

# Eco Friendly Flooring Guide



## Eco Friendly Flooring Guide

### Table of Contents

<b>Eco Friendly Flooring Sustainability and Health</b>	<b>Health - Indoor Air Quality</b>	<b>Bamboo Flooring</b>
Sustainability and Health Concerns	Volatile Organic Compounds	Eco Friendly Bamboo Flooring: Not All Bamboo is Equal
Wood as an Eco Friendly Building Material	Formaldehyde	Types of Bamboo Flooring
Recycled Wood	Eco Friendly Flooring Using Zero Formaldehyde Adhesives	Bamboo Hardness: Fact & Fiction
Reclaimed and Salvaged Wood		
Harvested Wood	<b>LEED</b>	<b>Eco Friendly Flooring Installation</b>
	LEED Flooring Credits	Eco Friendly Flooring Installation
<b>Environmental Factors</b>	<b>Wood Characteristics</b>	Eco Friendly Floor Pads
Industrial Forestry in the U.S.	Hardwoods and Softwoods	Eco Friendly Adhesives
Ancient or Frontier Forests	Wood Structure	Nail or Staple Down Method
Illegal Logging	Heartwood and Sapwood	Floating Method
Global Warming	Growth Rings	Glue Down Method
Subsistence Farming	Wood Expansion and Contraction	
Responsible Forestry & Harvesting	Wood and Moisture	<b>Subfloors &amp; Finishes</b>
	Wood Hardness	Subfloor Types and Basic Installation
<b>Eco Friendly Flooring Certification</b>	Wood Durability	Considerations
Eco Friendly Flooring Certification	Wood Color Change	Installing Over Radiant Heat Subfloors
		Eco Friendly Flooring Finishes: Factory Applied & Site Applied
<b>Forest Stewardship Council</b>	<b>Eco Friendly Flooring Overview</b>	<b>Care &amp; Maintenance of Eco Friendly Wood Floors</b>
Forest Stewardship Council	Solid Wood Flooring	Care & Maintenance of Eco Friendly Wood Floors
Which Product is "Greener?"	Wood Surface Treatments and Finishes	Common Pitfalls of Wooden Flooring
Where is Responsible Forestry Practiced?	Engineered Wood Flooring	Refinishing an Eco Friendly Wooden Floor: Screening & Top-coating
FSC Managed Forests	Sliced Veneer	
FSC Certification	Rotary Veneer	
FSC and Forest Protection	Solid vs. Engineered Wood Flooring	
FSC Labels	Benefits of Engineered Flooring	
Verifying a Product is FSC		

*Sustainability and health are two main aspects to the environmental commitment of eco friendly flooring.*

#### Sustainability Concerns

Sustainability is a broad concept that encompasses many issues. A common definition for sustainability is “meeting the needs of the present without compromising the ability of future generations to meet their needs” (Source: Brundtland Commission). When working with eco friendly flooring materials there are a few important questions that need to be answered:

- Were the raw materials extracted in such a way that they did not degrade natural habitats?
- Did the energy that was used in manufacturing and transporting the product cause as little ecological damage as possible?
- Were the scrap and waste materials recycled or re-used?



#### Health Concerns

There are also questions about health concerns regarding eco friendly flooring:

Was the product manufactured in a manner that did not release toxic chemicals into the air, water, or soil during the manufacturing process? Once installed, does the product release any harmful chemicals into the air in a home or office?

### Wood as an Eco Friendly Building Material

As a material, wood is inherently “green,” especially in comparison to non renewable resources such as steel and concrete. The manufacturing of a non-renewable building material such as steel studs requires 25x more water, causes 2x the water pollution, and creates 3x more CO<sub>2</sub> in the atmosphere. Besides being renewable, wood is non-toxic, energy-efficient to grow and manufacture, as well as recyclable and biodegradable. Wood is the only major building material whose production yields life sustaining oxygen and absorbs the main agent of global warming, carbon dioxide.

Wood can be a truly sustainable resource, but to realize that potential it must be 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.

#### Recycled Wood

Most recycled wood incorporates by-products of another manufacturing process (such as sawdust) and is referred to as “pre-consumer” or “post-industrial.” Recycled wood that is taken from existing structures or products and re-used could be described as “post-consumer.” Some recycled wood is particularly valuable, especially if the product has come from an old growth forest and it has the opportunity to be re-used.

#### Reclaimed and Salvaged Wood

The terms reclaimed and salvaged wood are often used interchangeably. If there is a distinction between them, it is because “reclaimed” wood usually refers to already manufactured wood products that are remanufactured into new ones. Examples of this process include timbers from the deconstruction of old buildings that are re-milled, or more unusual sources such as old crates and pallets.

“Salvaged” wood frequently refers to the direct reuse of wood products (salvaged doors) or logs that can be salvaged from a variety of sources such as street trees, river and lake bottoms, orchards, and even forests (diseased and dead wood or small diameter trees that are thinned out as part of fire prevention measures). An example of a reclaimed hardwood that is certified by the Forest Stewardship Council includes remanufactured railroad ties from Southeast Asia. Tropical hardwood railroad ties are being replaced with concrete ties in that region and the old ties are then milled into flooring and other products.

#### Harvested Wood

People are generally less comfortable with harvested wood



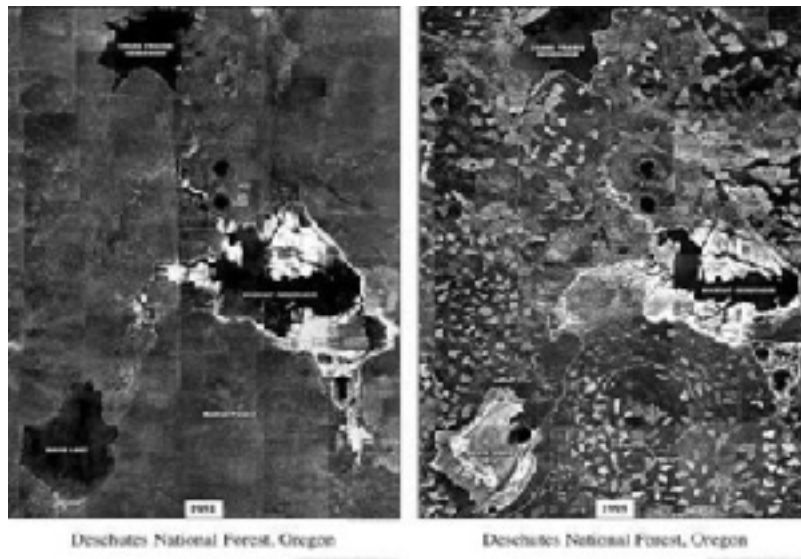
than they are with recycled, reclaimed, or salvaged wood, but of course all wood is harvested at some point in time. The reason a lot of people are not fond of the idea of logging forests is because it reminds them of the huge amounts of clear-cut land from traditional, industrial forestry. Logging does not have to destroy forests, but it often has in the past and still does today.



## Environmental Factors

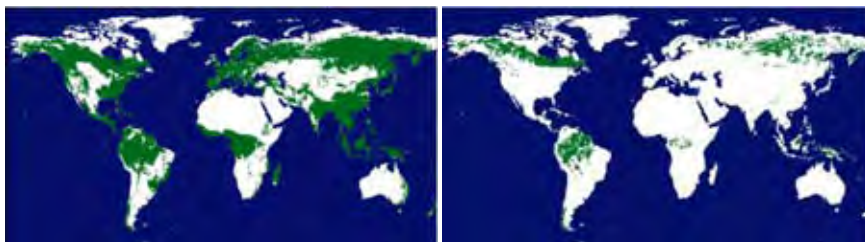
### Impacts of Clearcutting

Some of the impacts of the large-scale clearcutting of natural forests include the loss of wildlife habitat, soil erosion, and siltation of rivers and lakes. In the images below of the Deschutes National Forest (Oregon), the white areas are clear cuts. Take particular note of the lake in the lower left, now full of silt:



### Ancient or Frontier Forests

The most controversial logging is in forests that have been around for a long time. These ancient or “old-growth” forests are likely to contain rare species and the most vital ecosystems on the earth. In most parts of the world these forests only remain in remote areas, so they are also occasionally referred to as “frontier forests”. If the remaining old-growth forests continue to be harvested, the effects will be devastating. When they are cut down it causes extreme habitat damage and reduces biodiversity, while also releasing carbon into the atmosphere. The world’s frontier forests have dwindled dramatically since people began logging them about 8,000 years ago:



## Illegal Logging

Some of the most destructive logging that takes place in the world is illegal cut-and-run logging where there is no attempt at forest management. Illegal logging is most widespread in the tropics, but it is also a big problem in the Russian Far East and parts of Eastern Europe. Illegal wood is sometimes consumed in the country of origin, but it is often laundered through international trade and manufacturing and imported into Europe and North America as finished products like decking, flooring, plywood, and furniture. A USAID estimate suggests that 50% of the hardwood imported into the U.S. comes from illegal logging.

