

GENERAL COMMERCIAL TERMS TECHNISTONE, a.s.

- Part I: General commercial conditions for sale
- Part II: Complaint rules
- Part III/1: General technical manual
- Part III/2: Technical manual for tiles installation
- Part III/3: Manual for cleaning and maintenance
- Part III/4: Technical manual for fabrication shops
- Part III/5: Manual Translucent

PART III/2

TECHNICAL MANUAL FOR TILES INSTALLATION

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1. Definitions

1.1. Engineered stone

Technistone[®] is produced from high-quality natural raw materials (quartzes, granites), mirror and glass granulates, from a small amount of color pigments and quality polyester resin. More than 90% of the product mass is formed by natural components.

- The polyester resin used as a binder causes not only the increase in the strength characteristics, but also in the thermal expansion of the product. Therefore, it is necessary to take this fact into consideration during designing the floors and wall claddings from Technistone[®]. Technistone material is suitable for surfaces with floor heating.
- Technique of production and used raw materials caused very low water absorption of the material. Therefore, pretensions for the base and adhesives or jointing materials are different as for natural stone or ceramic.
- The product Technistone[®] is recommended **for interior use only**. For exterior facades product Technistone Exterior[®] is recommended.

1.2. Tile

Finished products prepared by cutting from basic slab sizes into tiles formats, various thicknesses, sizes (max. 600 x 600 mm, bigger sizes are non-standard formats) and surface finishes (according to EN 15285 standard).

2. Technical parameters of the product

2.1. Tiles

Non-standard shapes, dimensions, sizes and physical-mechanical properties of the product can be made as well but must be agreed to by the manufacturer and customer in advance.

2.1.1. Sizes of tiles

From the basic thickness of the slab a whole-format product can be prepared in the form of a slab or other elements may be cut – the tiles. The basic dimensions of the tiles are 30 x 30 cm, 40 x 40 cm, 60 x 30 cm and 60 x 60 cm. The products can be manufactured in thickness from 10 up to 30 mm, the standard thickness being 10, 12 and 20 mm.

2.1.2. Tolerances of the tile sizes

Allowed deviations correspond with EN 15285 Agglomerated stone – Modular tiles for flooring and stairs (internal and external); techniques of measurement correspond with EN 14617-16.

Maximal permitted size tolerances of tiles

Characteristics	Testing method	Declared value
Size - length and width	EN 14617-16	± 0,5 mm
Side straightness	EN 14617-16	± 0,3 mm
Rectangularity	EN 14617-16	± 0,9 mm
Flatness - central deformation - side deformation - torsion	EN 14617-16	± 0,2 % related to length

2.1.3. Tolerances of the tile thickness

Allowed deviations correspond with EN 15285 Agglomerated stone – Modular tiles for flooring and stairs (internal and external); techniques of measurement correspond with EN 14617-16.

Tolerances: + 0,5 mm / - 0,5 mm from the basic thickness of the slab.

Basic thickness for polished, antique and slate finish is 10 mm, 20 mm or 30 mm. Basic thickness for brushed finish is 19,2 mm or 29,2 mm.

2.1.4. Physical-mechanical characteristics of the product

Basic technical requirements for physical-mechanical specifications of the tiles (according to standard EN 1585 Agglomerated stone – Modular tiles for flooring and stairs). The tests are performed on the machined product not earlier than 24 hours after the production of the semi-finished product. (The requirements for the absorbability are set at the level of surface machining: polished; the requirement for the flexural strength is set for the thickness 10 mm of the test sample).

Classification of tiles according to their characteristics

Production group	Water absorption	Flexural strength (bending)	Reaction to fire	Heat conductivity	Slipperiness
	(%)	(MPa)	-	(W/mK)	SRV dry/ SRV wet (type of the surface)
Sand	$W_4 \leq 0,05$	$F_4 \geq 40$	B _{fl} , s1	1,3 (tabular value)	86/50 (slate) 83/44 (brushed) 80/32 (honed) 72/23 (polished)
Granite	$0,5 \geq W_3 > 0,05$	$25 \leq F_3 < 40$			
Mirrors	$W_4 \leq 0,05$	$F_4 \geq 40$			
Crystal	$W_4 \leq 0,05$	$F_4 \geq 40$			
Applied standard	EN 14617-1	EN 14617-2	EN 13501-1	EN 12524	EN 14231

Another characteristics of tiles

Production group	Abrasion resistance <i>maximum</i>	Coefficient of the linear thermal expansion α (30 up to 60 °C) <i>maximum</i>	Coefficient of the linear thermal expansion α (20 up to 130°C) <i>maximum</i>	Coefficient of the linear thermal expansion α (20 up to 70 °C) <i>maximum</i>	Coefficient of freeze resistance <i>minimum</i>
	(mm)	($10^{-6} / ^\circ\text{C}$)	($10^{-6} / ^\circ\text{C}$)	($10^{-6} / ^\circ\text{C}$)	-
Sand	25	30	35	40	0,80
Granite		20	25	35	
Mirrors		25	30	40	
Crystal		35	40	43	
Applied standard	EN 14617-4	EN 14617-11	EN 14617-11	EN ISO 10545-8	EN 14617-5

