BS EN 17409:2020

BSI Standards Publication

Surfaces for sports areas – Code of practice for the sampling of performance infills used within synthetic turf surfaces

bsi.

National foreword

This British Standard is the UK implementation of EN 17409:2020.

The UK participation in its preparation was entrusted to Technical Committee PRI/57, Surfaces for sports areas.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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EUROPÄISCHE NORM

EN 17409

May 2020

ICS 97.220.10

English Version

Surfaces for sports areas - Code of practice for the sampling of performance infills used within synthetic turf surfaces

Surfaces pour sols sportifs - Code de bonnes pratiques pour l'échantillonnage des matériaux de remplissage utilisés dans les surfaces de gazon synthétique

Sportböden - Regeln für die Probenahme bei Füllungen, die in Kunstrasenflächen verwendet werden

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN 17409:2020: E

European foreword

This document (EN 17409:2020) has been prepared by Technical Committee CEN/TC 217 “Surfaces for sports areas”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2020, and conflicting national standards shall be withdrawn at the latest by November 2020.

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1 Scope

This document specifies the minimum procedures for the sampling of performance infills used within synthetic turf surfaces to verify compliance with toxicology, environmental and performance regulations and standards.

Four sampling procedures are specified:

Method 1 specifies how to take samples during production of the infill material.

Method 2 specifies how to take samples from big bags delivered to site.

Method 3 specifies how to take samples from small bags delivered to site.

Method 4 specifies a procedure for taking samples from a synthetic turf (e.g. sports, recreational or landscaping surface).

The procedures specified are suitable for all forms of infill.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
big bag
flexible container capable of holding ≥ 1 m^3 (1 000 l) or more of infill

3.2
field sample
sample taken in the field and from which laboratory samples are produced

3.3
increment
sub-portion of material extracted in a single operation by the sampling device

3.4
infill
particulate materials used to infill the synthetic turf pile to provide support of the carpet pile and to aid the provision of the required performance characteristics of the surface

3.5
laboratory sample
sample or sub-sample sent to or received by the laboratory

3.6
lot
defined quantity of infill material for which a characteristic is to be determined

3.7
sample
mix of all the increments taken from a lot

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b) a fixed quantity in a production day/shift;

c) a fixed quantity;

d) a quantity produced in a fixed time frame.

NOTE 2 Option d) is most appropriate for continuous production with no beginning and no end.

5.3 Sampling point and apparatus

Based on health and safety assessments and producer equipment, a fixed sampling point for the collection of sample increments shall be chosen for each material fraction to be monitored. Sampling shall be carried out using a sample box or other suitable equipment.

The sampling box shall be passed through the stream of falling material so that it uniformly cuts the full flow of falling material. The box shall be large enough so that it does not become overloaded. Automatic systems fulfilling these criteria may also be used.

NOTE A procedure for preparing samples for chemical analysis is given in Annex A.

5.4 Size of sample increment

The sampling box shall have a capacity of not less than 0,5 l (0,000 5 m^3).

The sampling operator shall record the approximate capacity of the sampling device in cubic decimetres.

5.5 Number of increments

One increment shall be taken per 10 t of produced infill, with a minimum of four increments per lot.

Where daily or weekly production quantities are small, the taking of increments should be increased to ensure the lot comprises at least four increments.

6 Method 2 — sampling from big bags

6.1 Principle

The laboratory sample is created by mixing several increments removed with a sampling tool from at least three levels, with at least one located on each level, as specified in 6.3.

6.2 Apparatus

6.2.1 Sampling tool

This tool shall be designed to take samples of dry or slightly cohesive wet materials,. It shall be shaped in such a way to allow the operator to reach different heights by simply screwing the tool into the big bag. Its opening shall be wider than three times the size of the largest particle expected to be present in the big bag.

6.2.2 Measuring flask

Container of known volume; greater than 1 l (0,001 m^3).

6.2.3 Container

Containers shall be used to recover the increments.

6.3 Procedure

6.3.1 Sampling

Using the sampling rod take, at least, three increments at different heights in accordance with 6.3.2 within the big bag as follows:

1. Close the container on the sampling rod (see Figure 1):

Figure 1 — Sampling rod

2. Insert the sampling rod into the big bag and twist in a clockwise direction from the top of the big bag (see Figure 2):

Figure 2 — Rotating sampling rod in big bag

3. When the sampling depth has been reached, open the sampling container by turning the sampling rod in the opposite direction.

4. Make three full rotations in the same direction to fill the container.

5. Twist the sampling rod in counter-clockwise direction in order to close the container.

6. Pull out the sampling rod and empty into the sampling container.

7. Repeat procedure to collect increments in the middle of the big bag, and then at the bottom of the big bag.

8. Merge the three increments accordance with Clause 9.

6.3.2 Sampling heights

Take increments from different heights. At least three increments shall be taken at different heights:

— P1: At the top of the big bag (approximately 20 cm from the surface)

— P2: In the middle of the big bag

— P3: At the bottom of the big bag (approximately 20 cm from the bottom)

