

**ISSS-meeting Vienna 2004**  
**„Artificial Turf - Burning Behaviour“**  
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## **1. Introduction**

The burning-behaviour is a technical property, which is difficult to - both - test and evaluate. These difficulties become apparent when we consider the long process of the European standardization as well as the big variety of existing standards world-wide. It seems essential to define a proper laboratory test according to the fire risk-scenario for the specific material considering the intended construction or facility design in order to reach a high level of security. As a side aspect of security it should be mentioned that this must include the determination of escape-routing and its simulation (fire drills).

Presently, the evaluation of burning behaviour is undergoing review and evaluation towards the goal of reaching a common European position. This will mean far-reaching alternations to the national standards.

When we talk about the indoor application of artificial turf, we will have a different risk-scenario than that of outdoor use. It is obvious that there will be the need for specially developed materials to reduce the spread of flames and control of smoke generation.

## **2. Standards / Studies on Burning Behaviour**

The following standards are to be considered in the examination of the burning behaviour of artificial turf (extracts):

European standardization:

1. **EN ISO 9239-1**: Examinations to the fire behaviour of floor-coverings; part 1: Determination of burning-behaviour - Radiant Panel test, 2002. This test gives results on the critical heat flow where the flame propagation on a horizontal surfaces stops.
2. **EN ISO 11925-2** (2002) - Examinations to the fire-behavior fire behaviour of building products, part 2: flammability under direct flame-exposure. This test examines the flammability of building products under the stress of direct exposure to a small flame.
3. **EN 13501-1**: Classification of building products and constructions according to their burning behaviour. This standard includes classification systems of building products and constructions within the new classes A to F
4. **prEn 13239 oder ISO 6925** (Tablets-test)

national standards (in extracts):

- 1) **ASTM E 648** (similar as EN ISO 9239).
- 2) **VN ÖNORM B 3806**: Requirements on the burning behaviour of building products, 2002
- 3) **ÖISS Guideline for Artificial Turf** (2003)

- 4) **DIN V 18.035 Part 7** (2002)– artificial turf referring to DIN 51960 – examination of burning behaviour (1975; 2003 withdrawn)
- 5) **BS 6307** (Methenamine Tablet Test).
- 6) **ASTM D2859** Flammability of finished textile floorcovering materials. (Methenamine Pill Test).
- 7) **BS 4790**: Hot Metal Nut Test.
- 8) **NF P 92-506**: Examination of burning behaviour with the French Radiant Panel

One study which has to be considered as the most important for the further qualification of artificial turf regarding burning behaviour, was carried out by Labosport in 2002 and was commissioned by UEFA 2002 (rapport 02-0236, 08/2002).

### **3. UEFA Study 2002**

In the scope of the study different tests were carried out according to the International standards as well as French standards.

Several different artificial turf products were examined in the study, they included samples with a variety in the pile height, different infill materials (black recycled SBR rubber and green EPDM rubber) and those with or without an elastic layer.

The tests showed interesting and important results, which have to be taken into account for further evaluation. The following listing show some general aspects:

- The non-filled artificial turf burns well (Polypropylene-based yarn burns intensively without special flammability-treatment). In particular the backing-material (latex) burns very severely.
- Turf systems with rubber infill made of recycled SBR rubber show clearly worse fire behaviour than when an infill of EPDM rubber is used. In addition the burnt surface with the recycled SBR rubber is very dangerous for the skin (hot rubber particles). The smoke density of SBR rubber is high. To fully extinguish the fire is difficult if SBR-rubber is used, because the fire starts again several time after extinguishing-action. Below the rubber layer, the silica-sand layer shelters the yarn of the pile as well as the backing-material.
- The burning behaviour of Turf systems with an integrated elastic layer is influenced by the elastic layer if contact occurs with the fire-source.
- Turf systems infilled with EPDM rubber show that the fire extinguishes without the need of an extinguishing aid. The development of smoke is much lower compared with recycled rubber (SBR).
- The test with tablets ist not suitable for the examination of burning behaviour due to little intensity of the flame.

The results which were gained by performing these tests show the main influence comes from the following components of the artificial turf system:

- - the backing material (in case of the tests: latex-coating)
- - the type of infill-rubber rubber infill
- - the flammability of an elastic layer

In the case of rubber-filled artificial turf-systems, the type material of the rubber being used seems to be the decisive aspect for the burning behaviour of the whole system. In case of non-filled systems it is the flammability of the backing material and – if used – , if used, of the the elastic layer.

For indoor use of artificial turf-systems turf systems only EPDM-rubber the use of EPDM rubber seems to be possible due to flammability and smoke.

#### **4. Tests performed in Austria – ÖISS-guideline**

In the years 2002 and 2003 several tests were performed under the care of the ÖISS-working group “Artificial turf” to define relevant testing procedures. Those tests were performed in Salzburg (in conjunction with the installation of the soccer fields in the Salzburg, Linz and Vienna stadiums. As a result of the Salzburg tests, which were carried out under observation of the governing bodies in Salzburg, the main risks were defined as “fireworks being thrown on to the soccer pitch”.

Therefore it was obvious that the DIN-test (DIN 18035, part 7) should not be adopted as a test procedure for the ÖISS-guideline due to the low energy input, which does not reflect the situation which occurs from fireworks (further on the DIN standard involved (DIN 51960) is withdrawn).

The tests showed, that the burning behaviour of artificial turf, with or without infill and with different kind of infills depends on several parameters:

- the kind of yarn and backing material being used
- the kind of infill EPDM or SBR (recycled tire and technical rubber).
- the height of infill in respect to the remaining exposed pile height
- the fire source

The test results were collected in the ÖISS working group and finally converted into a test procedure and set of requirements for outdoor pitches with a set risk level:

For outdoor installations of artificial turf systems, the burning behaviour test is carried out on a 1 x 1 m<sup>2</sup> sample prepared as for a typical installation. In the centre of the sample a firework, defined as „bengalisches Feuer“, class T1, length 25 cm (burning time of at least 6 minutes) is laid down and then lit. The burning process shall be without influence of wind.

The requirements are as follows:

- a) the fire must self-extinguish.

- b) The resultant burn mark shall be smaller than 1 x 1m<sup>2</sup>, therefore the fire must self-extinguish before reaching the edge of the sample.

The results obtained on filled artificial turf pitches (silica-sand and EPDM or SBR rubber) show that these requirements are met by both infill varieties (EPDM or SBR). However infills with SBR show much higher intensity of the fire and larger burn marks than infills with EPDM.

The following documentation shows two results on the burning behaviour by using the ÖISS-method. The photographs give a good impression of the general behaviour when using EPDM or SBR infill, as mentioned above.



**figure 1:** Test with firework („bengalisches Feuer“) – EPDM rubber infill - damaged area



**figure 2:** Test with fireworks („bengalisches Feuer“) – SBR rubber infill