2.1.5. Linear thermal expansion coefficient

Linear thermal expansion	Standard	Linear thermal expansion coefficient ΔT (30-60)°C		Linear thermal expansion coefficient ΔT (20-130)°C	
		Required values (maximum)	Real values (average)	Required values (maximum)	Real values (average)
Production Group	EN 14617-11	Unit [$^{\circ}\text{C}^{-1} \times 10^{-6}$]			
Sand		30	21,8	35	30
Granite		20	13,4	25	17,3
Mirrors		25	17,5	30	22,7
Crystal		35	17,5-31	40	22,7-37,9
Source	TZÚS Plzeň institute Czech Republic				

The usage of the thermal expansion coefficient α during the calculation:

$$\text{Relation : } \delta_1 = \alpha \times (c_2 - c_1) \times l_0$$

δ_1 = length difference (mm)

α = thermal expansion coefficient

c_2 = final temperature (°C)

c_1 = initial temperature (°C)

l_0 = initial length (mm)

Example:

Tile Taurus Brown Pearl 40 x 40 cm, temperature change from 20 to 70 °C. The length difference of one tile due to temperature change δ_1 is 0,42 mm. To be calculated after substitution of the relevant values into the relation. According to that, the tile size will be 400,42 mm long at the temperature of 70 °C ($\alpha = 21 \times 10^{-6}$, $c_2 = 70$ °C, $c_1 = 20$ °C, $l_0 = 400,0$ mm).

2.1.6. Antislipperness properties of the product surface**Antislipperness according to DIN 51130 (ČSN 725191)**

Slip - resistance DIN 51130 (ČSN 725191, shoe)			
Production group	Surface finish	angle (°)	classification
Sand	Honed	12,0	R10
Granite	Honed	10,2	R10
Granite	Brushed	15,0	R10
Granite	Antique	8,8	R9
Mirrors	Polished	7,0	R9
Mirrors	Honed	13,0	R10
Mirrors	Brushed	16,8	R10
Crystal	Polished	9,0	R9
Crystal	Slate	17,1	R10
Crystal	Honed	11,1	R10

Source TZÚS Praha - branch Plzeň

3. Recommended use of the product

The engineered stone Technistone® may be used for small-sized or large-sized wall and floor tiles, interior components, construction elements, furniture and accessory components.

The product Technistone® is recommended for interior use only. For exterior facades product Technistone Exterior® is recommended.

3.1. Tiles

To use the product for interior tiles it is necessary to follow these recommendations:

3.1.1. Recommended thickness depending on the dimension of the tile (standardly loaded areas)

Product sizes (cm)	Minimal recommended product thickness (mm)
up to 60 x 60	10
larger and non-standard sizes	the solution has to take the project conditions, installation and load into account 12 – 20 mm

3.1.2. The influence of the surface finish on the antislipperness properties of the product (tiles)

Increase of slip-resistance	Surface finish
↑	Brushed, Slate
	Honed
	Polished, Antique

3.1.3. Suitability of the usage of the product at higher mechanical load (including industrial, abrasive and travelling dynamic loading)

Load increase / increase of the suitability of usage	Production group	Product thickness (mm)	Product color	Surface finish
↑	Sand ↑	14 ↑	Multicolor ↑	Brushed ↑
	Crystal	13	Light monicolor	Honed
	Granite	12	Dark monicolor	Slate
	Mirrors	10	White	Polished, Antique

3.1.4. Suitability of the usage of the product at high thermal load
(floor heating, permanent exposure to sunlight, alternation of high and low temperatures – entrances)

Load increase / increase of the suitability of usage	Production group	Product thickness (mm)	Product color	Granularity of the product
↑	Granite ↑	14 ↑	White ↑	Coarser ↑
	Mirrors	13	Light	
	Crystal	12	Darker	Medium
	Sand	10	Dark	Fine

3.1.5. Recommended thickness of the tiles according to the dynamic (traveling) load of the area (resistance to damage, deformation...)

Average flexural strength (MPa)	Product	Thickness of the tile (mm), classification into group							
		6 mm	9 mm	10 mm	11 mm	12 mm	13 mm	14 mm	20 mm
37	Karpat Arizona, Taurus Brown Pearl, Taurus Blue Bahia, Taurus, Taurus Nordic, Karpat Arizona, Vesta Negro, Taurus DT Idaho; Crystal: Taurus, DT Kansas, DT Oregon, Beryl, Colorado, Sahara, Savannah; Venetians	1	2	2	3	3	3	4	5
42	Taurus Gold, Kalahari; Starlight: Aquamarine, Azurite, Black, Blue, Citrine, Green, Grey, Red, Violet; Crystal: Topaz, Ivory, DT Utah, DT Montana; Fresh: Brown, Green, Orange, Red; Translucent: Snow White, Ice, Onyx; Classic: White, Beige, Black, Grey, Ice	1	2	3	3	3	4	4	5
47	Sonora Light, Sonora, Starlight: Brown, Colorado, Sonora, Ruby, Sapphire, White, Yellow; Crystal: Quartz White, Creme Beige	1	2	3	3	4	4	4	5
52	Gobi: Black, Brown; Crystal: Beach, Colorado, Dark Shell, Diamond, Porto, Pure Black, Rio, Royal, White; Elegance: Concrete Grey, Dark Grey, Prairie; Taurus Porphyry	1	3	3	3	4	4	4	5
62	Gobi: Grey, White, Mahogany; Crystal Polar White, Elegance Cream, Classic Nevada	2	3	3	4	4	4	5	5