Dimensions in centimetres

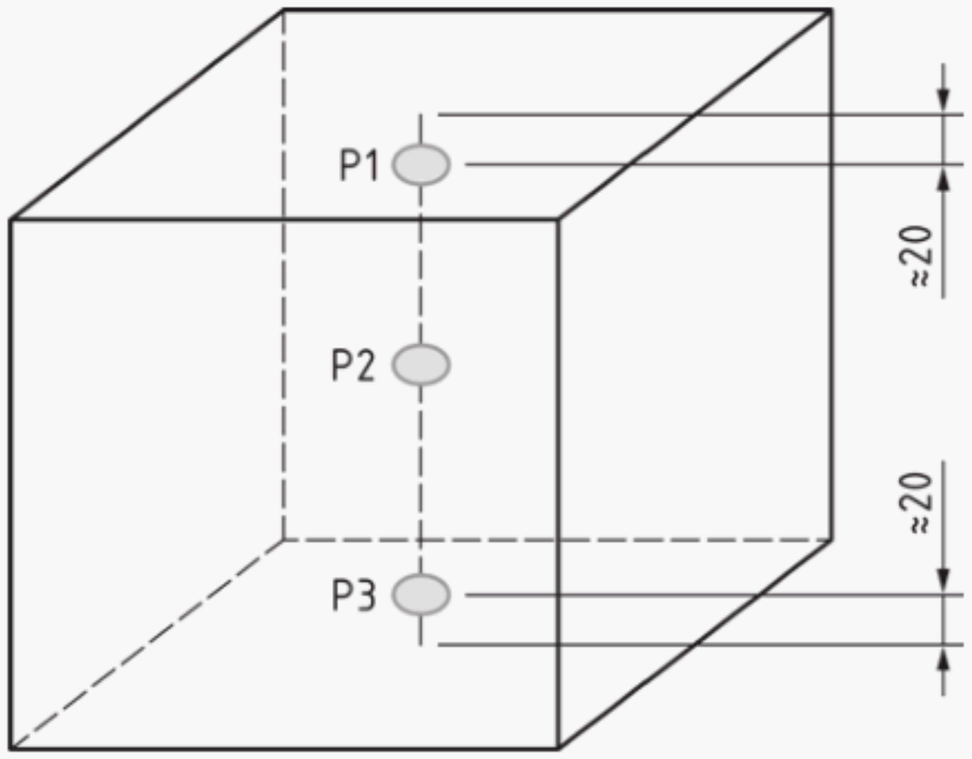


Figure 3 — Position of increments for three portions

If it is not possible to take increments in the centre axis of big bag (see Figure 3) then six increments shall be taken, on two opposite sides of the big bag at different heights (see Figure 4).

Dimensions in centimetres

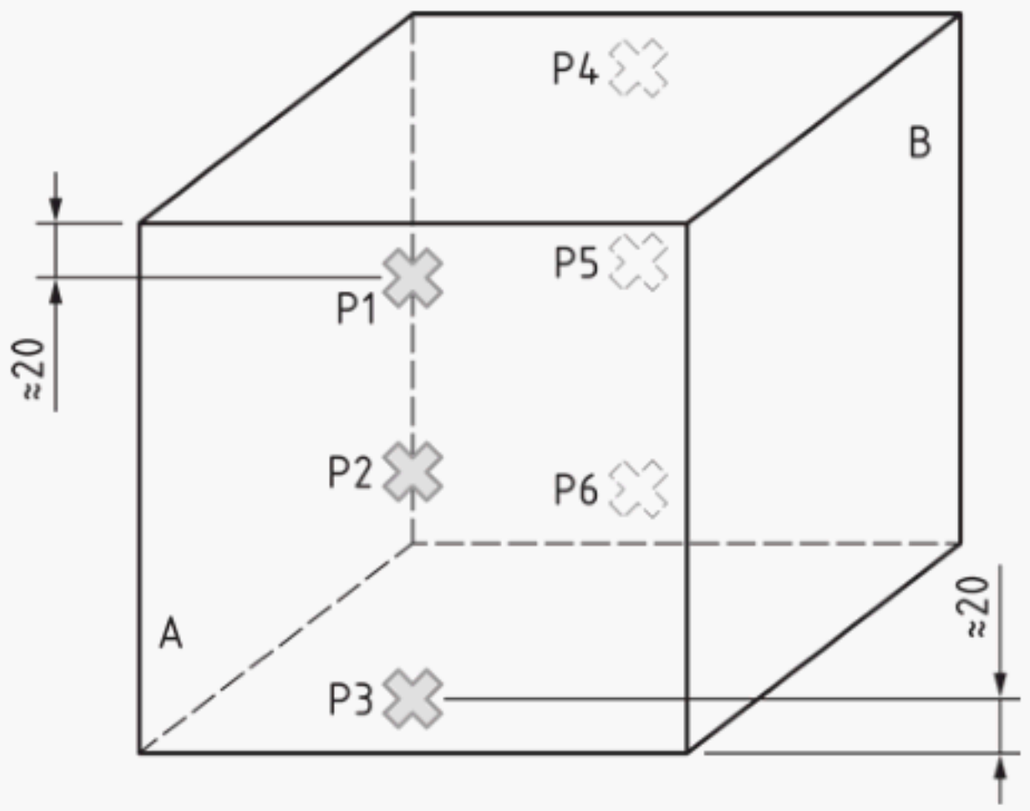


Figure 4 — Position of increments for six portions

Merge the increments in accordance with Clause 9.

Ensure the combined increment is equal to or greater than 1 l (0,001 m^3).

7 Method 3 — sampling from small bags

7.1 Principle

The laboratory sample is created by mixing several increments removed with a sampling tool from several individual small bags.

7.2 Apparatus

7.2.1 Sampling tool

This tool shall be designed to take samples of dry or wet materials by being inserted into the small bag. It shall be shaped as shown in Figure 5, to allow the operator to reach different heights by simply pressing on the tool and introducing it into the big-bag. Its opening shall be wider than three times the size of the largest particle expected.

The tool should be preferably used by inserting it through the big-bag's fabric, after having made an "X" shaped cut. Upon removal, the bag should be sealed with adhesive tape.

