



Foundations for Peak Performance

A Specifier's Guide to Sports Flooring

Gerflor[®]



INTRODUCTION

Australia is undoubtedly a sporting nation. The average Australian spends two hours and twenty-seven minutes a week playing sports or engaging in physical activities, compared to two hours and twenty-two minutes watching TV, according to McCrindle Research.¹

In light of these figures, there are significant opportunities in the design and construction of sports and recreation facilities.

While there are many elements that contribute to athletic performance, the type of flooring athletes practice and compete on is a factor that is often overlooked. An athlete's career can be greatly impacted by the choice of sports flooring, which can improve performance on the field or court and lower the chance of injury.

Sports flooring provides stability, support and impact absorption. It is more than just a surface; it is a dynamic element that can help or hurt an athlete's performance. Whether it is a school gym, a world-class training facility, or a commercial recreation centre, the quality of the floor is a crucial component of the overall experience.

In accordance with European guidelines, any facility that has a floor with multiple sets of game line markings must specify a sports floor. This definition, however, is restrictive; it would be wise to designate a sports floor anywhere where people regularly exercise.

To be able to select an appropriate solution, designers and specifiers need to understand the properties that make up a high-performing sports floor. In this respect, the European Standard EN 14904 "Surfaces for sports areas - Indoor surfaces for multi-sports use" provides the most useful guidance.

WHY WE NEED SPORTS FLOORING

Safety first. Sports flooring is essential for reducing the risk of injury. Sports involving high-intensity movements and jumps are particularly prone to impact-related injuries like sprains, strains and fractures. The right flooring can absorb shock, reduce joint stress and minimise the risk of slips and falls.

Peak performance. For athletes and fitness enthusiasts, high-quality sports flooring improves performance. Athletes will experience more fatigue and injuries on a

floor that has dead spots or is inconsistent. They will also lack the confidence to make dynamic movements if the floor does not provide adequate support.

Durability and longevity. Not only do athletes need a long-lasting surface, but facility managers also need flooring that is durable and easy to maintain to minimise operational costs. Quality materials in a well-designed flooring system will provide a reliable playing surface for years to come.

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INITIAL DESIGN CONSIDERATIONS

What level and age are the athletes?

The level of protection you need from the floor may depend on the level and age of its main users. Children, for example, need more protection as they have less perception of risk, less developed motor skills and less honed technique. A group of professional athletes may require less protection but demand greater support and responsiveness.

The physical characteristics of the athletes are relevant. When striking a timber floor after a trip or fall, children, who have smaller, lighter bodies, may not be able to initiate the shock absorption and therefore may not receive adequate protection.

What sport is being played?

One of the most important things to find out is if the sport's governing body has any specifications regarding the kind of floor the sport is played on. For example, at the international level, basketball flooring must be made of timber, but at other levels of competition, there may not be such strict requirements.

The specifier should consider the types of surfaces a sport is traditionally played on, but that should not preclude

the possibility that there is a surface out there that could provide superior performance and versatility.

Multi-use facilities

Many gyms and sporting facilities offer a diverse range of sports and activities, each with their own unique flooring requirements. Sports flooring options that are versatile can be used for a variety of activities, providing facilities with greater flexibility.

Specifiers should compare different flooring materials, including hardwood, synthetic and rubber, and their suitability for various sports. There are also adaptable and modular flooring systems that can be customised to meet specific performance, safety and aesthetic requirements.

Accessibility

In Australia, more than 180,000 people use wheelchairs.² The choice of flooring can have a direct impact on a wheelchair's moveability. If the surface is too rough or soft, a wheelchair user may have difficulty moving across the floor and experience fatigue earlier than expected during a sporting activity.



UNDERSTANDING THE IMPORTANCE OF EN 14904

European Standard EN 14904 specifies requirements for surfaces for indoor facilities for multi-sport use. Its purpose is to ensure that the flooring provides the necessary safety, comfort and performance for athletes.