Source: Technistone, a.s. laboratory

Classification, specification and use of groups

Group 1: residences without travel load

Group 2: public, shopping and industrial buildings with irregular transport by vehicles with inflatable tyres

Group 3: public, shopping and industrial buildings with transport by vehicles with elastic rubber tyres

Group 4: public, shopping and industrial buildings with transport by vehicles with hard plastic wheels

Group 5: public, shopping and industrial buildings with transport by vehicles with hard plastic wheels with very high load

Cleaning machines are meant under the term transport, too.

It is recommended to get acquainted with the publication „Mechanisch hoch belastbare keramische Bodenbeläge“ – ZDB Germany 2002 (Ceramic flooring with high mechanical load).

3.1.6. The recommended use of the individual production groups of the Technistone® product and its dependence on the expected abrasive loading of the product

Abrasive load of the floor	Recommended production group			
	Sand	Granite	Mirrors	Crystal
High	yes	yes	yes ¹	yes
Medium	yes	yes	yes	yes
Low	yes	yes	yes	yes

¹ the surface finish – polished – may not be used!

Abrasive load of the floor	Recommended finish			
	Brushed	Honed	Antique, Slate	Polished
High	yes	yes	yes	no
Medium	yes	yes	yes	yes
Low	yes	yes	yes	yes

At medium and high load, installation of a cleaning zone and regular maintenance of the product in use is necessary!

Examples of the dependence of the use of the product on its abrasive load:

High load (heavy traffic + high presence of abrasive and liquid contaminants)

- installed in entrances and exits from the buildings and halls, in front of cash desks, receptions, counters, in underpasses, covered platforms, etc.

Medium load (heavy traffic without higher presence of abrasive contaminants)

- installed in shops, offices, halls, corridors, etc.

Low load (medium traffic without the presence of abrasive contaminants)

installed in residences, internal offices, halls, decorative places, etc.

3.2. Raised floors

When placing the product on the grates of raised floors it is necessary to follow the following recommendation:

Recommended thickness:

Recommended product sizes (cm)	Minimum recommended product thickness (mm)
up to 60 x 60	20
more than 60 x 60	30

3.3. Wall tiles

All product types and all surface finishes are appropriate for interior wall tiles. It is necessary to take the mass of the product into account.

Glued wall tiles (recommended height up to max. 2,5 m)

Recommended dimensions of the product (cm)	Recommended thickness of the product (mm)
30 x 30	10

Wall tiles on supporting mounted grates

Recommended dimensions of the product (cm)	Recommended thickness of the product (mm)
according to the used system and product	10 - 20

Anchored wall tiles

Dimensions of the product (cm)	Minimum recommended thickness of the product (mm)
up to 60 x 60	30, exceptionally 20 (according to the system)
more than 60 x 60	30

3.4. Stair components

When using the product for stair components it is necessary to follow this recommendation:

Recommended thickness:

Way of laying down the component	Minimum recommended thickness of the product (mm)
whole area on substrate concrete	10 - 20
into construction, self-supporting	30

All production groups of the engineered stone are suitable for usage as a stair component. Attention is to be paid to the antislipperness finish of the tread surface. For each concrete application of the product its sizes must always be considered in relation to its physical-mechanical characteristics and with respect to the system of fixing the product.

4. Installation of the product

4.1. General rules

During installation of the engineered stone Technistone® it is necessary to conform to relevant standards, MSDSs (Material safety data sheets) of used products, recommendations of the producers of the subfloor mixtures and of the producers of glues, jointing and dilatation materials (some of the recommendations are listed in this document). Furthermore, it is necessary to assess and take into account the following facts, which are based on tests and practical experience. Only general hints are introduced here, because the manufacturer of the engineered stone has no influence on the individual building conditions and performance.

