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American Academy of  
Healthcare Interior Designers

# How Flooring Supports the Healthcare Built Environment



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**A White Paper by the  
American Academy of  
Healthcare Interior Designers**

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# American Academy of Healthcare Interior Designers

The American Academy of Healthcare Interior Designers administers the CHID Certified Interior Designer® examination, certifying interior designers, architects, and administrators who specialize in acute, ambulatory, and residential care facility design.

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# How Flooring Supports the Healthcare Built Environment

## An Analysis of Healthcare Flooring Selection and Its Impact on Infection Control and Prevention

### Introduction

This report was developed as part of an initiative supported by the [American Academy of Healthcare Interior Designers](#) (AAHID) and [Tarkett](#) to examine the process of flooring selection for healthcare facilities and its implications for infection control and prevention and the transmission of pathogens that cause healthcare-associated infections (HAIs). The goal of this paper is to present key information and real-life experiences on the topic from a **CHID Certified Interior Designer's** perspective that will enable designers, owners, and facility managers within the healthcare industry to make informed decisions about flooring selection and positively impact today's healthcare environments.

Infection control and prevention is a top priority for healthcare facilities. According to the [Centers for Disease Control and Prevention](#) (CDC), at any given time, 1 in 31 patients suffer from HAIs ("Data Portal"). These cost healthcare systems across the globe valuable time, money, and labor; HAIs can cost anywhere from \$21,000 to \$60,000 per patient (Lyles). In total, HAIs affect 1.7 million patients and cost U.S. hospitals over \$35 billion annually (Pollack).



The [COVID-19](#) pandemic has fostered a heightened urgency for proper infection prevention and control methods, especially in the healthcare setting. According to [Johns Hopkins University and Medicine's Coronavirus Resource Center](#), in the United States alone there have been over 50 million reported cases of COVID-19 that have resulted in over 800,000 deaths. Globally, there have been over 270 million cases resulting in over 5 million deaths ("Coronavirus Resource Center").

Eyes have turned to healthcare facilities as they manage bed-surge capacity needs while still maintaining the safety of their patients and medical staff. Infection control and prevention of HAIs is an important factor in the design of indoor environments. While there are several institutions that provide guidance to designers, owners, and facility managers, there needs to be a larger body of knowledge on flooring material's ability to mitigate the spread of germs. Now more than ever, it is important to prioritize the selection of flooring from an infection-control perspective to ensure the wellbeing of all healthcare building occupants.

### Background: Flooring and The Design Process

#### Building Codes and FGI Guidelines

Based on an industry-wide body of knowledge, including evidence-based design and best practices, several organizations dictate minimum architectural and interior design requirements for the built environments at the national level. Most prominently, the U.S. [Facility Guidelines Institute](#) (FGI) and Canada's [CSA Group](#) provide formal guidelines for the design of healthcare spaces: [FGI: Guidelines for Design and Construction of Hospitals](#) and [CSA Z8000-18: Canadian Healthcare Facilities](#). Included in each are standards for interior finishes including walls, floors, ceilings, and millwork. It is important to note that not all spaces within the healthcare environment are created equal. In spaces with high infection-control considerations, FGI requires that floor assemblies be smooth and monolithic with an integral wall base that extends up the wall a minimum of 6 inches (110). However, in many other instances, there are no specific code requirements.

#### Evidence-Based Design

For every designer, selecting flooring for the healthcare environment is a balancing act between aesthetics, performance, life-cycle cost, and infection control and prevention. While it can seem overwhelming to determine which criteria is most important, looking to evidence-based design principles and best practices can help streamline the decision-making process. Evidence-based design (EBD) is defined by [The Center for Health Design](#) (CHD) as "the process of basing decisions about the built environment on credible research to achieve the best possible outcome" ("About EBD"). EBD principles aid in promoting clinical excellence, improving measurable positive patient outcomes, and increasing overall staff and operational efficiency. When selecting flooring materials, there are many key EBD criteria that are significant (Nanda 55):

- reducing slips, trips, and falls

- reducing patient and staff injuries associated with falls
- reducing noise levels
- reducing staff fatigue
- reducing surface contamination and potential risk of HAIs
- improving the patient experience
- improving indoor air quality
- representing best return on investment.

Assessing flooring selection through each of these lenses is key to specifying the best product for the specific healthcare environment. Additional criteria that are significant when making flooring material selection include

- durability
- reducing glare
- moisture concerns
- sustainability
- ease of cleaning and maintenance.

