Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e. V. (FLL)

Landscape Development and Landscaping Research Association (FLL)

TP-Synthetic Artificial Turf

Technical Conditions of Examination to determine microplastic emissions due to wear using the Lisson Tretrad machine

Prepared by the Editorial Board of TP-Synthetic Artificial Turf

Draft

Phase of objection 1st Jun. 2022 until 31st Aug. 2022

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Ed.: FLL e. V., Friedensplatz 4, D-53111 Bonn

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1st edition (English), Bonn, October 2022
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1 Preface

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1 Scope of application

This International Standard specifies a method for the determination of the mass loss and microplastic emission of synthetic artificial turf due to mechanical wear using the Lisson Tretrad machine.

2 Normative references

The documents listed in this section contain specifications which are necessary for the application of these technical conditions of examination.

In the case of dated references, the edition stated applies; in the case of undated references, the latest edition of the document stated applies.

Members of ISO and IEC maintain registers of currently valid International Standards.

INTERNATIONAL ORGANISATION OF STANDARDISATION (ISO):

- ISO 139: Textiles — Standard atmospheres for conditioning and testing.
- ISO 1765: Machine-made textile floor coverings — Determination of thickness.
- ISO 1957: Machine-made textile floor coverings — Sampling and cutting specimens for physical tests.
- ISO 2424: Textile floor coverings — Vocabulary.
- ISO 8543: Textile floor coverings — Method for determination of mass.

3 Terms and Definitions

For the purposes of this International Standard, the following terms and definitions apply, in addition to those in ISO 2424:

mass loss per unit area m_V
difference between the sample mass before and after the wear test, related to the tested area (see clause 10)

relative mass loss m_{rV}, for pile carpets
ratio of the mass loss per unit area m_v as a percentage of the mass of pile per unit area above the substrate (in accordance with ISO 8543)

4 Principle

The specimens of a synthetic artificial turf are mechanically stressed at constant load and slippage and for a prescribed number of double passages by the Lisson Tretrad machine (refer to ISO 12951). The emitted material is collected and classified regarding the particle size.

The specimens have to be pre-treated in accordance with DIN 75220, tab. 2, outdoor-day, 480 hours, humid climate.

5 Apparatus

5.1 Lisson Tretrad machine

For the Lisson Tretrad machine and its calibration procedure refer to ISO 12951 (see Figure 1). For details about handling of specimens and preparation refer to ISO 1957:2000-07.

5.2 Filter

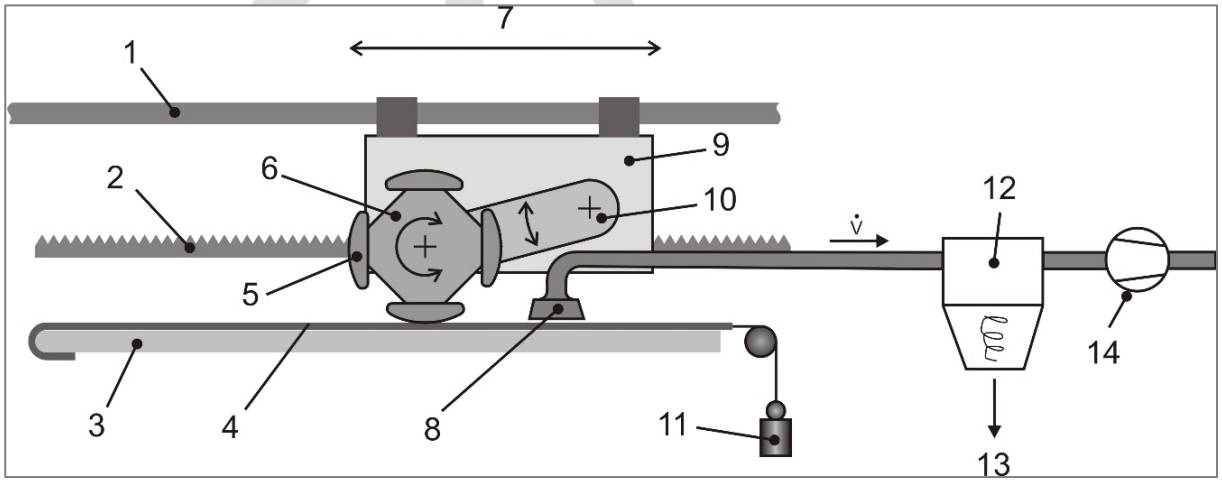
The filter is designed in a way that it holds back all material that is picked up by the dust suction. The filter itself can be removed from the total assembly to measure the weight before and after the test. In addition, the filter includes the opportunity to remove the collected material for determination its weight.