In Europe, sports flooring installation and construction are governed by the EN 14904 standard. It covers surface systems, which can be produced in situ, prefabricated, or a combination of the two. Surface systems comprise both their upper and supporting layers.

Why is EN 14904 important for practitioners in Australia?

EN 14904 outlines performance criteria for various types of sports, ensuring that the flooring has specific properties that help athletes perform at their best and

prevent injury. Adherence to the standard provides a benchmark for durability, quality and performance, allowing specifiers to choose products with confidence.

In Europe and Australia, sports facilities are frequently required by law or regulation to meet EN 14904, which ensures that the venues follow health and safety guidelines. This trend is seen around the world, including in Australia, where it has been adopted by sports governing bodies, school boards and other institutions in the design of sporting facilities to minimise the risk of injury and ensure ease of sports practice.

In some cases, specifying a floor that is compliant with EN 14904 is required by a duty of care. For example, a duty of care exists between schools and their students to take reasonable care to avoid foreseeable risks of injury.

TYPES OF SPORTS FLOORING

There are three main categories of flooring systems in EN 14904, which are classified depending upon their performance values (see “Properties of sports flooring”). These categories are:

- **Point elastic.** The main characteristic of a point-elastic floor is that applying a point force causes deflection only at or close to the point of application of the force. It is typically composed of a soft playing surface (e.g., vinyl or another synthetic material) that is placed on a hard surface, such as concrete. Point-elastic sports floors are classified under the EN 14904 standard as P1, P2 or P3.

- **Area elastic.** Area-elastic systems, such as sprung wooden floors, offer a high degree of comfort and shock absorption by deflecting an impact over a large surface area. Area-elastic floors are classified as either A3 or A4 under EN 14904.
- **Combined-elastic system.** A combined system refers to an area-elastic floor with a point-elastic top layer. A point-force application results in both localised and wider-area deflection. These systems are classified as C3 or C4 under EN 14904.

PROPERTIES OF SPORTS FLOORING

EN 14904 covers a wide range of flooring properties that contribute to safety and suitability for sports. Below, we explain some of the key factors under EN 14904. For the complete set of requirements, refer directly to the full EN 14904 document.

Performance

Shock absorption evaluates a surface's ability to reduce impact force. Sports flooring with the right amount of shock absorption can lessen the force applied to ligaments, muscles and joints, lowering the possibility of sprains, strains and stress fractures. Every sports floor has its shock absorption measured in accordance with EN 14808. The "target values" for different sporting activities are found in the relevant standards (e.g., sports hall floors (EN 14904)). Premium materials, such as PVC or sprung wood flooring, are engineered to withstand impact forces.

Vertical deformation refers to the ability of the floor surface to deform under load. The purpose of this value is to ensure that the flooring has appropriate deformation to absorb

energy and prevent injury. For increased safety, a limited vertical deformation offers consistent surface behaviour, good foot support, reactivity and playability. Vertical deformation is determined in accordance with EN 14809.

Vertical ball behaviour, which is tested under EN 12235, is the determination of the height of the rebound of a ball when it falls vertically on a surface. It is used to test the floor's suitability for sports like basketball.

Co-efficient of friction (CoF) is a measurement of slip resistance and describes the ability of surfaces to resist the sliding or slipping of the selected material. EN 13036-4 provides the slip resistance classification for all flooring products. In order to prevent injury to the athlete during acceleration, deceleration, and abrupt direction changes, there needs to be a balance between good surface friction, grip support and sliding. The ideal level of friction varies when it comes to indoor sports. More resistance to sliding is needed for some sports, like sprinting, than for others, like basketball.

