INSTITUT FÜR SPORTBODENTECHNIK

DIPL. ING. H.J. KOLITZUS

Member of

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DIN V 18035-7 „Sports Grounds; Part 7: Synthetic Turf Areas“ June 2002

Comments on the new 2002 version

Hans J. Kolitzus

The German DIN V 18035-7 standard has been revised and republished in June 2002. This appears to be based on comments/criticism expressed during the ISSS Technical Meeting 2000 in Schaffhausen (Switzerland). Although the standard is just 3 month old, it lags far behind the current international development. Nevertheless, it may be of interest to know about the changes made as compared with the version published in August 2000.

The goal of these comments is to generate a basis for international discussion and examination of the issues involved. To aid in this, translations of tables 4 through 7 have been included.

Table 4 –5

For the most part, the requirements of tables 4 and 5 have not changed. It should be noted however, that in table 5 the requirement for tensile strength of elastic layers has been set to a minimum of 0.1 N/mm^2. It must be asked if this is not a counter-productive reduction of the quality of elastic layers.

Table 6

In table 6, row 2, the abrasion of elastic infill materials is required to be less than 700mm^3 acc. to DIN 53 516. The question arises as to why this complicated standard was selected when on EN level, the Taber Test was specified for abrasion testing of sports surfaces. Additionally, the Taber Test is more cost-effective and much easier to perform.

Aging of elastic infill materials: this extensive specification will cause devision in the industry as these tests connot be performed with recycled rubber granules. Was the goal to replace the recycled rubber with EPDM or was this section only to apply to EPDM infills? The motive here is not clear.

Continuing in table 6, the Water permeability of non-filled pile layers has been reduced by the factor 0.02.

Aging of pile fibers: the parameters of Melting Index and Viscosity Index were retained in this version when current opinion must force the question of why, when they are considered to be non-usable parameters?

The results of current data will also trigger a look at the Ball roll requirements. Two determination methods for ball roll length/distance are specified. However, recent studies (UEFA/ISSS) showed

CH 8264 Eschenz
Hauptstr. 34, Switzerland
www.isss.de/ist-ch.htm

Phone +41-52-740 3005
Fax +41-52-740 3009
Email ist-mailbox@bluewin.ch

that the requirements do not satisfactorily comply with intentions of the test. and based on these data of soccer turf testing a conversion factor will be developed.

It is encouraging to note the addition of requirements limiting dimensional deviations of dimensions of playing fields along with the lines and marking.

Table 7

Environmental compatibility: the requirements are mostly the same as in the version 2000. However, special attention should be paid to Zinc.

It is interesting that elastic layers and elastic supporting layers are prepared for extraction testing by first sealing the cut edges of the sample with PUR. Thus, almost no ‚naked' rubber is directly exposed during the testing process, which reduces the Zinc content of the extract considerably. This must therefore be noted as a major change.

The Toxicity (nitrification) test needs a more precise specification: is the result intended to be obtained after 4 hours or 2 days.

Infill materials are subject to a special regulation. On one hand, the Inhibition of Nitrification test does not apply. On the other hand, the extraction test in practice needs to be performed in neutral/non-acid **and** acid environment. If the Zinc content is less than 0.5 mg/l **or** less than 3.0 mg/l respectively the material meets the standard. Rather complicated conditions. There was tough bargaining about this issue in the DIN committee. It seems as if Zinc is the „Poison of the Year". But what about the millions of tons of rubber being uncontrolled released to the nature and sewage systems every year by car tires ?

The following tables are translations of the respective tables of DIN 18035-7:2002-6 performed by H.J. Kolitzus. For the full version (German) see www.din.de

Table 4 Requirements and Tests of Bound Elastic Supporting Layers

Column	1	2	3
Row	Characteristic	Requirements	Testing acc. to
1	Binder	Elastic (for instance Polyretha-ne)	----
2	Elastic Components	Elastomers in the form of gra-nules and/or fibers	----
3	Mineral Components	Resistance against frost acc. table 2, row 1	DIN 4226-1
4	Nominal Thickness	35mm with limiting deviations of ± 10mm	----
5	Transverse Tensile Strength	≥ 0.08 N/mm2	6.9
6	Water permeability	≥ 0.002 cm/s	DIN 18035-5:1987-01, 5.1.2
7	Slope[a]	table 3, row 6	----
8	Level[a]	table 3, row 7	----
9	Curbing[a]	table 3, row 8	----
10	Evenness[a]	table 3, row 9	----

[a] Requirements of the surface of the synthetic turf layer. They have to be met at the installation of the bound supporting layer in order to meet them with the synthetic turf layer.