## Illegal Wood Trade

Today, about a third of the world's illegal wood is processed in China. From 1997 to 2006, exports of manufactured wood products from China to the U.S. increased by 1000%. Much of China's imported wood comes from Russia, Southeast Asia, and Africa. According to researchers, China's increased wood imports are "worsening the problems of deforestation, unsustainable harvesting practices, illegal logging, marginalization of the indigenous and other poor communities..."

The graphs below show the rate of illegal logging around the world (Source: World Wildlife Fund's "Keep It Legal" Guide, 2007).



Country	Amount of Illegal Wood
<b>Eastern Europe</b>	
Estonia	50% of production
Latvia	20% of production
Russia	Up to 60% of production and 50% of exports
<b>Africa</b>	
Cameroon	30-65% of production
Equatorial Guinea	30% of production
Gabon	30% of production
Ghana	30-50% of production
Liberia	Up to 100% of production

Country	Amount of Illegal Wood
<b>E &amp; SE Asia</b>	
China	30-50% of production 30-32% of exports
Malaysia	5% of production 70% of log imports
Indonesia	60-80% of production 55% of plywood exports
Papua New Guinea	20% of production 65% of log exports
<b>Latin America</b>	
Brazil	15-37% of production
Ecuador	70% of production
Peru	70-90% of production

## Global Warming

Currently, deforestation and the burning of tropical forests is the second leading cause of global warming. These two devastating practices are responsible for more greenhouse gas emissions than all cars, trucks, ships, trains and other forms of transportation combined. When forests are cleared for agriculture and other uses they release enormous amounts of carbon into the air, adding to rising global temperatures.



## Subsistence Farming

Roads that are cut into tropical forests by illegal loggers, miners and oil companies open the way for subsistence farming. Millions of people, each clearing a few acres of forest every few years adds up to an ecological catastrophe. One primary method of clearing the land is to use the slash and burn technique, which can be extremely destructive, especially when done on such a large scale.



## Responsible Forestry & Harvesting

Logging does not need to harm or destroy the world's forests. Natural forests can be managed carefully in ways that preserve their diversity and the services they provide. Wood can also be grown efficiently in plantations or tree farms. But because forest ecosystems are valuable, tree farms should complement natural forests rather than replace them.



The left-side photo above is a managed natural forest -- it is logged but the ecosystem is still healthy and diverse. The photo on the right is a teak plantation which was established 30 years ago on degraded cattle pasture. It helps take pressure off of natural forests, rather than replacing them.

Wood has the potential to be a very sustainable product, but we need to harvest it responsibly from forests, thus allowing them to continue to produce clean water, air and healthy soil.

### **Bamboo or Wood?**

Because it grows much faster than trees, bamboo is an excellent flooring choice for those looking for more sustainable flooring options, and EcoTimber is proud to offer a range of top-quality bamboo flooring products. 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.

## Eco Friendly Flooring Certification

How can you tell if wood products come from well-managed forests as opposed to irresponsible or illegal sources? The answer lies in the independent certification of forests and forest products. By putting a "green" label on wood products that are backed by high standards, credible forest certification lets consumers use their purchasing power to support forestry that conserves forests for future generations. Credible forest certification sets high standards for responsible forestry, audits forests and plantations to ensure that standards are followed, labels products and establishes a system for tracking products from the forest to the end user.

The fact that a wood product is "certified" does not mean that it comes from an ecologically well-managed forest. There are now various types of forest certification and most do not have meaningful environmental standards, enforcement mechanisms, or methods of tracking the wood through the supply chain to keep out illegally logged material and prevent misrepresentation.

The following are forest certification systems that DO NOT enjoy the support of most environmental groups:

### **SFI (Sustainable Forestry Initiative)**

- Founded and dominated by the timber industry
- Weak environmental protections

- Allows conversion of natural forests (including old-growth) into tree farms
- No mandatory Chain of Custody to keep out illegal wood

### CSA (Canadian Standards Association)

- Allows conversion of natural forests (including old-growth) into tree farms
- Fails to protect First Nations

### PEFC (Program for the Endorsement of Forest Certification)

- Weak environmental standards
- No mandatory Chain of Custody
- Mutually recognizes virtually all forest certification systems, including SFI and CSA
- PEFC wood could come from almost any source

### ISO (International Standards Organization)

- Standards address manufacturing practices, not forest management

### IBAMA (Program of the Brazilian Government)

- Low environmental standards, poorly enforced
- No Chain of Custody
- Many reports of corruption

### Forest Stewardship Council

The FSC is the ONLY forest certification system endorsed by the major environmental groups. Major international conservation groups such as Greenpeace, Sierra Club, World Wildlife Fund, Natural Resources Defense Council, Rainforest Action Network, and many others, help support the FSC. FSC certification is considered the “gold standard” for forest certification. There are competing forest certification systems that have been launched by the forest products’ industry to compete with FSC, but they are much weaker and are lacking in credibility. By purchasing FSC certified products, you are supporting truly responsible forestry practices.



### Which Product is “Greener?”

Are there species of wood we shouldn't use? Is Oak better than Brazilian Cherry? With the exception of a few species that are near extinction, the answer is:

**There are no good or bad species -- there is only good and bad forestry.**

The certification of wood products is similar to the certification of organic produce. Tomatoes are not inherently more organic than lettuce - it is a question of what farming practices were used where the produce was grown. There are organic tomatoes, and there are tomatoes that come from farms using chemical fertilizers and pesticides. Similarly, there is Oak that comes from bad forestry and Brazilian Cherry that comes from excellent forestry - and vice versa. This is why we use the FSC certification process to create the link between the quality of the forestry and the wood floor in our customers' homes and businesses.

### Where is Responsible Forestry Practiced?

Generally speaking, North American and Western European woods are more likely to have been harvested responsibly than are tropical woods or woods from Eastern Europe or Siberia. When choosing among tropical woods, keep in mind that responsible forestry is much more widespread in Latin America than it is in Africa, Southeast Asia, or Indonesia, so it's generally advisable to avoid species from those areas (for example, Teak, Merbau, Kempas, Wenge, Doussie, Iroko and Sapele) unless they are FSC certified.

### FSC Managed Forests



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### FSC Certification in the Tropics

FSC certified forestry means forests are managed for ecological health, sustainable harvest levels, and social responsibility. The ecological health includes protecting the wildlife, water, air and soil. By never cutting more than what will grow back, they ensure sustainable harvest levels. Giving workers and communities a fair share helps create vibrant, sustainable local economies. By developing responsible forest management practices, the FSC is ensuring that existing forests will be around for future generations to come. Forest ecosystems are often destroyed to make way for tree plantations, so FSC certification is essential even with plantation-grown wood. FSC does not certify plantations that replace natural forests.

In Guatemala, jungle areas that were set aside as reserves have been illegally settled, while the FSC area has a healthy ecosystem where the locals protect their own forest. This situation shows how buying FSC-certified wood can help save a forest ecosystem: “a forest that pays is a forest that stays.” A reserve with no management is pictured on the left below, while a FSC Managed forest is pictured on the right below. By buying FSC-certified tropical wood, we create an economic value for the rainforest ecosystem, creating an alternative to land uses that destroy the forest such as subsistence farming, soy beans, and cattle.



### FSC Labels

There are several different types of labels for FSC certified products. Each label is backed by a different set of procedures that manufacturers must follow. The two FSC labels most often used in the wood flooring industry are the “FSC Pure” label and the “FSC Mixed Sources” label.