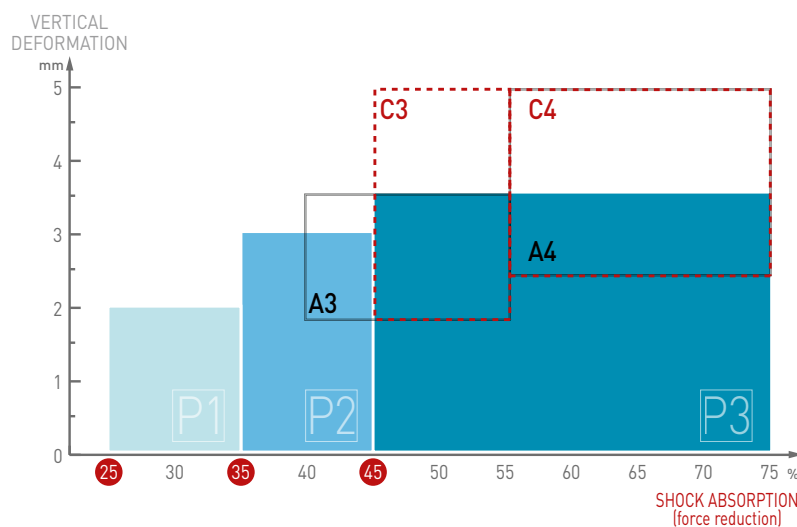


Figure 1. Classification of sports floors. Source: <https://www.gerflor.com/media/gerflor-guide-taraflex-gb-03-2021.pdf>

Health and hygiene

Easy-to-clean surfaces make maintenance easier and encourage a hygienic atmosphere free of moisture, dust, and other particles that could weaken the flooring's structural integrity and endanger athletes' safety. Resistance to scratches and stains and the floor's ability to withstand different types of cleaning chemicals are also important factors.

Floors with low volatile organic compound (VOC) emissions are a necessity. Ensure the floor is formulated to minimise the emissions of harmful chemicals that could impact the health of users over time. EN 14904 includes requirements for formaldehyde emissions and the content of pentachlorophenol.

Durability

Durable materials ensure longevity and minimise the need for frequent repairs or replacements. Flooring needs to be resistant to impact, indentation, and static loads. It also needs to be able to withstand cracking, tearing or splitting from rolling and static loads.

For high-traffic areas (such as the areas in front of goals on ball courts) that are vulnerable to material loss through abrasion, resistance to wear is especially crucial to ensure a reasonable expected lifetime of use.. These values are covered in EN 14904 using established test methods.

Testing and verification

The tests required by EN 14904 are conducted under strict guidelines and are overseen by independent, certified testing bodies. The results of these tests should be displayed in official test reports. These reports provide assurance that the product of your choice satisfies the necessary performance requirements and specifications.

EN 14904 standard values:

EN 14904	DESCRIPTION	STANDARD	REQUIREMENT	UNITS
SPORTS PROPERTIES	Vertical deformation	EN 14809	≤ 3.5	mm
	Shock absorption (Force Reduction)	EN 14808	≥ 25	%
	Friction coefficient	EN 13036-4	80 - 110	-
	Ball bounce	EN 12 235	≥ 90	%
TECHNICAL CHARACTERISTICS	Indentation resistance	EN 1516	≤ 0.5	mm
	Wheel resistance	EN 1569	≥ 1500	N
	Impact resistance	EN 1517	≥ 8	N/m
	Abrasion resistance	EN ISO 5470-1	≤ 1000	mg
	Gloss	EN ISO 2813	≤ 30	%
	Flatness	EN 13036-7	< 6mm/3m	-
CLASSIFICATION	Fire rating	EN 13501-1	C _{f1-s1}	-
	Formaldehyde emission	EN 717-1/2	≥ E1	-
	Pentachlorophenol emission	EN 12673	< 0.1	%

Figure 2. EN 14904 standard values. Source: <https://www.gerflor.com/media/gerflor-guide-taraflex-gb-03-2021.pdf>

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Aesthetics

For both players and spectators, a sports facility's aesthetic appeal can improve the whole experience. Customisable elements, like colour palettes, logos and graphics, enable organisations to imbue their sports flooring with a distinctive brand identity and lasting impact.

One of the most important visual elements of a sports floor are its zone and line markings. Court marking is the process of drawing boundaries and lines to designate playing areas. A properly marked surface shows professionalism and adds value to the sporting experience.

