TKB-Briefing Note 15

Installation of Design and Multi-Layer Floor Coverings

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- Bundesverband Estrich und Belag e.V.
- Zentralverband Raum und Ausstattung
- Bundesverband der vereidigten Sachverständigen für Raum und Ausstattung e.V.
- Fachverband der Hersteller elastischer Bodenbeläge e.V.
- Verband mehrschichtig modularer Fußbodenbeläge e.V.
- Bundesverband Farbe Gestaltung Bautenschutz

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1. Introduction

This briefing note contains information for installers regarding selection of materials for installation of design and multi-layer floor coverings. It describes the different types of floor coverings and classifies them according to the relevant European standards and type of installation. This briefing note only deals with floor coverings with a synthetic top layer, such as PVC, Polyurethane and linoleum. For installation, the specific properties of the individual floor covering as well as the specific use requirements must be taken into consideration. Based on these parameters, the type of required substrate preparation as well as type of installation and suitable adhesive types are described.

2. Classification of Design- and Multi-layer Floor Coverings

Design and multi-layer floor coverings consist of multi-layer sheets, tiles, planks, boards or panels. Generally, the bottom-up structure is as follows:

- backing
- carrier and stabilizer insert if needed
- top layer or decorative layer
- wearing surface and sometimes surface finish

Not all floor coverings necessarily are comprised of all layers described above, some may even have additional layers, e.g. for impact sound insulation. (Note: On installation site, additional surface treatments may be applied, such as sealers, finish or initial care treatment. This is not part of the installation and must be agreed separately if needed).

These floor coverings are manufactured with a wide range of decors, such as stone, wood, metallic and various other looks.

They are produced in different thicknesses and structures for various applications and installation methods.

Design and multi-layer floor coverings are described in the following standards:

- DIN EN ISO 10582:2012-04 „Resilient floor coverings - Specification for heterogeneous vinyl flooring to include luxury vinyl tile requirements“
- DIN EN 14085:2011-07 „Resilient floor coverings - Specification for floor panels for loose laying; DIN EN 16511:2014-08 „Loose-laid panels - Semi-rigid multilayer modular floor covering (MMF) panels with wear resistant top layer“

- E DIN EN 16776: „Resilient floor coverings - Heterogeneous polyurethane floor coverings – Specification“

Often, the term LVT, i.e. Luxury Vinyl Tiles is used synonymously for design floor coverings. However, this term can only be used for vinyl or PVC design floor coverings and from a technical standpoint it may even be misleading.

Generally, for all types of floor coverings, a proper preparation of the substrate is essential for subsequent damage-free use and high-quality and attractive visual impression.

In the following sections, design and multi-layer floor coverings are classified according to the type of installation.

2.1. Floor coverings for gluing down

This group includes thin (up to 4 mm) multi-layer synthetic floor coverings without locking system designed exclusively for bonding according to manufacturer instructions.

These floor coverings are suitable for many areas of application and even for heavy traffic areas. The proper adhesive must be selected based on the expected loads the floor will be subjected to (also see section 5).

2.2. Self-adhesive floor coverings

This group includes thin (up to 4 mm) multi-layer synthetic floor coverings without locking system, already pre-coated with a pressure-sensitive adhesive by the manufacturer.

These floor coverings are only suited for areas of application with light loads (e.g. residential areas without strong temperature fluctuations). The load bearing capacity can not be increased by using additional adhesives when installing the floor covering.

2.3. Floor coverings for floating installation

This group includes thick (starting from 4 mm) multi-layer synthetic floor coverings with polymer compact or wood composite carrier with locking system designed for floating installation according to manufacturer.

Admissible loads are based on manufacturer specifications. In consultation with flooring and adhesive manufacturer, higher loads may be permissible by full-surface bonding on properly prepared substrate.

2.4. Self-laying floor coverings

This group includes thick (starting from 4 mm) multi-layer synthetic floor coverings with polymer compact carrier without locking system designed for self-laying installation according to manufacturer.