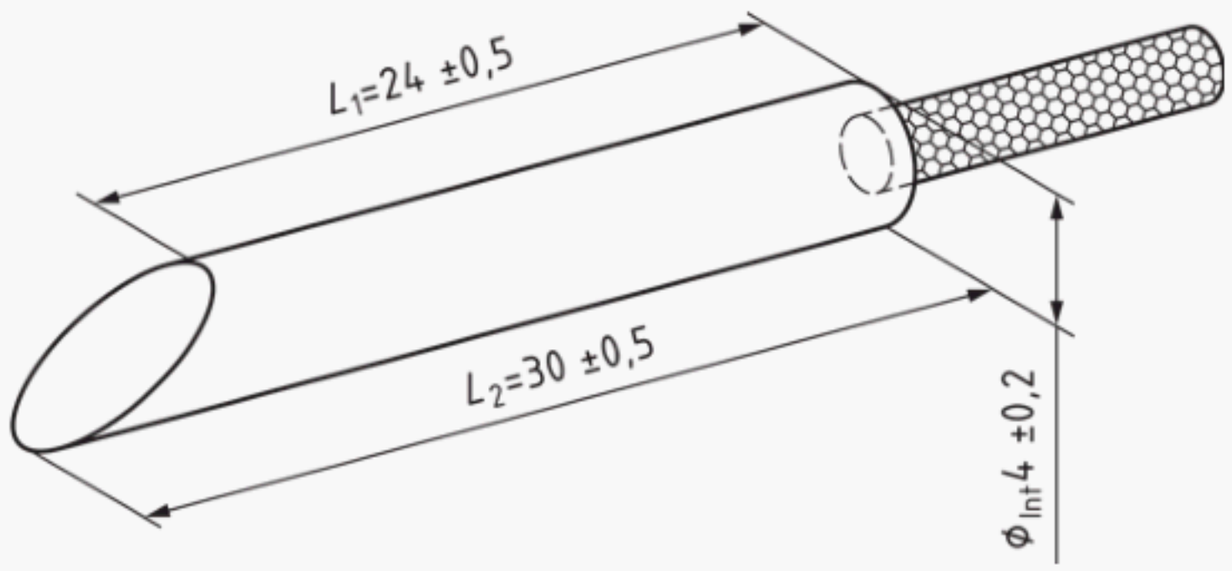


Figure 5 — Small bag sampling tool

7.2.2 Container

Container used to recover the increments of known volume; greater than 1 l (0,001 m^3)

7.3 Sampling

7.3.1 Number of increments

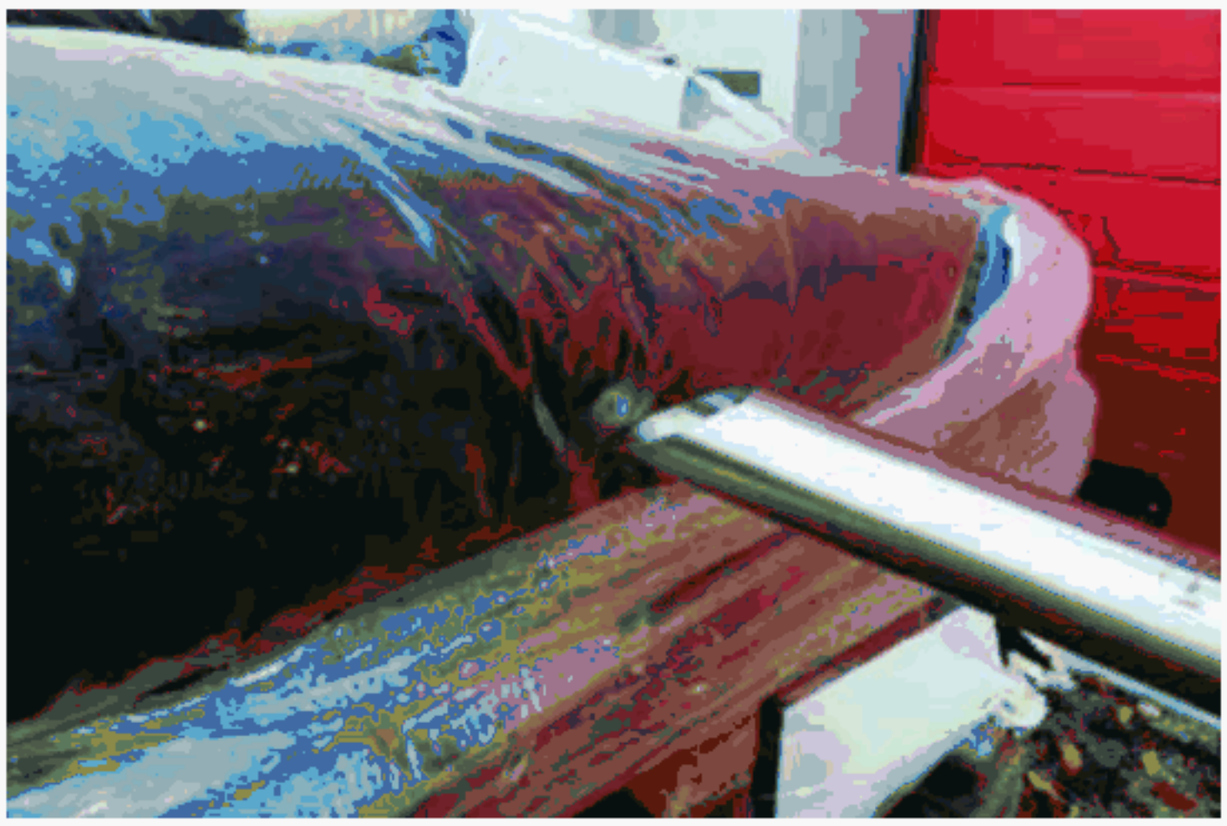
For bags delivered on palettes, select a minimum of four bags randomly and take one increment from each bag, ensuring the combined increment is equal to or greater than 1 l (0,001 m^3).

NOTE For infills with low bulk densities, more than four bags may need to be sampled.

7.3.2 Method of sampling

Turn the bag on the floor several times (mixing its internal content).

Insert the sampling tool into the side of the bag as shown in Figure 6.



