Sikafloor® HEALTHCARE FLOORING

SURFACE COST ANALYSIS

BUILDING TRUST

AN ANAYLIS OF HEALTHCARE SURFACES TRUE COSTS

Like the hardworking hospital staff, flooring solutions are driven by performance and endurance – and selecting the best floor and wall surface finishes for hospitals is uniquely important.

Not only are the hospitals operating around the clock, the facility itself must be maintained to a higher standard to minimize Healthcare Acquired Infections (HAI). With the introduction of the mandatory reporting for HAI in combination with insurers' "no-pay" policies for "preventable events", hospitals have expanded their focus on maintaining sanitary facilities and practices for healthcare, marketing and financial reasons.[1, 2]

Unlike most commercial and institutional applications where aesthetics play a primary role in finish selections, hospitals are driven by performance first and aesthetics second. The floors and walls must meet the needs of the specific area of usage, be easily maintained, and provide an extended service life. Each area or department within the hospital must be evaluated for the performance requirements. Typical hospital functional properties considered include:

- Smooth surface to accept wheeled traffic
- Slip resistance
- Minimum sound transmission
- Low porosity for ease of cleaning and disinfection
- Point loading from instruments and furniture
- Ease of maintenance and disinfection, including transitions
- Chemical resistance to anticipated conditions such as cleaning chemicals, foods, body fluids or trafficked soil
- Long life cycle as measured by abrasion resistance

The flooring selection for hospital applications must consider the installation as well as the daily and periodic maintenance as these may affect the hospital operations and the healing environment.[3, 4] Renovation and repurposing facilities with ongoing operations favor products with little or no removal, dust, debris, noise and odor.

Options that meet the requirements can then be evaluated for economic considerations. This evaluation of life cycle cost addresses the initial installation costs, annual maintenance costs, service life and replacement costs. Hospital renovations, and areas being repurposed for specialty care, are conducted while the hospital continues operations. Providing a clean, low odor, quiet, and debris free environment around patients is critical to the overall healing process.

Once the selection process has identified the options that meet the performance criteria and are within the budget, the aesthetic qualities can be evaluated. Aesthetics are important in a hospital and have been shown to positively influence a patient's healing process. Wayfinding, both an aesthetic and functional property, can be incorporated into a flooring or wall system using colors and patterns.

Table 1

LIFE CYCLE COST COMPARISON OF FLOOR FINISHES WHEN USED IN HOSPITALS

SELECTED FINISH	INITIAL	MAINTENANCE	LIFE	REPLACEMENT	50 YR COST
Resinous	*$10.00 / sf*	*$.96 /sf/yr*	*20 / YR*	*$8.00 / sf*	*$69.80 / sf*
Rubber Flooring	*$8.00 / sf*	*$.96 /sf/yr*	*20 / YR*	*$9.50 / sf*	*$70.25 / sf*
LVT & Polyolefin Tile	*$6.00 / sf*	*$.96 /sf/yr*	*15 / YR*	*$7.50 / sf*	*$71.30 / sf*
Linoleum & Sheet Goods	*$7.00 / sf*	*$.96 /sf/yr*	*15 / YR*	*$7.00 / sf*	*$71.33 / sf*
Terrazzo	*$25.00 / sf*	*$.96 /sf/yr*	*40 / YR*	*$30.00 / sf*	*$80.30 / sf*
Concrete Stain/Polish	*$10.00 / sf*	*$1.29 /sf/yr*	*20 / YR*	*$15.00 / sf*	*$96.80 / sf*
Ceramic & Porcelain Tile	*$7.50 / sf*	*$2.00 /sf/yr*	*40 / YR*	*$12.00 / sf*	*$110.50 / sf*
VCT	*$2.00 / sf*	*$2.08 /sf/yr*	*15 / YR*	*$3.00 / sf*	*$112.80 / sf*
Carpet & Carpet Tile	*$4.50 / sf*	*$1.25 /sf/yr*	*6 / YR*	*$6.66 / sf*	*$115.84 / sf*