#### FSC Mixed Sources

As the name implies, the FSC Mixed Sources label is used on products that contain a mixture of FSC certified and non-certified material and/or recycled material. The FSC requires that the non-certified portion be from “controlled” sources, meaning that this non-FSC wood must at least be from sources that are not illegally logged, from old growth forests, or other unacceptable sources. However the procedures for overseeing “controlled wood” claims are still in development and are not nearly as reliable as the verification of FSC certified wood.

A significant percentage of the engineered wood flooring on the market that bears the FSC Mixed Sources label uses a non-certified wear layer on top of core and back material that comes from FSC certified plantations. The wood that you see and walk on is not FSC certified, and no one can prove that it comes from responsible sources. In fact, the only claim that can be made is that it doesn't come from the very worst sources, and today even this claim is hard to prove or disprove.

In a couple of cases (our Elements line and our Hard Maple), EcoTimber has made the decision to use uncertified top layers in order to make the products as affordable as possible, but we do so only after thoroughly researching and verifying that the top layers come from excellent forestry. In the case of our Maple, it comes from well-managed forests in Canada. Canadian Maple forests are, in general, managed very well.

Luckily, clear-cutting a northern hardwood forest doesn't make economic sense. In the case of our Elements, all of the White Oak comes from Germany, where strict forestry laws ensure sustainability regardless of certification. It is our intention to upgrade these product lines to 100% FSC as soon as there is adequate FSC log supply at reasonable pricing. Our customers can be assured that we will NEVER sell Mixed Sources products that originate from tropical rainforests or other forests of concern.

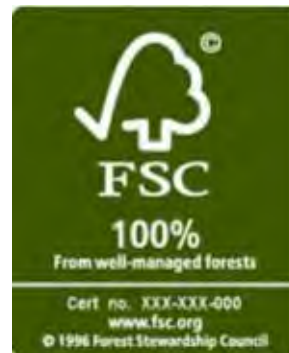
### FSC Pure

The FSC Pure label means that ALL of the wood in the product comes from FSC certified forests or plantations. Obviously, this is a much higher standard than the FSC Mixed Sources label. Given that FSC is the gold standard for forest certification, then FSC 100% is as good as it gets! EcoTimber is the market leader in engineered wood flooring with the FSC Pure label. Nearly all of our engineered wood flooring products are FSC Pure. EcoTimber is in the process of achieving FSC Pure status for all of our products.

### Verifying a Product is FSC Certified

The fact that a company has FSC certification does not mean that what is being sold is FSC certified. Many companies that have FSC "Chain of Custody" (COC) certification, which gives them the right to buy and sell FSC certified wood, do not really sell much FSC certified wood at all. This is particularly true in the wood flooring industry. Some flooring companies are even using the FSC logo on display samples, but ship uncertified material to fill your order. Either they don't really offer that product FSC-certified, or they only do so on a special order basis, and the consumer doesn't realize this until the flooring is delivered, the installation is scheduled, and it's too late to turn back.

Most FSC certified wood products have on-product FSC labels. If you are purchasing what you believe is FSC certified wood, but there are no FSC logos on the product packaging, it most likely is not certified, no matter what the rest of the information provided by the manufacturer or supplier might indicate. To verify the FSC certified status of a wood product that does not bear the FSC logo, demand not only the supplier's COC certificate, but also an invoice or receipt detailing the FSC certified status of each product on an individual line-item basis. If the invoice line item does not say "FSC-certified," the material is not certified.



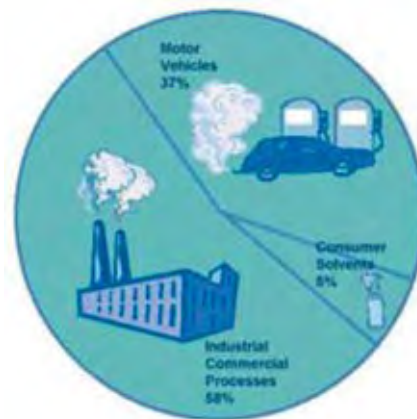
Qty	Unit	Sq. Ft./ Box	Box Qty	SKU	Description
198	SQ FT	22	9	HEDN441	HAND-SCRAPED HICKORY FLOORING, PREFIN. ENG. MOUNTAIN, 1/2" X 5" X RL (12-42"), 100% FSC-CERTIFIED

### Health - Indoor Air Quality

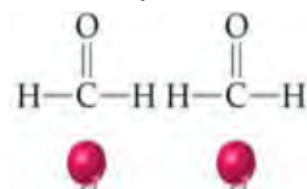
The issue of indoor air quality (IAQ) gained attention in the 1980s when people learned that many building materials emit harmful chemicals into the air that make people sick.

#### VOCs

Volatile organic compounds (VOCs) are chemicals that can become a gas at room temperature, some of which have short and long term health risks. One of the most common and dangerous VOCs is formaldehyde, which is used as an adhesive, bonding agent and solvent. Sources of VOCs are primarily industrial processes that emit 58%, motor vehicles that emit 37%, and consumer solvents that emit 5%.



#### Formaldehyde



Formaldehyde is an important chemical used widely by many industries to manufacture adhesives that are used in various building materials including engineered wood products, carpeting, paints and wood finishes. Building materials that contain high levels of formaldehyde are a major concern because they can off-gas into building interiors and affect interior air quality long after the products are installed.





Formaldehyde is a colorless, strong-smelling gas that can cause watery eyes, burning in the eyes and throat, nausea, fatigue, and difficulty breathing in some humans exposed at levels above 0.1 parts per million.

Some people are very sensitive to formaldehyde, while others have no reaction to the same level of exposure. High concentrations may trigger attacks in people with asthma. It has also been shown to cause cancer in animals and is now believed to cause cancer in humans.

## Formaldehyde Limits

According to the California Air Resources Board:

“In 1992, formaldehyde was formally listed by the Air Resources Board as a Toxic Air Contaminant in California with no safe level of exposure. Health risks from total daily average formaldehyde exposures in California from all sources are estimated to range from 86 to 231 excess cancer cases per million for adults, and from 23 to 63 excess cancer cases per million for children”

(<http://www.arb.ca.gov/toxics/compwood/factsheet.pdf>).

Here are the limits to formaldehyde emissions required by a number of agencies:

World Health Organization: Below 0.10 ppm

European E1 Standard: Below 0.10 ppm

OSHA Hazard Communication Standard: Hazard warning labels on any manufactured product that may emit 0.10 ppm or greater

GreenGuard® Environmental Institute Certification: Below 0.05 ppm

State of California: Below 0.05 ppm

## Sources of Formaldehyde

In residential and commercial construction, the most significant sources of formaldehyde are likely to be pressed wood products that are made using adhesives that contain urea-formaldehyde (UF) resins. Engineered wood flooring is one example of a pressed wood product that often uses adhesives containing urea-formaldehyde. Other pressed wood products that are made for indoor use includes particleboard, hardwood plywood, medium density fiberboard (MDF), and high-density fiberboard (HDF). MDF and HDF contain a higher resin-to-wood ratio than any other UF pressed wood products, and are generally recognized as being the highest formaldehyde-emitting wood products. MDF and HDF are often used as substrates for laminate and some engineered wood flooring.



Other engineered wood products, such as softwood plywood and oriented strand board (OSB) are produced for use in exterior construction and contain the dark-colored phenol-formaldehyde (PF) resin. Although formaldehyde gas is emitted from both types of resins, pressed woods that contain PF resin generally emit formaldehyde at considerably lower rates than those containing UF resin.

## Eco Friendly Flooring Using Zero Formaldehyde Adhesives

To avoid formaldehyde off-gassing, high quality eco friendly engineered flooring is made with a non-formaldehyde glue called EPI. Once EPI adhesives have cured, they are inert (no off-gassing whatsoever). EPI glues are also superior in performance as they are stronger and more flexible than the urea-formaldehyde glues traditionally used in the wood flooring industry.

The 'I' in EPI stands for isocyanate. Precautions need to be taken with isocyanate in its liquid form, as it can have harmful effects at high concentrations. Responsible factories that use EPI adhesives make sure that protective measures are taken for the employees that work around the substance. Isocyanate is also found in some installation adhesives that are used on construction jobsites to glue flooring down to the sub-floor.

