

## Installation of self-laying Carpet Tiles and Sheets

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## 1. Introduction

This technical briefing note advises the installer on installation and demounting of self-laying carpet tiles and sheets (designated as SL tiles in the following). These SL tiles are primarily used where ready access to installations in hollow or double floors is required or where the floor covering needs to be easily and flexibly replaced in parts or in larger areas. The briefing note gives details regarding properties and range of application of loose-laid or removable SL tiles as well as regarding installation, removal and care.

## 2. Substrates

As for details regarding assessment and preparation of substrates, please refer to TKB Technical Briefing Note 8 “Assessment and Preparation of Substrates for Installation of Floor Coverings and Parquet”.

### 2.1 Screeds

All common screed types such as cement screeds, calcium sulphate (flow) screeds and magnesite floor screeds are suitable for installation of SL tiles on the condition that the screeds are level and ready for installation. Mastic asphalt screeds need

first to be levelled with sufficient thicknesses (2 - 3 mm using calcium sulphate or cement-based levelling compounds) to ensure a uniform absorbency and levelness.

### 2.2 Pre-fabricated Screed Elements

Types, constructions and installation methods for pre-fabricated screed elements as well as tests to be performed and measures to be taken before any kind of floor covering is installed, are described in TKB Technical Briefing Note 8 “Assessment and Preparation of Substrates for Installation of Floor Coverings and Parquet”. SL tiles do not pose particular demands on pre-fabricated screed elements. However, it is important to remove all protrusions in the joint area and if necessary to smooth joints using an appropriate levelling compound. Under certain conditions, it might be advisable to level the entire area covered with pre-fabricated screed elements using a self-levelling compound.

### 2.3 Hollow and double Floors

Types of construction and areas of application for hollow and double floors are described in TKB Technical Briefing Note 8 “Assessment and Preparation of Substrates for Installation of Floor Coverings and Parquet”.

In particular for double floors, SL tiles are a very suitable and commonly used floor covering, since tiles as well as the double floor panels can be easily removed to gain access to the installation level.

### 2.4 Assessment of Substrate

All required substrate tests and their execution prior to installation of SL tiles are described in TKB Technical Briefing Note 8 “Assessment and Preparation of Substrates for Installation of Floor Coverings and Parquet”. In particular, as with installation of other textile or resilient floor coverings, the requirements of DIN 18365 shall be observed.

### 2.5 Preparation of Substrate

The individual measures for preparation of the substrate are described in TKB Technical Briefing Note 8 “Assessment and Preparation of Substrates for Installation of Floor Coverings and Parquet”. It is essential that substrate is clean, even and dry. When pre-fabricated screed elements have been installed, protrusions in the joint area must be removed and level offsets between the panels of double floors must be avoided.

### 3. Loose-laid and removable Carpet Tiles and Sheets

#### 3.1 Structure

As all other textile floor coverings, SL tiles are classified as per ISO 2424 into textile floor coverings with or without pile. Textile floor coverings and SL tiles with pile are then sub-classified into coverings with loop pile (Bouclé) and those with cut-loop pile (velours). Needle felt and twined yarns are also available in tiles. They are an example for floor coverings without pile.

As with all textile floor coverings, these days, the tufting process is prevalent in the manufacturing of textile floor covering tiles. The tufting process is a needle process for the manufacturing of needled floor coverings without pile (needle felt), needled coverings with pile (pile fleece covering) or needled pile carpets (tufting carpets). For some SL tiles the weaving process is used, however only woven carpets with pile are offered as tiles.

For the manufacturing of needlefelt floor coverings, short staple fibres cut from monofilament yarn are needled in one or several layers. The wear layer is mostly made from polyamide, but also other synthetic fibres or natural fibre, e.g. goat hair, are used. The finished needlefelt with one or more layers can then be further strengthened by chemical treatment. Woven pile fleece coverings then receive a structured velour or loop type surface using a special needling technique.

