http://greenhome.huddler.com/products/innovations-in-wallcoverings-innvironments-collection-wall-covering>. 2009.

and applied to a variety of secondary uses. Strata is composed of natural, renewable, or recyclable materials.¹⁷⁴

MILLIKEN & COMPANY

Milliken & Company offers 180 Walls, a self-adhesive textile wall covering that the company reports hangs without paste, experiences no wet movement, shrinkage, or corner peel, and can be removed years later without damage to walls. Additionally, a dry pressure-sensitive adhesive is used on the product instead of a wet paste, which is typically a food source for mold and spores. Finally, an antimicrobial agent incorporated into the product reduces the risk of mold and mildew. All 180 Walls products carry a Class-A fire rating and have emission levels 90 percent below accepted standards.¹⁷⁵ The manufacturing processes are respectable as well: 43 Milliken manufacturing sites do not send waste to landfills (resulting in less than one-tenth of one percent of the company's solid waste going to landfills in 2008), more than 90 percent of Milliken locations have achieved ISO 14001 registration, and Milliken & Co. has received awards and recognition from various organizations at the national, state, and local levels.¹⁷⁶

¹⁷⁴ Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.
¹⁷⁵ Ibid

¹⁷⁶ Milliken & Company. "Respect for Our Earth." <http://www.180walls.com/hr/wwwmlkn.nsf/HomeILFrameset?Open>. 2009.

PAINT

ENVIRONMENTAL HOME CENTER

Environmental Home Center¹⁷⁷ gives a great explanation about the dangers of paint and how to avoid them:

WHAT ARE VOCs?

We think of organic things as being good for us, as organic food is. So why are VOCs (volatile organic compounds) bad? The confusion stems partly from a misconception about the word “organic.” To a chemist, “organic” simply means a compound containing carbon. This includes everything that is or was once living—even petroleum, which isn’t what most people mean when they talk about “organic.” Besides containing carbon, VOCs also are volatile. This means they evaporate readily at typical room temperatures. When refineries process crude oil, they heat it, capture the gasses, and distill them to produce a wide variety of chemicals that then become building blocks for paints, plastics, fuels and many other products used today. The most volatile distillates, the ones that boil off first, evaporate at such low temperatures that they quickly get into the air when used in paints or adhesives. If they’re also dangerous, that means they have high potential for harming indoor air quality and causing health problems. VOCs include formaldehyde, many pesticides, solvents and cleaning chemicals, as well as some ingredients that are not considered particularly hazardous, such as propylene glycol and natural aromatherapy oils.

177 Environmental Home Center. “What are VOCs?” http://www.environmentalhomecenter.com/learn.shtml?Directory_Code=topicsmain&Page_Code=vocs. 2009.

“WHY ARE VOCs SUCH AN ISSUE WITH PAINTS AND FINISHES?”

In sunlight, some organic solvents traditionally used in paint can react with nitrous oxides in the atmosphere to form smog. (Nitrous oxides are created by any combustion, from a candle to a car to a power plant.) In Southern California, where smog has been a terrible problem, the regional air-quality board was assigned the task of clamping down on ingredients that contribute to smog. Because of the severity of the problem, the regulators went after an array of smaller players in smog formation, including paints and other finishes. Manufacturers responded by creating paints that didn’t contain so many VOCs, and once they showed that it could be done, other regulators eventually reduced the allowable amounts even where smog has been less of an issue. Because many VOCs are highly toxic, many people have championed the new paint formulas as ones that help promote better health.”

EARTHEASY

Eartheasy¹⁷⁸ provides more insight:

NON TOXIC PAINTS

Indoor air is three times more polluted than outdoor air, and according to the EPA, is considered one of the top five hazards to human health. Paints and finishes are among the leading causes. Paints and finishes release low level toxic emissions into the air for years after application. The source of these toxins is a variety of VOCs, which, until recently, were essential to the performance of the paint. New environmental regulations and consumer demand have led to the development of low-VOC and zero-VOC paints and finishes. Most paint manufacturers now produce one

178 Eartheasy. “Non-Toxic Paints.” http://www.eartheasy.com/live_nontoxic_paints.htm. 2009.

or more non-VOC variety of paint. These new paints are durable, cost-effective and less harmful to human and environmental health.