Hospital Floor Finishes Overview

There are a variety of different use areas within a hospital and no one floor finish is perfect for every environment.[5] Flooring options have changed over the past 50 years and new technology is available that addresses some of the deficiencies of commercial flooring when used in hospitals. *Table 1. Life Cycle Cost* compares the various flooring options detailing initial installed cost, annual maintenance costs and replacement cost in a hospital environment.[6, 7, 8, 9, 10]

In most hospitals, the maintenance costs for all flooring finishes will be higher than those experienced in other commercial markets.[11] It is also likely that the life of any flooring surface will be on the low end of the range simply due to the fact that the facility is in constant use and the cleaning regiment is frequent and aggressive.

A quick analysis of this data clearly shows that initial costs are not the best indicator of economy. These numbers vary from one study to the next and actual costs and life will depend upon the usage conditions and area of the country.

Hospital Floor Finish Options

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VINYL COMPOSITION TILE

VCT was one of the most commonly used hard surface floor finishes in the past due to the low initial cost. In hospitals where cleanliness is a requirement, this product requires the most maintenance with mopping, waxing, buffing, and stripping. In addition, replacement can be expensive and disruptive.

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LUXURY VINYL TILE [12, 4]

The tile manufacturers addressed the high maintenance costs of VCT by developing Luxury Vinyl Tile and Polyolefin Tile, which are produced with a protective coating to minimize the maintenance process and costs. The LVT tile design does not extend throughout the tile as with VCT. Therefore, the life of the tile is dependent upon the rate of wear through of the protective coating. Although this product ranks well with respect to life cycle costs, seams may present a problem for hospitals, especially in wet areas or areas requiring a high degree of disinfection.

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LINOLEUM AND SHEET GOODS

Resilient sheet goods minimize the seams as compared with tiles and are manufactured with a protective coating to minimize maintenance costs. Welded seams are potential areas for system failure, especially in wet areas. Expected life will be limited in the area receiving the most aggressive wear pattern. Replacement may be more expensive than initial installation due to removal and surface preparation requirements.

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RUBBER FLOORS

Rubber sheet goods have been used in hospitals because they minimize seams and provide a resilient smooth surface that is comfortable, sound damping and good for wheeled traffic mobility.[13] This finish has good chemical resistance and is relatively easy to maintain. Initial cost of this product is higher than tile or other sheet goods with comparable expected life.

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CERAMIC OR PORCELAIN TILE

The weak link with ceramic and porcelain tile for hospital applications is the grout joints. Uneven surfaces in hospitals become problematic for wheeled traffic. Grout joints are also much more difficult to maintain, may harbor dirt and microbes, and frequently need repair or replacement.[2]

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CARPET OR CARPET TILES

Although studies have shown that the patient recovery is positively affected by a "homey" environment, carpet acts as a reservoir for fungi and bacteria.[14] It should not be used in areas at risk of spills or wet conditions. Cleaning and sanitizing carpet is more difficult than hard floor finishes. Hospitals should limit carpet selection to non-patient treatment areas such as waiting rooms and offices.[15]

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TERRAZZO

Terrazzo, especially resinous terrazzo, has proven to be a highly decorative, long lasting finish. Terrazzo is ground to a smooth, honed and polished finish. Caution must be taken when using this finish in any area expected to be wet due to potential slipperiness. Hospitals will frequently select this finish for lobbies to enhance first impressions. The initial cost of terrazzo is high relative to the other options but it is common to expect a useful life of three to five decades.

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POLISHED AND STAINED CONCRETE

Stained and polished concrete have become popular over the course of the last 10 to 20 years. Using grinding and densifying techniques, the concrete itself is finished as a decorative wear surface. As with terrazzo, the smooth polished surface requires care to prevent slip and fall accidents in wet conditions. The surface also requires frequent period protective coating to prevent wear through to the concrete itself. It is important to prevent long-term exposure of chemicals or spilled foods as they may adversely affect the sealant and stain. Hospitals may choose to utilize this finish in exterior patios, covered walkways, or lower traffic decorative areas.

