



FLOORING CONSIDERATIONS

Cork: Originating from the Mediterranean, cork flooring has been made for over 100 years. Cork is an evergreen tree (*Quercus Suber*) grown mostly in Spain and Portugal as well as India and the western U.S. Cork flooring is an abundant, renewable and sustainable product when harvested and produced appropriately.

Only the bark is used for flooring. Once a tree reaches 20 years old, its bark is ready to be harvested. Subsequent harvests of regenerated bark occur at 9 to 14 year intervals without harming the tree. Plantation cork oak can easily live for 150 years. Bark quality (smoothness) is said to improve with each harvest.

During cork production, the bark is granulated, pressed with binders, formed into blocks, baked and sliced into tiles. Production is usually chemical-free. Manufacturing generates little waste, recycling it back into the product. Some manufacturers fabricate their product from recycled bottle-cork industry waste.

Cork tiles can be made in virtually any color, providing great design possibilities. Currently, the availability of sustainable dyes used in cork production is limited. Cork tiles are easily cut and can be crafted into designs and patterns more easily achieved than with other materials. Cork parquet is available and so are cork/rubber combination hybrids.

Cork is an excellent sound and thermal insulator. Its structure of miniscule, airtight 14-sided cells makes it one of the best natural insulators. Cork also exhibits superior indentation recovery, a natural ability to spring back to original shape after compression. It is durable and suitable for various applications including libraries and gym floors. It is resilient and fire resistant. It is naturally anti-bacterial and known to be chemically benign with the possible exception of the binder, which can be natural or synthetic resins and/or glues. Newer cork flooring products include tongue-and-groove products with a top layer glued over a pressboard backing or vinyl-cork-hybrid tiles, which are not considered sustainable products.

Cork is usually long lasting and moisture resistant. Cork is not recommended for bathroom applications or other places where water contact may regularly occur. Unless pre-finished, a sealant and protective finish should be applied periodically since cork can retain water and stain. For those with chemical sensitivities, cork flooring is best when water-based adhesives and top finishes are used.

Installation: Cork-tiles are generally glued to the subfloor. There are many water-based adhesives and sealants to choose from.

LEED points: MR Credit 6 for rapidly renewable materials and possibly MR Credit 4 for recycled content materials.

Ceramic Tile: Tiles are available in many varieties, glazed and unglazed, mosaic and quarry tile and in various sizes, surface textures and colors. Unglazed, often called Mexican pavers, are all clay usually requiring a coat of protective sealant before or after installation to prevent soiling and bacterial growth. They are usually less expensive than glazed.

The glass-like surface on glazed tiles is derived from sand. Some manufacturers offer glazed tiles containing recycled content of glass light bulbs, bottles, automobile windshields and waste from feldspar mining. Some glaze pigments are obtained from heavy metals and some conventional tiles can have radioactive glazes, particularly cobalt blue and some yellows. Radiation detectors are available to test the levels. Glazed tiles are water-resistant, require no sealant and permanently retain both their hard quality and their surface color.

Ceramic tiles are growing in popularity for many reasons, including offering good sustainable characteristics. They are highly durable, freeze-proof and easy to clean and maintain. They also have a high thermal storage capacity which means they retain their heat and emit it slowly — especially good in applications where climates are warm during the day and cool at night.

Although relatively abundant resources, clay and sand are nonrenewable. Sustainability issues include the mining of these raw materials which can produce soil erosion, pollutant runoff and habitat loss. Tile manufacturing is energy-intensive, but the industry is making many improvements in this area.

To ensure getting the most sustainable tile for your project, specify recycled content tile from a manufacturer using energy-efficient processing methods.

Installation involves adhesives and grout which are typically derived from petrochemicals and can contain plastic additives, considered inert when cured, but can emit VOCs while curing.

LEED points: MR Credit 4 for recycled content materials where appropriate.

Tile Installation: This is generally a costlier way of setting tiles because of labor costs for a very skilled installer taking careful time to do it correctly.

The less expensive cement board (also called backerboard) method can be installed over the subfloor. Cement board is Portland cement, commonly a 1/2" thick. The seams are usually taped with fiberglass mesh tape, presenting a smooth and level surface ready for mortar and tiles.

Modified latex-Portland cement mortar or thinset mortar can then be used to adhere the tile to the cement board or the subfloor. Specify the relatively odorless thinset mortars. Like their conventional counterparts, they are primarily made of Portland

cement but usually without the odorous additives which are known to emit VOCs while curing. They are generally considered inert once cured.