With the tufting process, the pile is threaded into a carrier material. The carrier material must have high strength and dimensional stability and is mostly made from polypropylene or polyester. In general, the carrier is a very stable spun-bonded fleece. The pile threads are made from polyamide or polypropylene, but also natural fibres, mostly wool, are used. Carpets with loop pile as well as those with cut-loop pile are manufactured with the tufting process. In addition, to improve fixation, the pile threads are glued to the carrier (inserted) on the underside. On top of this insert, a heavy coating or similar is applied. This heavy coating is mostly made up of bitumen, PVC or foamed plastics. Of the common types of coating such as SR (foam backing), TR (textile backing), VR (fleece backing), SB (heavy layer backing) and VS (reinforcement layer), only VR and SB are used for SL tiles.

Weaving, the oldest method of carpet manufacturing, is only used for the production of woven pile carpet SL tiles. The carrier fabric is made up of warp yarns and weft runs which run across. Filling warps which run parallel to the warps, increase stability. The pile threads are inserted in the same work step. Woven pile carpets are also produced with loop and cut-loop pile. There are a number of different structures which

differ based on the number of weft runs and the type of binding of the pile yarns. Pile fibres are mostly made of polyamide, however binding, filling and weft fibres can also be made of polyester and polypropylene.

A major feature of SL tiles is that they lie very flat even when not glued to the substrate. However, this requires a structure with very high dimensional stability and a high grammage. Appendix A of DIN 1307 specifies a grammage of  $\geq 3.5 \text{ kg/m}^2$  for loose-laid tiles and  $\geq 2.5 \text{ kg/m}^2$  (tested according to ISO 8543) for glued down removable tiles.

For SL tiles, this grammage is achieved with a heavy coating made from bitumen or PVC, these days also increasingly from polyurethane (PUR), ethylene-vinyl-acetate-copolymers (EVA) or polyolefins.

When SL tiles are installed to be removable or if they are fixated, the non-woven cover fleece of the heavy coating must be firmly attached to the tile.

Considering that the tiles shall be removed frequently, it is advisable to test the bond strength of the combination of backing and fixation.

#### 3.2 Properties

SL tiles are mainly characterized by their dimensional stability and their ability to stay flat even without fixation. Compared to other textile floor coverings, SL tiles have a higher grammage which guarantees flatness.

The tiles are mostly installed on an adhesive medium/tackifier/fixation. This fixation is designed to prevent slipping and raising of edges during use.

The typical sizes of SL tiles are  $50 \times 50 \text{ cm}^2$  or  $60 \times 60 \text{ cm}^2$ . These dimensions correlate with the dimensions of double floor elements which are preferably used as substrates for SL tiles. In addition, this relatively small format supports a good flatness of the tiles.

SL tiles are characterized by a number of parameters, such as edge length, grammage (DIN EN 1307), overall thickness (ISO 1765), manufacturing process (ISO 2424), structure (ISO 2424), pile type, pile service weight (ISO 2424), thickness of the pile layer (ISO 1766), material of pile, carrier and backing or of pile, warp and weft runs, number of tufts (ISO 1763), contact resistance (ISO 10965), surface resistance (ISO 10965), sound insulation improvement ratio (ISO 140-8), impact-sound reduction (EN ISO 354), thermal resistance (ISO 8302) and fire resistance (EN 14041).

The dimensional tolerances for SL tiles are specified in EN 1307. Within one batch, the dimensional tolerance shall not exceed  $\pm 0.2 \%$ ,

with relation to the nominal dimension deviation shall not exceed  $\pm 0.3$  % (tested according to EN 994).

As for dimensional stability, during testing according to EN 986 of self-laying and non-permanently glued down tiles, shrinkage or expansion may not exceed a maximum of 0.2 %. When testing according to EN 986, the SL tiles may only cup or bulge for not more than max. 2 mm.

### 3.3 Applications

SL tiles are used in industrial and residential projects when a certain flexibility in floor construction is required, e.g.