THE LIFE EXPECTANCY OF ANY SURFACE FINISH IS RELATED TO WEAR. TO ENSURE THAT A SURFACE CONTINUES TO LOOK GOOD AND PERFORM WELL OVER ITS EXPECTED SERVICE LIFE, CHOOSE A PRODUCT DESIGNED AND FORMULATED TO WITHSTAND THE INTENDED USE OF THE SPACE.

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SEAMLESS RESINOUS FLOORS

Seamless resinous flooring systems are fluid applied and cured in place. The product functionality and aesthetics are driven by the resin chemistry, the aggregates and the application techniques. The system designs provide a great deal of flexibility to this category. Some systems utilize resins with extremely fast cure cycles expediting renovation applications.[2] Other systems are designed specifically for hospital environments using flexible resins to provide a sound damping and resilient finish similar to rubber. All resinous flooring systems intended for hospital applications have excellent chemical and stain resistance to harsh cleaning chemicals, body fluids and foods. Most manufacturers of resinous floor systems utilize environmentally friendly, low VOC chemistry, qualifying LEED material and air quality credits.

By definition, resinous floors and wall coatings are ideal for maintaining a clean disinfected area. The resins utilized typically have high crosslink densities providing excellent chemical and stain resistance plus cure to a smooth surface minimizing microbial growth areas. Depending upon the system design, resinous flooring can utilize color for aesthetics or wayfinding and include surface texture to improve safety. Unlike many of the other options, resinous flooring is unique in that with the appropriate cove detail, the wall to floor transition provides a completely seamless interface with a “negative” edge that will not collect dust.

Getting the right floor and wall system for the right environment is essential. Each environment has specific criteria that needs to be met for the safety and well-being of the patients, visitors and staff, as well as for operational efficiencies and flexibility in space use.

A well-designed system can actually improve the quality of care and health outcomes of patients, increase staff productivity lower life cycle costs.

Hospital Wall Finishes [16, 2]