Specify formaldehyde-free plywood for the sub-floor, since formaldehyde exposure can be problematic to workers, installers and end-users. Specify more sustainable grout for filling the spaces between tiles. The more chemically laden conventional grouts contain many chemical additives, often including epoxies and silicones. VOCs can be emitted during curing. Grouts requiring damp-curing are generally considered the most inert. If toxicity of grout or mortar is a concern, specifying larger tiles requiring less grouting joints to fill helps reduce the concern. Cured grout joints can be sealed with water glass, a clear, odorless sodium-silicate solution.

Tiled surfaces are easily cleaned and maintained with mild soap. Vinegar or hydrogen peroxide are often effective when stains appear.

LEED Credits: Possibly EQ Credit 3 - Construction IAQ Management Plan and/or EQ Credit 4 - Low-Emitting Materials.

Linoleum: Linoleum is made from linseed oil (from flax seed), ground cork or wood flour, and plant resins — all renewable resources. This mixture is pressed onto a backing, usually jute or polyglass [fiberglass and polyester fibers].

Linoleum is regaining its popularity because of its many favorable qualities including being sustainable. It's made from natural, renewable resources and it's biodegradable. Manufacturing generate little waste, recycling most of it back into the product.

This is a durable, resilient product, stable at varying temperatures and humidities. Linoleum sheet has a static load resistance of 150 psi. Linoleum tile has a load resistance of 700 psi. It resists indentations, cracks and water. It is resistant to burning. It is innately anti-bacterial, naturally killing bacteria and molds. It is cost-effective with a life span of at least 40 years. No offgassing formaldehyde, although linoleum can sometimes have a strong natural odor when first installed. This odor can be bothersome to the more sensitive person. Sealing it reduces any odors.

Linoleum is available in a variety of colors, both solid and marbled patterns. These colors extend through the entire thickness of the material, which decreases the amount of visible wear, increasing the life of the material. Although water resistant, proper moisture protection from the subfloor during and after installation is recommended. A low maintenance cost and effort generally only involves a dry maintenance system and periodic buffing.

Installation: Linoleum is often glued directly to the subfloor. Sealants are recommended to add protection against moisture and scuffing. We prefer water-based adhesives and sealants. Although water resistant, proper moisture protection from the sub-floor during and after installation is recommended. We also recommend installation by qualified professionals specifically familiar with installing linoleum and sealing it. Special installation requirements are necessary in some situations.

LEED points: MR Credit 6 for rapidly renewable materials and EQ Credit 3 - Construction IAQ Management Plan.

Terrazzo: Today, terrazzo chips are derived from mined marble, granite, quartzite, quartz or silica pebbles. These chips are added to a cementitious mixing compound that acts as a binder, holding the suspended chips in place.

As substitutes for the cement compound, newer mixing compounds have been developed such as latexes, vinyls, rubbers, epoxies and polyesters, which are all less sustainable than the cement.

When the mixture is hardened, the surface is ground, polished and sealed. Components of conventional sealers, primers and resins are generally derived from petrochemicals. More sustainable and most inert are sodium-silicate sealers, referred to as water glass. Water based acrylic sealers are also available.

Sustainability issues can include mining of the raw materials, which has generally moved underground, reducing most environmental issues of soil erosion, pollutant runoff and habitat loss. Terrazzo flooring products made from recycled glass stone and glass aggregate are the most sustainable options.

When curing is complete, most terrazzo is basically inert, does not offgas and contributes to a healthier Indoor Air Quality. The results are a very hard surface which performs well and requires only periodic maintenance.

Installation requires dividers which separate and accent the mixture. Traditionally these dividers have been metal. Today, vinyl (PVC) is often used. We do not recommend PVC. You can request that your installer use metal. Installation over some surfaces may require chemical bonding agents.

Bamboo Flooring: Many bamboo forests are carefully managed and require essentially no pesticides, fertilizers or irrigation. They often occupy steep slopes and hilly lands, beneficial in preventing soil erosion. Many bamboo crops are cut by hand to minimize effects of possible erosion. And, bamboo harvesting does not adversely affect pandas. They feed on a different species of bamboo and live at higher elevations.

Bamboo can be harvested for flooring generally every 4 years. Bamboo shoots reach full size in one to 2 years. After the third year, the plant no longer depends on the shoot for nutrient delivery and the plant benefits from its removal. Hollow round shoots are sliced into strips and boiled to remove starch. Strips are then dried and laminated into solid boards, which are then milled into standard strip flooring in either horizontal flat grain layers or multiple layers of vertical grain. At this time, standard lamination includes urea-formaldehyde binders.