5.3 Suction

The suction system ensures a volume flow between the dust suction and the filter of at least 1,8 m³/min.

5.4 Scale

Capable of weighing the filter and collected material to the nearest 0,001 g.



Key

1	Support	8	Dust section
2	Cogbar	9	Frame
3	Bed plate	10	Drive
4	Specimen	11	Tension weight
5	Foot	12	Filter
6	Tretrad wheel	13	Material loss
7	Movement of the Tretrad wheel	14	Suction system

Fig. 1: Lisson Tretrad testing machine including filter

6 Sampling and selection of test specimens

Select the specimens in accordance with ISO 1957. For each test, prepare at least two specimens each 1500 mm in the direction of manufacture (machine direction) by 100 mm in the cross-machine direction.

7 Atmosphere for conditioning and testing

The specimens shall be conditioned for at least 48 h in the standard atmosphere 23/50 for conditioning and testing specified in ISO 291:2008, prior to testing in the same atmosphere (air temperature: 23 °C / relative humidity: 50 % r.F.).

The specimens shall be laid out singly, use surface uppermost.

8 Calibration of the apparatus

For calibrating the Lisson Tretrad testing machine please refer to DIN EN ISO 12951:2020-10.

9 Procedure

The tests are performed in four sequences of 5.000 double cycles to at least 20.000 cycles in total. During the tests, the specimens remain on the base plate of the Lisson Tretrad machine. Before each sequence, new rubber soles are fitted to the Tretrad.

Adjust the height of each Tretrad to +5 mm in relation to the bed plate according to DIN EN ISO 12951:2020-10.

Before each sequence, the weight of the filter is taken to determine m_1 (see 10.1) to the nearest 0,001 g. After each sequence, the weight of the filter is taken to determine m_2 (see 10.1) to the nearest 0,001 g.

Continue the sequences to the total number of cycles of 20.000.

From the collected material fibers longer than 15 mm must be removed.

The weight of the removed fibers m_3 is determined.

After every test cycle, a photo of the center area is taken.

10 Calculation and expression of results

10.1 Mass loss per unit area m_V

Calculate the mass loss per unit area m_v in grams per square metre according to the following equation:

$$m_v = \frac{(m_2 - m_1 - m_3)}{A}$$

where

m_1 is the mass of the filter before sequences, in grams;

m_2 is the mass of the filter after the sequences, in grams;

m_3 is the mass of the removed fibers l > 15 mm, in grams;

A is the tested area of the specimen in square metres (width of Tretrad foot multiplied with length of track over which Tretrad walks in accordance with 5.1).

Calculate the mean and coefficient of variation.

The mass loss is calculated for each sequences of 0 to 5.000 cycles, 5.000 to 10.000 cycles, 10.000 to – 15.000 cycles and 15.000 to 20.000 cycles.

10.2 Relative mass loss m_{rv}

Calculate the relative mass loss m_{rv} according to the following equation:

$$m_{rv} = \frac{m_v}{m_{AP}} \text{ x } 100$$

where m_{AP} is the mass of pile per unit area above the substrate in grams per square metre, determined according to ISO 8543.

The relative mass loss is calculated for each sequence of 0 to 5.000 cycles, 5.000 to 10.000 cycles, 10.000 to – 15.000 cycles and 15.000 to 20.000 cycles.

10.3 Unusual phenomena

The tested specimens shall additionally be inspected for unusual phenomena which may be indicative of a manufacturing fault. These may be e.g., release of tufts from the pile or fibres from the substrate and changes in the back coating. In case unusual phenomena occur, the test is not valid and must be repeated.

11 Test report

The test report shall contain the following information:

a) reference to this International Standard, i.e. ISO 12951;

b) a complete identification of the product tested, including type, source, colour and manufacturer's reference numbers;

c) previous history of the sample;

d) number of test specimens;

e) mean mass loss per unit area m_V in g/m^2, rounded to the nearest 0,1 g/m^2;

f) mean relative mass loss m_{rV}, rounded to the nearest 0,1 %;

g) the value of l_{TR};

h) absolute and relative confidence limit of m_V (confidence level 1 2 α = 0,95);

i) unusual phenomena as described in 10.3;

j) any deviation from this International Standard which may have affected results.

Annex A (informative)

pictures of the treated specimen: