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What? Hospital flooring must satisfy numerous requirements including: comfort, low-maintenance, infection control, low cost, safety, and aesthetics. Sustainable flooring alternatives are available to meet these demands and reduce environmental impacts during manufacturing and installation.

Why? Enhanced Community Reputation:

- Visible and attractive
- Demonstrates environmental stewardship

Environmental/Staff/Patient Benefit:

- Less impact on the environment and building occupants
- Can improve employee satisfaction by reducing staff fatigue, and slip, trip, and fall incidents
- Can reduce maintenance

Cost Competitive:

- Reduces environmental impact during installation
- Less chemical use and reduced accidents can lower maintenance costs

- How?**
- Assemble diverse product review team including relevant staff
 - Identify most recent products available
 - Quantify benefits: lower maintenance chemicals and labor; improved air quality, safety improvements

- Case Studies**
- Emory University
 - University of Florida



Green Guide for Health Care (GGHC) Criteria: *Construction: Materials & Resources and Operations: Environmental Services and Environmentally Preferable Purchasing* www.gghc.org

This is one of 5 **Building Healthy Hospitals** case studies developed by EPA's Pacific Southwest Regional Office, with Resource Conservation Challenge and Pollution Prevention funds.

www.epa.gov/region09/waste/p2/projects/hospart.html

Indoor Air • Sustainable Flooring • Process Water Efficiency • Lighting Efficiency • Energy Efficiency



Sustainable Flooring

HEALTHCARE - TOP 5 GREEN BUILDING STRATEGIES

The number and variety of sustainable flooring materials is in a state of flux with new daily offerings from manufacturers and an equally wide range of applications and user experiences to consider and digest. The following table summarizes the commonly available sustainable flooring materials and provides brief descriptions, cost ranges, and applicability in healthcare facilities.

SUMMARY OF SUSTAINABLE FLOORING MATERIALS			
Flooring Material	Description	Cost (per ft²)	Healthcare Application and Maintenance Considerations
Bamboo is aesthetically pleasing, durable, and made from a rapidly renewable, abundant resource.	Installed similar to hardwood, bamboo is available in a variety of lengths and finishes	\$3.75 - \$6.50	Very durable products and appearance is similar to other natural wood products familiar to the public. Available product can vary significantly in quality; source certification is less easy from some suppliers though most well-known manufactures offer it. Some products are susceptible to very-high moisture applications.
Cork is harvested from the bark of the cork oak tree every 9-11 years, leaving the tree to remain living an average of 100-120 years.	Cork is available as floating floors (earth series and classic series), parquet tiles, EcoCork, wall tiles, and underlayment.	\$5.00 - \$8.00	Cork is comfortable, reduces noise, and is easy to maintain. However, porous surface can be difficult to clean to strict infection control standards at healthcare facilities.
Linoleum is a natural product made from linseed oil, wood flour, rosin, jute and limestone.	Installed similar to other sheet flooring.	\$3.75 - \$7.50	Use of this material in areas where frequently exposed to sitting water (or high risk of temporary flooding) is not recommended; increasingly common in healthcare.
Rubber is a hard-flooring alternative made from natural material.	Durable, no-wax maintenance, and more slip-retardant than other types of hard surface flooring.	\$3.00 - \$5.00	Some facilities do not approve of its aesthetic in common areas. Some concerns for individuals with multiple chemical sensitivities (MCS).
Forest Stewardship Council (FSC) Certified wood flooring comes from recycled, sustainably harvested, and/or local family forestry operations.	Conventional hardwood flooring; available in solid and laminated veneers	\$4.50 - \$12.00	Available as engineered or solid and prefinished or unfinished product; not commonly found in healthcare settings outside of decorative use in lobbies and waiting rooms.
Note: Costs vary constantly for flooring choices and the number and variety of sustainable choices is ever-increasing; check with your designer and contractor for current offerings.			

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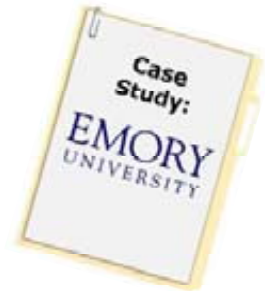
CASE STUDY 6: MARMOLEUM—A NATURAL LINOLEUM FLOORING

- Applicability: New construction, major renovation, or remodeling projects.
- Environmental Impact: Reduce chemical and hazardous material use in flooring manufacturing process; reduced chemical use associated with maintenance.
- Other Benefits: Varies by flooring materials (long term maintenance requirements, improved safety through reduced slip, trip, and fall incidents, etc.)