#### CDC Guidelines

The CDC classifies floors as "low-touch surfaces" in the healthcare environment. This status constitutes that floors should be cleaned daily but that a disinfectant is not necessary ("Infection Control Assessment Tools"). When designing a space, this could give both designers and healthcare administrators a false sense of security in their flooring selection's effectiveness in mitigating the spread of harmful bacteria. CDC recommendations demonstrate the minimum requirements for infection-control practices, whereas Environmental Services (EVS), and sometimes the facilities management team, is ultimately responsible for implementing infection-prevention protocols. EVS is also responsible for maintaining flooring materials following the product manufacturer's recommendations.

## Infection Control Risk Assessments

From the perspective of reducing surface contamination, designers, owners, and facility managers have several resources at their disposal to determine the best plan for optimal patient safety. An infection control risk assessment (ICRA) is required for facility modification work within a healthcare environment. An ICRA is an evaluation that assists various facilities and construction departments in assessing infection prevention practices and guides quality improvement activities (Patrick). “It is a living document that forms the foundation of any comprehensive [infection prevention and control] program,” according to a 2016 Infection Control Today [article](#) written by Marcia Patrick, former infection prevention consultant and surveyor for the [Accreditation Association for Ambulatory Health Care](#) (AAAHC). These assessments consider multiple factors, including geography, population, communications, employees, environment, cleaning/disinfection, risk for infection, procedures, emergency management, and education (“Environmental Cleaning in Resource-Limited Settings”). Their importance cannot be understated. According to Patrick, ICRA’s benefit facility management and design teams by

- providing a basis for infection surveillance, prevention, and control activities
- identifying at-risk populations/procedures in facilities
- focusing surveillance efforts toward targeted goals
- meeting regulatory and other requirements.

## The Role of Flooring in Infection Control and Prevention

While evidence-based design, FGI guidelines, CDC recommendations, and ICRA’s should all contribute to the flooring selection process, official guidance only goes so far. The product specifier’s preference still influences the final selection.

Prior to 2015, there was limited literature on the topic of flooring and its potential to contribute to

the spread of HAIs. Only some publications, such as “Limiting the Spread of Infection in the Healthcare Environment” (Lankford et al. 15), supported by the Coalition for Health Environments Research (CHER) and The Center for Health Design (CHD), examined the ability of various surfaces to harbor harmful pathogens such as vancomycin-resistant Enterococci (VRE) and *Pseudomonas aeruginosa* (PSAE). In this investigation, the research team demonstrated that floors may be a location for the survival of bacteria because of their ability to provide infectious reservoirs. “Of the surface applications tested, flooring and wall finishes were found to have an increased potential for transmission,” the authors stated (Lankford et al. 15). At the time, this evidence was valuable, but it was still clear to the research team that more experiments needed to be conducted to fully uncover if the study results were related to the material composition, surface palmar contact, or testing methodology.

Later, a 2017 study published in the *American Journal of Infection Control* paved the way for the idea that the topic of flooring may prove to be a gap in our body of knowledge on infection prevention. The research team, led by Abhishek Deshpande, MD PhD, tested over 150 patient rooms at Cleveland-area acute care facilities. The results showed that several harmful pathogens including methicillin-resistant *Staphylococcus aureus* (MRSA), VRE, and *Clostridium difficile* (*C. difficile*) were often present on the floor and, of the tested rooms, nearly half had multiple high-touch objects in contact with the floor. The research team concluded that while flooring is typically overlooked, “floors could be an underappreciated source for the dissemination of pathogens.”

Since then, several articles have been published that convey similar sentiments. In a 2020 observational cohort study titled “Timing and Route of Contamination of Patient Rooms with Healthcare-Associated Pathogens” published in *Infection Control and Hospital Epidemiology*, researchers tracked the spread of *C.*

*difficile* and MRSA through observation and collection of serial cultures for pathogens from patients and surfaces in inpatient rooms. Seventeen patients were enrolled in the study, and it was found that, in a subset of patients, “MRSA was subsequently recovered from patients’ socks and bedding and ultimately from the high-touch surfaces in the room,” including call buttons, tray tables, and bedrails (Redmond, “Timing and Route of Contamination of Hospitalized Patient Rooms with Healthcare-Associated Pathogens”). Many other sources also draw attention to the heightened sense of urgency for floor decontamination, further conveying that “items which contact the floor are contaminated and serve as vectors” (Pyrek). Taking these data into consideration, it is possible that we need to begin examining infection prevention and control from the ground up.