Benefits of Using Non Toxic Paints

- Health. Reduced toxins benefit everyone, including those with allergies and chemical sensitivities.
- Environment. Reduces landfill, groundwater, and ozone depleting contaminants.
- Effective. Low-VOC products perform well in terms of coverage, scrubability and hideability (covering flaws on previous coats).
- Water-Based. Easy cleanup with soap and warm water.
- Little or No Hazardous Fumes. Low odor during application; no odor once cured. No off-gassing. Painted areas can be occupied sooner, with no odor complaints.
- Not Deemed Hazardous Waste. Cleanup and disposal greatly simplified.

The term “non-toxic” is used here in its broadest sense. With paints and finishes, it’s more a matter of degree. Even Zero-VOC formulations contain some small amounts of toxins. Here are three general categories of non-toxic (or low-toxic) paints: natural paints, zero VOC, and low VOC

NATURAL PAINTS AND FINISHES

These are paints made from natural raw ingredients such as water, plant oils and resins, plant dyes and essential oils; natural minerals such as clay, chalk, and talcum; milk casein, natural latex, bees’ wax, earth and mineral dyes. Water-based natural paints give off almost no smell. The oil-based natural paints usually have a pleasant fragrance of citrus or essential oils. Allergies and sensitivities to these paints are

uncommon. These paints are the safest for your health and for the environment.

ZERO VOC

Any paint with VOCs in the range of 5 grams/liter or less can be called “Zero VOC”, according to the EPA Reference Test Method 24. Some manufacturers may claim “Zero-VOCs”, but these paints may still use colorants, biocides and fungicides with some VOCs. Adding a color tint usually brings the VOC level up to 10 grams/liter, which is still quite low.

Low VOC

Low VOC paints, stains, and varnishes use water as a carrier instead of petroleum-based solvents. As such, the levels of harmful emissions are lower than solvent-borne surface coatings. These certified coatings also contain no, or very low levels, of heavy metals and formaldehyde. The amount of VOCs varies among different “low-VOC” products, and is listed on the paint can or MSDS. Paints and stains, to meet EPA standards. Varnishes must not contain VOCs in excess of 300 grams per liter. As a general rule, low VOC paints marketed by reputable paint manufacturers usually meet the 50 g/L VOC threshold. Paints with the Green Seal Standard (GS-11) mark are certified lower than 50 g/L (for flat sheen) or 150 g/L (for non-flat sheen). Low VOC paints will still emit an odor until dry. If you are particularly sensitive, make sure the paint you buy contains fewer than 25 grams/liter of VOCs.

ETHYLENE GLYCOL

Ethylene Glycol, a solvent used in latex paints, is listed as a hazardous substance and a toxic air contaminant under many federal and state regulations. A clear, colorless, odorless liquid,

ethylene glycol and its vapor can be toxic to humans. Exposure may cause irritation to the skin, eyes, nose, throat and lungs, and allergic reactions are possible. Overexposure could lead to nausea, vomiting, drowsiness, coma, and respiratory failure. Repeated overexposure can permanently damage the kidneys. Among the major latex paint brands, the full line of Dunn-Edwards paints is ethylene glycol-free.

NON-TOXIC PAINT STRIPPERS

Most paint strippers are caustic—they work by melting the paint. The active ingredient, methylene chloride, is a potential carcinogen. A new generation of biodegradable paint strippers is now entering the market. They are water-soluble, noncaustic and nontoxic—some can even be washed down the drain. The active ingredient in these products is N-Methylpyrrolidone, an organic solvent. The downside? These new strippers are more expensive than their traditional counterparts, and they take longer to work.

TIPS

Read the label and product literature. Besides general information, look for:

- **VOC Content:** Usually listed in grams per liter, this can range from 5 to 200. Using a product with the lowest VOC content will yield the lowest overall health risk.
- **Solids Content:** Solids, or pigments, can range in concentration from 25 percent to 45 percent by volume. The higher the percent solids, the less volatile in the paint.
- **EPA, OSHA, DOT Registrations:** When a product has an EPA, OSHA or DOT registration number, this means that it contains toxic ingredients, which must be monitored. One way

to ensure that you are using a product that is safe both for the environment and the applicator is to seek out products that are not registered with these agencies.