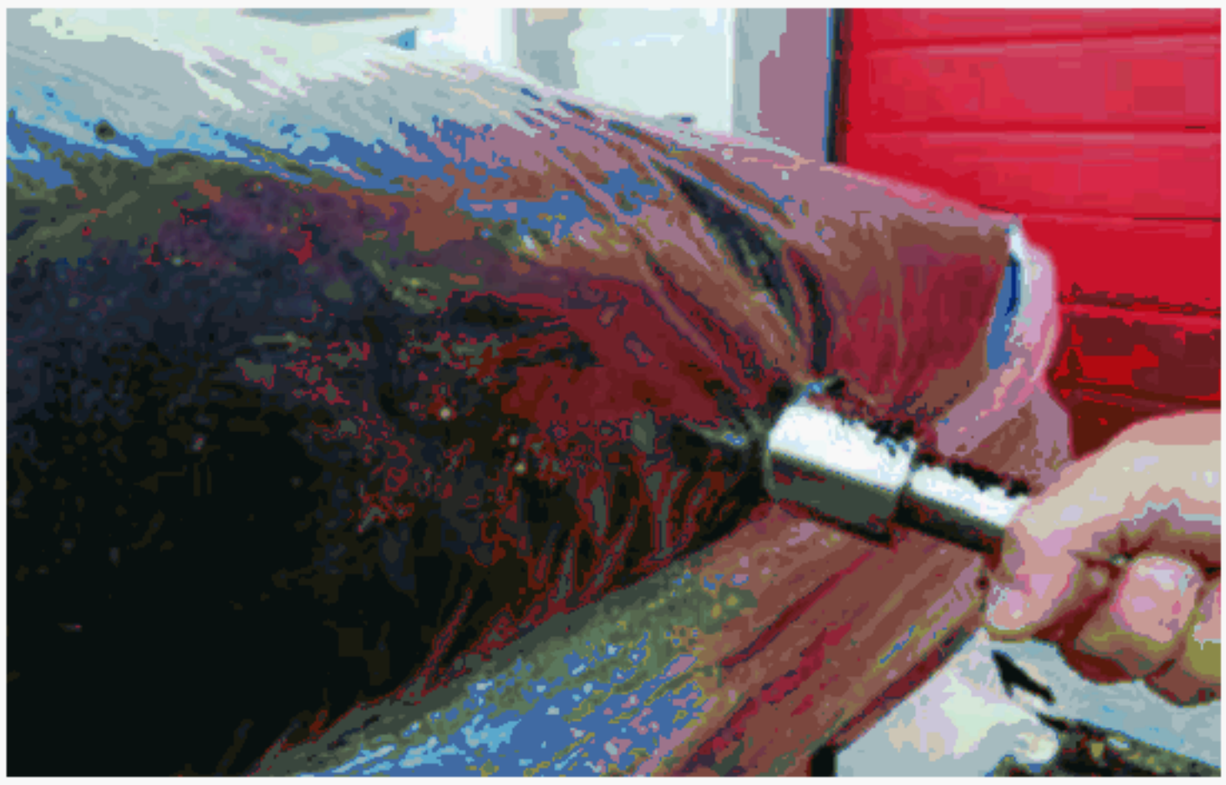


Figure 6 — Small bag

Collect the increment with the sampling tool from the centre of the bag, taking as much infill as possible from the whole depth of the bag. Pull out the sampling tool and empty into the sampling container.

Merge the increments in accordance with Clause 9.

8 Method 4 — sampling from synthetic turf surfaces

8.1 Principle

The laboratory sample is created by mixing several increments removed from the synthetic turf surfaces.

8.2 Equipment

The following equipment shall be used:

— fresh nitrile gloves;

— clean metal rake;

— sampling containers.

8.3 Procedure

8.3.1 Sampling conditions

Sampling from sports fields having areas of over 4 000 m^2 shall be undertaken in the seven positions shown in Figure 7.

Sampling from sports areas having areas of less than 4 000 m^2 shall be undertaken in three positions S1 or S3, S2 and either S4, S5, S6 or S7 shown in Figure 7.

Sampling from non-sports areas shall be based on taking at least three increments from locations considered to be representative of the different levels of the area used.