## Healthcare Associated Infections and Patient Safety

### Cleaning and Disinfection in Healthcare Environments

To reduce risks associated with infections common in the healthcare environment, proper floor cleaning is a simple way to reduce the spread of pathogens. It is highly recommended that all cleaning and disinfecting be performed according to the manufacturer’s recommendations to ensure that the wrong product or protocol does not void the floor manufacturer’s warranty and cause damage to the flooring. Furthermore, it is important to recognize that flooring maintenance is often overseen only by the owner—not the specifier/designer or manufacturer. EVS personnel alone have the responsibility to determine which products and equipment are used (standard mops, single disc rotary machines, or automated cleaners) as well as the frequency of cleaning and disinfections (Walter).

It is crucial to understand the difference between cleaning and disinfecting; each of which is equally vital in the two-step process of proper maintenance. Floor

cleaning consists of dry dust mopping followed by wet mopping with a neutral detergent to clean further. Dry mopping is performed to collect dust and debris from the floor to prepare it for wet mopping. Dry mopping may be done with microfiber mops or pads to reduce dispersal of dust and debris. A fresh mop pad should be used for each room. Wet mopping can be done using a bucket and loop cotton, microfiber or polyester mop (Ontario Agency for Health Protection and Promotion). Because floors are considered noncritical items within healthcare settings, they may not always receive diligent disinfection even though they have the potential to disseminate pathogens. For example, a heavy burden of pathogens can be spread between rooms if the water, cleaning chemical, mop, or microfiber cloth is not changed at appropriate intervals to maintain the efficacy of the chemical solution or the cleanliness of the cloth or mophead (Rutala 13).

According to the CDC, depending on the type of healthcare facility or their maintenance procedures, some or all of the floors may be disinfected with low-level disinfectants used on noncritical items using [U.S. Environmental Protection Agency](#) (EPA)-registered hospital disinfectants designed for housekeeping purposes in patient care areas (Rutala 12). To ensure effectiveness of disinfectants, appropriate dilution rates and application methods must be followed based on product labels. Most chemicals are not intended to be used full strength, and many require specific dwell times and rinsing after application. Disinfectants like hydrogen peroxide, quaternary ammonium compounds, and bleach all can adversely impact some flooring types. Therefore, flooring products with higher chemical resistance are better suited for frequent cleaning and disinfection, in accordance with the manufacturer’s recommendations. Surfaces should be selected, designed, and installed with the goal of making cleaning and disinfecting more efficient and effective.

## The Impact of COVID-19 on Infection Control Protocols

As a result of COVID-19, healthcare facilities only saw minor changes in floor cleaning protocols other than increased cleaning frequency. Environmental Services (EVS) best practices for the COVID-19 virus are the same as for other similar-type viruses. Most cleaning products and disinfectants that are regularly used in hospitals and healthcare settings—as specified in the EPA’s [List N: Disinfectants for COVID-19](#)—are strong enough to deactivate the coronavirus (SARS-CoV-2) and prevent spread. Specific to floors, cleaning procedures have been adapted to reduce chances of aerosolization; vacuum cleaning carpets and buffing floors without proper HEPA filtration during an outbreak can potentially recirculate infectious aerosols (Sehulster).

In a study published in August 2020 in *Infection Control and Hospital Epidemiology*, the authors reported frequent detection of COVID-19 nucleic acid on floors and shoes of personnel on a COVID-19 ward. Contamination was reduced with simple modifications to floor cleaning and disinfection protocols (Redmond, “Severe Acute Respiratory Syndrome Coronavirus 2 [Sars-Cov-2] Nucleic Acid Contamination of Surfaces on a Coronavirus Disease 2019 [Covid-19] Ward and Intensive Care Unit”). Proper cleaning and disinfecting of surfaces have always held great significance; while the last year has not changed that, it certainly has given the population a higher sense of urgency. That urgency, in turn, has led to an overuse of disinfectants. During an outbreak, many surfaces that are not typically disinfected in day-to-day operations are getting disinfected during the pandemic.

## Sheet Versus Tile Goods Comparison of Commonly Utilized Healthcare Flooring Types

While there are many flooring types, there are generally only a few that make the shortlist for healthcare settings.