- in offices to have easy access to electrical installations under double or hollow floors
- in hotels and restaurants for easy exchange of soiled or damaged tiles in heavy duty areas
- in store construction and exhibition stand construction for easy and quick installation or renovation
- in all projects where individuality, a variety of designs and variability is required

For these application, the SL tiles are placed on a fixation to secure them against sideways slipping. Consequently, they can later easily be taken up without damage to the tiles and if needed, put back without having to renovate the substrate.

For installation, this entails the following:  
On the one hand, not only floor covering, slip-resistant fixating agent and substrate must be suited for the heavy duty demands of the project but more importantly, the combination system must stand up to these requirements and on the other hand the flexible and non-destructive removal of the SL tiles must be ensured. This requires specialized products and exact observance of special parameters, before, during and after installation.

## 4. Installation

### 4.1 Storage and Conditioning

SL tiles must be stored in a dry place. If manufacturer has not issued diverging instruction, the SL tiles must be unpacked and conditioned for a period of 1 - 2 days at temperatures between 18 °C and 22 °C and a relative air humidity of 45 – 65 %. In order to prevent excessive stress on lower tiles, tiles shall not be stacked too high. This applies if flooring manufacturer has not issued other instructions.

### 4.2 Installation conditions

During installation and for 7 days after installation, the following ambient conditions shall be observed:

- substrate temperature: min. 15 °C
- material temperature: min. 15 °C
- substrate temperature with underfloor heating systems: 18 – 22 °C (3 days before and up to 7 days after installation)
- air temperature: min. 18 °C
- relative humidity: preferably 40 – 65 %, max. 75 %
- since SL tiles react to changes in relative humidity, always carefully observe above conditions.

### 4.3 Application of anti-slip Layer

As their name implies, SL tiles are self-laying and based on their structure and depending on their grammage, do not necessarily require to be glued down. One advantage of self-laying tiles is that they can easily be taken up which makes them the ideal floor covering option for double and hollow floors. Consequently, SL tiles are only prevented from slipping by application of a special fixation. These are mostly special polymer dispersions, often designated as SL tile fixation or anti-slip layers. Once dry, they form an elastic film with low adhesion properties so that SL tiles can be taken up easily without damage to tile and can be re-used if required.

If manufacturer has not issued other instructions, the fixation shall be applied with an appropriate fine-pored foam roller in a thin layer using a stripping grid. With double floor systems it shall be ensured that the liquid fixation does not enter between the individual floor panels, since panel edges might glue together and subsequently panels are difficult to remove at a later date. To avoid leakage of fixation between panels, mask the joints or apply fixation panel by panel.

The adhesion film must air completely and must be absolutely dry in order to prevent floor covering to be glued down permanently. If tiles are placed on film too early, instead of a anti-slip effect, a full bond is achieved and SL tiles can be damaged when taken up.

### 4.4 Installation of Floor Covering

On delivery, the pallets with SL tiles are often numbered or the installation sequence of the individual pallets is specified. The boxes normally have batch numbers which must be followed on account of colour tolerances. The SL tiles need to be conditioned before installation as described under 4.1.

The SL tiles must lay flat even without adhesion film applied. SL tiles with cupped edges or bulging centres must be discarded.

During installation, make sure there are no significant colour deviations from tile to tile. For this reason, always observe the numbering of consignment described above.

Direction of installation is normally indicated on backside of tile. Always observe manufacturer's instructions regarding installation direction.

For installation, make sure that cut tiles on facing walls are roughly the same size.

After room has been measured, installation starts in the centre of the room. It has been proven helpful to install tiles along an exact rectangular reference line. First, 4 tiles are fixated and serve as starting point for the rest of the installation. Installation is then continued in a stepped manner, joint meeting joint. Always make sure that protruding pile of velours tiles is not wedged in or bent.

When installing SL tiles on double floor panels, SL tiles with identical edge lengths as floor panels (normally 60 x 60 cm<sup>2</sup>) are aligned to the existing double floor grid so that the centre of the SL tiles covers the crossing point of the double floor panels. By this type of offset installation, joints of double floor panels are best covered. When using SL tiles size 50 x 50 cm<sup>2</sup>, a partial overlap of joints between tiles and joints of double floor panels is unavoidable.

#### 4.5 Conductive Installation

The surface and contact resistance of SL tiles is typically approx. 10<sup>8</sup> to 10<sup>9</sup> Ω. For conductive installations, conductive fixation media are used. Typically, a conductive agent is added to the regular SL tile fixation. The surface conductivity of such conductive fixations is between 10<sup>5</sup> to 10<sup>7</sup> Ω. Conductive installation of anti-static SL tiles normally results in an overall contact resistance of 10<sup>8</sup> to 10<sup>9</sup> Ω.

A defined grounding is achieved by placing a blank copper strip (w = 10 mm, t = 0.1mm) into the fixation layer. The copper strip shall be installed circularly in the room with a wall clearance of 25 cm. For grounding of conductive floors, potential equalization is required for every 30 m<sup>2</sup> of surface (VDE 0107/3.68). A copper strip with a length of min. 1 meter is placed in the fixation layer and shall overlap the copper strip which has been installed along the walls with 25 cm clearance. This copper strip shall jut out by 1 meter from installation surface to serve as terminal for the electrician to make potential equalization.

#### 4.6 Taking up and Re-use of SL Tiles

In order to ensure proper re-use of the SL tiles, the tiles shall be removed by a professional installer. The tiles have to be taken up carefully and be properly stored in an air-conditioned place. After tiles have been taken up, it must be ensured that the fixation film is not exposed to dirt or dust.

The floor space with the exposed anti-slip layer shall be protected from dust and dirt by covering it with a PE sheets.

When replacing the SL tiles, it shall be made sure that each tile goes back to its initial position in order to maintain the original appearance. This ensures that the original colour variation pattern is restored.

### 5. Cleaning and Care

SL tiles shall only be cleaned with dry cleaning processes or using special cleaning pads. Wet cleaning methods, e.g. spray extraction or wet shampooing, are not admissible to prevent damage to floor covering and substrate. This applies if flooring manufacturer has not issued other instructions.

### 6. Relevant Standards and Technical Briefing Notes

In the following, please find the relevant applicable standards and technical briefing notes. They represent the version valid at time of publication.

#### 6.1 Industrial Safety

Gefahrstoffverordnung (vom 26.08.1986)  
Verordnung zum Schutz vor gefährlichen Stoffen in der gültigen Fassung vom 23. Dezember 2004  
12-2004  
Bundesgesetzblatt

GISCODE für Verlegewerkstoffe  
aktuelle Fassung  
Gefahrstoff-Informationssystem der Berufs-  
genossenschaften der Bauindustrie; Frankfurt

EMICODE  
aktuelle Fassung  
Gemeinschaft Emissionskontrollierte Verlege-  
werkstoffe, Klebstoff und Bauprodukte e.V.;  
Düsseldorf

TRGS 600  
Substitution  
08-2008  
Ausschuss für Gefahrstoffe (AGS)  
Bekanntgegeben durch Bundesministerium für  
Arbeit und Soziales

**TRGS 610**

Ersatzstoffe und Ersatzverfahren für stark lösemittelhaltige Vorstriche und Klebstoffe für den Bodenbereich  
03-1998

Ausschuss für Gefahrstoffe (AGS)

Bekanntgegeben durch Bundesministerium für Arbeit und Sozialordnung

**TRGS 613**

Ersatzstoffe, Ersatzverfahren und Verwendungsbeschränkungen für chromathaltige Zemente, chromathaltige zementhaltige Zubereitungen  
10-2002

Ausschuss für Gefahrstoffe (AGS)

Bekanntgegeben durch Bundesministerium für Arbeit und Sozialordnung

**TRGS 900**

Grenzwerte in der Luft am Arbeitsplatz  
Erscheinungsdatum/Herausgeber: 01-2006

Ausschuss für Gefahrstoffe (AGS)

Bekanntgegeben durch Bundesministerium für Arbeit und Sozialordnung

**6.2 TKB Technical Briefing Notes****Technical Briefing Note 8**

Assessment and Preparation of Substrates for Installation of Floor Coverings and Parquet  
06-2004

Technische Kommission Bauklebstoffe of Industrieverband Klebstoffe; Düsseldorf

**Technical Briefing Note 9**

Technical Specification and Installation of Floor Levelling Compounds  
04-2008

Technische Kommission Bauklebstoffe of Industrieverband Klebstoffe; Düsseldorf

**6.3 Standards for Floor Covering Work****DIN 18365**

VOB Vergabe- und Vertragsordnung für Bauleistungen - Teil C: Allgemeine Technische Vertragsbedingungen für Bauleistungen (ATV) – Bodenbelagsarbeiten  
10-2006

**DIN 18202**

Toleranzen im Hochbau  
10-2005

**6.4 Standards for Textile Floor Coverings****DIN ISO 2424**

Textile floor coverings – Vocabulary  
01-1999

**DIN EN 685**

Resilient, textile and laminate floor coverings – Classification  
11-2007

**DIN EN 14041**

Resilient, textile and laminate floor coverings – Essential characteristics  
05-2008

**DIN EN 986**

Textile floor coverings – Tiles – Determination of dimensional changes due to the effects of varied water and heat conditions and distortion out of plane  
03-2006

**DIN EN 994**

Textile floor coverings - Determination of the length of the edges and squareness of tiles  
08-1995

**ISO 1765**

Machine-made textile floor coverings - Determination of thickness  
11-1986

**ISO 1766**

Textile floor coverings - Determination of thickness of pile above the substrate  
10-1999

**ISO 1763**

Carpets - Determination of number of tufts and/or loops per unit length and per unit area  
11-1986

**ISO 10965**

Textile floor coverings - Determination of electrical resistance  
11-1998

**DIN CEN/TS 14159**

Textile floor coverings - Requirements for tolerances on (linear) dimensions of rugs, runners, carpet tiles and wall-to-wall carpet and for tolerances on pattern repeat  
07-2007

## 6.5 Other Standards

DIN 18299

VOB Vergabe- und Vertragsordnung für Bauleistungen - Teil C: Allgemeine Technische Vertragsbedingungen für Bauleistungen (ATV) – Allgemeine Regeln für Bauarbeiten jeder Art  
10-2006

DIN 1960

VOB Vergabe- und Vertragsordnung für Bauleistungen - Teil A: Allgemeine Bestimmungen für die Vergabe von Bauleistungen  
05-2006

DIN 1961

VOB Vergabe und Vertragsordnung für Bauleistungen - Teil B: Allgemeine Vertragsbedingungen für die Ausführung von Bauleistungen  
10-2006

DIN EN ISO 140-8

Acoustics - Measurement of sound insulation in buildings and of building elements - Part 8: Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight standard floor  
03-1998

DIN ISO 354

Acoustics - Measurement of sound absorption in a reverberation room  
12-2003

ISO 8302

Thermal insulation - Determination of steady-state thermal resistance and related properties - Guarded hot plate apparatus  
08-1991

## 6.6 Literature and Commentaries

Harald Kaulen, Günter Hahn, Ortwin Baumann  
Erläuterungen zur DIN 18365 – Bodenbelagarbeiten und DIN 18299  
Holzmann Verlag, Bad Wörrishofen  
Ausgabe 2002; 6. Auflage 2004

Hans Harald Kaulen, Norbert Strehle, Richard Kille  
Kommentar und Erläuterungen VOB DIN 18299 – Allgemeine Regelungen für Bauarbeiten jeder Art, Band 1  
Holzmann Verlag, Bad Wörrishofen  
2008

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Kommentar zur DIN 18365 Bodenbelagsarbeiten  
SN-Verlag, Hamburg  
2006

Karl Remmert, Josef Heller, Horst Spang  
Fachbuch für Bodenleger  
SN-Verlag Hamburg  
2003