Since most flooring installers generally do not carry adequate protection and usually work in somewhat confined spaces, isocyanate should be avoided in installation glues. Some 'low-VOC' or 'zero-VOC' installation adhesives that are currently on the market contain isocyanate, xylene, and other hazardous chemicals. Although a product may have a low VOC content, that does not make it safe. EcoTimber's HealthyBond installation adhesive is ultra-low-VOC and contains no hazardous chemicals or solvents.

EcoTimber products that do not use EPI adhesives use PVA adhesives (known as 'white glues') that contain no formaldehyde and do not require any protection for those working around them. Modern formulations of PVA adhesives have made them as strong and water-resistant as urea-formaldehyde glues.

If it weren't for the small amounts of formaldehyde that are naturally emitted by wood, EcoTimber's flooring products would emit no formaldehyde whatsoever -- the glues and finishes are not contributing to the overall formaldehyde emissions. All EcoTimber flooring products easily meet both the European E1 formaldehyde standard and the new California Air Resources Board regulations, including the most stringent CARB standard that won't go into effect until 2012.

## LEED

### U.S. Green Building Council



U.S. Green Building Council (USGBC) is a national non-profit organization headquartered in Washington DC. USGBC is built on its members that were around 11,500 strong as of 2008. USGBC's members are organizations (businesses, government agencies, non-profit organizations, etc.) rather than individuals. USGBC has numerous chapters at the regional and state levels. Individuals who want to get involved in USGBC usually do so through their local chapter at a modest fee. An interactive map with all USGBC chapters can be found at [www.usgbc.org](http://www.usgbc.org).

USGBC's main activity is to develop and administer the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. LEED was created in the late 1990s by pioneers in the green building movement to create a common standard for defining and assessing environmentally-responsible, whole-building, high-performance design and building practices. It was also intended to stimulate green competition among the tens of thousands of companies that supply the building industry. In LEED circles, this competition and the environmental improvements it drives is called **market transformation**.



### Growth of the LEED Market

In recent years, LEED has experienced dramatic growth. It is now a factor in nearly all sectors of the building industry. As of late 2007, there were projects representing over 850 million sq. ft. that registered to seek LEED certification. There were 75 regional chapters and over 30,000 LEED "Accredited Professionals" or experts in LEED who have passed a difficult test to demonstrate their proficiency, as well as about 30 additional people a day becoming LEED AP's. More than 22,000 people attended Green Build 2007, the annual conference for USGBC and LEED. Hundreds of federal agencies, state and municipal governments, educational institutions, and major corporations are embracing LEED.

With the launch of LEED for Homes in the summer of 2007, LEED has moved into the residential market. In addition to LEED for Homes, there are numerous state and local residential green building programs. California's Build It Green program is just one example.

### Residential Market now Going Green

There is every sign that the green building movement is about to sweep the home building industry. LEED has had a more powerful effect on the market for green building products than any other factor and so far it has been focused on the commercial sector. With the launch of LEED for Homes in the summer of 2007, LEED has moved into the residential market. In addition to LEED for Homes, there are numerous state and local residential green building programs. California's Build It Green program is just one example.

### LEED or "Leeds"?

A common mistake many people make when talking about the LEED rating system is to say "Leeds" rather than "LEED". This is a pet peeve among green building professionals. There is no quicker or surer way to damage your credibility in the LEED marketplace than to say "Leeds". So remember: LEED is a green building rating system. Leeds is a city in central England.

### LEED Certifies Buildings, not Products

A common mistake made by product manufacturers and others is to say that their product is "LEED certified." There is no such thing as a

LEED-certified product because LEED only certifies buildings. It is more accurate to say that a product is LEED compliant, meets LEED credit requirements, or contributes towards earning one or more LEED points.

### Earning LEED Points

LEED is based on a system of credits and points. You have to earn a certain number of points to achieve LEED certification for a building. More points can mean a higher “ranking” in the LEED System (from lowest to highest, the levels are Certified, Silver, Gold, and Platinum). Some LEED points are earned by using LEED-compliant products such as those that contain recycled content, no added formaldehyde, and FSC certified wood. Using any single LEED-compliant product usually will not be enough to earn a point, but it will contribute. A project may have to use many, many products of a given type in order to earn a point.

### Wood and Bamboo Flooring Credits

Credit	Applicable Materials
Materials and Resources 4.1 and 4.2 - Recycled Content	Reclaimed wood or recycled-content underlayments
Materials and Resources 5.1 and 5.2 - Regional Materials	Flooring or accessories extracted, processed and manufactured within 500 miles of project
Materials and Resources 6 - Rapidly Renewable Materials	Bamboo flooring (Engineered Bamboo does not count due to its wood content)
Materials and Resources 7 - Certified Wood	FSC-certified wood flooring
Indoor Environmental Quality 4.1 - Low-emitting Materials - Adhesives and Sealants	Installation adhesives with no more than 100g/L VOC content
Indoor Environmental Quality 4.2 - Low-emitting Materials - Adhesives and Sealants	Floor finishes with no more than 100g/L VOC content
Indoor Environmental Quality 4.4 - Low-emitting Materials - Composite Wood and Agrifiber Products	Engineered wood and bamboo flooring that contains no added urea-formaldehyde resins

### FSC and LEED

Only FSC-certified wood products comply with the requirements of the LEED Certified Wood credit (Materials and Sources 7). Wood products certified under competing forest certification systems such as SFI, CSA and PEFC are not currently recognized by LEED.

### LEED for Homes

The above table of credits is for LEED rating systems that apply to commercial construction. LEED for Homes, the rating system for residential construction, has a different system of points and requirements. For instance, LEED for Homes requires that all tropical wood used in a project must be FSC certified. As in LEED for commercial construction, forest certification systems other than FSC are not currently recognized by LEED for Homes.

## Wood Characteristics

### Hardwoods and Softwoods

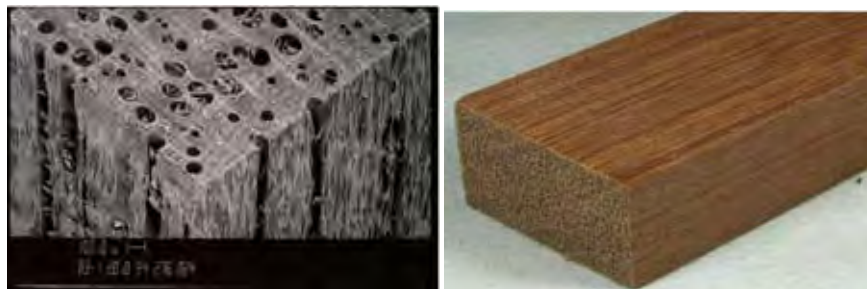
Hardwoods come from broad-leaf (deciduous) trees. Softwoods come from needle-bearing (coniferous) trees. Most hardwoods are harder than most softwoods, but there are exceptions. For example, Balsa is a very soft hardwood and Australian Cypress and Heart Pine are hard softwoods. Many people believe that the stability of a wood (the amount that it expands or contracts in response to humidity changes) relates to its hardness, assuming that harder woods are more stable. In fact, stability and hardness are not related, and some of the hardest woods are some of the least stable, while some of the



softer woods are extremely stable.

## Wood Structure

The structure of wood resembles a bundle of long, tiny "straws" that transport nutrients and water (sap) up and down the tree. When wood is milled, these straws look different when viewed on the side or face of a board than they do when viewed from their cut ends, such as on the ends of a piece of lumber.



## Heartwood and Sapwood

Trees grow in thickness from their center by adding layers of cellular "straws" at the outside of the tree. As the tree grows and ages, the cells closer to the inside of the tree cease conducting sap and die. The dead cells become the heartwood and the newer cells that still conduct sap form the sapwood. In many woods, the sapwood and heartwood are clearly differentiated, the sapwood often being much lighter in color.



## Growth Rings

Growth rings are concentric rings that radiate out from the center of the tree, each ring representing one year of growth. The term "grain" usually refers to the way that growth rings appear on the surface of a piece of wood. That appearance will vary depending on how the wood is cut from the log.

## Wood Expansion and Contraction

The "straws" that make up wood structure absorb or lose moisture with changes in humidity. The moisture content of wood will always gradually equalize with the moisture of its surrounding environment. All wood expands when it takes on moisture and shrinks when it loses it. When it does, it changes size across its width and thickness, but only slightly in its length. This expansion and contraction continues forever, no matter how long ago the tree was cut down.