Maintenance of sports flooring

Maintenance requirements will vary depending on the type of floor. For example, some synthetic floors do not have to be sanded, but some do (e.g., polyurethane floors), requiring long downtimes. Some floors have a synthetic treatment applied to the surface, which enhances its anti-bacterial properties and reduces cleaning costs.

Environmental impact

Manufacturers of sports flooring are prioritising the use of eco-friendly materials and production techniques. Sports facilities can lessen their carbon footprint and environmental impact by utilising environmentally friendly materials like Best Environmental Practice PVC, recycled rubber, sustainable hardwoods, low-emission adhesives and other sustainable options.

Some sports flooring products incorporate bio-based alternatives to plasticisers and natural products like linoleum to enhance sustainability and reduce environmental impact. Bio-based plasticisers, which are made without phthalates, terephthalates or their derivatives, offer a more sustainable alternative to traditional petrochemical plasticisers, lowering the carbon footprint and potential health risks associated with toxic emissions.

Furthermore, natural materials like linoleum, which is derived from natural and renewable ingredients like wood flour and linseed oil, provide strong and environmentally friendly flooring materials that meet the growing demand for sustainable building materials.

Specifying high-performance sports flooring

Gerflor Taraflex®

Gerflor Taraflex is a high-performance vinyl sports flooring range recognised as the gold standard in sports flooring used in premium facilities around the world. From low-impact activities (like school hallways) to elite and performance sports (like professional sporting venues), it provides a full range of P1/P2/P3 products (compliant with EN Standard 14904) to offer the ideal solution to adapt to all users.

Taraflex is the most widely specified synthetic sports surface in the world; it has been selected for consecutive Olympic Games for indoor surfaces like handball, volleyball, badminton, table tennis and sitting volleyball. The range includes:

- **Taraflex Evolution:** P1 category (25 to 35% shock absorption). An excellent solution for a large variety of sports.
- **Taraflex Performance:** P2 category (35 to 45% shock absorption). The best balance of sport performance and safety.
- **Taraflex Comfort:** The first sports floor in the P3 category (over 45% shock absorption). Provides the best levels of safety and protection for a point elastic floor and is suitable for sports and leisure activities where immediate protection is key.
- **Taraflex Multi-Use:** A real sports floor in the P1 category (25 to 35% shock absorption). Provides high resistance to loads and impacts and ideal manoeuvrability for wheelchairs.
- **Taraflex Surface:** Meets EN 14904 when installed on sub-construction (A3/A4 category), then providing high levels of shock absorption and high resistance to heavy loads. Ideal for rolling sports and heavy-duty multipurpose usage.

Taraflex flooring is also a healthy and eco-friendly choice, offering some of the lowest VOC emissions and being free from heavy metals, solvents, and formaldehydes. Its durable ProtecSol surface treatment lowers maintenance costs and extends the floor's lifespan. With high light reflectance values, the colour selection enhances energy efficiency by reducing lighting needs. Made from up to 81% recycled and natural content, with PVC being 100% recyclable, Taraflex also promotes sustainability through a second-life program for reusing post-installation waste.

Gerflor Connor® Sports

Gerflor's Connor Sports is the ideal area elastic option for hardwood sports flooring, offering unparalleled quality and performance. Thousands of schools, community groups and professional teams from across the country play on the maple hardwood flooring and subfloors.

Every square metre of Connor Sports flooring is subjected to thorough testing, including humidity resistance, long-term stability, force reduction, vertical deflection and area of deflection to exceed the strict MFMA industry standards.



REFERENCES

- ¹ McCrindle Research. "Australia, the sporting nation." McCrindle. <https://mccrindle.com.au/article/blog/australia-the-sporting-nation-2> (accessed 2 July 2024).
- ² Goldsmith, Michelle. "Artificial intelligence wheelchair puts users in control." CSIRO. <https://www.csiro.au/en/news/all/articles/2023/april/artificial-intelligence-wheelchair> (accessed 2 July 2024).