- the product is intended for internal use
- suitability of the individual product types of Technistone® for the usage in the given environment should be considered especially with respect to the mechanical-physical characteristics of the Technistone® products (e.g. a higher thermal expansion and contraction, lower absorbability...)
- characteristics of the used product Technistone® must be consistent with characteristics of all other used construction materials
- the behaviour of the Technistone® product after installation depends on the quality of the installation and fixation
- during installation it is necessary to pay special attention to the quality of the subfloor surface
- carrying out jointless installation of the floor and wall tiles from the Technistone® product is strongly not recommended
- it is recommended to have the Technistone® product installed by a specialized company, which is experienced in installing the Technistone® product, engineered or natural stone
- it is necessary to adhere to the preparation technology and production procedures given by the producers of the used subfloor mixtures, gluing and jointing materials and other used constructional chemicals
- after jointing is performed it is necessary to follow correct technology of the product cleaning

4.2. Installation of floor and wall tiles

4.2.1. Recommended adhesives

The following adhesives are recommended by the producer for installation:

Elastorapid (Mapei)

- Usage: at all standard installations of floor and wall tiles.
- Characteristics: Improved, quickly solidifying, two-part cementing binder (white and grey color), slip-resistant, with prolonged fading.
- Classification according to EN 12004: class C2FTE
- Classification according to EN 12002: class S2
- Thickness of the layer of the adhesive: up to 10 mm.
- Preparation: in accordance with the instructions of the producer.

Technical data (at +23°C and 50% relative humidity) :

Acceptable temperature for application: from +5 to +30°C	Ascendability: after 4 hours.
Application life: 60 - 75 min.	Spreading: toothed spatula (square-edged teeth).
Final setting time: 120 - 150 min.	Consumption: 3 - 6 kg/m ²
Jointing: after 4 hours.	Storage life: 12 / 24 months.
Increased loadability: after 48 hours.	-

Granirapid (Mapei)

- Usage: at all standard installations of floor and wall tiles, especially when a quick solidification of the adhesive and a shorter waiting period for ascendability is needed.
- Characteristics: Quickly solidifying, two-part cementing binder (white and grey color).
- Classification according to EN 12004: class C2F
- Thickness of the layer of the adhesive: up to 10 mm.
- Preparation: in accordance with the instructions of the producer.

Technical data (at +23°C and 50% relative humidity) :

Final setting time: 20 min.	Jointing: after 3 hours.
Application life: 45 min.	Spreading: toothed spatula (square-edged teeth).
Ascendability: after 4 hours.	Consumption: 3 - 8 kg/m ²
Loadability: after 24 hours.	Storage life: 12 months.
Increased loadability: after 48 hours.	-

Keralastic (Mapei)

- Usage: in special cases – gluing on metal or wood, at stronger requirements for adherence, elasticity, waterproofness, at higher thermal loads, etc..
- Characteristics: Two-part elastic waterproof polyurethane binder for gluing and sealing.
- Preparation: in accordance with the instructions of the producer.

Technical data (at +23°C and 50% relative humidity) :

Thermal resistance: - 40°C + 100°C	Jointing: after 12 h
Application life: 6 – 8 h	Spreading: toothed spatula
Final setting time: 2 h	Consumption: 2 – 3,5 kg/m ²
Time, when corrections are possible: 3h	Storage life: 24 months
Full loadability: after 7 days	-

Kerapoxy (Mapei)

- Usage: when increased chemical durability is required, at higher thermal loads, at simultaneously increased thermal and mechanical loads...
- Characteristics: see section 4.2.2., jointing materials.

AD 530 (Lasselsberger)

- Usage: Flexible adhesive with an extended open time, intended for gluing of all types of all wall tiles and floor tiles in internal and external environments, including materials with an extremely low absorption capacity, for gluing on surfaces where dimensional changes occur (such as heated floors, balconies, and terraces).
- This adhesive is suitable also for areas stressed by traversing of forklift trucks etc. The adhesive is characterised with simple processing, high stability and strength, frost resistance and flexibility.
- Characteristics: EN 12004: type C2TE
- Preparation: in accordance with the instructions of the producer.

Technical data (at +23°C and 50% relative humidity) :

Spreading rate: 1250 kg/m ³	Full loadability: after 7 days
Application life: 3 - 4 h	Spreading: toothed spatula
Jointing of wall cladding: after 1 day	Amount of batch water: 0,26-0,30l/kg
Jointing of floor: after 2-3 days	Granularity: 0-0,7 mm

AD 570 (Lasselsberger)

- Usage: Highly treated hyperflexible adhesive with an extended open time and high value of lateral deformation. It is intended, in particular, for gluing of tiles with an extremely low absorption capacity and for gluing on problematic substrates.
- It is suitable also for gluing on substrates with extreme dimensional changes occurring due to excessive thermal stress (large-area terraces) and for areas stressed by traversing of forklift trucks etc.
- Characteristics: EN 12004: type C2TE
- Preparation: in accordance with the instructions of the producer.

Technical data (at +23°C and 50% relative humidity) :

Spreading rate: 1250 kg/m ³	Full loadability: after 7 days
Application life: 3 - 4 h	Spreading: toothed spatula
Jointing of wall cladding: after 1 day	Amount of batch water: 0,20-0,22 l/kg
Jointing of floor: after 2-3 days	Granularity: 0-0,7 mm

4.2.2. Recommended jointing materials

At the installation the producer recommends to use the following jointing materials. If silicone sealant is used it is necessary to use a neutral type only!