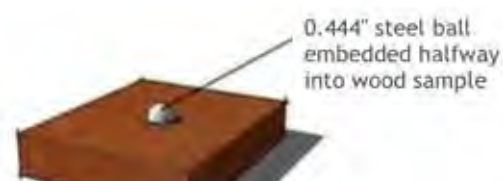
Unlike solid wood, Bamboo expands and contracts somewhat along its length, as do planks of engineered flooring (due to expansion across the width of the cross-ply layers). Installers who are not familiar with this aspect of Bamboo and engineered flooring will sometimes fail to leave adequate expansion space at the ends of rows of installed planks. With solid hardwoods, you can generally get away with this, but with Bamboo and engineered hardwoods, you must leave expansion space on all sides of a floor.

## Wood and Moisture

Because moisture changes cause wood to move, especially wood flooring and most other wood products, moisture and wood DO NOT mix well. Most failures of wood flooring are due to moisture related problems, including wet mopping, flooding, inadequately cured concrete slabs, and HVAC systems that create job site conditions that are either too dry or too moist. Radiant heat subfloors and regions that have significant fluctuations in humidity also pose challenges to wood floors that can eventually cause significant damage.

## Wood Hardness

The standard measure used in the U.S. for the hardness of wood flooring is the Janka test. It measures the force (in pounds per square inch, or PSI) required to drive a steel ball 0.444 inches in diameter into a given wood to the depth of half of the ball's diameter. Red oak, the wood flooring industry standard, is 1290 PSI on



the Janka scale. Maple, often used for sports floors, is 1450. A number of exotic species are 3000+ on the Janka scale. In general, most tropical woods are harder than most domestic woods.

### Wood Durability

All wood will dent if sufficient force is applied. Women's high heel shoes exert tremendous force via the heel, so a 115 lb woman will exert about 2500 lbs of force. In high traffic applications, it is best to select harder woods. Oak would be a minimum (1290 on the Janka scale), but the harder exotics (2000+ Janka hardness) or EcoTimber woven bamboo (about 3000 Janka hardness) are the best choices from a durability standpoint.

### Wood Color Change

Wood is a natural product and some degree of color variation is inevitable. Some species have a much higher degree of color variation than others. The only real ways to achieve uniform color in wood are to select out much of the material, which is a poor environmental choice, or to apply a stain. Some wood species change color dramatically as they age (oxidize). Others change color when exposed to light (UV radiation). Some do both, and sunlight generally accelerates the oxidation process. People who use wood products should expect the wood to change color over time unless it is heavily stained. In conditions of prolonged, intense direct sunlight, some species that normally darken with time will actually bleach to a lighter color.

## Eco Friendly Flooring Overview

### Solid Wood Flooring

Solid wood flooring is milled from lumber and each plank is a single species and a single piece of wood throughout its thickness and width. It is commonly available unfinished and factory-prefinished, and the standard thickness is 3/4". Solid wood flooring that is 2-1/4" wide (or less) is called strip flooring, while solid wood flooring that is 3" to 5" wide is called plank flooring. Solid wood flooring 6" and wider is generally referred to as wide plank flooring. Solid wood flooring in widths wider than 6" or 7" are rare. Solid wood in those widths is available but it is not stable and shrinks or expands significantly with changes in relative humidity. The wider the board, the more susceptible it is to expansion and contraction. This makes wide plank floors quicker to develop gaps under dry conditions and cupping or buckling under wet conditions. With wide plank solid flooring, many installers choose to both glue and nail the flooring to help keep the planks flat and in place.



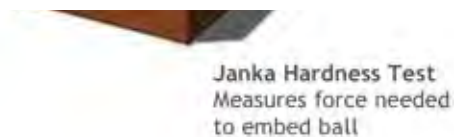
### Engineered Wood Flooring

Unlike solid wood flooring, engineered wood flooring is made up of multiple layers and components. There are many different types and formats of engineered wood flooring. All types of engineered wood flooring have two basic components. The first is a wear layer or surface layer. This is the wood that is seen and walked on in the installed floor and therefore typically gives the product its name (a maple wear layer on a pine substrate is called "engineered maple flooring"). The second component is a substrate, or the platform that supports the wear layer and can be made up of various materials and/or layers.



In at least one of those layers, the grain orientation runs perpendicular to the grain of the wear layer. The wear layer of engineered wood flooring can be sawn from lumber, and the substrate can be made from lumber or from composite materials. Wear layers and substrate materials can also be made of veneer.

### Sliced and Rotary Veneers



A veneer is a relatively thin sheet of wood that is sliced either from lumber, half- or quarter-logs, or peeled in a rotary process from whole logs. In both cases, the process is performed with an extremely sharp knife and generates no sawdust and little waste. Sliced veneer generally goes into high-end applications such as architectural paneling, custom casework and furniture, and so forth. It is rarely used in flooring.

Rotary veneer is peeled from whole logs. The log is placed on a machine that is basically a large lathe and spun at high speeds before engaging with a sharp knife that runs the length of the log and ‘peels’ the veneer away in a continuous sheet, until all that remains is a core. Because the process is perfectly circular, while logs are not, the knife wanders in and out of the growth rings, producing graining that is often wild and random. While rotary peeling is the most efficient way to produce veneer and peeled veneer can be thicker than sliced veneer, because of its wild graining, rotary veneer is rarely used in architectural paneling. Rather, it is used for the plies of construction plywood and for less expensive engineered wood flooring.

### Solid vs. Engineered Wood Flooring

Both solid and engineered wood flooring have a place in the marketplace. Each has its appropriate application, depending on project conditions and customer priorities. That being said, there are a number of persistent myths and misconceptions surrounding engineered wood flooring. Solid wood flooring is considered by some to represent real quality in wood flooring, while engineered wood flooring is sometimes thought to be a cheap substitute for the genuine article. While it is true that there are cheap and low quality engineered wood flooring products on the market, there are many flaws in this conception as it applies to EcoTimber engineered wood flooring and other quality brands.

The great advantage of solid wood flooring over engineered is that the solid planks almost always have a thicker wear surface (the wood above the tongue & groove), allowing for additional sanding and refinishing. 3/4” solid wood has about 1/4” of wood



above the T&G, which in most cases will allow for 3 to 5 sandings. Most engineered wood floors will allow for 2 to 3 sandings, depending on the thickness of the wear layer, the hardness of the wood and the skill of the craftsman.

### Benefits of Engineered Flooring

- **Cost:** Engineered wood flooring is generally less expensive to install than solid wood flooring, especially when it is installed directly over concrete subfloors. Solid wood requires a plywood subfloor, as it generally has to be nailed down. If a jobsite has concrete subfloors, then purchasing and installing plywood on top of the concrete in order to accept solid wood floors adds significantly to costs and uses extra resources.
- **Stability:** Because of its layered construction, engineered flooring expands and contracts less than solid wood flooring.
- **Versatility:** Engineered wood flooring can be floated over and glued to concrete and other non-wood subfloors as well as nailed or stapled down to wood subfloors.
- **Other Benefits:** The other benefits of engineered wood flooring include their efficient use of resources. Engineered flooring uses high quality wood only where it counts, which is in the visible wear surface of the floor. As the diagram below shows, the raw material yield is far superior. In the substrate, engineered wood flooring generally uses relatively abundant grades and fast-growing species of wood. Solid wood flooring is generally all higher grades of a desirable species, which are a precious and limited resource. From the tongue & groove down, which is usually about 2/3rds of the product, this precious wood is essentially wasted.



### Bamboo Flooring

Eco Friendly Bamboo Flooring: Not All Bamboo is Equal

Bamboo is proving to be a durable and attractive alternative to hardwoods for flooring. It is rapidly renewable, growing to maturity in five to

seven years, compared to 50-150 years for many hardwoods. It is sturdy, with a hardness that rivals and in some cases exceeds the hardness of hardwoods. Bamboo is attractive and readily available in solid, woven and engineered versions. It offers a variety of colors and grains and it is cost effective, often being less expensive than hardwoods and just as easy to install.