- **Buy the Right Amount of Paint for the Job.** Before you begin a painting project, measure the area first. Calculate the area to be painted (height x width = total square feet). One gallon covers about 400 square feet.
- **Re-use Turpentine and Paint Thinners.** Simply allow used thinner or turpentine to stand in a closed, labeled container until paint or dirt particles settle to the bottom. Pour off the clear liquid and reuse.
- **Avoid Cleaning Brushes and Rollers.** Paintbrushes and rollers used for an on-going project can be saved overnight, or even up to a week, without cleaning at all. Simply wrap the brush or roller snugly in a plastic bag, such as a bread or produce bag. Squeeze out air pockets and store away from light. The paint won't dry because air can't get to it. Simply unwrap the brush or roller the next day and continue with the job. (This works for water and oil-based paints and stains. It does not work for varnishes or lacquers.)
- **Disposing of Paint.** When you do finally wash you brushes or rollers, wash them in a bucket of water than in the sink. Pour the used paint-laden water in a sealed container and bring to your local waste depot along with your empty paint cans.
- **Natural Brush Cleaner.** Turpentine, made from the resin of coniferous trees, is an environmentally friendly solvent. It is excellent for cleaning brushes used with oil-based paints, and for cleaning up small drips. Use a short glass

jar, filled no higher than the bristles. Add a few drops of dishwashing liquid. After cleaning the brush, rinse with water.

- ***Circulate.*** To reduce the impact of indoor air pollutants, circulate fresh air through your house as often as possible. Avoid the use of spray paints altogether. When painting ceilings, especially, be sure to provide cross-ventilation to remove paint fumes. Fumes rise as paint dries, and so with ceilings the fumes dissipate more slowly since there's no air above the paint. You can reduce fresh paint odors by placing a small dish of white vinegar in the room.
- ***Beware Old Lead Paint.*** Paint manufactured before the 70's contains lead, which has harmful effects on health and development. If the paint is still in good shape, you can paint over it, or leave it be—lead is only poisonous if ingested or inhaled. If paint must be removed in small areas, wet the surface and scrape carefully. Never sand dry lead paint. Clean up with trisodium phosphate (TSP). For large areas, call in a professional certified in lead abatement.
- ***Store Partially Full Cans Upside Down.*** Leftover paint can be saved for months if stored properly. Make sure the lids are well sealed, then store the cans upside down. This prevents air from getting inside the can and causing the paint to thicken and dry.
- ***Remember the BUD Rule.*** **BUY** no more product than you need. Ask your retailer for help in assessing the quantity you need. **USE** up all the product you buy. Give leftovers to a neighbor or community organization. **DISPOSE** of leftovers in a safe, responsible manner.

Here is a list of some companies that produce ecologically conscious paints, stains, and varnishes: Benjamin Moore (EcoSpec, Aura, Saman), Sherwin-Williams (Harmony), ICI/Dulux (LifeMaster 2000), Rodda Paint Co. (Horizon), Vista Paint (Earth Coat), Kelly-Moore (Enviro-Cote and E-Coat Recycled Latex), YOLO Colorhouse, Algaia, Livos, Auro, EcoDesign (BioShield), Weather-Bos, SoyGuard, Silacota, Anna Sova, Green Planet Paints, AFM Safecoat, Best Paint Company, ICI/Decra (Shield), Devoe Wonder Pure, Ecoshield, American Pride, Frazee Paint EnviroKote, Allied PhotoChemical, Olympic Paint and Sun, Green Planet Paints, Mythic Paints, PPG Architectural Finishes (Pittsburgh Paints Pure Performance), Homestead Paints, EarthSafePaints, Cloverdale (Horizon, EcoLogic), Miller Paint, OIKOS Paints, and Timber Ox Green.

OLD FASHIONED MILK PAINT

Old Fashioned Milk Paint produces paint that is healthy for humans as well as the environment. Its recipe combines milk protein, lime, clay, and earth pigments such as ochre, umber, iron oxide, and lampblack. The company uses no lead, chemical preservatives, nor fungicides, and the paint contains neither hydrocarbons nor any other petroleum derivatives. Old Fashioned Milk Paint does report a slight milky odor when the paint is applied but says it is VOC-free and safe for occupants with



multiple chemical sensitivities. In addition, the paint is completely biodegradable.¹⁷⁹

179 Old Fashioned Milk Paint. "The Greenest Paint There Is." http://www.milkpaint.com/path_safe.html. 2009.

Surfacing Materials

A number of interesting surfacing options are now available that provide a wide range of textures and patterns for interiors.

