

When the Rubber Hits the Floor

All images courtesy Dinoflex Group LP

Designing functional flooring with recycled tires

By Cara Murphy

Pressure is mounting on architects and designers to create practical and sustainable projects. Clients want beauty and ease of maintenance from long-lasting products, but within a limited budget. Thoughtful design and the use of proper materials, like recycled rubber flooring, can help ensure this model is achieved.

Whether it is a commercial, institutional, government, industrial, or residential building, the premise of design starts with the needs of the end-user. The basic elements of comfort must be considered.

These include:

- ambient temperature;
- efficient lighting;
- noise control;
- non-toxic environments; and
- visually appealing spaces.

In creating successful indoor spaces, the focus must be on developing a superior acoustic environment that subdues the noises of equipment and shuffling feet while providing a comfortable surface that is slip-resistant—qualities of recycled rubber flooring.

Rubber flooring 101

As a sustainable choice, recycled rubber flooring is derived from the post-consumer use of passenger tires. Simply put, tires that would have ended up in landfills are broken down into rubber crumbs that are reused to create vibrant, durable flooring for all building types.

Recycled rubber flooring first conjures images of a dirty, black floor that smells like a mechanic's garage. On the contrary, the tire is put through a rigorous process that cleans it, separates the rubber from the metal, grinds it, and then repeats the cleaning process. What remains is a clean and odourless rubber or powder. This can then be combined with coloured ethylene propylene diene monomer (EPDM) crumbs to create various patterns and colours used for many products, including recycled rubber surfaces for both indoor and outdoor uses. Applications can be found in outdoor products like playground mulch, playground tiles, and pavers for walkways, decks, and patios.

Recycled rubber flooring further fits the sustainability model by using post-consumer synthetic and natural materials that can be

Figure 1

LIFECYCLE COST COMPARISONS							
(Costs per Square Feet)							
Material	Product Life	Installation Cost	Times replaced (15yrs)	Material cost (15yrs)	Maintenance & Cleaning (15yrs)	Refinishing Cost	TOTAL Lifecycle Cost (15yrs)
Recycled Rubber	20+	\$6.00	0	6.00	7.50	n/a	\$13.50
Bamboo	25+	\$12.00	0	12.00	1.50	3.25	\$16.75
Hardwood	25	\$12.00	0	12.00	3.00	3.25	\$18.25
Cork	50+	\$11.00	0	11.00	7.50	3.25	\$21.75
Linoleum	40	\$4.75	0	4.75	18.00	n/a	\$22.75
Ceramic Tile	20	\$8.00	0	8.00	27.00	n/a	\$35.00
Carpet - High Grade	5	\$4.45	3	13.35	24.75	n/a	\$38.10
VCT	15	\$1.45	0	1.45	45.00	n/a	\$46.45
Sheet Vinyl	20	\$4.23	0	4.23	58.50	n/a	\$62.73

Data courtesy Dinoflex and *Environmental Design & Construction*

reclaimed and reground after the floor has outlived its usefulness. Tires are first constructed using natural rubber, styrene butadiene rubber (SBR), or a combination of both.

Natural rubber is derived from the para rubber tree (*hevea brasiliensis*)—native to South America (first discovered in Brazil), and since the 1800s has grown in abundance in rubber tree farm plantations in Asia. The tree is tapped (much like maple for its sap to make syrup), and the sap, or 'latex,' becomes rubber once

hardened. The cultivated para tree has a lifespan of 32 years—seven to mature and then 25 of sap production.

SBR, on the other hand, is a synthetic substance invented in Germany in 1926 when the availability of natural rubber became restricted. This synthetic rubber combines of 25 per cent styrene—a compound drawn from the sap of the styrax tree—and 75 per cent butadiene, an industrial chemical created as a byproduct of petroleum refining.

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With its durable, sound-absorption qualities, recycled rubber flooring is used in many offices to create an efficient space that is slip-resistant and comfortable for both employees and visitors alike.



Subjected to rigorous testing, recycled rubber flooring is a great choice for use in school libraries, cafeterias, locker rooms, and stairwells. Such spaces require materials that can stand up to abuse.

Natural and synthetic rubber compete with each other for a multitude of products that include:

- leak-proof seals for windows;
- hoses;
- belts;
- gloves;
- toy balloons;
- erasers; and
- rubber bands.