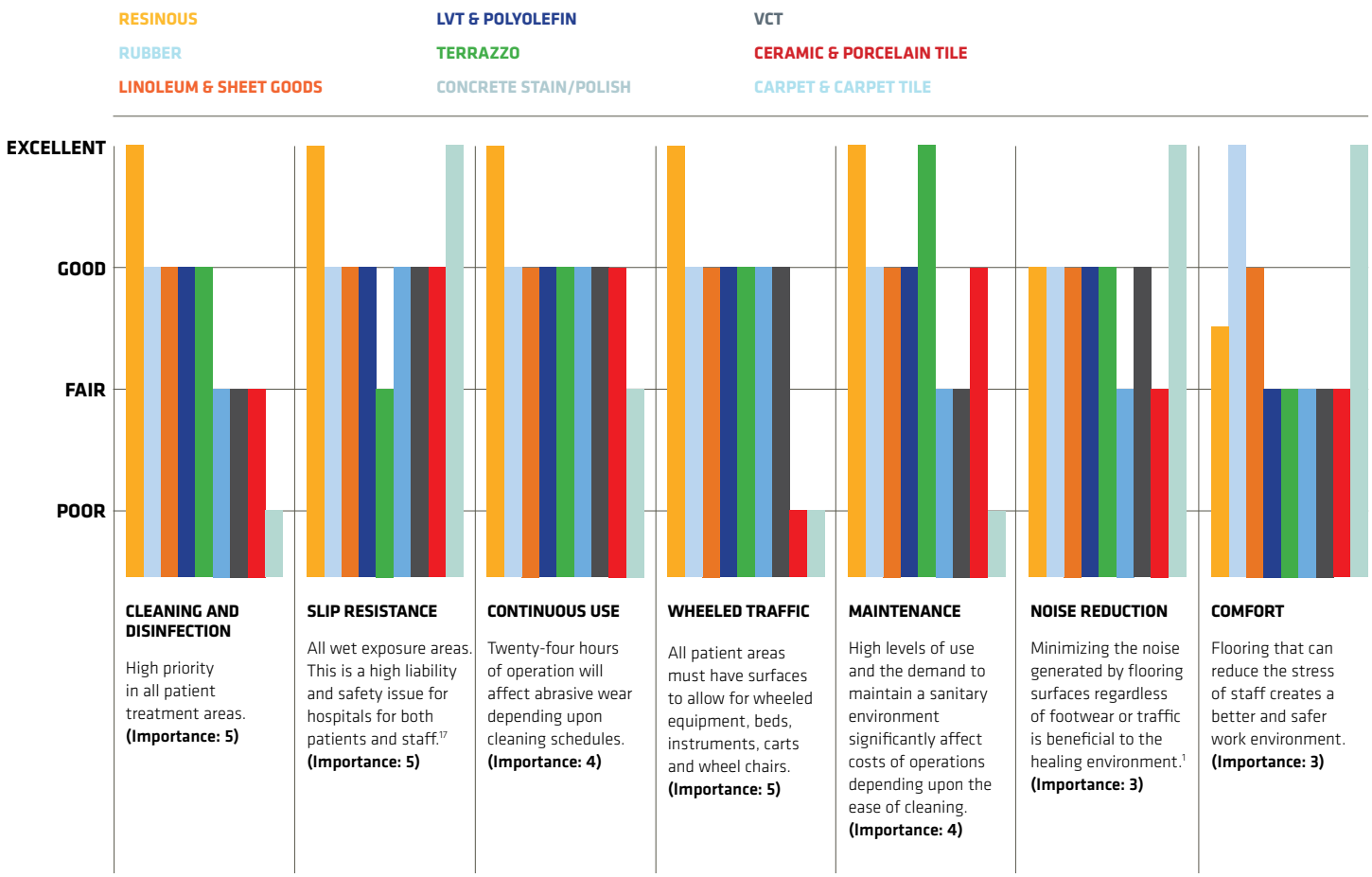
The walls and ceilings in a hospital can be divided into typical commercial-like applications that are finished with the desired paint, and high performance applications which require a coating to meet the stringent cleaning and sanitary conditions. Operating rooms, emergency rooms, patient rooms and hallways require a two-component epoxy or polyurethane finish. Areas prone to impact may incorporate a reinforcing fabric within the resinous wall system. Installation of a high performance system in these specialty areas will minimize maintenance and sustain a cleaner environment. As mentioned previously, high performance wall systems can be installed over a floor cove eliminating a dirt collection point with an overlapping transition. This is especially important in areas that may receive a thorough wash down and stringent disinfection such as surgery rooms.

Comparing Floor Finishes by Area of Use

When considering the patient treatment areas within the hospital including surgery, emergency room, intensive care, patient rooms and hallways, a subjective performance comparison is presented for each finish. These may vary when evaluating individual products versus the class in general. The chart below evaluates the main categories.

The level of importance was assigned to each of the functional properties whereby 5 is the highest importance in patient treatment areas. The finishes were then ranked based upon their performance/importance multiple. The highest score indicates that seamless resinous flooring is, in general, the best option for patient treatment areas.

SCORE	FINISH
93	**Resinous**
90	Rubber Flooring
87	Linoleum & Sheet Goods
84	LVT & Polyolefin
83	Terrazzo
75	VCT
72	Concrete Stain/Polish
66	Ceramic & Porcelain Tile
66	Carpet & Carpet Tile



Hospital kitchens must be designed to handle more volume than most major restaurants. Urethane cement mortar seamless systems have become the industry workhorse because they address all of the variables present within this workspace:

- Slope to drain
- Slip resistance texture
- Minimum sound transmission
- Thermal shock resistance for fryers, freezers or industrial ovens
- High point loading
- Excellent abrasion and impact resistance
- Optional design and color features

Hospital mechanical equipment rooms should also have the concrete floor finished with a resinous coating. Elevated rooms in highrise hospitals will also require a waterproofing membrane and wear surface. This will minimize dusting, maintain good air quality and provide a long lasting, slip resistant surface.