PAPERSTONE COMPOSITES

PaperStone Composites' surface materials were first brought to market in 2003. Since then, it has been a company taking great strides in making its products more environmentally benign. PaperStone offers the original PaperStone product, which is made from 50 percent post-consumer recycled paper. With the advancements in paper and the development of a 100 percent water-based resin, the company has added multiple colors to their product lines. KlipTech Composites, a division of PaperStone Composites, has created a new and improved product line, PaperStone Certified. KlipTech founder Joel Klippert explains that "This great new product is further advancement over the original product by going to a 100 percent post-consumer recycled paper and is FSC certified by SmartWood."¹⁸⁰ KlipTech reports that a 1-inch by 5-foot by 12-foot sheet of PaperStone Certified (opposed to regular phenolic composite manufactured from virgin fiber and a regular solvent-based resin) saves 1,233 gallons of water, 2.03 million BTUs of energy, 131 pounds of solid waste, 254 pounds of greenhouse gasses, 55 pounds of petroleum-based phenol, and 22 pounds of natural gas-based methanol.¹⁸¹

180 Green Building Supply. "History." <http://www.greenbuildingsupply.com/utility/showArticle/?objectID=706>. 2009.

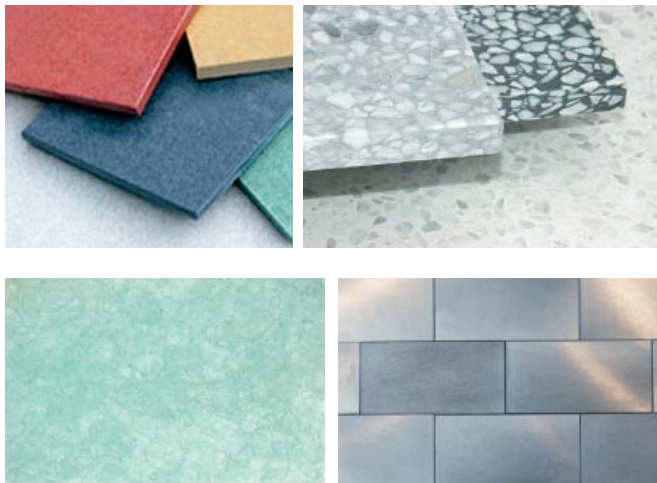
181 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.



COVERINGS, ETC.

Coverings Etc. offers ECOcoverings, a wide variety of floor and wall panels that consist of natural, reclaimed, reused, recycled or recyclable materials, which aside from their practical applications and contemporary design appeal, are moisture, mold, and mildew resistant and contain low or no off-gassing. Also, less energy is potentially required for illumination when light colored flooring and countertops are specified and modeled. ECOcoverings' materials are substantially stronger than conventional materials and provide energy efficient designs that will save energy costs and increase resale value. By using "future friendly" materials, Coverings Etc. helps to conserve natural resources and create an improved environment. Four of the offered designs are: BIO-GLASS (slabs made of recycled glass and 100 percent post-consumer recycled content), ECO-CEM (concrete mix with wood pulp that contains both pre- and post-consumer recycled content), ECO-GRES (unglazed porcelain sheets, tiles and mosaics that are highly sustainable, easy to install and maintain,

and contains pre-consumer recycled content), and ECO-TERR (pre-cast terrazzo tiles and slabs made of naturally occurring marble and granite aggregates, containing pre-consumer recycled content). Most products at Coverings Etc. are third-party certified, and all have a timeless beauty.¹⁸²



3FORM

3form's Varia Ecoresin is a system engineered by encapsulating textured, colored, and natural interlayers within high performance polymer skins to create vibrant translucent panels. Shatterproof, formable, and flame- and smoke-rated, Varia is lightweight and can be cut and drilled with common hand tools. Varia features a minimum 40 percent recycled content and is recyclable. It has been tested for flammability, toxicity, off-gassing, safety impact, and air quality. It is also free of plasticizers, stabilizers, and PVC. The company's Full Circle collection of Vaira products works with artisans and global communities worldwide to encourage the development of local indigenous economies.¹⁸³

For example, the Ithemba collection features a
 182 Coverings Etc. "ECOcoverings." <http://www.coveringsetc.com/AboutEcoverings.aspx>. 2009.