The surge in popularity of bamboo as an eco-friendly flooring material has created a rush to market with a simultaneous surge in manufacturing capacity. The rapid growth has resulted in a wide range of quality of the finished product, depending on the manufacturing processes used. There are a number of manufacturing variables that determine the ultimate quality of bamboo flooring. These include processing time, moisture content, density level, the adhesives that are used to manufacture the end product, and the quality of the surface coating.



Processing time is extremely important. The stalks should be processed quickly after cutting. If they are not processed promptly, they can develop a surface mold that is often visible in the finished product. Quality manufacturers process their cut stalks immediately, thus eliminating the possibility of mold.

Moisture content is also imperative and in general it should be as low as possible at the time of manufacture. It can vary widely, from 7% to 14%, and many Bamboo flooring mills ship material that has only been dried to 9-12%, which is not adequate in many climate regions. With Woven Bamboo, in particular, the drying process is essential. If Woven Bamboo is manufactured to 9-12% moisture content and then installed in a dry climate area, it has a tendency to crack or develop ripples on the plank face. For installations in areas where relative humidity drops below 35%, material that has been well-dried at the factory is essential. All EcoTimber Bamboo flooring is dried to 6-8% moisture content, making it ideal for use in a wide range of climates.

## Types of Bamboo Flooring

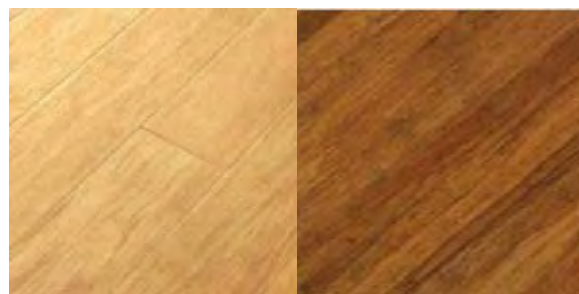
Bamboo flooring comes in a variety of types. The three most common styles in the marketplace are solid, woven (strand) and engineered bamboo flooring.

### Solid bamboo flooring

Solid bamboo flooring bears its name because it is made up of pieces of solid bamboo. This distinguishes it from engineered bamboo, which combines bamboo wear layers with wood cores and backs. It also differentiates the solid bamboo from woven or strand bamboo which is made of shredded bamboo fibers. In actuality, “solid” bamboo flooring is made up of small strips of bamboo that are glued together to form the finished product.



### Woven bamboo flooring



Woven bamboo flooring is also known as strand or strandwoven bamboo. Woven bamboo results from a fundamentally different manufacturing process than the one used for solid bamboo flooring. In this process, the timber bamboo is shredded into fibers, which are then mixed with resin and compressed into solid blocks that are then cut into planks to be milled to a standard flooring profile. Woven bamboo is much harder and denser than traditional bamboo flooring (about 3000 on the Janka scale), making it well suited for high-traffic areas. The hardness results from the resin that is used and the density achieved by pressing the fibers tightly

together.

The adhesives that are used are a critical factor in determining the quality of a finished product. Low quality adhesives, especially those containing urea-formaldehyde, can emit harmful chemicals in the home and should be avoided. Higher quality adhesives eliminate these problems. EcoTimber Solid Bamboo is made with a top-quality formaldehyde-free European adhesive, and EcoTimber Woven Bamboo is made with a proprietary phenolic resin that contains no urea-formaldehyde.

### Engineered bamboo flooring

Engineered bamboo flooring faces some issues with reliability. Because it is laminated to a cross-ply backing, the top layer of an engineered bamboo floor does not have the ability to shrink when the floor is exposed to dry air, and this causes stresses develop within the plank. With most hardwoods, the natural material (lignin) that binds together the fibers is strong enough to withstand these stresses and resist cracking. With bamboo, the fibers are very strong, but the bonding material between them is weak, making engineered bamboo floors much more susceptible to surface checking (cracking) than most engineered hardwoods.

Traditional solid and Woven Bamboo flooring, by contrast, have all of the fibers aligned in the same direction, so when the plank needs to shrink, it can do so without developing those internal stresses. At EcoTimber, we no longer offer engineered Bamboo flooring because we feel that no matter how carefully it is manufactured, the biology of Bamboo makes this format unreliable in many areas of the country.

### Bamboo Hardness: Fact & Fiction

The Janka test can give misleading information about bamboo's durability as a flooring product. Because of the strength of the bamboo fibers, the floor resists impact with round objects like the steel balls used in Janka tests. The fibers act like a trampoline and bounce the steel ball out. However, as noted, the bonding material between the bamboo fibers is much weaker than the lignens in wood. If a sharp object such as a rock in someone's shoe cuts the bamboo fibers, the bamboo scratches or gouges easily because the material between the fibers is relatively soft. Therefore, if a bamboo floor and a hardwood floor have identical Janka test ratings, in reality the hardwood floor will dent and scratch less than the bamboo. It is also important to note that some bamboo flooring companies report very misleading Janka test ratings. They get high ratings by performing the test on the 'knuckle' or node of the bamboo stalk, which occupies only a tiny portion of the floor's surface area and is substantially harder than most of the floor.

Traditional bamboo flooring has Janka ratings of 1300-1600 PSI for the Natural color, and 1100-1300 for the Carbonized ('Amber') color. The inherent hardness, combined with a tough finish (often acrylic), makes bamboo a durable choice for flooring, but the hardness of traditional Bamboo flooring has been greatly exaggerated by some manufacturers. Woven Bamboo, on the other hand, rivals the hardness of the most dense tropical hardwoods. EcoTimber Woven bamboo flooring is 3000 on the Janka Scale of hardness, harder than Brazilian Cherry (Jatoba), which is rated at 2800.

## Eco Friendly Flooring Installation

*There are a variety of proven methods for installing wood flooring, each of which has advantages and disadvantages.*

### Nail or Staple Down Method

Nailing or stapling to a plywood sub-floor is relatively fast and inexpensive provided that there is already an acceptable substrate in place. Particleboard is not an acceptable substrate because it will not hold nails or staples adequately. With most flooring, a pneumatic stapler appropriate for the thickness of flooring being installed and 1-1/4" or 1-1/2" staples are recommended. Some staplers or nail guns may need an adaptor plate for use with flooring that is 9/16" or 5/8" thick, as most are made for either 1/2" or 3/4" thick flooring.

### Floating Method

A floating installation is very fast and inexpensive. Flooring can be floated over all types of substrates, including wood, gyp-crete, and concrete. With regular tongue and groove (T&G) flooring, a bead of glue is applied to the grooves on the sides and ends of each piece of flooring and it is then fitted to the tongue of the installed course. Some floors, such as EcoTimber Elements, have "click" T&G systems that allow a floor to be floated without glue. In both cases, the entire floor forms a single panel that 'floats' over the subfloor without actually being attached to it.

There are several advantages to the floating installation method. It is fast, clean and inexpensive relative to other methods. In situations where moisture is a concern, floating floors allow the installer to lay an impermeable moisture barrier (plastic sheeting) between the subfloor and the flooring. Glue down and nail down installations cannot be performed over plastic sheeting and may require that moist concrete be sealed. This process is much more expensive and less reliable than the layer of plastic that can be used under floating floors. In a floating installation, when planks expand and contract in response to humidity changes, they move together as a unit toward or away from the walls. This means that a properly installed floating floor will not develop gaps between the planks under dry conditions and is less likely to cup or buckle under moist



conditions.

There are also disadvantages of the floating installation method. Floating floors can have a “springy” feel, although this is mainly an issue with thin flooring like laminates or when flooring is installed over cheap foam underlayments that are not sufficiently dense. Floating floors sometimes produce a clicking or tapping sound as the floor flexes and rubs the underside of the base moldings. Insufficient glue at the seams or base moldings that have been installed too tightly against the flooring can also sometimes result in cracking noises.

Solid wood flooring cannot be floated. Solid wood expands and contracts much more than engineered flooring, so if it were floated it could pull out from under the moldings under dry conditions or crush against the walls under wet conditions. In addition, the floating installation method requires a tight tongue-and-groove fit and since solid flooring has to be acclimated at the jobsite, the tongues & grooves may change in size during acclimation and make it impossible to fit the planks together.

