



Specifying Dance Floors

WHITE PAPER ON THE REQUIREMENTS OF DANCERS



1. Overview

Professional dancers often spend six to eight hours a day working in a dance studio. It is their place of work and should offer a safe environment. A proper dance floor minimizes the risk of slips, falls, and longer-term stress injuries. A good dance floor instills confidence in dancers to give full expression to their creativity, safe in the knowledge that the dance floor will offer a consistent response. Floors that have been developed specifically for dance offer protection which commercial grade, industrial, and sports floors cannot deliver. This publication reviews the issues relevant to specifying floors suitable for dance, progress on defining standards, and new research.

2. What dancers need from a dance floor

Experienced dancers can judge a good floor instinctively as to whether or not it feels right. If it feels right they can effectively forget about the floor and focus on the artistic performance. They can perform with confidence that they are not going to slip and fall, that lifts can be performed safely, and on landing from jumps the floor will consistently return the right amount of energy absorption. Quantifying this subjective rating of a floor into a series of repeatable tests is no simple task. Anyone specifying floors for dance should remember that dancers may not be the commissioning clients, but they are the end users. Major dance companies understand this, which is why it is not uncommon for them to ask their dancers to “test” floors before the final choice is made.

3. Specifying the wrong floor

There are recognized international standards for general types of floor, but not yet for dance floors. Although it is customary to specify compliance with a published and recognized standard, using general flooring or sports floor standards will not ensure the right floor is installed; only a floor developed specifically for dance will do. There have been some high profile examples where floors have had to be replaced by a dance company after the building is complete and dancers have their first experience of dancing on the floors. Replacing floors after construction is complete is an expensive error that should be avoided at all costs.

4. Why sports floors are not suitable for dance

It is tempting to presume that as the elite athleticism of top dancers is on par with sports athletes, that a sports floor is appropriate. It is not. There are some critical factors that distinguish the requirements of dancers from those of athletes. Many sports require a firm floor which allows balls to bounce predictably. Sports footwear is generally cushioned to protect against impact injuries. The footwear also provides grip for the athlete. By contrast, dancers need more absorption or cushioning on landing from jumps. Their footwear varies according to dance style and doesn't cushion landings. Dancers also need the right degree of traction from the dance surface.



Athletes	Dancers
Footwear is generally cushioned & provides grip	Footwear does not cushion landings; may dance barefoot
Floor surface must allow full movement to avoid twisted ankles and knees	Floor surface must provide traction to prevent slips
Require a firm floor to allow balls to bounce	Require cushioning on landing from jumps to ease pressure and prevent injuries

5. *Developing an international standard for dance floors*

As already noted, at present there is no published standard for dance floors, but work on developing such a standard is in progress. The approach builds on the adoption of the DIN 18032 standard, but utilizing test criteria specifically for dance. Similar tests have also been adopted for the European Standard EN14904, the standard for sports surfaces for multi-use sports. This recognizes the different requirements of athletes and dancers. Some styles of dancing such as ballet require 'traction' from the floor to prevent slips during performance, but too much traction for a basketball player blocks movement and potentially results in twisted ankles or knees. On the other hand, the basketball player will need the 90 percent ball bounce specified in DIN 18032, something irrelevant to the dancer.

A minimum deviation of vertical deflection allowed in DIN Standard 18032-2 is 2.3mm. Meanwhile tests on dance floors popular with dancers indicate higher levels in the range 3.3mm to 3.8mm are preferred, suggesting that, in broad terms, dance floors are softer than sports floors. A related issue is that the sports type of floor results in deformation which is too inconsistent for dancing.

6. *Research studies seek to establish essential data*

Correlating the subjective evaluation of floors as judged by dancers with measurement criteria has prompted a number of avenues for research, particularly in the field of biomechanics.

One researcher is dance scientist and biomechanics expert Dr. Luke Hopper, whose pioneering research investigates the effects of dance floors on dancer performance and injury. Hopper explained, "Dance floors are an integral part of the dance environment, yet little information is available for the dance community that concerns how dance floors may affect dancer performance and injury. For the dedicated dancer striving to improve, injury can sadly be an all too common occurrence. By gaining knowledge concerning the relationship between dance floors and dancer performance and injury, the dance environment can be optimized in order to give dancers the best opportunities in their training. Research has reported that dancers can be required to perform on substandard floors which were shown to affect ankle joint stress during dance movements. Dancers also demonstrated the distinct ability to sense changes in dance floor properties. Dance institutions are now able to use this information and work with dancers in creating dance environments with the aims of helping dancers to dance better, stronger and for longer."

Another researcher is Dr. Boni Rietveld, an orthopaedic surgeon at the Centre for Medicine, Dance and Music in The Hague, Netherlands. He is also past President of the International Association for Dance Medicine and Science. Rietveld observed, "There is a distinction to make between injuries caused by the floor and those caused accidentally. As far as the former are concerned, it is evident that there is a cause and effect relationship between dancers' injuries and the floor on which they perform."

"Generally, dancers should refuse to perform on unsuitable floors and demand the right to have a touring floor that has the same absorbent characteristics as the floor installed in their rehearsal studio. As far as private dance schools are concerned, they should be more careful in choosing their flooring. In my opinion, a dance floor should be neither too supple nor too soft. A hard floor has the effect of causing serious return shock waves and can bring about injuries or premature wear in the cartilage. A soft floor causes the muscles, and therefore the tendons, to work harder. Additionally, a floor that is too soft can be dangerous for dancers because of the effect of surprise."

Both Dr. Hopper and Dr. Rietveld are currently involved in further research with dancers, as are other researchers in the field.

7. *Researching dancer protection*

While the EN14904 standard stipulates that a floor used for sport must offer a minimum of 25 percent force reduction to people using the floor, it does not in any way quantify the impact protection on contact with the floor, a factor considered particularly important for young dancers of school age.

To establish a way in which different levels of "protection" as opposed to force reduction could be quantified, research was carried out in a five year study by the biomechanics department of the University of Poitiers in France. The study concluded that force reduction, while being essential in the determination of a safe dance floor (i.e. protection against long-term injuries), is not always sufficient for the profile of the people that use it. Protection is crucial against immediate injury risk such as bruising and even more important when it comes to the protection of younger dancers.

8. *The role of the flooring manufacturer*

Harlequin is widely recognized as the world's leading authority on dance floors. As an enlightened manufacturer, Harlequin has always worked closely with the dance community to develop floors that dancers want to dance on. Flooring products in the Harlequin portfolio were typically evolved to meet the specific needs of a particular dance style and have been developed in conjunction with dancers themselves.

Aware of the high injury level among dancers, Harlequin is an active supporter of the International Association for Dance Medicine and Science (IADMS) and of the National Institute of Dance Medicine and Science (NIDMS). NIDMS, through shared expertise and a network of multidisciplinary partners, is working to provide better and more affordable access for all dancers to high quality, evidence-based, dance specific health care and dance science support services.

Harlequin also provides backing and support for research work and is leading the quest for a relevant international standard for dance floors that can, in due course, be referred to in specification documents. Meanwhile, the information derived from research studies already informs new product development.