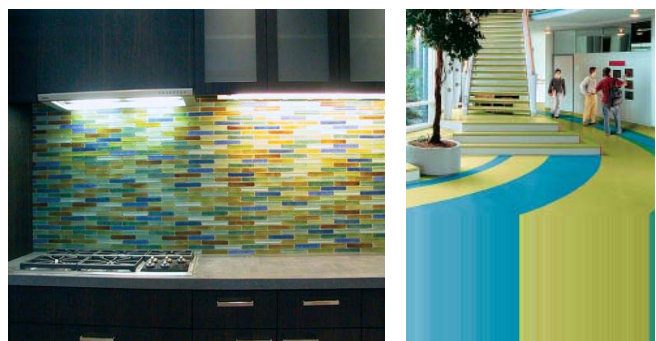
183 3form. "Varia Ecoresin." <http://www.3-form.com/materials-varia.php>. 2009.

masterpiece of woven wire mesh that has been meticulously created by African women artisans who are affected by HIV or AIDS. Through a partnership with a local non-profit group, 3form helps provide a market for their talents.¹⁸⁴



BEDROCK INDUSTRIES

Bedrock Industries' Blazestone tiles are crafted entirely from post-industrial and post-consumer stained glass, and contain neither oxides nor colorants. Each tile is handmade from unique combinations of glass that give tiles a distinctive appearance and subtle color variation.¹⁸⁵ Blazestone tiles are offered in a variety of sizes and shapes including diamonds, rectangles, triangles, rosettes, circles, leaf shapes, tear drops, squares, and cat's-eyes.¹⁸⁶



184 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

185 Bedrock Industries. "Blazestone." <http://www.bedrockindustries.com/blazetile.html>. 2009.

186 Ibid

Window Coverings

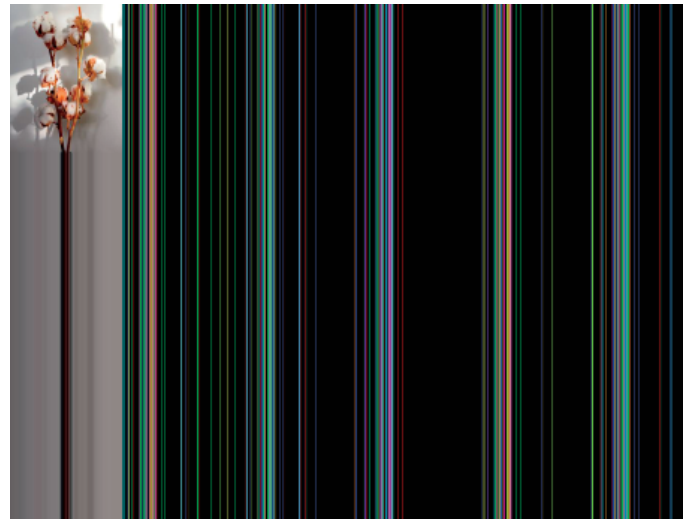
Historically valued primarily for their aesthetic appeal, window coverings are now recognized for their ability to offer dramatic opportunities for manipulating the quality and quantity of light that enters a space. This manipulation can in turn provide benefits in energy-savings, privacy, and the ability of a room's occupants to visually connect to the natural world.

MECHOSHADE SYSTEMS

MechoShade Systems' EcoVeil solar shade cloth incorporates a material constructed with a yarn called EarthTex that allows the cloth to be recycled back into new shade cloth through a continuous cradle-to-cradle cycle. A take-back program allows customers to return their EcoVeil shades to MechoShade after they are done using them. The material is then reconstituted into raw materials and made into new EcoVeil shade cloth or other EarthTex-based products. MechoShade also recaptures scraps and cut-offs for immediate recycling which the company estimates saves more than 1 million pounds of scrap from going to a landfill or incinerator each year. EcoVeil is also less prone to edge fraying, and its lighter weight allows some larger shades to be lifted manually rather than requiring a motor. EcoVeil is washable, UV-resistant, flame-retardant, and antimicrobial¹⁸⁷. MechoShade Systems also offers their ThermoVeil shade cloth that filters sunlight to reduced heat while providing a view to the outside.¹⁸⁸