Technistone silicone sealant

Neutral silicone sealant Technistone is single – component sealant executed in the form of solid paste. As the paste is extruded out of the package, it turns vulcanized into a silicone rubber by air humidity. Vulcanization starts on the surface and penetrates the mass; the speed of this process depends on the relative air humidity. As per decrees by the Health Ministry of the Czech Republic, Technistone sealant can be used in direct contact with foodstuffs and meals. The sealant shades are based on Technistone color range (see in the table below).

Review of color shades of neutral silicone sealant Technistone:

Shade of the color	Usage
1. transparent	universal using
2. white	Crystal Polar White, Crystal Diamond, Crystal Quartz White, Starlight White, Translucent Snow White
3. black	Starlight Black, Gobi Black, Crystal Pure Black
4. grey	Starlight Grey, Gobi Grey
5. brown	Taurus Brown Pearl
6. beige	Crystal Royal, Crystal Dark Shell
7. red	Starlight Ruby

Products made by Mapei:

Ultracolor

Cementing jointing material for joints 2 – 20 mm wide.

Kerapoxy

Two-part acidproof jointing material on the basis of epoxide resin. Use when the resistance to acids, chemical substances, solvents, wear resistance and heavy load is required and when water-impermeability and easy cleaning is required.

Mapesil LM

One-part, neutral (not acid!!) silicone jointing and sealing material for permanently elastic joints in civil engineering

Mapeflex PU21

Two-part self-levelling sealing material for horizontal joints on the basis of polyurethane for permanently elastic sealing of dilatation and contact joints, for permanently elastic sealing of joints exposed to intense mechanical stress (supermarkets, car repair services, car showrooms...).

Mapeflex PU30

Thixotropic two-part sealing material for horizontal joints on the basis of polyurethane for permanently elastic sealing of dilatation and contact joints, for permanently elastic sealing of joints exposed to intense mechanical stress (supermarkets, car repair services, car showrooms...). Suitable for jointing oblique (descending) areas.

Tilepox (producer: Sincolor)

Two-part jointing material on the basis of epoxide resin. Joints: 3-15 mm wide. For internal and external using. Required for ceramic cladding and natural or engineered stone. Excellent resistance to chemical and mechanical damages with very **easy cleaning!** Colors are resistant against UV light, some chemical and atmospheric impacts and they are resistant for a long time against action of water from swimming pools.

4.2.3. Tools and instruments

To fulfil the installation the worker has to be equipped with at least these tools and instruments:

- toothed spatulas: to apply and spread uniformly the adhesives
- smooth spatula: to rub the glue in the subfloor and to spread a layer of the glue on the back face of a tile
- angle, meter, ruler, water level, plumb, etc. for accurate measuring and levelling of the tiles and slabs
- lath batten, ruler, etc.: for fixing and continuously checking of the flatness of tiles and slabs during installation
- rubber or plastic spatulas: to apply and spread the jointing material or binder
- sponge: for correcting the smoothness of the joint and for rubbing down the remains of jointing material from the tile
- hammer, drilling machine, drills, sawing machine with diamond circular saw cooled down by water: for possible size adjustments or other corrections
- boards, plywood, foil: to protect newly-installed floor tiles

4.3. Subfloors

4.3.1. Generally

The preparation of subfloors must be in compliance with the requirements of relevant standards and project documentation.

All subfloors on which the product is installed must be dry, stable, solid, compression-resistant, sufficiently flat and cleared from removable particles, dry surface „cement grout“, dust, fats, oils, wax, paints, dismantling chemical agents and everything that could decrease their adherence. These removable particles must be removed in the best case by sand blasting, (milling off or honing also possible), which is followed by sucking up the remains with a vacuum cleaner. The subfloors have to be suitable for the acceptance of the load and endure the stress expected in the specific application.

In the case of concrete subfloors not only structural joints must be created, but also the dilatation joints or separation into cca 6 x 6 m large parts have to be accomplished, while taking into account the geometrical shape and seamless pouring of the concrete. The joints are obtained by mechanical cutting or by inserting plastic profiles and they must run through at least 1/3 of it. The peripheral joints must be created along of all walls, columns, stairs etc. and their minimum width must be 3 – 5 mm for all areas greater than 7 m².

4.3.2. Concrete

Sufficient maturing must be reached – at least 4 weeks! After the concreting is finished the concrete must be moistened properly and protected against too quick evaporation or against frost for at least 15 days. The humidity of the concrete must be max. 2 – 3% before the installation. The humidity is measured by a carbide moisture meter. Minimum compressive strength of the concrete must be 22 MPa, when higher loads of floors are expected, it is necessary to achieve higher values of the strength. It is necessary to perform proper ground humidity insulation. The surface must be strong, cohesive, without dust, see section 4.3.1. The strength in tension of the subfloor (the strength of the surface layer) of the concrete must be at least 0.8 MPa. The strength of the surface layer may be determined also by the Schmidt impact hammer. It is necessary to apply bonding primer to the subfloor (e.g. Primer G of the Mapei company for absorbent subfloors), other types of the penetration according to the absorption capacity of the subfloor, which will increase the adherence of the used adhesive to the subfloor.