The most utilized flooring types within healthcare spaces include, but are not limited to, rubber sheet, rubber tile, linoleum sheet, homogeneous vinyl sheet, homogeneous vinyl tile, heterogeneous vinyl sheet and luxury vinyl tile/plank.

There are several design elements that are considered when applying best practices to material selection in healthcare facilities. All commonly utilized healthcare flooring types have associated benefits and costs. Understanding that infection control and prevention should be prioritized in design decisions for patient and staff well-being, owners, facility managers, product manufacturers, and designers alike are turning to resilient sheet goods in many locations within healthcare facilities for the best outcomes.

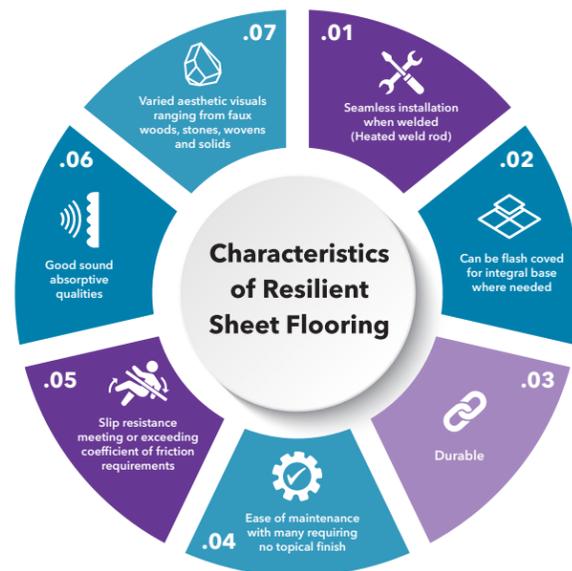


Fig. 1 Characteristics of Resilient Sheet Flooring from CRGA Design, <https://crgadesign.com/>

## Public Health Ontario and Infection Control Association of Canada

Resilient sheet goods are preferred in most healthcare settings because of their minimal seams and nonporous properties. In the United States, this is a topic that is widely discussed among healthcare designers but is lacking in official guidance. From an international

perspective, it is significant to note that several countries advocate for smooth, impermeable flooring surfaces for best results. Like the FGI, the [Australia Health Facilities Guidelines](#) suggest that smooth, impervious, seamless surfaces—specifically, welded resilient sheet flooring—are preferred in areas with high risk of infection (NSW Health). Most notably, [Public Health Ontario’s Provincial Infectious Diseases Advisory Committee](#) (PIDAC), in “Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Health Care Settings,” specifically makes recommendations toward seamless, resilient sheet goods in most healthcare environments. PIDAC writes that “seams may [harbor] microorganisms and are difficult to clean,” while recommending nonporous, seamless selections for optimal cleanliness (Ontario Agency for Health Protection and Promotion). Similar to other flooring types, there are several resilient flooring products on the market. **Table 1** indicates the varying tile and sheet good types and advantages and disadvantages of each within the healthcare setting.