187 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

188 MechoShade Systems. "EcoVeil." <http://pdf.archiexpo.com/pdf/mechoshade-systems/ecoveil-10944-21846.html>. 2009.



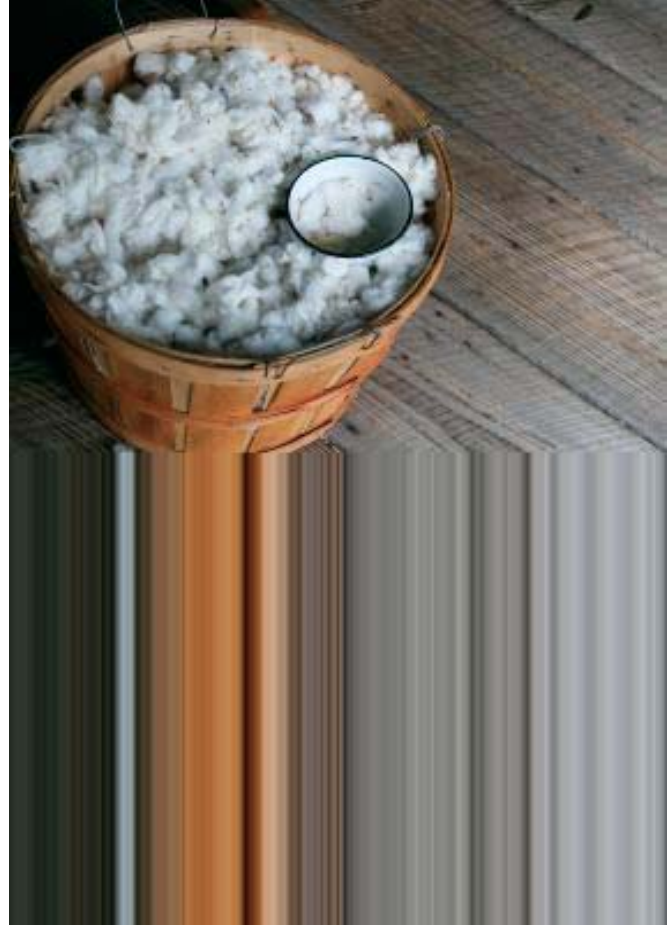
CONTROL IMPORTS

Conrad Imports offers draperies, a sliding panel shade system, and an outdoor fabric collection, in addition to over 80 custom-woven shades of natural grasses, reeds, and fibers.¹⁸⁹ These products are works of art, hand woven from plants and grasses that are rapidly renewable and grown and harvested in a sustainable manner. Natural fibers have several advantages on the window as well as the environment. Natural flax and hemp are quite strong and durable with high abrasion resistance. Flax and hemp also have a high natural resistance to ultraviolet exposure. Some natural fibers have anti-mildew and microbial properties, making them highly resistant to mold and bacteria. Natural fibers, particularly smooth-surfaced fibers like flax, can also help to inhibit static electricity, making them an excellent material for windows. The natural wax content of flax and other fibers also offers a beautiful sheen that adds to the beauty of the product. These

189 Bonda, Penny; Sosnowchik, Katie. Sustainable Commercial Interiors. Wiley Publishing, Inc. New Jersey. 2006.

products do not emit toxins or VOCs. They also have a long life cycle, they require very little care and maintenance, and they enhance local economies.¹⁹⁰

Hunter Douglas offers Duette honeycomb shades that have significantly better energy performance than standard shades because of their accordion-fold design. When expanded, the fabric opens up, providing pockets of trapped air that assist in retaining heat in winter and reflecting it in summer. Duette shades provide different degrees of privacy and light control, from semi-opaque for filtered light to opaque fabrics for complete privacy. This product also provides significant acoustic properties and flame resistance.¹⁹¹



190 Conrad Imports. "Green Matters." http://www.conradshades.com/about/green_matters.html. 2009.

191 Hunter Douglas. "Duette Honeycomb Shades." <http://www.hunterdouglas.com/our-products-detail.jsp?id=6>. 2009.



Concluding Thoughts

Regardless of how efficiently we use resources, if design doesn't inspire people, it will not last. If we get it right, sustainable design promises to bring art and science together. — Lance Hosey, co-chair, Architecture of Sustainability conference.

I have attempted to convince you that sustainable is the way to go. I want to make very clear that there is a strong correlation between sustainability and business welfare; and more importantly between the health of your environment and yourself. If you are in a healthy environment, the likelihood that you are drinking clean water and breathing clean

air increases. You will decrease the amount of toxins that enter your body and benefit your well being. In turn this will decrease stress, increase productivity, and overall make you and those surrounding you happier beings. Of course, you cannot have complete control over your environment, but you can help. If you think “green” and take suggested environmental measures—whether it be taking your own canvas bags to the grocery store, driving a hybrid car, or designing your office interior with sustainable products—you can help your earth, your company, and yourself.