



Introduction: This document contains the area deflection requirements for several standards commonly used to evaluate indoor sport and dance surfaces. This document is specific to indoor sport and dance surfaces including natural (Maple, Beech, Bamboo) as well as synthetic surfaces (Full Pour Urethane, Rubber, Pad and Pour Urethane, Vinyl and Marley) for indoor courts and running tracks. It does not address artificial turf.

Standards change and the reader should verify that all of the information within this document is still correct. ASET will make all efforts to keep this information current, but we may not make changes or be notified of changes immediately.

All of the standards in this document use identical equipment and computations. Their only differences are the values required to pass or achieve certain type ratings, and their uniformity requirements.

As a reminder, performance reports do not offer any guarantee that the surface will deliver the specified or required performance to the actual installation. Small changes in the installation can result in significantly different performance levels. Closely monitoring materials and installation methods to make sure they match those provided in the Suitability report is one way to help ensure that the proper performance is delivered. Commission testing of new surfaces to ensure that the specified performance levels were delivered is another option.

Note: None of the standards listed in this document make any allowances for field testing results. Unless otherwise specified field tests would be subject to the same performance requirements used in laboratory settings.



Review of Area Deflection Requirements

DIN 18032-2: There are two versions of this standard used by manufacturers within North America. There are significant differences between them. The older standard applied requirements only to the average values obtained on a floor. The newer pre-standard applied limits to every test point, and in 4 directions as well as the average value. Both standards have been effectively repealed and replaced by EN 14904 (a unified CEN standard throughout Europe). These standards are still found within several specifications in North America and occasionally in other regions of the globe.

Standard Surface Type	Requirement					
	Average	All Points				
DIN 18032-2 (1991)						
Area Elastic	≤ 15%					
Point Elastic	-					
Combined Elastic	≤ 5%					
Mixed Elastic	> 0%					
DIN 18032-2 (2001)		Dir 1	Dir 2	Dir 3	Dir 4	Avg
Area Elastic		≤ 20%	≤ 20%	≤ 20%	≤ 20%	≤ 15%
Point Elastic (Cat 1)		-	-	-	-	-
Point Elastic (Cat 2)		-	-	-	-	-
Combined Elastic		≤ 10%	≤ 10%	≤ 10%	≤ 10%	≤ 5%
Mixed Elastic		> 0%	> 0%	> 0%	> 0%	> 0%



EN 14904: This standard replaced DIN 18032-2. Area deformation was not included in EN 14904 as the member countries could not come to a consensus on its importance and how it should be measured.

ASTM F2772: This standard was developed in response to both DIN 18032-2 and EN 14904. North American user groups, labs and manufacturers had no voice in the development of either DIN or EN standards. At this time, ASTM F2772 does not include area deflection testing.

ANSI E1.26 : ANSI E1.26 or Entertainment Technology - Recommended Testing Methods and Values for Shock Absorption of Floors Used in Live Performance Venues was developed by the Entertainment and Services Association, or ESTA. This is a general standard and within the Recommendations Section (5), it does provide some guidance for the area deflection properties of the surface:

- Acceptable deformation depression (AKA area deflection) levels shall be a maximum of 20% and a maximum of 65%.

While these levels may have been intended to be requirements, they are within the recommendations section.

FIBA 2014: The International Federation of Basketball (FIBA) has adopted rules for basketball surfaces. The newest version of their rules was published in 2014. This was a revision from rules published in 2011, with the main change being that the performance requirements were switched from applying to the average value to applying to every test point, similar to DIN 18032 (2001). Not all surfaces are clearly defined within the rules.

Standard	Surface Type				
FIBA (2014)		Dir 1	Dir 2	Dir 3	Dir 4
Level 1 (Permanent Wooden)	Average	≤ 20%	≤ 20%	≤ 20%	≤ 20%
	@ Each Point	≤ 30%	≤ 30%	≤ 30%	≤ 30%



MFMA PUR™: The Maple Flooring Manufacturer's Association, or MFMA, has adopted a PUR™ Standard for Maple sport and dance surfaces. The MFMA has set performance requirements using a range of activities. These standards were developed by the flooring manufacturers. ASET is unaware if any input from user groups, or research/test organizations were used to determine these levels.

Standard	Surface Type				
MFMA PUR (2016)		Dir 1	Dir 2	Dir 3	Dir 4
Basketball	@ Each Point	≤ 20%	≤ 20%	≤ 20%	≤ 20%
Basketball (Portable)		-	-	-	-
Volleyball	@ Each Point	≤ 20%	≤ 20%	≤ 20%	≤ 20%
Squash	@ Each Point	≤ 20%	≤ 20%	≤ 20%	≤ 20%
Racquetball	@ Each Point	≤ 20%	≤ 20%	≤ 20%	≤ 20%
Handball	@ Each Point	≤ 20%	≤ 20%	≤ 20%	≤ 20%
Aerobics	@ Each Point	≤ 25%	≤ 25%	≤ 25%	≤ 25%
Dance	@ Each Point	≤ 25%	≤ 25%	≤ 25%	≤ 25%



Notes:

- 1- All of the standards listed in this document are valid for laboratory and on-site testing.
- 2- Area deflection is a measure of how well or poorly a sport surface transmits vibrations within the plane of the sports surface. At this time ASET is unaware of any study that links area deflection performance to a reduction in injuries or an improvement in performance. While it is not known to reduce injuries, basketball players tend to prefer floors with lower area deflection levels. Lower area deflection levels are associated with less vibrations generated and felt during dribbling.
- 3 – The standard test to evaluate area deflection involves a 20 kg (44 lb) mass that is dropped from 120 mm (4.72"). Athletes and users come in all different shapes and sizes. The test provides a standard method for testing the surface, but the results do not correlate equally to all user groups. A dancer with a slight build and no shoes for example interacts with the surface in ways that are significantly different than a professional basketball player wearing sports shoes.