**Table 1: Resilient Flooring Product Comparison Matrix**

Material Type	General Material Composition	Advantages	Disadvantages	Resilient Sheet Goods Comparison			Cost (installed) \$ = 4-7 \$\$ = 7-9 \$\$\$ = 9-12
				Installation Method	Health Safety Wellness Considerations	Maintenance	
Rubber Flooring-Sheet	ASTM F1859 - Standard Specification for Rubber Sheet Floor Covering Without Backing	long life cycle; scratch, stain, scuff, gouge, tear resistant; some factory finishes available; increased surface traction over coated products; reduced surface generated sound; more shock absorbing than hard surface flooring does not promote bacteria growth can be formed into integral cove base; can be welded to support IPAC; non PVC, phthalate free, halogen free, heavy metal free, supports good IAQ	can be difficult to maneuver heavy rolling loads; less than 6' wide options contributes to increased seams; requires good floor prep; welds can fail if not installed properly; cannot be recycled at end of life	direct glue to concrete or subfloor; weld seams; requires smooth level sub floor	good surface traction; conversely difficult to maneuver heavy rolling loads which can lead to back injury reduced surface generated sound; can be welded to support IPAC more shock absorbing than hard surface flooring; non PVC, phthalate free, halogen free, heavy metal free, supports good IAQ; cannot be recycled at end of life	clean regularly with neutral floor cleaner solution; auto scrubber with manufacturer recommended pads; some versions offer a PUR top coating; some versions offer a special maintenance system	\$\$\$
Rubber Flooring-Tile	ASTM F1344 - Standard Specification for Rubber Floor Tiles	highly customizable long life cycle; scratch, stain, scuff, gouge, tear resistant; some factory finishes available; increased surface traction over coated products; reduced surface generated sound; more shock absorbing than hard surface flooring does not promote bacteria growth; non PVC, phthalate free, halogen free, heavy metal free, supports good IAQ	can be difficult to maneuver heavy rolling loads; not for areas where seamless application is needed; may not meet IPAC standards; cannot be recycled at end of life	direct glue to concrete or subfloor; requires smooth level sub floor	good surface traction; conversely difficult to maneuver heavy rolling loads which can lead to back injury reduced surface generated sound; not seamless, may not meet IPAC standards more shock absorbing than hard surface flooring; non PVC, phthalate free, halogen free, heavy metal free, supports good IAQ	clean regularly with neutral floor cleaner solution; auto scrubber with manufacturer recommended pads; some versions offer a PUR top coating; some versions offer a special maintenance system	\$\$
Linoleum Flooring-Sheet	ASTM F2034 - Standard Specification for Sheet Linoleum Floor Covering	long life cycle; Scratch, scuff, gouge, tear resistant; can be formed into integral cove base; can be welded to support IPAC; 100% bio based, non-PVC, phthalate, and halogen free variety of factory applied finishes good surface traction greater reduction in surface generated sound over 2mm products more shock absorbing than hard surface flooring naturally bacteriostatic; does not promote bacteria growth can be formed into integral cove base; can be welded to support IPAC	less chemical resistant than vinyl, some brands vulnerable to hand sanitizers, vulnerable to high pH; not suitable for wet areas or areas exposed to a lot of water; welds can fail if not installed properly; integral cove base can be more challenging to work with if not installed properly may be susceptible to puncture; cannot be recycled at end of life	direct glue to concrete or subfloor; weld seams; requires smooth level sub floor; requires low moisture in slab	100% bio based, non-PVC, phthalate and halogen free naturally bacteriostatic; does not promote bacteria growth; good surface traction reduced surface generated sound over vinyl; can be welded to support IPAC; more shock absorbing than hard surface flooring; cannot be recycled at end of life	clean regularly with neutral floor cleaner solution; auto scrubber with manufacturer recommended pads; avoid high pH products	\$\$
Vinyl Sheet-Homogeneous	ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing	long life cycle; variety of quality levels available through pattern & color construction, does not wear through; excellent scratch, stain, scuff, gouge, tear resistant; chemical and disinfectant resistance; variety of PUR factory finishes available with variety of performance levels does not promote the growth of bacteria; good surface traction excellent for static and dynamic loads; phthalate and heavy metal free; can be recycled at end of life	less surface traction than uncoated rubber; welds can fail if not installed properly; requires good floor prep for installation; some versions of heat welds require additional maintenance	direct glue to concrete or subfloor; weld seams; requires smooth level sub floor	good surface traction; supports rolling loads for ease of mobility; more shock absorbing than hard surface flooring; excellent support of IPAC; phthalate & heavy metal free; can be recycled at end of life	clean regularly with neutral floor cleaner solution; auto scrubber with manufacturer recommended pads; some versions of factory finishes are dry buff restorable; some versions of heat welds require additional maintenance	\$\$
Vinyl Tile-Homogeneous	ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile	long life cycle; variety of quality levels available through pattern & color construction, does not wear through; excellent scratch, stain, scuff, gouge, tear resistant; chemical and disinfectant resistance; variety of PUR factory finishes available with variety of performance levels does not promote the growth of bacteria; good surface traction excellent for static and dynamic loads; phthalate and heavy metal free; can be recycled at end of life	less surface traction than uncoated rubber; requires good floor prep for installation; tiles can shrink if not properly installed	direct glue to concrete or subfloor; requires smooth level sub floor; requires low moisture in slab	good surface traction; supports rolling loads for ease of mobility more shock absorbing than hard surface flooring; not seamless, may not meet IPAC standards; phthalate & heavy metal free; can be recycled at end of life	clean regularly with clear water and/or neutral cleaner; auto scrubber with manufacturer recommended pads; surface cannot be dry buffed or restored; some versions of heat welds require additional maintenance	\$\$
Vinyl Sheet-Heterogeneous	ASTM F1303 - Standard Specification for Sheet Vinyl with Backing	wood, stone, textile and abstract-organic visuals; variety of quality levels available through pattern & color construction; excellent scratch, stain, scuff, gouge, tear resistant; chemical and disinfectant resistance; variety of PUR factory finishes available with variety of performance levels does not promote the growth of bacteria; good surface traction excellent for static and dynamic loads, can be formed into integral cove base; can be welded to support IPAC; phthalate and heavy metal free; can be recycled at end of life	not as gouge and tear resistant at homogeneous products; not appropriate for surgical & procedure spaces due to equipment and sharp objects; less surface traction than uncoated rubber; welds can fail if not installed properly; requires good floor prep for installation; some versions of heat welds require additional maintenance; surface cannot be dry buffed or restored; embossed versions can be challenging to clean	direct glue to concrete or subfloor; weld seams; requires smooth level sub floor; requires low moisture in slab	natural visuals speak to biophilic design; residential feel with commercial performance; good surface traction; supports rolling loads for ease of mobility more shock absorbing than hard surface flooring; excellent support of IPAC; phthalate & heavy metal free; can be recycled at end of life	clean regularly with neutral floor cleaner solution; auto scrubber with manufacturer recommended pads; surface cannot be dry buffed or restored; some versions of heat welds require additional maintenance	\$\$
Luxury Vinyl Tile/Plank	ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile	wood, stone, textile and abstract-organic visuals; variety of quality levels, wear layers, platforms and edge conditions available; excellent scratch, stain, scuff, resistant; chemical and disinfectant resistance; variety of PUR factory finishes available with variety of performance levels does not promote the growth of bacteria; good surface traction excellent for static and dynamic loads; phthalate and heavy metal free; can be recycled at end of life	not as gouge and tear resistant at homogeneous products; not appropriate for surgical & procedure spaces due to equipment and sharp objects; less surface traction than uncoated rubber; requires good floor prep for installation; surface cannot be dry buffed or restored; embossed versions can be challenging to clean	direct glue to concrete or subfloor; weld seams; requires smooth level sub floor	natural visuals speak to biophilic design; residential feel with commercial performance; good surface traction; supports rolling loads for ease of mobility more shock absorbing than hard surface flooring; not seamless, may not support IPAC; phthalate & heavy metal free; can be recycled at end of life	clean regularly with neutral floor cleaner solution; auto scrubber with manufacturer recommended pads; surface cannot be dry buffed or restored	\$-\$\$