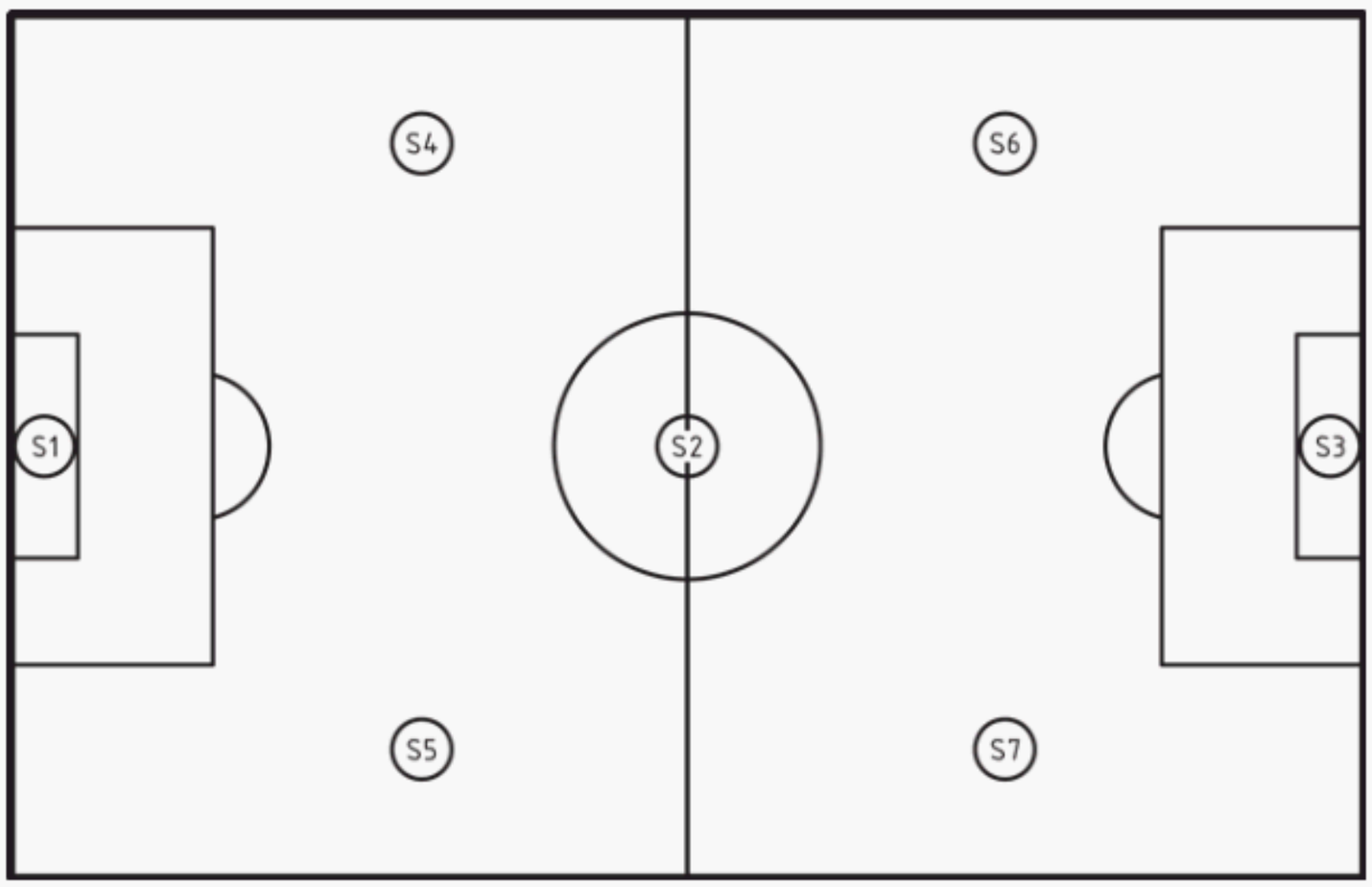


Figure 7 — Field sampling positions

8.3.2 Site sampling

At each sampling location define a sample collection point, comprising an area of about 1 m^2. Ensuring the operative is wearing fresh nitrile gloves, use a small metal rake to pull out the infill, according to its approximate layer thickness, ensuring contamination of the increment from any different underlying infill or surface detritus, is kept to a minimum.

Collect increments of nominally equal volume at each location, ensuring an adequate amount is taken to produce a lot of at least (0,001 m^3) 1 l.

If samples are being taken from a field or site to enable chemical analysis tests to be undertaken, it is recommended that samples of soil from areas nearby the field or site are also taken and tested, to determine if chemicals found in the subsequent analysis are from the infill or due to contamination of the infill and local environment by other sources. See Annex C for details.

When collected on-site, samples may contain sand or other non-infill material. A procedure for separating the materials is given in Annex B.

9 Test sample and test portion preparation

9.1 Apparatus

9.1.1 Ventilated oven

Ventilated oven, thermostatically controlled to maintain a temperature of (70 ± 5) °C, or other suitable equipment for drying the aggregates, if it does not cause any particle size breakdown.

9.1.2 Apparatus for simple division

A means of undertaking dividing sample division methods based on one of the following apparatus:

9.1.2.1 Rifle splitter

A sample splitter having at least 12 slots and an even number with adjacent slots directing material into two different sub-samples. The width of the slots shall be at least three times the nominal top size of the material to be riffled to prevent sample bridging. See Figure 8.

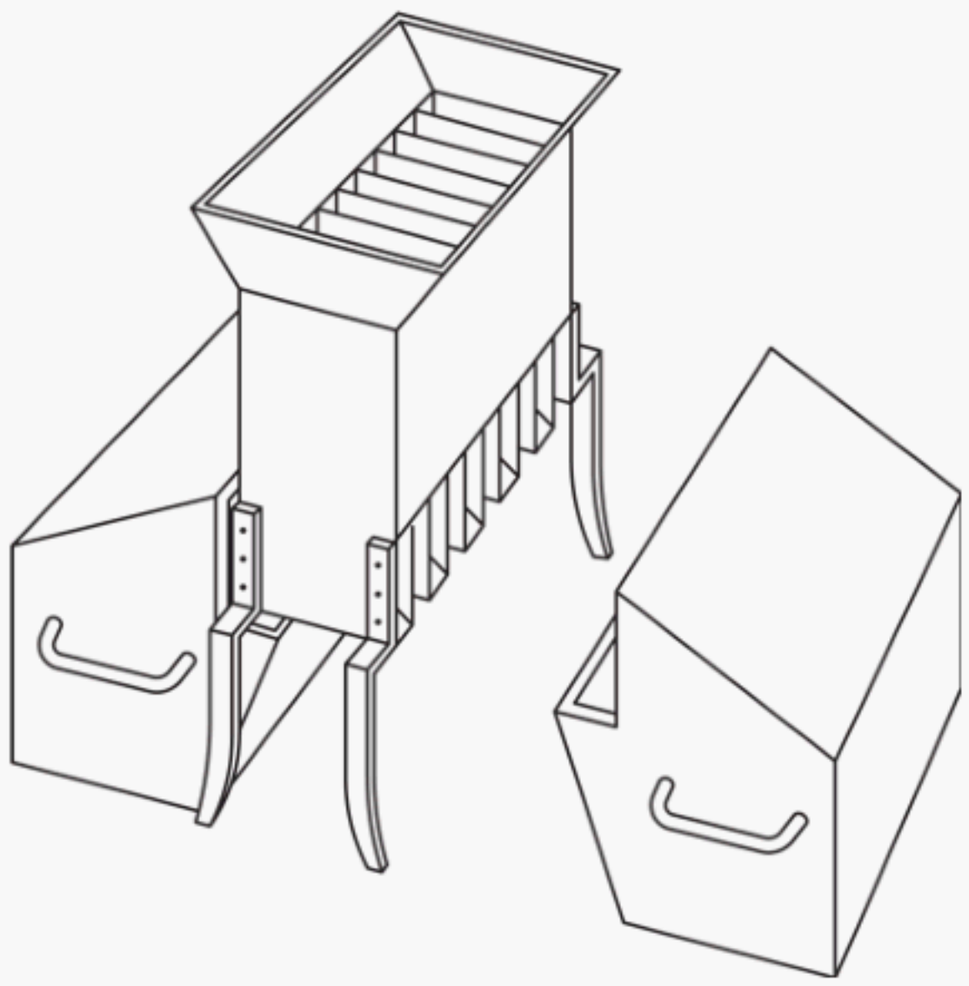


Figure 8 — Example of rifle splitter

9.1.2.2 Rotary sample divider

A rotary sample divider used according to its manufacturer's instructions. The inner dimensions of the equipment where the sample is fed into it shall be at least three times as wide as the nominal top size of material to be processed.