4.3.3. Usual cement screeds

The screed must be supporting and be at least 5 cm thick; the thickness depends on the expected load. It is composed of a concrete built up by inert heterogeneous material with the diameter from 0 to 8 mm and from Portland cement 425 kg/m³. Greater thickness requires inert material of greater diameter (up to ¼ of the thickness of the screed). After the screed is created, it must be moistened properly and protected against too quick evaporation or against frost for at least 15 days. The minimum compression strength of the screed must be 22 MPa min., when higher load of the floor is expected, it is necessary to achieve higher values of the strength.

Sufficient maturing must be reached – at least 4 weeks! The humidity of the screed must be max. 2 – 3% before the installation. The humidity is measured by a carbide moisture meter. The surface must be strong, cohesive, without dust, see section 4.3.1. The strength in tension (the strength of the surface layer) of the concrete base must be at least 0.8 MPa. The strength of the surface layer may be determined also by the Schmidt impact hammer. It is necessary to apply bonding primer to the base (e.g. Primer of the Mapei company for absorbent bases), other types of the penetration according to the absorption capacity of the base, which will increase the adherence of the used adhesive to the base.

4.3.4. Cement screed Mapecem

Quick-setting and maturing cementing binder for creating floating and anchored screeds, on which the tiles have to be glued quickly. The thickness of the screed depends on the expected load. The installation of the engineered stone is possible after 24 hours.

4.3.5. Cement screed Topcem

Special hydraulic binder for producing screeds. The installation of the engineered stone is possible after 7 days. The thickness of the screed depends on the expected load.

4.3.6. Previously existing floors and wall facing

Cement floors or floors composed of old ceramics, floor tiles, marble, must be strong, well anchored to the subfloor and without cracks. Cleaning from oils, waxes, fats, etc. must be performed in such a way, that their overall and also in-depth removal is guaranteed. Existing coatings must be removed.

4.3.7. Metal

The subfloor must be degreased by means of solvents of suitable cleaning agents. It is necessary to remove possible rust.

4.3.8. Spattered dashes and plasters

They have to be sufficiently mature and strong to hold the weight of the tiles (when products are used, which are mixed in advance, it is necessary to follow the technical procedure described by the producer). The surface has to be dry, solid, without impurities and dust.

4.3.9. Walls from blocks of expanded cement

Considering the great diversity of the products present on the market it is absolutely essential to consult producers, in order to learn about the properties and the suitability of their products. The surface must be dry, strong, without impurities and dust.

4.3.10. Anhydrite floors

They must be sufficiently mature and supporting. The strength of the surface layer may be determined also by the Schmidt impact hammer.

The humidity of the anhydrite floor must be max. 0,5% before the installation!! The humidity is measured by a carbide moisture meter. The surface must be strong, cohesive, without dust, see section 4.3.1.

The surface has to be penetrated two times by means of the Primer G agent (Mapei), in order to achieve a good adherence of the used adhesive to the base. After finishing the penetration it is necessary to wait until it dries.

4.4. Levelling of subfloors

In case of an uneven surface it is necessary to perform levelling or correction by using suitable levelling materials (e.g. Mapecem, Topcem, Ultraplan, Novoplan 21, Nivoplan, Nivorapid of Mapei company). Deviation from the flatness should be max. ± 2 mm on 2 m of the surface. During the preparation and application of all levelling means the technical procedure described by the producer is to be followed strictly.

4.5. Color shades consistency

Being made from nature materials the color variations of the product could appear. The product is sorted by producer according to the basic color standards. Slight optical color differences are proper and should be respected. There is mostly one color shade packed on one pallet and always one color shade in the same cardboard box and the respective lot No. and color shade is given on the box label.

In spite of the fact, before starting the installation it's necessary to open several boxes with the tiles, lay the tiles on the floor under natural light and check the color consistency.

To avoid any problems with color consistency on the floor it is recommended to lay down the tiles consecutively one by one from several checked open cardboard boxes, simultaneously, not only from one cardboard box.

4.6. Environment conditions during the installation

The installation can be started only after making sure that the temperature and moisture conditions meet the conditions prescribed by the technical brochures of the used adhesives.

For a longer period than 24 hours the temperature cannot decrease beneath +5 °C and exceed +30 °C.

The surfaces must not be strongly heated up by the sun before the installation (it is recommended to accomplish the installation during colder hours). In a dry and ventilated environment it is necessary to pay special attention to a film creation on the adhesive. It is necessary to spread the adhesive on small areas and check the moistening. The bottom face of the formats must not be wet or dirty after previous cutting.

Every adverse situation is to be discussed with the work manager.

4.7. Preparation of adhesives

It is necessary to use a clean vessel for the preparation of adhesives, binders, levelling screeds, etc.

To mix the agents it is necessary to use a mechanical mixer with small number of revolutions (approximately 150 rpm). During mixing of all agents it is necessary to strictly follow the technical procedure described by the producer. It is always necessary to add powder to a liquid and not vice versa.