### Industry Application: Resilient Sheet Goods

When selecting flooring for a specific environment, understanding the variations in material composition, installation methods, infection control considerations, maintenance, and associated costs is key to selecting the appropriate product for each unique healthcare environment. While recognizing that there are several integral elements in flooring selection, manufacturers provide key information to their customers that helps them make the best flooring selections to meet the most demanding requirements for each space, as demonstrated in

**Table 2.**

**Table 2: Technical Flooring Requirements**

	Seamless & Smooth	Integral Cove Case	Welded Joints Resistant	Chemical Resistant
Homogeneous Vinyl (Sheet)	●●●	●●●	●●●	●●●
Heterogeneous Vinyl (Sheet)	●●●	●●●	●●●	●●●
Linoleum (Sheet)	●●●	●●	●	●●●
Rubber (Sheet)	●●	●●	●●	●●
LVT	—	—	—	●●●
Carpet	—	—	—	—
Wood	—	—	—	—
Ceramic	—	—	—	●●●

●●● optimal   ●● above average   ● average   — not an attribute of this material

Source: "Infection Prevention and Control: The Contribution of Flooring in the Health Care Environment," Tarkett International, 2020

For the best results in areas where infection control is a priority, some manufacturers suggest vinyl rolls with heat welded thermal fused seams. This product application creates smooth, watertight, easy to clean surfaces in the healthcare setting. It is important to consider that tile products are installed with multiple seams that create crevices that are not easily cleaned and therefore may collect dirt and soil that may harbor pathogens. Minimizing joints prevents accumulation of dirt and growth of microorganisms, whereas small formats such as tile products have more joints and can be more difficult to clean in some environments. Overall, vinyl rolls help to control infection due to their monolithic surfaces, hygienic standards, and efficient cleaning methods ("Infection Prevention and Control: The Contribution of Flooring in the Healthcare Environment").