9.1.3 Balance

If required by the test method to be undertaken, balances or scales accurate to ± 0,1 % of test portion mass.

9.2 Procedure

9.2.1 Sample drying

If required to dry, do so by heating the increments at a temperature of (70 ± 5) °C to constant mass. Allow to cool.

9.2.2 Sample division

Mix the increments that have been collected together in a container of suitable size to form a sample.

Determine the required mass or volume of the sample lot to undertake the necessary tests or analysis. Feed the sample through the sample divider until the required sample reduction is complete, taking into account the need for duplicate test portions, or extra material in cases where tests need to be repeated because of doubtful results.

The laboratory sample may need to be reduced to a test sample before a test portion is produced.

NOTE If in doubt, the laboratory undertaking the analysis can advise the volume or mass of the sample required.

Annex A
(informative)

Procedure for preparation of samples for chemical analysis

A.1 General

Performance infill materials can be highly heterogeneous and the preparation of reliable test portions for chemical analysis should be performed to ensure the representativeness of test results.

Starting from the laboratory sample, a first step of sub-sampling should be performed in such a way that the obtained sub-samples are as much representative and homogeneous as possible, with respect to the initial batch.

Depending on the type of analysis to be performed, the size of the test portion can be sufficient to contain a large number of particles that contains all of the components of the infill material to be analysed.

On the other hand, most of the test methods aimed at determining the concentration of certain elements are fit for very small test portions, often the size of a few milligrams. A limited quantity of material might not contain a sufficient number or variety of particles that are truly representative of the original sample. In such a case, the comminution of a sub-sample is necessary to ensure the representativeness of test results.

A.2 Test portion for elution

Typical elution tests that are used to characterize performance infill materials, such as the DOC (dissolved organic carbon) and heavy metals in leachates, require sample masses of 100 g. In this case the test portion can be easily obtained by using a riffle splitter (see Clause 9).

Moreover, the leaching of certain elements from granular materials strongly depends on the particle size of the material and its specific surface area. Because of that, it is strongly recommended not to adulterate the particle size distribution of infill materials when a small test portion (less than 20 g) is required by an elution test method. In such a case, it is highly recommended to replicate the analysis several times in order to test no less than 20 g of infill material.

A.3 Test portion for chemical testing

Chemical methods best suited for determining either the elemental composition or the content of certain substances in granular materials require test portions with masses that range from about 1 mg to 500 mg. When the infill material is heterogeneous, such a limited quantity of material cannot be representative of the entire sample as the number of particles that undergo the analysis could not contain all the infill's components.

Whenever the mass of the test portion to be analysed is less than 5 g, the preliminary particle size reduction of a representative sub-sample is required.

EXAMPLE The average weight of a granulate with particle size between 2 mm and 3,5 mm is around 10 mg, more than the mass of the smallest test portion required, while only 50 granulates would be contained in the largest test portion.

The initial laboratory sample is first reduced by means of a riffle splitter to obtain a sub-sample of approximately 250 g. The sub-sample is then frozen with liquid nitrogen and ground to obtain fine particles of less than 500 µm, as follows:

a) emersion in liquid nitrogen;

b) grinding by means of an ultracentrifuge grinder or other similar devices;

c) draining into the collection recipient. If, when producing infill material, smaller particles with identical chemical composition are produced, and if statistical experiments show that analytical results are similar to results obtained for the “cryogenically” frozen and ground infill material, then such smaller particles may be used as a representative sample for the larger infill material, providing sampling complies with this document.

Annex B
(informative)

Procedure for separating mixed infills

B.1 General

When collected on-site, samples may contain sand or other non-infill material. This procedure describes a way of separating these materials from the performance infill (see Figure B.1). The materials are separated in a water solution, using the differences of densities.

B.2 Equipment

The following equipment is required:

— new nitrile gloves;

— clean storage container (>5 l in volume);

— clean agitator;

— if required, clear fluid with density ≥1,25 g/cm^3 (e.g. calcium chloride solution, glycerol, etc.);

— skimmer or similar tool;

— oven to dry samples.

Depending on the density of the infill material. The fluid must not chemically interact with the test sample.

B.3 Cleaning — separation procedure

B.3.1 Preparation of water solution

In a container, pour the fluid. If some form of salt solution is being used, mix until total dissolution of the salt occurs.

B.3.2 Separation of infill and non-infill materials

Pour the infill sample in the container with fluid. Mix the sample. Wait until the fluid inside the container becomes clear again.

Use the skimmer or similar tool to collect the upper fraction of infill material.

Discard the lower fraction of infill material, which is generally composed of inorganic materials (sand).

