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GEN-005: Area Elastic Standards Comparison – North America

This article is specific to the standards and requirements for area elastic (i.e. wood) sports surfaces. It provides a high level comparison of the performance standards that are commonly used in North America. Many of these standards are international, and thus the information is valid in many parts of the world. Within North America current practices are that performance is tested in the lab and then never validated in the field. Field testing and validating that the actual performance meets both the standard and the project specifications are common outside of Europe. This process provides manufacturers with feedback when and if the components of their systems start to drift or if installers are not following proper installation methods.

There was a time when performance testing and understanding specifications in North America were easy. Before the 1980's it was very easy. There was not a performance standard common to North America. Then in the 1980's, the German Performance Standard DIN 18032-2 was introduced to North America. This standard quickly worked its way into product specifications, where it remained the only option until 2001. This could be considered when the flood gates opened. DIN 2001 would be the first of 5 additional standards to be introduced to North America over the next decade.

These new standards have created opportunity and confusion for many within the sports surface market. The new standards provide new ways for companies to promote and for architects to specify their products. They also create confusion when one standard is specified and a product is submitted with results from another standard. The rest of this document will be focused on a brief explanation of each of the standards, and a table comparing the key requirements of each standard will also be presented. This is a simple comparison and those interested in understanding the small nuances that may be different are invited to research other publications available in ASET Services' Library section.

This article is not intended to be an in-depth comparison but rather a high level comparison of the most common standards used to evaluate and specify acceptable performance levels for area-elastic (wood) systems.

- DIN-1991 – This is a reference to the original version of DIN 18032-2 issued in 1991. It was an internationally recognized standard. This standard is still commonly used in North America, even though it is no longer recognized by Germany or any international standardization body. ASET considers this to be a 'dead standard,' one that is no longer published and no longer being improved upon by active revisions.
- DIN-1991 – This is a reference the newest version of DIN 18032-2 issued in 2001, and it was only published as 'Pre-Standard' which is a reference document only. DIN-2001 was used extensively within Germany until the new EN standard was developed in 2006. It was never recognized by the majority of the international community as a valid standard. This standard is still commonly used in North America, even though it is no longer recognized by Germany or any international standardization body. ASET considers this to be another 'dead standard,' one that is no longer published and no longer being improved upon by active revisions.
- EN-14904 – This standard was developed by the CEN which is the central standardization body of the European Union. It was ratified and published in 2006. Upon its publication it immediately replaced DIN 1991 and DIN 2001 within all members of the European Union. North American remains one of the few places the use of DIN-1991 and DIN-2001 are used

and promoted more extensively this EN14904. ASET considered this to be a 'living standard' as it is constantly under review. While it has not been updated since 2006, the CEN has a standing committee that is actively engaged in trying to improve the document and methods. The fact that all members of the European Union must agree to these changes makes them very politically charged and slow to achieve.

- ASTM F2772 – This standard was developed within ASTM, and it is the only one that gives manufacturers, users, sports governing bodies, and testing labs a vote and therefore a voice in the development process. This standard was first published in 2009. ASET considers this a 'living standard' and is the most actively reviewed and updated international standard used in North America.
- MFMA-PUR™ - This standard was developed by and is maintained by the Maple Flooring Manufacturer's Association, which is commonly referred to as the MFMA. The manufacturer members of the MFMA selected tests from a variety of the above international standards and created their own performance requirements. Compliance with their PUR™ program can only be granted by the MFMA and then only to members of its manufacturing association. While ASET considers this to be a 'living document,' it lacks formal recognition by an impartial standardization body. Its development is controlled by the MFMA and its members, with no involvement of user groups or testing labs.
- FIBA – The International Federation of Basketball developed its own standards in much the same way that the MFMA did. This federation does oversee international basketball competition. FIBA has several sports surface manufacturers as members, but it represents facilities and athletes as well. FIBA has a technical alliance with certain testing labs within Europe, meaning that this standard was developed with some consideration for all parties involved in the sports surfacing marketplace.

The development of the MFMA and FIBA standards lacks the transparency provided with the rigorous and time consuming process used by international standardization bodies such as ASTM, or EN.