### Limiting Post-Installation Setbacks

#### Why You Should Bring Manufacturers On as Partners in the Implementation of New Designs

Product selection is important, but is that enough? Not really. Merely choosing the optimal flooring for the healthcare environment is only half the battle. The real work then lies in

- the construction team’s ability to properly install the product
- communication between designers, manufacturers, healthcare management, and EVS staff
- overall upkeep and proper maintenance of material.

Maintenance directly impacts product performance and life-cycle costs. If the flooring material chosen is not installed correctly or maintained properly, this can cause issues that result in flooring replacement or defects throughout the material’s lifetime. A helpful strategy is to create an interdisciplinary team in the design/preconstruction phase of the project. Including the product manufacturer’s representative in the preinstallation process mitigates overall risks associated with flooring installation and helps to ensure that the flooring performs to each healthcare facilities’ standards of excellence.

Discussions within the design community have demonstrated that “a proactive approach is needed to include flooring selection as an interdisciplinary process that is considered in the context of organization policies and procedures” (Taylor). Recent literature also suggests that product application and complexity of manufacturers’ recommendations for surface disinfection should be considered when selecting materials for healthcare environments. A 2020 [article](#) published in the [American Society for Healthcare Engineering's](#) (ASHE's) *Health Facilities Management* magazine speaks to the importance of engaging the manufacturer to create and implement a comprehensive training program for EVS

the director of training and applications for [Diversey](#), a hygiene, infection prevention, and cleaning solutions company. “Some manufacturers have excellent training and application tools available to ensure consistency and thorough practices,” says Walter.

#### Saving Time and Money by Working Directly with Environmental Services Staff

The role of EVS in the maintenance of interior finishes in the healthcare setting is paramount to understanding and preventing post-installation setbacks. Shari Solomon, president at [CleanHealth Environmental](#), shared her knowledge of the subject in an interview. Shari spoke of the benefits of hands-on training with EVS staff and how turnover rates impact healthcare facilities.

“EVS is a healthcare department long recognized to have a high rate of staff turnover. This creates a challenge for management surrounding training. Training on infection control best practices should be provided to every new hire, and refresher training should be provided on a regular basis, annual at minimum, or as needed when policies and procedures are not adequately followed. Competency testing and documentation of such is also imperative. Unfortunately, the process for training is inconsistent. There is no nationally accepted standard for this process” said Shari, recognizing the challenges that healthcare systems face daily.

In all scenarios, it is important to recognize that partnership with the flooring manufacturer has become an invaluable resource in the design process. This collaborative partnership helps ensure that the flooring selected will perform as intended and not pose any infection-control concerns.

## Case Study: Flooring Standardization

CRGA Design, a healthcare-focused architecture and interior design firm, recently partnered with a large regional healthcare system to unify its brand and develop standards for the ambulatory and acute care facilities.

With both regional and national design firms completing work at each of the healthcare system’s various locations across the region, the challenge was to create a comprehensive design standards framework that enables the system to create and maintain design consistency. The primary goal of this initiative was to develop standards for interior material specifications that will ultimately result in consistent brand recognition while empowering the owner to procure products in the most cost-effective manner. Another pivotal factor was the client’s request to approach the standards development with infection prevention and control at the forefront of the design vision, with the desired result of implementing consistent cleaning and maintenance protocols established by their corporate Environmental Services (EVS) group.

Flooring is one of the most highly scrutinized materials for healthcare settings, making it crucial to select materials that meet the needs of the healthcare system not only for function and aesthetics but also for durability, maintenance, and infection control. To ensure that material selection was made from an evidence-based design perspective, the design team, comprising several CHID Certified Interior Designers®, conducted numerous site visits and facility manager surveys of all real estate holdings to evaluate current state conditions and challenges.

In meetings with the multidisciplinary stakeholder groups, CRGA identified a driving factor for flooring selection, brought to the design team’s attention by

EVS throughout the selection review and approval process. The EVS team expressed concern that the high turnover rate of their staff would potentially pose difficulties in proper maintenance and upkeep. With the understanding that their team has limited time to conduct daily and terminal cleaning, it was important to the client that the materials selected have similar maintenance protocols to facilitate ease of cleaning and ensure that floors would be maintained properly from a long-term perspective.