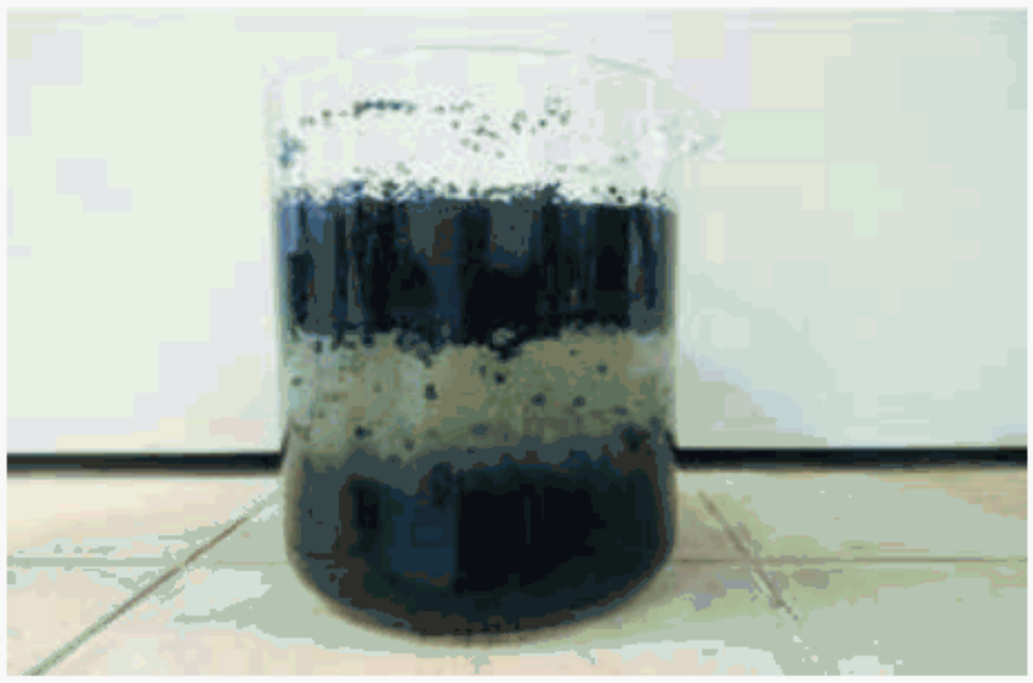
B.3.3 Cleaning and drying

Clean the separated infill sample with water using a suitable container, ensuring infill with smaller particle sizes are not washed away.

After cleaning, dry the sample in an oven, for example at 50 °C or 70 °C.

The clean infill sample is then available for further analysis.

a)



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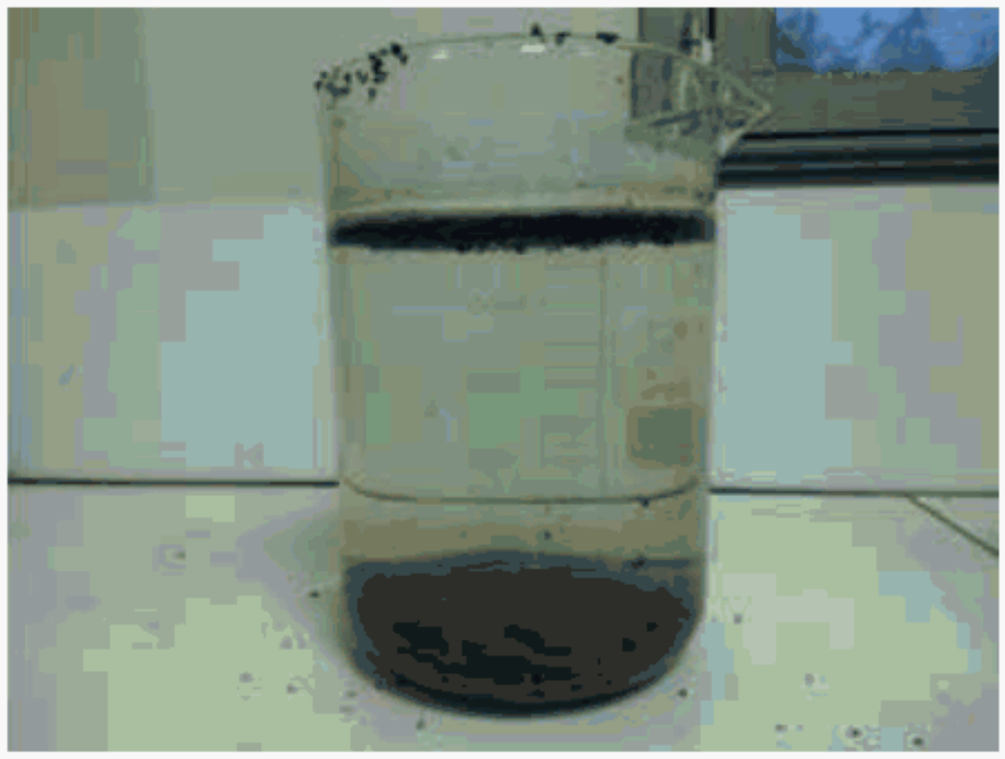

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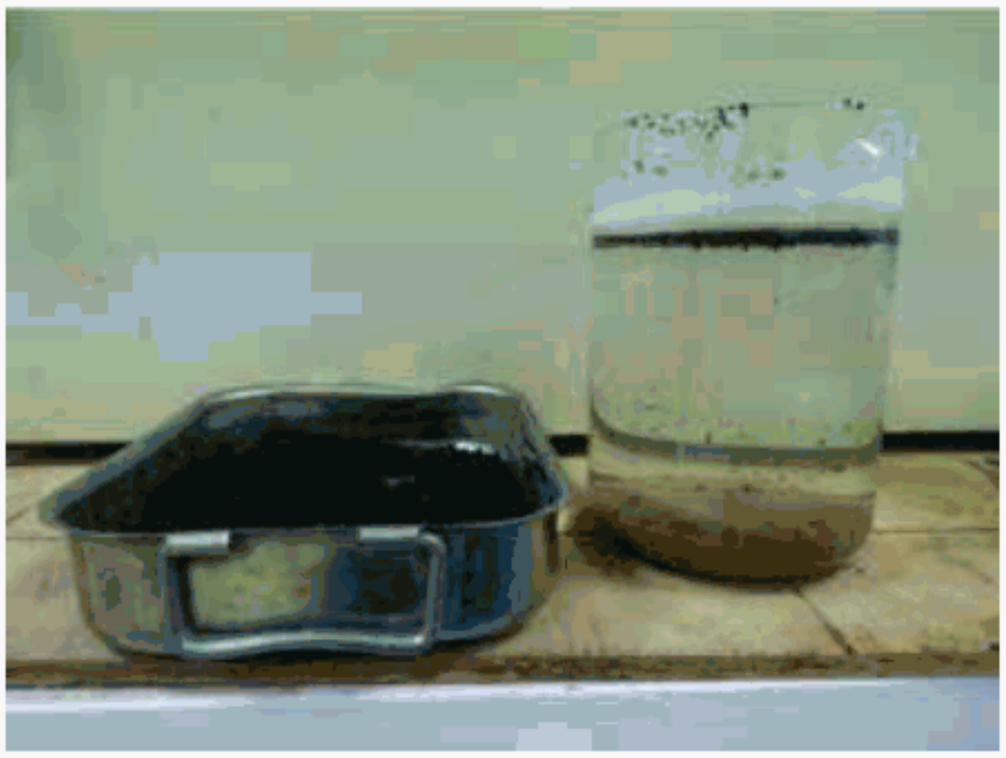