Bamboo is strong and dimensionally stable. Bamboo flooring has 90% hardness of oak. Dimensional change with moisture content is significantly less than for most common hardwoods.

With a natural resistance to moisture and mildew, it is ideal for commercial or residential buildings. To meet building codes, it is often treated with chemicals for insect and fire resistance. Boric acid is the sustainably preferred treatment. Flooring boards are available in several finished color choices including natural and carbonized (darker brown with matte finish), and unfinished (which can be stained in your client's choice of color). Prefinished products all use UV-cured finishes with low-VOC. Water-based urethane can raise the grain.

Most bamboo flooring can be sanded and refinished, dyed or stained, similar to hardwood flooring. Whenever your budget allows, specify the thicker sizes (sizes vary from 1/2", 9/16" and 5/8") which can be sanded and refinished many times, extending its life several decades and making it a more sustainable choice. The thinner size (1/2") is initially less expensive, but can usually only be sanded once.

Bamboo is a sustainable resource also used in other products such as plywood, paneling and veneer, stair nosing, reducer strips, thresholds and grills.

Maintenance is similar to that of hardwood, with periodic cleaning and refinishing as recommended by the finish manufacturer.

Installation is also similar to hardwood flooring. Bamboo can be nailed or glued down depending on wood or concrete subfloor. Moisture levels should be checked before installation and manufacturer's recommendations followed. When installed properly bamboo can come with warranties on manufacture and finish.

LEED points: In most cases, when choosing bamboo flooring, it is applicable toward LEED MR Credit 6 for rapidly renewable materials.

Wood Flooring: To assist their preservation and newer forests' management, certification programs have developed. Forest Stewardship Council (FSC) helps establish forest management standards and is the only independent, nonprofit, non-governmental organization that trains, accredits and monitors third-party certifiers. We can recommend FSC certified or approved wood products be preferred.

Sustainable wood flooring is available in certified solid hardwoods, softwoods or composites in strip, plank or parquet styles. Strips, usually narrower than 3-1/4", and planks, wider than 3-1/4", are available as virgin certified wood or reclaimed and remilled wood. Both come in tongue and groove edges for a tighter floor, and are available in factory-applied prefinishes, usually preferred by the chemically sensitive person. Many pre-finishes are water based polyurethane. Other sealers and finishes are available.

For strip and plank flooring, oak is the most commonly used wood. Other hardwoods are maple, beech, walnut, ash and pecan. Softwoods are most often southern pine, douglas fir, west coast hemlock, spruce and western red cedar. Whenever your budget allows, specify the thicker size (3/4") which can be sanded and refinished many times, extending its life several decades and making it a more sustainable choice. The thinner size (1/2") is initially less expensive, but can usually only be sanded once. Strip and plank composites are being developed from wood waste products.

Parquet is most commonly made from oak, maple, walnut, cherry, mahogany or teak. Sustainable parquet flooring is composed of pieces of wood, commonly held together by glue (like plywood) with a thin upper layer in various patterns and stains. Newer parquet floors have a very thin upper layer and can not be sanded without ruining them. Older, solid wood parquets do not have this problem. Parquet is also available in tongue and groove with factory-applied prefinishes.

When specifying and purchasing wood, remember that terminology can be confusing. Sustainable usually refers to the preservation of the ecosystem, while sustained yield generally refers to the annual production of a given quality and quantity of timber.

LEED points: when choosing sustainable wood flooring: LEED MR Credit 3 - Resource Reuse for reclaimed or salvaged wood, MR Credit 6 - Rapidly Renewable Materials where bio-based board is used, MR Credit 7 - Certified Wood, EQ Credit 3 - Construction IAQ Management Plan and/or EQ Credit 4 - Low-Emitting Materials for agrifiber and composites use.

Mesquite Flooring: Mesquite flooring is an unusual hardwood that may become more popular because of its distinct color and grain patterns. Mesquite is beautiful not only as flooring, but also as paneling. You can enjoy your mesquite wood floor in any room of your house.

Mesquite flooring is much harder (Janka rating of 2345) than the commonly used white oak (Janka rating of 1360) flooring, which makes it more resistant to warping and splitting. Mesquite is the most stable of all natural woods (400% more stable than oak) and at 2360 psi it is one of the hardest woods available (222% harder than oak, 168% harder than maple). Mesquite flooring can be used in places most woods could never be used, such as bathrooms, saunas, boat decks and other high moisture areas. It can be applied directly to concrete and used in remodeling without changing the elevation of the floor significantly.