Rubber is also used as an adhesive in manufacturing, mostly in the paper and carpet industries. However, the primary product made with rubber is the tire.

Some tires are manufactured using solely natural rubber, like in the aviation industry. This is because natural rubber is stronger than synthetic rubber. Other tires are made completely of SBR or a combination of natural and synthetic

rubber. Synthetic rubber has a higher market share due to the availability of the products to make the SBR. However, they all have one thing in common—a limited lifespan. Once the tread on the tire wears down, it is discarded. The problem then becomes how to dispose of the tire.

A sustainable solution

In the past, the tire was often taken to the landfill where it was buried or burned. Burying the tire proved useless because over time, the ground would churn it up and spit it out. Burning a pile of tires in a landfill site became an ugly, environmental mess as the smoke billowed for months, creating massive air pollution and dangerous situations for landfill site workers. Simply amassing tires is an issue as they are difficult to store—75 per cent of the tire is void space, and piling them causes methane gases to build at the surface, damaging landfill liners.

Tires also collect rainwater and become breeding grounds for mosquitoes and vermin. Illegal dumping is common, creating an ugly eyesore and contamination of ravines, creeks, woods, and other natural habitats. While the damage caused by one discarded tire may seem minute, consider that approximately one tire is discarded per person, per year, in the world today. Recycling tires is a smart, sustainable solution.

Tires cannot be recycled into new ones because they must meet certain criteria to be used on vehicles due to safety regulations. However, tires can be 'retread' using new rubber materials, which is commonly done with larger industrial tires. Due to the cost and availability of passenger tires, most people tend to replace their old tires and buy new.

Beyond indoor flooring, recycled rubber can be used for various purposes, including:



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By using bright and colourful recycled rubber tiles, a pattern is easily created to liven up the room.

- patio surfacing;
- sidewalks;
- gaskets for the auto industry;
- turf for fields and equine;
- rubberized asphalt;
- industrial products;
- artificial reefs;
- landscaping tiles; and
- playground tiles.

Using rubber in exterior surfacing increases safety because rubber is inherently slip-resistant, even when wet. When exterior pavers or playground tiles are used, water seeps into the ground. In the winter, the recycled rubber surface can be kept free of snow and ice just like any other paved area with the use of shovelling and salt. The cushioning effect of the rubber means should a fall occur, the impact-absorbing property would most likely minimize injury as compared to a hard surface. One should look for products that have met the strict testing procedures as specified by ASTM standards.

Rubber flooring is also durable because depending on the outdoor product used, and the purpose of the application, recycled rubber surfaces maintain their appearance over time. They do not crack when exposed to extreme freeze-thaw cycles and, therefore, will last for many years.

Using materials that are recycled, recyclable, long-lasting, and durable are proving to be not only a benefit to the environment, but to pocketbooks as well. In the process of designing a building that meets the customer's criteria, long-term operational costs must be considered. What is the point of installing a beautiful, creative floor low in initial cost, but prohibitive to

maintain? This is often the crux of the design process—finding a product that meets the stringent demands of these facilities while still offering a low lifecycle cost and an environmentally responsible footprint. In the discussion of lifecycle costs, recycled rubber flooring is beginning to take centre stage (Figure 1, page 75).

In this whole building approach, many architects and designers use Leadership in Energy and Environmental Design

(LEED) as a guideline. Recycled rubber products contribute toward LEED credits for construction projects in numerous categories. The most prominent is Materials and Resources (MR) Credit 4, *Recycled Content*, but another key component is found in the Indoor Environmental Quality (EQ) category. Most manufacturers submit their products through rigorous indoor air quality (IAQ) emissions requirements to earn Resilient Floor Covering Institute (RFCI), in

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Safety and comfort is ensured with the use of recycled rubber playground tiles.



Recycled rubber flooring, including a logo inlay in the lobby, was laid 10 years ago at the Springbank Park for All Seasons in Calgary. It still looks new today.

conjunction with the Scientific Certification Systems' (SCS') FloorScore certification,¹ as well as Collaborative for High-performance Schools' (CHPS') certification. This means the recycled rubber floor is a low volatile organic compound (VOC)-emitting material, requiring minimal maintenance. It is this low maintenance that translates into a very low lifecycle cost in comparison to other flooring products.