d)

Figure B.1 — Separation of performance infill from other materials

Annex C
(informative)

Sampling to determine if local ground and site conditions may have influenced results obtained on infill taken from synthetic turf surfaces

C.1 General

This annex describes different options that can be carried out to assess if the results of analysis on infill samples taken from fields and sites are affected by pollutants from the air or surrounding ground.

C.2 Sampling of the ground/soil around a field

Assessing the possible contamination of natural soil areas around the perimeter of a synthetic turf field can assist in determining if the accumulation of external pollutants have contaminated the infill material in the synthetic turf field.

Before carrying out a soil sampling program, it is important to verify the presence of enough areas of natural soil around the field and the suitability of the soil/ground in relation to the proposed sampling programme.

The total area to be sampled should be preferably at least 60 m^2.

During the design of the sampling programme, a list of parameters to be determined should be prepared since this will influence the sampling procedure to be used e.g. the sample containers, the sample quantity, the preservation procedures to be adopted, handling, transport of the soil samples, etc.

The laboratory to be used should be chosen in relation to the type of analysis to be carried out on samples and on the expected concentrations of chemical substances considered to be in the soil samples (the minimum value requested could affect the analytical methods used).

As recommended in ISO 18400-104, the minimum sample size of the soil sample for determination of chemical parameters should be 500 g to 1 000 g. The sample size should be sufficiently large to enable all required analyses to be performed. If there are enough natural areas surrounding the fields, it is preferable to collect composite samples by taking several increments and combining them to form a composite sample. As indicated in ISO 18400-104, research has shown that a single composite sample prepared by combining at least 25 increments will yield a reliable estimate of average properties of the soil.

As recommended in ISO 18400-104, when the distribution of chemical substances on the site under investigation is unknown and it is possible to estimate a uniform distribution of substances on the ground/soil, a non-systematic pattern of sampling, using a X shape and sampling along the diagonals, can be used.

The sampling equipment should be chosen according the criteria described in ISO 18400-102.

The soil samples, once collected should be transported, stored and preserved in accordance with ISO 18400-105.

The following precautions should be considered when collecting soil samples:

As the samples taken will be subjected to chemical analysis tests special care should be taken to ensure they are not contaminated. This should include:

— collecting them in appropriate containers;

— storing samples in a secure location to preclude conditions which could alter the properties of the sample;

— using a clean pair of new, non-powdered, disposable gloves each time a different sample is collected. The gloves should be donned immediately prior to sampling and should be changed any time during sample collection when their cleanliness is compromised;

— using new, verified/certified-clean disposable or non-disposable equipment;

— keeping the sampling equipment clean (cleaning of new containers to remove dust and packing material).

Collected samples should remain in the custody of the sampler or sample custodian until the samples are transported to the laboratory.

Chain-of-custody documents should be filled out and remain with the samples until custody is relinquished to the laboratory that is going to analyse the sample.

C.3 Atmospheric pollutants

Measuring deposition's rates of atmospheric pollutants may be used to assess how the air pollutants may have led to the contamination of infill materials in a field.

The reference methods for the sampling of deposited polycyclic aromatic hydrocarbons, arsenic, cadmium, mercury and nickel are: EN 15980:2011, EN 15841:2009, and EN 15853:2010.

Bibliography

[1] EN 15980:2011, *Air quality — Determination of the deposition of benz[a]anthracene, benzo[b] fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, dibenz[a,h]anthracene and indeno[1,2,3-cd]pyrene*

[2] EN 15841:2009, *Ambient air quality — Standard method for determination of arsenic, cadmium, lead and nickel in atmospheric deposition*

[3] EN 15853:2010, *Ambient air quality — Standard method for the determination of mercury deposition*

[4] CEN/TS 17188:2018, *Materials obtained from end of life tyres (ELT) — Sampling method for granulates and powders stored in big-bags*

[5] ISO 11074, *Soil quality — Vocabulary*

[6] ISO 18400-100, *Soil quality — Sampling — Part 100: Guidance on the selection of sampling standards*

[7] ISO 18400-102, *Soil quality — Sampling — Part 102: Selection and application of sampling techniques*

[8] ISO 18400-103, *Soil quality — Sampling — Part 103: Safety*

[9] ISO 18400-104, *Soil quality — Sampling — Part 104: Strategies*

[10] ISO 18400-105, *Soil quality — Sampling — Part 105: Packaging, transport, storage and preservation of samples*

[11] ISO 18400-107, *Soil quality — Sampling — Part 107: Recording and reporting*

[12] ISO 18400-202, *Soil quality — Sampling — Part 202: Preliminary investigations*

[12] ISO 18400-205, *Soil quality — Sampling — Part 205: Guidance on the procedure for investigation of natural, near-natural and cultivated sites*

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