4.8. Application of adhesives

First, the actual base is checked, for it has to be perfectly flat, dry, mature, without cracks, and carefully cleaned. Parts that are not tightly bound with the base have to be removed.

The preparation and application of the adhesive is performed according to the technical conditions of the producer. The prepared adhesive must be perfectly homogeneous and easily spreadable. Always only such an amount is prepared, which is possible to apply before the adhesive starts to lose its adhesiveness and applicability.

The prepared adhesive is first well rubbed as a thin layer to the base by a smooth spatula to build a quality transition between the base, the adhesive and the tile. Only such an area will be prepared, which prevents drying of the surface layer of the adhesive at those places, where the tiles were still not installed. Afterwards the layer of the adhesive is spread on the base by a toothed spatula.

Recommended size of the toothed spatula:

Size of the tile	Size of the toothed spatula
20 x 20 cm, 15 x 15 cm.....	8
Up to 40 x 40 cm (30 x 30 cm, 40 x 40 cm)	10
over 40 x 40 cm (60 x 30 cm, 60 x 40 cm, 60 x 60 cm and larger)	15

The toothed spatula also delimits the thickness of the adhesive layer and by its individual teeth it creates a space for the uniform spread of the adhesive after the tile is laid down.

The uniform spread of the adhesive during the installation of the tiles can be checked by lifting off of the tile. The tooth-formed adhesive layer is continuously to be checked, whether it does not lose its adhesiveness (by a finger test).

It is necessary to use the system with **double coating** in such a manner that 100 % of the tile surface is glued-on. A continuous 1mm layer of the adhesive is applied on the bottom face of the tile and only after that the gluing of the tile to the tooth-formed adhesive applied to the base will be accomplished.

During the installation of the floor tiles the flatness is to be checked continuously. The tiles should be installed by keeping the joint from 3 up to 7 mm according to the characteristics of the base, the sizes, dimensional stability and thermal expansion coefficient of the product and according to the environment, where the installation takes place.

It is necessary to avoid horizontal mismatch (protrusion) between individual tiles, especially at those places, where the dynamic loading of the area is expected (traveling of vehicles).

4.9. Dilatation and dividing joints

During solution of the dilatation joints it is necessary to take into account the relevant standards, the project documentation and the characteristics of the product, especially its thermal expansion.

The dilatation joints on the installed area must consistently follow the dilatation joints already existing on the subfloor, on the load-bearing structure and on the walls (main object joints).

It is necessary to keep the dilatation joints near the wall connections, columns and other constructional parts passing through the floor (peripheral joints). The product is installed in 1 cm distance from the walls, columns, breaks, corners, etc.; the gap is covered by a skirting and filled with elastic binder.

In the case of large areas the dividing joints are created by dividing the area according to the following manner:

- squares of approximately 4x4 m for installation on area exposed to high traffic, mechanical, dynamical or thermal load and on the subfloors subject to motions or flexures.
- squares of approximately 7x7 m on stable areas

The dilatation joint should have a rectangular cross-section with the side ratio 2 : 1.

The dilatation joint can be created by using the original dilatation strips or the Mapei system with elastic filling.

The elastic filling is built by using an elastic sealing gasket (rope) MAPEFOAM, which is pressed down into the joint. The width of the rope is chosen greater than the width of the joint (1 cm wide joint – rope with the diameter of 1,5 cm). The upper part of the joint is filled according to the requirements for the traffic on the floor with the jointing neutral silicone binder Technistone silicone sealant or MAPESIL LM (standard traffic) or MAPEFLEX PU21 (heavy traffic, horizontal floor) or MAPEFLEX PU30 (heavy traffic, slanted floor). Before the binders are applied the edges of the dilatation joint are to be impregnated by the PRIMER FD agent.

The dilatation joints must be secured by the edge-protecting profiles in the case of dynamic loading (traveling of vehicles), in the case of increased dynamic loading protecting metal profiles are recommended, which have the shape of transitional bridge, that covers the joint.

Whole tiles must be installed along the dividing joints; cut sizes implied by the field dimensions must be installed inside the fields.

4.10. Jointing

During the preparation and application of the jointing materials it is necessary to follow the instructions of their producers.

The tiles should be installed by keeping the joint size from 3 up to 7 mm according to the characteristics of the base, the sizes, dimensional stability and thermal expansion coefficient of the product and according to the environment, where the installation takes place.

In the case of small areas without a high mechanical or thermal load the width of the joint is chosen 3 – 6 mm.

In the case of large areas, larger tiles or higher mechanical or thermal load the width of the joint is chosen 5 – 7 mm and the joint after each 5th – 6th tile is jointed by a silicone jointing material.

The jointing of dilatation joints and of the joints done with silicone binder is carried out as the first. Then, the jointing with cement jointing materials is done after 24 hours (or earlier, according to recommendation of producer).