Background

Both the University of Florida and Emory evaluated potential flooring materials for installation at their respective buildings against the following informal performance criteria:

- aesthetically pleasing;
- durable enough to withstand heavy pedestrian traffic and frequent equipment rolling loads;
- easy to clean and maintain; and
- provides a safe walking surface for staff, patients, and visitors.



Of those listed above, Emory found the most difficulty in finding sustainable flooring materials that are both durable and easy to clean to strict infection control standards of healthcare facilities. Furthermore, when materials do meet these criteria—such as bamboo or FSC certified hardwood—the preferred choices are not more expensive to purchase compared to conventional flooring materials.

After separate analyses and despite Emory’s challenges, both facilities installed Marmoleum, a natural linoleum flooring material.

MARMOLEUM PRODUCT SAMPLES



Vibrant colors with texture



Lightly marbled texture



Solid color, no texture

Courtesy of Forbo® Flooring.



Performance

Emory installed Forbo® Marmoleum in the clinical areas of Winship Cancer Institute and the University of Florida installed the Forbo® Marmoleum in its physical therapy rooms and various other locations. Like other hard flooring products, Marmoleum comes in a variety of colors and patterns to ensure the products fits with the aesthetic design of the building. In 2 years of use at Emory, the material has endured the high-traffic and frequent equipment rolling loads in the clinical areas. And despite problems with the underlayment preparation (unrelated to the Marmoleum) at the University of Florida's Sports and Orthopedic Surgery and Sports Medicine Institute, the Forbo® Marmoleum has performed well. Lastly, both facilities have received feedback from staff and patients surveyed that they are "as comfortable" or "more comfortable" on the floor compared to similar areas with conventional flooring with the walking surface in terms of slipping and stability.

At Emory, the success of using Marmoleum at the Winship Cancer Institute was a combination of pre-installation design considerations, wear-prevention, and proper cleaning and maintenance. Emory generally found no additional maintenance effort with the Marmoleum when following strategies recommended by Forbo's® General Floor Care Guidelines:

- **Color Selection.** The selected color of a floor covering can play a significant role in the apparent cleanliness of the floor. Emory chose to install patterns and colors to minimize the visible appearance of dirt being tracked into the Winship Cancer Institute.
- **Entrance Mats.** Forbo® estimates that as much as 80 percent of dirt entering a building comes in on occupants' footwear; therefore, use of entrance mats can considerably reduce floor soiling. Emory employs entrance mats at all building entrances and cleans them regularly as part of routine maintenance tasks.
- **Staining from Mobile Equipment.** Equipment with dark rubber tires or casters are commonly used (and frequently moved around) in healthcare facilities. Although the discoloration is generally less marked with linoleum flooring than with vinyl flooring, precautions should always be taken to minimize the risk of staining. Emory did not change the wheels of any rolling equipment and did not report floor marks or additional effort related to mark removal
- **Physical Damage.** All resilient flooring materials are susceptible to certain types of physical damage. Stationary objects such as furniture should have adequate floor protectors. If the pressure exerted by an object on the floor covering exceeds the floor covering's rated capacity, permanent indentations can occur. Emory takes the



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same precaution with its Marmoleum flooring as with other flooring instructing its staff:

- Do not slide heavy objects across the floor.
- When moving heavy objects, protecting the floor covering with thin sheets of masonite or plywood.
- **Proper Use of Floor Care Chemicals.** The chemicals used to clean flooring directly impact the appearance, wear, and longevity of the product. Quaternary ammonium compounds are commonly used in hospital disinfection programs. When mixed and used properly, quaternary ammonium compounds will have little or no effect on the physical properties of most flooring materials. Phenolic disinfectants are very caustic and may damage floor coverings or other surfaces that they come into contact with. Forbo's warranty does not cover damage caused by phenolic disinfectants. Linoleum flooring should never be cleaned or stripped with high pH chemicals because permanent damage may occur. Abrasive powders or cleansers should not be used on Forbo floor coverings. Emory finds that proper cleaning techniques is the most important factor to maximizing the life of the Marmoleum and premature wear of the flooring is most likely a result of inappropriate cleaning and maintenance techniques.

Cost

Neither Emory nor University of Florida provided specific cost information on this product.



Case Study Vitals

The following summarize success criteria for implementing this project at other healthcare facilities:

- Evaluate sustainable flooring materials to the specific performance needs of each use area, such as administrative, patient care, and common areas. Determine which sustainable flooring product(s) can be installed in each area.
- The success of installing sustainable flooring materials is contingent on a combination of pre-installation design considerations, wear-prevention, and proper cleaning and maintenance.