## Eco Friendly Underlayment

EcoTimber's proprietary Floating Floor Pad has 92% post-industrial recycled content (minimum), no formaldehyde emissions, and qualifies for LEED credits. It is suitable for use over all types of subfloors, is excellent for floating installations over radiant heat systems, and contains an EPA-registered anti-microbial agent that inhibits bacterial, fungal and dust mite growth.. It also reduces ambient noise and floor-to-ceiling sound transmission, outperforming foam, cork and rubber products of equivalent thickness in most sound tests. It insulates cold floors, provides a cushion over concrete sub-floors and smoothes out subfloor imperfections. Finally, EcoTimber Floating Floor Pad's pre-attached vapor barrier helps prevent water damage and can eliminate one step in the installation process for jobs where a moisture barrier is needed. If a leak or spill causes moisture to accumulate under the flooring, EcoTimber Floating Floor Pad's unique wicking action will spread the moisture out, allowing it to move toward the walls and escape, thereby reducing the likelihood of damage in the location where the spill or leak occurred.

## Glue Down Method

A glue down installation involves applying wood flooring adhesive to the entire surface of a subfloor and then laying each piece of flooring directly into it. The resulting installation is quiet and feels more solid underfoot than a floating installation. Because glue is spread across the subfloor and establishes a bond with the entire surface area of the back of each plank, glue down installations can help keep the planks flat in situations where they might otherwise cup or buckle, although even the strongest glue will not keep wood flat under severe humidity conditions.

The main disadvantage of glue down installations is that they are relatively costly, messy, and labor intensive, and require curing time (usually 24 hrs.) before the space can be occupied. Further, many commonly-used adhesives used to glue down flooring contain relatively high levels of hazardous chemicals.

## Eco Friendly Adhesives

A truly eco-friendly glue-down installation must include the use of an eco-friendly flooring adhesive. Some adhesives that are marketed as "Zero-VOC" are actually quite harmful, off-gassing toxic chemicals like xylene and isocyanate that are considered hazardous, but are not classified as VOCs. Just because something is VOC-free does not mean it's non-toxic.

EcoTimber HealthyBond Adhesive is solvent-free, isocyanate-free, has very little odor, negligible levels of VOCs (7 grams per liter), no hazardous chemicals -- and meets all federal, state and local indoor air quality regulations. It contains high solids for superior coverage (up to 240 square feet per 4-gallon pail) and is easy to spread with good early strength for an immediate "grab". HealthyBond is so strong, the only complaint we receive is that it's very difficult to pull up flooring that has been installed incorrectly.

## Subfloors & Finishes

### Subfloor Types and Basic Installation Considerations

There are many different types of subfloors over which wood flooring can be installed. There are certain basic attributes that are critical for successful wood flooring installations done over all types of subfloors. The subfloors must be dry and will remain dry year round. The moisture content of wood subfloors must not exceed 12%, wood flooring moisture content must be within 3% of wood subfloor moisture content and

concrete must not exceed 3 lbs. per a calcium chloride test, or 2 lbs. when installing over radiant heat. The subfloor material must be structurally sound. It also needs to be clean, thoroughly swept and free of all debris. For glue down installations, the subfloor must be free of wax, grease, paint, sealers, old adhesives, etc., which can be removed by sanding. Additionally the subfloor must be level or flat to 3/16" per 10-foot radius.

#### Wood Subfloors

Nail down installations are most common over wood subfloors, but glue down and floating installations are also possible. Wood subfloors must be well secured, by using a nail or screw every 6" along the joist to avoid squeaking. If the subfloor is not level, sand down high spots and fill low spots with a polymer-modified cementitious leveling compound such as Chemrex Self Leveling Underlayment from BASF. CDX plywood must be at least 5/8" thick for joist spacing up to 16" on center and a minimum of 3/4" thick for joist spacing greater than 16" on center (19.2" maximum). OSB should be at least 3/4" thick. Underlayment grade particleboard can only be used with the glue down method. If using an existing wood floor it must be smooth, level, well adhered and unfinished (if gluing down new flooring).

#### Concrete Subfloors

Concrete must be fully cured, at least 60 days old, and should have a minimum of 6-mil poly-film between the concrete and the ground. If it is necessary, grind high spots down and fill low spots with a polymer-modified cementitious leveling compound or Ardex K-15 Leveling Compound. If gluing down onto concrete which is on or below grade, it is recommended to use a concrete sealer approved by the manufacturer of the adhesive that you have chosen. A concrete slab on/below grade that measures dry today may become moist tomorrow due to rising groundwater. Installing a moisture barrier may be viewed as an insurance policy against concrete becoming wet in the future, which can lead to subsequent floor failure.

#### Other Subfloors

Gypcrete can be used in floating installations only. Gypcrete, otherwise known as lightweight concrete, is not strong enough to hold together when a wood floor that is glued to it expands and contracts. If the flooring planks buckle and lift, they may pull pieces of gypcrete up with them. Some manufacturers of flooring and glue say that it is fine to glue their products over gypcrete, but they are only responsible for the bond of the floor to the gypcrete. If the gypcrete itself breaks apart as the wood moves, they will not take responsibility.

Resilient tile and vinyl tile subfloors can be used with glue down or floating installations. Vinyl must be new and non-urethane coated. Ceramic tile, resilient tile and sheet vinyl must be well bonded to the subfloor, in good condition, clean and level. Do not try to sand existing vinyl floors, as they may contain asbestos.

### Installing Over Radiant Heat Subfloors

When installing over radiant heat subfloors it is good to know the facts. Most flooring is not warranted for installation over electric radiant heat systems, as these can heat up too quickly and damage the wood. However, many eco-friendly flooring products can be installed over radiant heat and are warranted for such use by their manufacturers. It is important to check with the manufacturer because not all products are warranted for such use, and typically only hydronic (hot water) systems are approved. The information below is specific to EcoTimber flooring:

When installing EcoTimber wood flooring over radiant heat, use the floating installation method only, and always use EcoTimber Floating Floor Pad as your underlayment.

Some EcoTimber products are not warranted for use over radiant heat, and NO EcoTimber flooring is warranted for installation over electric radiant heat systems. Only hydronic (hot water) systems are approved. When installing EcoTimber flooring over radiant heat, the system must be able to control the surface temperature of the subfloor so that it never exceeds 82 degrees F. Also, it's essential that the subfloor be maintained at within 15 degrees F. of its normal operating temperature at all times.

Radiant heat systems keep the wood flooring very dry, so if the system is turned completely off (for example, during hot summer months), the flooring will absorb moisture. When the system is turned back on again, it will dry the wood very quickly, which is the most common cause of damage. After the system has been off or not functioning, the floor should be brought back up to normal operating temperature very slowly, over the course of several days.

For an Ecotimber floor to be warranted over radiant heat, additional restrictions apply. Please read our installation instructions carefully before selecting a specific product in a radiant heat application.

## Eco Friendly Flooring Finishes: Factory Applied & Site Applied

Floor finishes can be applied prior to installation by the manufacturer of the flooring or on site by the floor installer. Each process has advantages and disadvantages:

### **Advantages Factory-Applied Finishes:**

- Applied in a controlled environment with no airborne dust or other impurities
- Subcoats containing special additives like aluminum oxide can be added, greatly increasing the wear-resistance of the finish
- Extra coats can be easily added by rollers. Nine coats of finish is not uncommon for a factory finish, while two to three coats is typical for a site-applied finish
- Factory finishes tend to be much more durable than the best available site-applied finishes -- about twice as durable is a good rule of thumb
- Less installation time and labor means much lower overall installed cost. Factories apply finishes for much less than contractors.
- Improved indoor air quality. Factory finishes are cured by ultraviolet rays in the factory and are completely inert by the time they are packaged. There is no off-gassing of solvents, VOCs, or other harmful chemicals

### **Disadvantages of Factory-Applied Finishes:**

- The seams between the planks are not sealed, potentially allowing spilled liquids to leak down and damage the wood. Also, the seams may require top coating to seal seams in areas where frequent spills are expected (restaurants, bathrooms, etc.).
- The end-user cannot change the wood's color with stains without sanding off the factory finish

### **Advantages of Site-Applied Finishes:**

- Creates a smooth, sealed surface over the entire floor
- Allows for color customization with stains, bleaches and/or dyes
- Allows you to select the gloss level of the finish
- Allows for use of spot-repairable oil finishes

### **Disadvantages of Site-Applied Finishes:**

- The wood must be sanded prior to coating, resulting in dust, longer installation times and substantially higher labor costs
- The end user must wait for finish to dry completely, meaning they are forced out of their home for longer periods of time
- Site applied finishes contain solvents and other drying agents that off-gas harmful chemicals into the air for days, weeks or even months after installation (depending on the type of finish)
- Even "natural" plant-based oil finishes off-gas harmful chemicals. Some "natural" oils have higher VOC contents than urethane finishes
- Contractors often make errors that result in finish bubbles, applicator marks, sanding marks, dust in the finish, and poor adhesion. Expensive and highly inconvenient mistakes are common.
- The long-term durability is much lower than with factory applied finishes

## Care & Maintenance of Eco Friendly Wood Floors

Proper care and maintenance is essential for the performance of any wood floor. Wood flooring should be one of the last items in the construction process to be installed. Once the flooring is installed it should be protected to avoid any damage that could be caused by tradespeople. If using the glue down or floating installation methods, do not allow foot traffic or heavy furniture on the floor for 24 hours after installation is complete.