With the input and data collected in the assessment effort, the design team thoroughly vetted all flooring material types and specific products through the lenses of key evidence-based design criteria, code requirements, and standard maintenance protocols. CRGA challenged the client to step outside of their comfort zone and evaluate the effectiveness of material selections from a purely evidence-driven perspective. The flooring types selected were ultimately chosen because they best met key evidence-based design criteria. While some clinical areas received specialty flooring, such as terrazzo or troweled epoxy resin flooring, most clinical areas were specified to receive rubber sheet, acoustic backed vinyl sheet, and homogeneous vinyl sheet flooring. In addition to the uniform cleaning performance of these materials, they also offer comfort underfoot and improved acoustics and are all heat weldable sheet goods that provide a monolithic floor that can stand up to harsh cleaning protocols.

After implementation of these new standards, the system has been able to institute uniform maintenance protocols system wide, resulting in reduced labor costs and shortened terminal clean times associated with maintenance due to the use of coverings that require no floor finish. The lack of shiny floor finish has also helped to reduce glare, in turn reducing the concern for slips, trips, and falls. Most importantly, the use of monolithic resilient flooring has enabled the system to address their

driving concern, infection control, through the reduction of cracks, crevices, and seams.

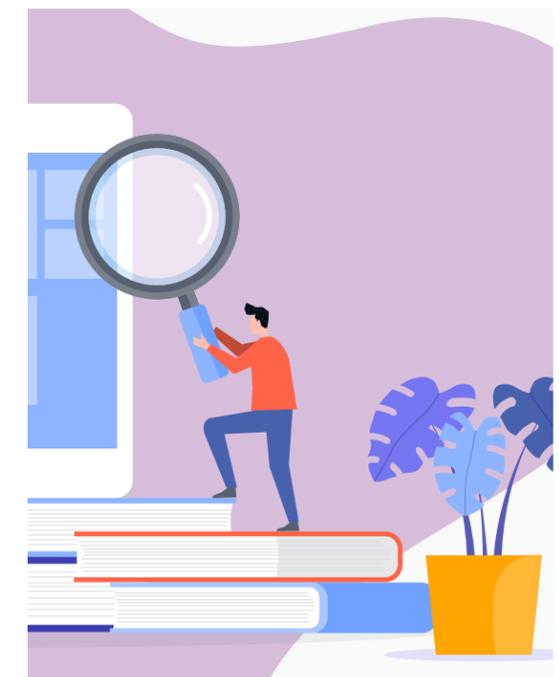
A key takeaway from the initiative was the importance of the manufacturer’s role throughout the design process. In this standardization effort, the owner’s partnership with the flooring manufacturers was an invaluable resource as the design team sought to optimize the built environment through appropriate flooring selection. Each of the manufacturers consulted have now implemented training seminars for EVS staff prior to turnover of a new floor at the end of new construction projects. They also are readily available to assist with any technical durability or maintenance challenges, ensuring that the flooring selected will perform as intended and help minimize any infection control concerns. The healthcare system felt strongly that partnering with manufacturers was the best way to achieve its goal of implementing consistent cleaning and maintenance protocols across the system’s facilities.

## Conclusion and Opportunities for Further Research

Ongoing research has allowed the authors to determine that floors may be an underappreciated source for harmful bacteria to collect. Therefore, appropriate flooring selections and maintenance should be a priority. Moving forward, there needs to be more primary research conducted to fully determine if flooring should be considered high risk through the lens of infection prevention. While maintaining proper cleaning and disinfection of flooring has always been recognized as a key element of the healthy, built environment, COVID-19 has turned the healthcare industry’s focus back to the foundation of healthcare design—patient safety. It should be considered best practice to implement resilient, seamless sheet flooring products when possible. Several national organizations, such as Public Health Ontario, suggest that nonporous, seamless goods are preferable,

and FGI guidelines speak to the benefit of seamless goods in certain acute care spaces.

Moreover, it is significant to note that material maintenance is equally as important as material selection. If the selected flooring is not maintained properly, it will not be able to support positive health outcomes for patients, visitors, and staff. Ensuring that flooring is cleaned and disinfected properly throughout its lifetime requires an interdisciplinary team of designers, manufacturers, healthcare management, EVS and clinical staff. An open line of communication between these different parties can save facility owners valuable time and money, whether they’re renovating an existing area, undergoing a new construction project, or standardizing facilities interior finishes.



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