These floor coverings are suited for areas of application with light loads (e.g. residential areas without strong temperature fluctuations), some manufacturers also recommend them for industrial objects with higher traffic and heavier loads. In consultation with flooring and adhesive manufacturer, higher loads may be permissible by full-surface gluing on properly prepared substrate (also see table 1, section 5.1.).

2.5. Other design and multi-layer floor coverings

This briefing note does not address other flooring structures not covered by the standards listed under section 2. Installation of other design and multi-layer floor coverings is performed according to manufacturer instructions. In case the structure is comparable, information in chapters 2.1. to 2.4. can be applied by analogy.

3. Preparation of Substrate

Detailed instructions and a description of all required tests are contained in the following briefing notes (only available in German language):

- TKB-Merkblatt 8 „Beurteilen und Vorbereiten von Untergründen für Bodenbelag- und Parkettarbeiten“
- BEB-Hinweisblatt „Beurteilen und Vorbereiten von Untergründen“

Typically, there are high standards for the optical appearance of surfaces constructed from design or multi-layer floor coverings. Consequently, the same standards apply for the substrate, in particular regarding evenness which may exceed the requirements demanded by DIN 18202, table 3, line 4.

The ZVPF Technical Information Sheet No. 2 "Qualitätsanforderungen an die Ebenheit von Untergründen für Bodenbeläge und Parkett" contains information regarding the possible quality classes which can be agreed between customer and installer.

Basically, on screeds, a leveling compound must be applied with a screed rake and a minimum thickness of 2mm (for screeds according to DIN 18202, Table 3, line 4) or 3mm (for screeds according to DIN 18202, Table 3, line 3) with subsequent leveling of the surface using a spiked

roller to achieve optimum evenness of the substrate. In the event that subsequently additional corrections are needed, the substrate can be sanded off and reworked using a fine leveling compound which can be feathered out to zero.

4. Types of adhesives

4.1. Dispersion and reaction resin adhesives

The adhesives described in this chapter in combination with the specified floor coverings comply with the requirements of DIN EN 14259.

4.1.1. Dispersion adhesives

Dispersion adhesives consist of organic binders, inorganic fillers and additives dispersed in water. Setting takes place based on a physical process by evaporation of the water. The setting characteristic of dispersion adhesives is influenced mainly by the room climate conditions as well as absorbency of the substrate. High temperatures and/or low humidity accelerate, low temperatures and/or high humidity slow down the setting process.

Dispersion adhesives are preferably used in a wet bonding process. This requires an absorbent substrate. For non-absorbent substrates, appropriate leveling compounds must be applied first with a layer thickness of minimum 3 mm to make the substrate absorbent.

Dispersion adhesives are not recommended for installations using pressure-sensitive bonding on account of the risk of residual impressions in design and multi-layer coverings.

Dispersion contact adhesives are processed with contact bonding. They are applied to both sides, i.e. on the prepared substrate as well as to the back of the floor covering and are flashed off sufficiently before installing the covering.

4.1.2. Reaction resin adhesives

Reaction resin adhesives used for bonding of design floor coverings are mostly two-component polyurethane resin adhesives, curing through chemical reaction. The curing speed is mainly influenced by temperature of adhesive, substrate and floor covering. They require strict adherence to the specified mixing ratio and careful mixing of the two components; they have a limited pot life and processing time, which always requires good organization of the bonding sequence.

4.2. Pressure-sensitive dispersion tackifiers for design floor coverings

These tackifiers are pressure sensitive formulations which are applied in lesser quantities than dispersion adhesives. Their properties as regards surface tack, final strength and interaction with floor coverings are specially tailored to design floor coverings. After professional installation, the coverings are immediately durable.

Products of this type are available on the market under designations such as roll adhesive for PVC design floor coverings, roll tackifier for PVC design floor coverings, pressure sensitive tackifier for PVC design floor coverings or similar. They are different from regular universal or non-slip tackifiers for SL tiles.

4.3. Dry adhesives/Self adhesive tapes

Dry adhesives are rolls and strips of various widths, self-adhesive on both sides. Manufacturers produce ready-to-use dry adhesives which do not need flash, curing or drying time. After professional installation, the coverings are immediately durable.

Depending on type and area of application, dry adhesives have different structures (composition of adhesive raw materials, with or without carrier, type of carrier material, thickness of adhesive film, permanent bonding or removable). The dry adhesive must therefore be selected to meet the requirements of the respective application (also see TKB briefing note 12).

5. Installation of design floor coverings

5.1. Types of installation

Besides the type of floor covering, the following factors play an essential role in deciding on type of installation:

- expected mechanical loads, e.g. residential spaces, industrial spaces, frequency of use, level of load.
- expected thermal stress, e.g. caused by underfloor heating or direct sunlight.
- expected moisture impact from above, e.g. wet areas, shops (entrance areas).

Table 1: Selection of floor covering and adhesive based on expected loads and use

	Cloor Coverings for gluing down			Self-adhesive Coverings	Click Floor Coverings with or without Carrier	Self-laying Floor Coverings
	Tckifier Dry Adhesive	Disper-sion Adhesive	Reaction Resin Adhesive			
Residential Area	X	X	X	X	X	X
Industrial Area	(X)*	X	X		X	
Temperature Impact		(X)*	X		(X)*	
Moisture Impact		(X)*	X		(X)*	

(*) based on manufacturer recommendations

5.2. Storage and Conditioning

Manufacturer instructions regarding storage and conditioning must be followed. Basically, design and multi-layer floor coverings shall be stored in a dry place and at temperatures between 15º and 25º C. Never expose floor coverings to direct sunlight, store panels and floor covering elements/planks flat in carton.

5.3. Installation conditions

Before installation, the floor coverings shall be conditioned according to manufacturer's instructions. This step is essential for the success of the installation process.

Preferably, the relative humidity for installation shall be in the range of 40-65%, however shall not exceed 75%. The ambient temperature as well as the temperature of the materials used for installation, e.g. floor covering and adhesive, shall be at least 18º C, floor temperature shall not fall below 15º C.

Based on the curing, drying and reaction times of the installation materials, the above climatic conditions must be maintained during and up to 7 days after floor covering work is completed.

In the event that during curing time of the adhesive temperatures increase, e.g. caused by direct sunlight, dimensional changes of the coverings may occur. Consequently, floor coverings and installation materials must be protected from direct sunlight or other heat sources before, during and after installation until adhesive is completely cured. Only place furniture on the floor covering after complete curing of the adhesive.

In addition, strictly adhere to specifications of installation material and floor covering manufacturers.

Design floor coverings are often used with wood decors. The laying pattern should mirror that of parquet: with irregular pattern ("wild pattern"), the individual boards shall be installed in individual rows. In each row, the strips are offset randomly. For bonding on substrate, a minimum offset of double the width of the planks needs to be observed. Minor deviations are admissible. Experience of the installer makes a decisive contribution to a pleasing appearance of the floor. For floating installation, not only optical but also technical manufacturer requirements regarding minimum offset must be observed.

5.4. Bonding or fixating

5.4.1. Dispersion and reaction resin adhesives

Dispersion and reaction resin adhesives according to section 4.1. are suited for firm and permanent bonding as per requirements of EN 14259. They are applied to the substrate using the recommended TKB notched trowel. The floor covering is then placed in the wet adhesive bed after it has flashed off for a short period. The working time specified by the adhesive manufacturer must be adhered to in order to ensure that the complete surface of the floor covering backing is sufficiently wetted.

Immediately after laying, the floor covering shall be rubbed down and, in particular for larger areas of more than 50 m2, after a waiting time specified by the adhesive manufacturer is pressed down using a heavy, 50 kg multisectional roller. This ensures adequate wetting of the backing of the floor covering and complete crushing of the adhesive ridges. This process prevents adhesive squashing during use and resulting indentations.

Dispersion adhesives can only be used with the wet bonding process described here if the substrate is sufficiently absorbent.
For non-absorbent substrates it is recommended to preferably use reaction resin adhesives for firm and permanent bonding.

5.4.2. Pressure-sensitive dispersion tackifiers

Liquid tackifiers according to section 4.2. are applied with a pressure-sensitive bonding process on absorbent as well as non-absorbent substrates. On absorbent substrates, a primer is recommended before adhesive is applied. The adhesives are applied with a roller. The design floor covering is placed in the completely flashed off tacky adhesive bed. With a finger test it can be checked whether a dry (to prevent water inclusions) adhesive film with sufficient surface tack has formed. When pressing a finger tip onto the adhesive film, no adhesive residue shall adhere to the finger. Many tackifiers change their color during drying – from milky to transparent.

The floor covering must be installed during the working time specified by the adhesive manufacturer. Then, the area, especially larger areas of more than 50 m2, is carefully pressed down using a heavy, 50 kg multisectional roller.
In areas with high thermal influences, this type of installation is not recommended on account of the risk of joint openings and protrusions.
With this process, the risk of adhesive squashing is relatively low on account of the evenly applied thin adhesive film, same as with the wet bonding process.

5.4.3. Dry adhesives/Self adhesive tapes

Generally, when using dry adhesives, floor coverings shall be glued to the complete surface according to section 4.3.

They may be applied to leveled new substrates as well as on suited, sufficiently firm and thoroughly cleaned old substrates. Depending on the substrate, a primer may be required. Please adhere to manufacturer instructions.

In a first step, the dry adhesive is applied over the whole area without joints and overlaps, with the protective paper on the surface not yet removed. Then, only remove enough protective paper as required to place down the first row of planks or tiles. Install the floor covering and rub it down carefully with a cork board. Then, continue to peel off the protective paper and glue on the next row with the respective offset depending on the desired pattern. Repeating these steps, the whole room is completed. It is recommended, in particular for larger areas of more than 50 m2, to carefully press down the floor covering using a heavy, 50 kg multisectional roller. After this step, the area is immediately durable.

When cutting the floor covering to size, avoid severing the dry adhesive film.

In areas with high thermal influences, this type of installation is not recommended on account of the risk of joint openings and protrusions.
With this process, the risk of adhesive squashing is extremely low on account of the evenly applied thin adhesive film.

For all types of installation listed in section 5.4., the following information applies:

Impressions visible in sidelight caused by high concentrated loads can never be completely ruled out for resilient floor coverings. However, they can be minimized by selecting the right adhesive and adhesive quantity applied, professional processing and the use of suitable chair and furniture gliders (preferable large ones with level and even contact areas, no sharp edges) and/or suitable pressure distribution mats under movable furniture or rollers (type W according to EN 12529).
In addition, use must be adapted to the type of floor construction.

5.5. Loose-lay or floating installation

For loose-lay or floating installation, a professional substrate testing and preparation is required, as described in chapter 3. Installation is performed following manufacturer's installation instructions. In particular, floor coverings need to be sufficiently conditioned. Edge joints must have a minimum width of approx. 5mm, if needed use spacers. Depending on the size of the installation area, expansion joints must be provided.

6. Relevant Standards and Briefing Notes

In the following, relevant standards and briefing notes are listed. The list reflects the current status at time of publication of this briefing note. If the title is not listed here in English, the publication is available in German only.

6.1 Occupational Safety

Verordnung zum Schutz vor Gefahrstoffen (Gefahrstoffverordnung - GefStoffV) vom 23. Dezember 2004 (BGBl. I S 3758), geändert durch Artikel 2 der Verordnung vom 18. Dezember 2008 (BGBl. I S 2768)

TRGS 430
Isocyanate - Gefährdungsbeurteilung und Schutzmaßnahmen (März 2009) Ausschuss für Gefahrstoffe (AGS) GMBl 2009 Nr. 18/19 (04.05.2009)

TRGS 610
Ersatzstoffe und Ersatzverfahren für stark lösemittelhaltige Vorstriche und Klebstoffe für den Bodenbereich (Januar 2011)
Ausschuss für Gefahrstoffe (AGS) GMBI 2011, Nr.8 (2.3.2011)

TRGS 900
Arbeitsplatzgrenzwerte (Januar 2006) Ausschuss für Gefahrstoffe (AGS) BArbBl. Heft 1/2006 zuletzt geändert und ergänzt: GMBl 2016 Nr. 45 (4.11.2016)

TRGS 907
Verzeichnis sensibilisierender Stoffe (Bekanntmachung des BMA nach § 52 Abs. 3 Gefahrstoffverordnung) (November 2011) Ausschuss für Gefahrstoffe (AGS) GMBI 2011 Nr. 49 - 51

EMICODE
Association for the Control of Emissions in Products for Flooring Installation, Adhesives and Construction Products e.V. (GEV – Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e.V.)

6.2 Standards for floor coverings

DIN EN ISO 10582:2016-07 - Resilient floor coverings - Specification for heterogeneous vinyl flooring to include luxury vinyl tile requirements

DIN EN 14041:2016-07 – Resilient, textile and laminate floor coverings - Essential characteristics

DIN EN 14085:2011-07
Resilient floor coverings - Specification for floor panels for loose laying

DIN EN 16511:2014-08
Loose-laid panels - Semi-rigid multilayer modular floor covering (MMF) panels with wear resistant top layer

DIN EN 16776:2016-09
Resilient floor coverings - Heterogeneous polyurethane floor coverings – Specification

6.3 Standards for adhesives for installation of floor coverings

DIN EN 14259:2004-07
Adhesives for floor coverings - Requirements for mechanical and electrical performance

DIN EN 1372:2015-06
Adhesives - Test method for adhesives for floor and wall coverings - Peel test

DIN EN 1373:2015-06
Adhesives - Test method for adhesives for floor and wall coverings - Shear test

DIN EN 1903:2015-07
Adhesives - Test method for adhesives for plastic or rubber floor coverings or wall coverings - Determination of dimensional changes after accelerated ageing

DIN EN 13415:2010-05
Test of adhesive for floor covering - Determination of the electrical resistance of adhesive films and composites;

6.4 Standards for floor covering work

DIN 18365:2015-08
VOB Vergabe- und Vertragsordnung für Bauleistungen - Teil C: Allgemeine Technische Vertragsbedingungen für Bauleistungen (ATV) – Allgemeine Regelungen für Bauarbeiten aller Art - Bodenbelagsarbeiten

6.5 Technical Briefing Notes of TKB

TKB Briefing Note 6
Trowel Notch Sizes for Installation of Floor Coverings, Wood Flooring and tiles
05-2007

TKB-Merkblatt 8
Beurteilen und Vorbereiten von Untergründen für Bodenbelag- und Parkettarbeiten
04-2015

TKB Briefing Note 9
Technical Specification and Installation of Floor Leveling Compounds
04-2008

TKB Briefing Note 12
Installation of Floor Coverings with Dry Adhesives
01-2010

6.6 Other Standards and Briefing Notes

BEB-Hinweisblatt
Beurteilen und Vorbereiten von Untergründen im Alt- und Neubau.
03-2014

ZVPF-Technisches Hinweisblatt Nr.2
Qualitätsanforderung an die Ebenheit von Untergründen für Bodenbeläge und Parkett
07- 2016

DIN 18299:2016-09
VOB Vergabe- und Vertragsordnung für Bauleistungen - Teil C: Allgemeine Technische Vertragsbedingungen für Bauleistungen (ATV) – Allgemeine Regelungen für Bauarbeiten aller Art

DIN 1960:2016-09
VOB Vergabe- und Vertragsordnung für Bauleistungen, Teil A: Allgemeine Bestimmungen für die Vergabe von Bauleistungen

DIN 1961:2016-09
VOB Vergabe- und Vertragsordnung für Bauleistungen, Teil B: Allgemeine Vertragsbedingungen für die Ausführung von Bauleistungen

6.7 Other literature and commentaries

Hans Harald Kaulen, Norbert Strehle, Richard Kille
Kommentar und Erläuterungen VOB DIN 18365 – Bodenbelagarbeiten
Ausgabe 2009; 7. Auflage, 2010

Arbeitskreis Bodenbeläge im Bundesverband Estrich und Belag e. V.
Kommentar zur DIN 18365 Bodenbelagsarbeiten
2. Auflage, 2011