Table 5 Reqirements and Testing of Elastic Layers on top of Bound Supporting Layer

Column	1	2	3
Row	Characteristic	Requirements	Testing acc. to
1	Thickness - In-situ installation, Limiting Deviations	±15 %	
2	Thickness – Prefabricated Products; Limiting Deviations	± 1 mm	
3	Nominal Thickness	Dependent on Design of Synthetic Turf Surface System	
4	Tensile Strength	(≥) 0.1 N/mm2	E DIN EN 12230
5	Water Permeability	≥ 0.002 cm/s	DIN 18035-6: 1992-07, 5.3.6 and 5.3.7
6	Evenness	Table 3, Row 9	

Table 6 Requirements and testing of Synthetic Turf Layers or Synthetic Turf Surface Systems

Column	1	2	3	4	5
Row	Characteristic	Requirements with		Testing	
		filled pile layer	non-filled pile layer	with turf surface system acc.	with layer/infill acc.
1	Force Reduction at temperature 23°C – 40°C [a]	45 to 70 % [b]		6.2	
2	Layer: Abrasion	pile tufts must not be removed. Slight abrasion of pile yarn is acceptable. Decrease of Force Reduction ≤ 10 % of original value		6.3	
	Elastic Infill: Abrasion [d]	≤ 700 mm^3			DIN 53 516
3	Water Permeability	≥ 0.002 cm/s	≥ 0.0004 cm/s	DIN 18035-6	
4	Sliding Behavior	No requirements since shoe soles have dominant influence		6.4	
5	Burning Behavior	Class I acc. DIN 51 960 [d]		6.8	
6	Aging Pile Material • Color Number Distance ΔE_{ab} • Grey Scale Grade acc. DIN EN 20105-A02 • Melting Index Increase of PP Fibers • Decrease of Viscosity Index of PA Fibers	≤ 4 > 4 ≤ 100 % ≤ 50 %			6.7 DIN 6174
7	Aging Elastic Infill • Change of Tensile Strength [c] of Film • Change of Elongation at Break [c] of Film • Color Number Distance ΔE_{ab} • Grey Scale Grade acc. DIN EN 20105-A02	± 10 % ≤ 20 % ≤ 2 4 - 5			DIN 53 504 DIN 53 504 DIN 6174
8	Change of Dimensions	≤ 1 %		DIN EN 986	DIN EN 986
9	Ball Pace Tennis Balls • Distance of Rebound • Height of Rebound	4.2 to 6.0 m ≥ 0.8 m		DIN 18035-6	
10	Ball Rebound • Soccer Ball • Hockey Ball • Tennis Ball	≤ 90 % 0.12 to 0.40 m ≥ 0.8 m		6.5	
11	Ball Roll Hockey Ball • Roll Distance • Roll Deceleration	5 to 20 m [e] 1.2 to 0.3 m/s^2 [e]			6.6
12	Slope	table 3, row 6			
13	Level	table 3, row 7			
14	Curbing	table 3, row 8			
15	Evenness	table 3, row 9			
16	Dimensions of Playing Field	For limiting deviations of playing fields and lining and marking the doubled values acc. DIN 18202:1997-04, table 1, row 1 apply		DIN 18 202	

17	Lining and Marking	The limiting deviations of line width is ± 10 % of the nominal width		
18	Mineral Infill • Grain Size • Particle Shape • Particles < 0.063mm • Content of SiO_2 • Content of $CaCO_3$ • Water Content at Installation	 0.25/1.25 mm Edges rounded to circular ≤ 2 mass % ≥ 96 mass % ≤ 3 mass % ≤ 0.5 mass %		DIN 4226-1
19	Elastic Infill • Grain Size Range • Particle Shape • Particles < 0.5 mm	EPDM and/or recycled rubber ≥ 0.5mm, ≤ 4.0 mm angular cut ≤ 1 %		DIN 53477 [f]

[a] Force Reduction may possibly decrease reasonably when the wet synthetic turf surface system is exposed to frost, especially whith filled, impermeable surfaces.