We have created a table comparing the most common properties from these 6 different standards. This table is presented on the next page. The information in that table is a high-level comparison and a starting point for people and organizations interested in understanding how they are related to each other.

One key feature that is missing from all of these standards within North America is validation of the actual performance. The performance level commonly presented by manufacturers is limited to testing of 1 sample in the lab under ideal conditions. Europe and many other parts of world utilize field testing after the surface is installed to make sure that the performance that was promised and specified was actually delivered. We are unaware of a single manufacturer with a quality control program that ever (let alone routinely) verifies that the performance at actual installations is comparable to the levels measured in the lab.

This publication is provided by ASET Services, Inc. ASET Services is committed to providing engineering and testing services to the sports surfacing industry. For further information contact ASET Services through one of the following methods:
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Requirement Summary for Area Elastic Sports Surfaces (Wood)

		Force Reduction	Ball Rebound	Vertical Deformation	Area Deflection	Friction	Rolling Load
DIN 1991	Average	≥ 53%	≥90%	≥ 2.3 mm	≤15%	0.5 min, 0.7 max	No Damage @ 1500 N
	Points	-	-	-	-	-	-
	Range[1]	-	-	-	-	-	-
DIN 2001	Average	≥ 53%	≥90%	≥ 2.3 mm	≤15%	0.5 min, 0.7 max	No Damage @ 1500 N, Indentation ≤ 0.5 mm
	Points	≥ 53%	≥ 90%	> 2.3 mm	All 4 Directions ≤ 20%	-	-
	Range	± 5%	± 3%	-	-	-	-
ASTM F2772	Average	Class 1: 10-21% Class 2: 22-33% Class 4: 34 - 45% Class 5: ≥ 55%	≥90%	Class A: 1.8 - 5.0 mm Class B: ≤ 1.7 mm	-	80 min, 110 max	-
	Points	-	-	-	-	-	-
	Range	± 5%	± 3%	± 0.7 mm	-	± 4	-
EN 14904	Average	Pass: ≥ 25%, < 44% Type 3: 45% - 54% Type 4: 55% - 75%	≥90%	Pass: < 1.8 mm Type 3: 1.8 - 3.4 mm[2] Type 4: 2.3 - 5.0 mm[2]	-	80 min, 110 max	No Damage @ 1500 N, Indentation ≤ 0.5 mm
	Points	-	-	-	-	-	-
	Range	± 5%	± 3%	± 0.7 mm	-	± 4	-
MFMA PUR™	Average	≥ 50%	≥93%	≥ 2.3 mm	-	0.6 min[3] (ASTM D2047)	
	Points	-	-	-	-	-	-
	Range	± 5%	± 3%	± 0.5 mm	-	± 0.1	-
FIBA™ Permanent	Average	≥ 50%	≥93%	≥ 2.3 mm	≤20%	0.4 min, 0.7 max (Pr-EN14903) 80 min 110 max (EN 1569)	Must be able to carry portable backboard without degrading the structure
	Points	-	-	-	No direction above 30%	-	-
	Range	± 5%	± 3%	± 0.7 mm	Average of all 4 Directions ≤ 20%	± 0.1	-
FIBA™ Portable	Average	≥ 40%	≥93%	≥ 2.3 mm	-	0.4 min, 0.7 max	Must be able to carry
	Points	-	-	-	-	-	-
	Range	± 5%	± 3%	± 0.7 mm	-	± 0.1	-

Notes:

1-All ranges repsent the allowable deviation of the maximum and minimum from the overall average performance of the sports surface.

2-Type 3 and 4 vertical deformation ranges overlap in EN 14904. The vertical deformation and force reduction types must be considered together to determine the overall system type.

3 - MFMA PUR standard utilizes ASTM F2047 (commonly referred to as the James Machine). Access to these machines is limited. The James machine assumes a leather soled shoe. The machine does not allow for field testing. The method has never been shown to correlate with sports related shoes or activities, therefore ASET does not endorse the use of the James Machine to measure the friction property of sports floors.