In order to prevent scratches it is wise to adhere to the following steps. There is no such thing as a "scratch proof" wood floor, but following these basic procedures will reduce the likelihood and frequency of scratches.

- Felt padding should be permanently affixed to the legs of all furniture before it is moved into the space.

- Do not allow people to wear spiked heels on the floor, as these will severely damage even the hardest wood floors and finishes.
- Pet claws should be properly trimmed at all times.
- Work boots and shoes that may have pebbles lodged in the soles should be removed prior to entering.
- It is important to remove grit. Care should be taken to prevent dirt, sand and grit from accumulating on the surface of your floor. They will act like sandpaper and abrade the finish. Walk off mats should be placed inside and out at all exterior exits, and the floor should be swept or vacuumed frequently. All mats or rugs should be cleaned and/or replaced on a regular basis. They should also be moved occasionally to allow natural color changes caused by light to occur evenly in all areas.
- Be sure to always use proper cleaning products. To clean a factory urethane finish, simple water (applied with a slightly damp mop, never a wet mop) is effective at removing most scuffs, dried spills, and dust film, but for a more thorough cleaning look for a non-toxic cleaner formulated specifically for hardwood floors such as Bona-X Floor Cleaner. Floor waxes, oil soaps and petroleum-based cleaners should not be used under any circumstances.
- Take precautions to avoid standing moisture. Water and wood floors do not mix. Never wet mop a wood floor, and always clean up spills and standing water as soon as possible. With water or any other cleaning agent, be sure to thoroughly ring out the applicator or mop prior to applying it to the floor. A damp mop is fine as long as the moisture is limited to an amount that will evaporate almost immediately. Moisture that is allowed to seep into the seams between the planks may cause damage to your flooring. Do not allow soiled mats or rugs to stay on the floor as they can trap moisture on the surface.

### Common Pitfalls of Wooden Flooring

Many wood flooring complaints and claims are a result of conditions that are beyond the control of the manufacturer or seller of the product. It is important to be aware of some of the most common pitfalls to avoid. It is critical to make sure that you do not have wet concrete slabs at time of installation. Inadequately cured concrete slabs will continue to release moisture after flooring is installed, which can cause movement and other problems for wood flooring. On- and below-grade concrete slabs can become wet if groundwater rises. Adequate curing times and proper moisture barriers are essential.

Improper heating and ventilation can cause damage. Most wood flooring is manufactured to perform best within relative humidity (RH) ranges of 35% to 60%. It is important to run heating and humidity control systems in advance of installing wood flooring so that site conditions at the time of installation are similar to those that will prevail when the space is occupied.

Conditions that are too dry can cause as many problems as conditions that are too wet! Dry climates can present environmental conditions that are very hard on wood flooring. This is not an issue with just eco friendly flooring, it is an issue with any wood flooring from any source. Wood floors are products of nature, and as such are subject to natural forces. If you expect your wood flooring installation to regularly experience humidity levels lower than 35%, the guidelines below may help prevent problems. Keep in mind that it's not only desert and mountain areas that experience dry conditions – in cold climates, humidity levels indoors during the heating season can be extremely low. A high rise building in New York City might be as dry as a home in Arizona during the coldest months of the year.

- Use Humidifiers: The best way to avoid problems caused by excessive drying is to regulate the moisture in the space with humidifiers, which should be functioning throughout the life of the floor. (Don't turn them off if you are away from home). Most flooring manufacturers require that humidity be maintained within certain levels (usually 35% to 60%) in order for the warranty to stay valid.
- Avoid Sudden Humidity Change: If the wood takes on moisture and is then subjected to its normal dry conditions, the rapid drying may damage the floor. Painting, plastering, or anything else that artificially adds moisture to the space should only be done if dehumidifiers are in place to remove that moisture from the air before the flooring has a chance to absorb it.
- Always follow the manufacturer's recommendations regarding acclimation prior to installation. Engineered flooring is generally not acclimated and should be left in its packaging on site. During installation, only open as much as needed to work from. If acclimation is recommended (as with EcoTimber Exotics when installed in dry conditions), only open the ends of the boxes in order to prevent the flooring from drying or taking on moisture too quickly. Once the flooring is laid, the factory finish will help seal the floor so that the moisture from the air enters or escapes slowly, preventing damage.
- No Wet Mopping: When you wet mop your floor in a dry climate, the dry wood will absorb moisture (causing expansion) and then shed it very quickly (causing shrinking) once you've finished mopping. This rapid change in dimension of the planks can cause cracking and other damage. To clean the floor, use a lightly damp applicator that does not allow moisture to sink into the seams.

Some species and formats are more susceptible to damage from excessive drying than others. For example, White Tigerwood and Oak will tend to perform better than Maple; and Vertical Grain Bamboo will tend to perform better than Horizontal Grain Bamboo. Generally, engineered bamboo or Cumaru (Brazilian Teak) are not recommended in dry climates unless humidity conditions are carefully controlled. Maple is somewhat unstable as well.

The EcoTimber products that are most likely to perform without problems in dry out-of-warranty environments are: engineered Hand-Scraped Hickory, engineered White Tigerwood, our Elements collection, and properly acclimated solid flooring such as solid Bamboo, Woven Bamboo and solid Exotics.

#### Wood Surface Scratching

This is one of the most common complaints that flooring dealers and installers receive from their customers. Unfortunately, there is no such thing as a scratchproof wood floor. When choosing wood flooring, it's important to have realistic expectations and to carefully follow the care and maintenance guidelines outlined above. It's also important to know that manufacturers of factory-finished wood floors and wood flooring finishes do not warrant against scratches. The so-called 'finish warranties' that manufacturers offer have to do only with wear-through, not scratch-resistance. Finally, wood flooring customers should realize that the hardness of a particular species of wood has nothing to do with how scratch resistant the surface of the floor will be. Harder woods will be more resistant to gouges and deep scratches, but most of the scratches in a typical wood floor are only in the coating, so it's really the quality of the finish that is the main determinant of how the floor will wear over time. In general, very dark and very light colored wood floors will show scratches more readily than medium-toned woods.

#### Refinishing an Eco Friendly Wooden Floor: Screening & Top Coating

Screening and top coating is a method of renewing the finish on a wood floor without actually removing the old finish and sanding down the wood. It will repair most signs of wear and create a uniform, sealed surface on the floor. It is relatively quick and inexpensive and can be repeated indefinitely. With screening and top coating, even the thinnest wood veneer wear layer can last forever because people walk on the finish, not on the wood. Factory applied finishes can be top coated just like jobsite applied finishes. In areas such as bathrooms, kitchens, and spaces where food service occurs, top coating a newly installed factory finished wood floor can help prevent against moisture damage. In heavy food service areas such as restaurants, two to three top coats are recommended.

There are both mechanical and chemical systems for screening, i.e. roughing up the surface of the old finish so that new top coats can adhere to it. The mechanical method usually involves putting a Scotchbrite pad on a standard drum flooring sander and operating the sander in a normal fashion. Chemical systems are offered by Bona Prep (Bona Prep Recoating Adhesion System) and Basic Coatings (Basic Coatings "TyKote" Sandless Recoating System). The manufacturer's instructions should be followed carefully. Also, be sure that the top-coat system you choose has been tested and approved by the manufacturer of the existing finish that is on the floor.



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