[b] The lower Force Reduction values are recommended for Hockey, the higher ones for Soccer. For Tennis no requirements apply.

[c] The investigation of films is valid for freshly produced EPDM only (see DIN EN ISO 1043-1). It is impossible to determine these characteristics with recycled rubber products. Conditions for aging: 7 days hot air of 100°C exposure, dumbells S2 acc. DIN 53 504, thickness (2 ± 0.2) mm

[d] When using recycled rubber, there is a risc of exceeding the requirements. this is due to inevitable non-homogenous character of the raw material.

[e] For facilities for international level competition the requirements of the FIH apply.

[f] Dry sieve analysis acc. DIN 53477

Table 7 Environmental Requirements (Soil and Ground Water) and Testing of Bound Elastic Supporting Layers, Elastic Layers and Synthetic Turf Layers (including infill material of pile layer)

Column	1	2	3	
Row	Parameter (Extract/Eluate)	Requirements	Testing	
			Extract/Eluate produced acc.	Analytic Method
1	DOC (diluted organic bound carbon)	≤ 20 mg/l [a] ≤ 40 mg/l [b]	6.11.2	6.11.5.1
2	EOX (extractable organic bound Halogenes)	≤ 100 mg/kg	6.11.4	6.11.6
3	Lead (Pb)	≤ 0.04 mg/l	6.11.3	6.11.7
4	Cadmium (Cd)	≤ 0.005 mg/l	6.11.3	6.11.7
5	Chromium (Cr) total	≤ 0.05 mg/l [c]	6.11.3	6.11.7
6	Chromium VI (CrVi)	≤ 0.008 mg/l [c]	6.11.3	6.11.7
7	Mercury (Hg)	≤ 0.001 mg/l	6.11.3	6.11.7
8	Zinc (Zn)	≤ 3.0 mg/l [d] or ≤ 0.5 mg/l [d]	6.11.3 or 6.11.2	6.11.7
9	Tin (Sn)	≤ 0.05 mg/l	6.11.3	6.11.7
10	Toxicity (as inhibition of nitrification)	inhibition ≤ 50% [e] or no requirement [e]	6.11.2	6.11.5.2
11	Biological Breakdown (aerobic)	if necessary	6.11.2	for instance: Guideline OECD 301 D
12	Smell	to be described		
13	Exterior Condition	to be described		

[a] without respect to EOX in total Assessment

[b] with respect to EOX in the total assessment

c The standardized methods of spectral photometry (see DIN 38405-24) and ion chromatography (see DIN EN ISO 10304-3) are capable of determination of CrVI of more than 0.05 mg/l only. Thus, total contents of Cr of ≤ 0.008 mg/l only meet this requirement. Is this not the case, the CrVI concentrations of less than 0.008 mg/l have to be proved using non-standardized methods.

[d] The requirement of ≤ 3 mg/l applies to elastic supporting layers, elastic layers and synthetic turf layers. The extract is produced acc. to 6.11.3 in acid environment. Elastic infill materials the Zinc content of which produced from non-acid 48h-extract (produced acc. 6.11.2) exceed 1 mg/l **and/or** the Zinc content of which produced from acid 48h extract (produced acc. 6.11.39) exceed 20 mg/l, do not meet the requirement at all (K.O. criteria). Elastic infill materials the Zinc content of which produced in non-acid 48h extract do not exceed 0.5 mg/l **or** produced in acid 48h extract do not exceed 3 mg/l meet the requirement.
It is emphasized that these requirements can be met reliably by EPDM granules only. When using recycled rubber, there is a risc of exceeding the requirements. This is due to inevitable non-homogenuous character of the raw material.

[e] The requirement of inhibition ≤ 50 % applies to elastic supporting layers, elastic layers and synte^hetic turf layers. The extract is produced in neutral environment acc. 6.11.2. There is no requirement set for elastic infill materials yet. Parallel and alternatively to this test, new test procedures and requirements which are relevant for the assessment of environmental compatibility are being developed.