Most of the other floor and wall surfaces in the "public" areas of the hospital can be selected using the typical commercial finish criteria. However, it is important to design floor and wall selections and maintenance policies when traffic patterns include tracking from "clean" environments to public areas.

Specifications

After you have evaluated the flooring system that meets the needs, budget and aesthetics for each area of use, confirm with the manufacturer and minimize the bid stage changes. Each manufacturer will have guideline specifications for their products and more importantly detail drawings to address transitions, joints, drains, slope and terminations.

Installation

Proper installation is critical to the long-term performance of many of these products. Most floor finishes require that the concrete have limited amount of moisture vapor emissions. This is outside the control of the flooring installer and therefore, a third party inspector should be used to qualify the concrete prior to flooring installation.

Maintenance and Sustainability

No product lasts forever when in constant use. Because hospitals are built to last and operate around the clock, flooring consideration needs to address replacement. How disruptive will a renovation process be and how long will it take? Dust, odors, debris removal and noise will interfere with the facilities normal operation and the healing environment required by patients. Some of the flooring systems can be renewed without removal of the old. Resinous flooring that is well bonded to the concrete may actually reduce the cost of installation of a new system as only a new wear surface may be required.[18] In older hospitals with limited budgets, renovation of VCT flooring can be effectively accomplished by providing a specialized coating that encapsulates the tile and seals the seams.

Summary

There are a number of floor finishes that are used in hospitals. Select the best system for performance and safety. The Center for Health Design has provided a checklist to aid in the selection of flooring systems.[19] The true value of the floor and wall finish is allowing the hospital to treat and cure patients. Each flooring system option has merits and when used in the appropriate environment will perform well. Selecting the best finish will improve the performance of the hospital, help prevent hospital-acquired infections and minimizes accidental slips and falls.

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Sikafloor® RESINOUS FLOORING

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For thirty years, Jim Hendley, Sika's Life Science Vertical Market Manager, has worked with BioPharm, Research and Healthcare owners and their design and construction teams to optimize their hygienic resinous floor and wall systems performance.

He has worked with some of the world's most recognized Healthcare and Life Sciences organizations on major projects both in the United States and abroad. Jim is an industry recognized expert, whose opinions are often sought after by the Life Sciences media. He is a published author and is a frequent speaker on issues relating to hygienic environments at industry forums and conferences.

Jim holds a NACE Level 3 Certified Coatings Inspector (Cert. No. 13504) and is available to share his extensive project planning expertise with your team on your next new installation or retrofitting project.next new installation or retrofitting project.

Sikafloor's Industry Expert Panel is on hand to provide free, expert assistance and consultation when designing floor and wall projects for the food and beverage, pharmaceutical, healthcare, life sciences, data center, educational and other specialty industries. Mr. Hendley may be contacted via email at: info.flooring@us.sika.com to arrange a free consultation.

Request a copy of the healthcare issue of Sika's FloorWard Thinking magazine at usa.sika.com/healthcare

WHO WE ARE

Sika AG is a globally active specialty chemicals company. Sika supplies the building and construction industry as well as manufacturing industries (automotive, bus truck, rail, solar and wind power plants, facades). Sika is a leader in processing materials used in sealing, bonding, damping, reinforcing, and protecting loadbearing structures. Sika's product lines feature high quality concrete admixtures, specialty mortars, sealants and adhesives, damping and reinforcing materials, structural strengthening systems, industrial flooring as well as roofing and waterproofing systems.

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