Benefits of rubber flooring

Recycled rubber surfaces are not only environmentally responsible, but also exceptionally durable, shock-absorbent, slip-resistant, and noise-reducing. The natural anti-fatigue properties associated with recycled rubber flooring eliminate the need for underlayments, as well as additional surface mat products.

While many flooring materials require underlay to offer cushioning, recycled rubber flooring has natural cushioning. Other flooring substrates like concrete can be cold, hard, and tend to cause fatigue in people who are working long periods on these floors. In many instances, an anti-fatigue mat is purchased and placed near machinery and equipment where an employee spends most of the day to alleviate aches and pains in feet, ankles, and knees.

Recycled rubber flooring is manufactured in roll format or tiles, offering designers the choice of installation means. While both are easy to work with, tile flooring offers an ease in pattern-making, and reduces waste at the installation site. These certified products are used in schools, community centres, healthcare facilities, and many other markets.

Controlling or eliminating glare by using speckled flooring, such as that found in recycled rubber surfaces, should also be a focus as it provides a setting that can be considered less harmful (*i.e.* reduced eye strain) to both visitors and employees.

Creating a high-quality visual atmosphere using a balance of scale, colours, texture, and patterns is also important. Available in palettes of neutrals, warm subdued colours, and bright, vivid, cool tones, recycled rubber flooring can help to create a place of healing, and in another area, an energetic place that engages employees.



A walking space was created at the Abbotsford Hospital in British Columbia to allow patients, staff, and visitors a safe, slip-resistant outdoor retreat.



Recycled rubber playground tiles are used all over the world due to their ease of installment, clean and attractive appearance, and impact-absorbing qualities.



Using bright tiles, this space became lively and inviting while incorporating the support beams into the mix.

Electrical equipment—including computers, server rooms, and other apparatus—could create static electricity. The physical properties of recycled rubber surfaces lends itself as a natural choice to combat this issue because the rubber acts as a deadener and does not conduct electricity.

Wayfinding and making sense of the facility's zones are also important aspects of creating a functional building design. The different areas can include:

- public (e.g. entries, lobbies, spiritual centres, schools, and conference and registration areas);
- customer/patient (e.g. departmental entries, waiting areas, consults, exam and treatment spaces, and patient wards);
- staff zones (e.g. offices, work rooms, copy spaces, locker rooms, lounges, and conference and all research areas); and
- service zone (e.g. building support spaces, communication, electrical rooms, stairwells, housekeeping, and food preparation).

Creating patterns, logos, and directional signage within the floor is easy and cost-effective with recycled rubber surfaces. They can all be inlaid—stencils are cut out and then placed into the floor. Recycled rubber floors come in various colours, and by mixing and matching them, it is easy to create a directional flow for foot traffic.


Recycled rubber surfaces are easy to clean because they do not require any stripping, waxing, or special cleaners. This low maintenance is a benefit for both the time spent and the cost of maintaining the floor.

It is important to be able to adapt to trends in design. Interlocking recycled rubber tiles lend themselves to easy updating of colours and patterns. This non-glued-down method allows the end-user to move tiles around, creating a new flooring pattern effortlessly, years after the floor has been laid.

Installation methods

There are two methods of installing recycled rubber tiles—glue-down and interlocking. To glue the tiles down requires a clean, dry, non-chemically treated surface at an ambient temperature. (This is so the rubber does not react with the chemical over time. Also, moisture can accumulate under the tiles, causing a reaction with the subfloor, the glue, and the levelling of the rubber product.) The glue is applied using trowels and the tiles are set into place. The floor should not be used for at least 24 hours.

For interlocking tiles, the same conditions of the subfloor must exist as in the glue-down application—clean, dry, and non-chemically treated. The tiles fit together and stay in place because of the precision cut of the interlocking pattern.

Recycled rubber surfaces help meet the criteria of creating a comfortable, attractive area that is sustainable without breaking the bank. 

Notes

¹ FloorScore certification tests and certifies hard surface flooring and flooring adhesive products for compliance with rigorous indoor air quality (IAQ) emissions requirements. Individual volatile organic compounds (VOCs) are evaluated using health-based specifications. Flooring and adhesives that earn FloorScore certification earn a legitimately enhanced market position, distinguished by the FloorScore certification label.

Cara Murphy is the marketing co-ordinator for Dinoflex Group LP. She is a two-time National Canadian Small Business Award winner. Murphy can be contacted via e-mail at cmurphy@dinoflex.com.