The cementing jointing materials are always spread over the whole tile. After the setting of the material in the joint starts (never earlier!), the surface of the joint is prepared (smoothed) with a moistened sponge and the remains of the jointing material are rubbed down from the tiles. The final cleaning of the surface by using recommended cleaning agents is done after the setting of the material in the joints is finished, circa after 24 hours or earlier, according to recommendation of producer.

The jointing materials listed in the section 4.2.2. are used for jointing.

The jointing material KERAPOXY or Tilepox is recommended for objects with chemical load.

It is necessary to wait before the start of the jointing:

- 24 hours in the case the adhesive KERALASTIC is applied during the installation (at the temperature 23°C)

- at least 4 hours in the case the adhesive ELASTORAPID or GRANIRAPID (at the temperature 23°C) are applied.
- at least 2 or 3 days in the case adhesive AD 530 or AD 570 (Lasselsberger company) are applied.

4.10.1. Cleaning of the tiles after finished jointing

After the setting of the material in the joint starts (never earlier!), the surface of the joint is prepared (smoothed) with a moistened sponge and the remains of the jointing material are rubbed down from the tiles. Especially the thicker deposits of the jointing material are removed from the tiles surface. The redundant deposits of the material on the margins of joints, that would be difficult to wash out after the setting is finished, are removed by smoothing the material in the joints.

The final cleaning of the tiles surface is done by using recommended cleaning agents after the setting of the material in the joints is finished, not earlier than after 24 hours.

The recommended cleaning agents are listed in GCT part III/3, some of them are listed below.

It is necessary to realise that the surface of a product made from the engineered stone, especially with the polished finish, is more sensitive to the erosion of surface that is exposed to strong chemicals or exposed to chemicals for a long time than a natural granite or hardened ceramics. These chemicals are also included in the used surface cleaning agents. Therefore the exposure to cleaning agents, especially the strong ones used at increased amount of impurities, has to be limited to a time period necessary to remove the impurity, which duration is in the order of **minutes!** After that time it is necessary to remove the cleaning agent together with the released remains of the jointing material and of the impurities from the surface, preferably by sucking them off, and immediately wash the surface carefully. This is the only way to clean the surface of the product without causing any damage to it.

Recommended cement film cleaners:

Company	Product	Note
Akemi	Ceramics Cement Film Remover	cement film remover, strong acid cleaner
HG International	HG cement, mortar and efflorescence remover	cement film remover, strong cleaner
HG International	HG marble cement & lime film remover	removes cement film and lime scale
Moeller Chemie	HMK-R63 Cement film remover	cement film remover, strong acid cleaner
Lithofin	Lithofin MN Builders Clean	cement film remover, strong acid cleaner, necessary to dilute
Bellinzoni	Extra strong detergent Bert 27	strong acid cleaner, deep cleaning, fats, grease and cement film remover
Bellinzoni	Ultra Stripper	effective fats, grease, wax and cement film remover
Lasselsberger	CL 802	remover of cement residues
Mapei	Keranet	cleaning of staining caused by cement, lime, efflorescence including dirt and oil

4.11. Installation of floor tiles on surface with floor heating

In these cases, it is necessary to pay special attention to the quality of subfloor concrete and to take into account the thermal expansion of the product. It is recommended to use the cement screed Topcem for producing the subfloor, for further reading see sections: 4.3.1 till 4.3.5. Before the installation is started, it is necessary to switch the floor heating on, in order to achieve a complete drying-up and stabilization of the subfloor. After it is warmed up (dried-up and stabilized), the floor heating is to be switched off. After the subfloor is cooled down to its original temperature it is possible to start the installation. It is necessary to carry out higher number of dilatation and dividing joints. For gluing it is necessary to use the adhesive binder Elastorapid from the Mapei company or adhesive binder AD 570 from the Lasselsberger company.

4.12. Installation of the product at higher thermal load

Valid for e.g. the installations around fireplaces, stoves, on strongly insolated areas (shop windows exposed to sun)....

In such cases it is necessary to pay special attention to the quality of the substrate concrete and take into consideration the thermal expansion of the product. It is recommended to use the cement screed Topcem for producing the base, for further reading see sections: 4.3.1 till 4.3.5. As the adhesive binder is in the case of high load recommended the binder Keralastic, in the case of low or medium load the binder Elastorapid or AD 570. The adhesive binder Kerapoxy or Tilepox is recommended for usage in the case of concurrent thermal and mechanical load (strongly insolated travelling areas). Higher number of dilatation and dividing joints is to be carried out.

4.13. Installation of the product as stair component

During the installation the mechanical-physical characteristics of the product have to be taken into account (flexural strength, thermal expansion ...). The junction to wall must enable longitudinal changes of the stair component, i.e. the space on the interface between the wall and the component must be filled with an elastic material, which enables dilatation.

In case of gluing to concrete, the substrate layer has to be made from quality and mature concrete. For gluing it is necessary to use the adhesive binder Elastorapid from the Mapei company or AD 570 from Lasselsberger company.

In case of gluing to metal construction it is necessary to use quality elastic-stable organic based adhesive binders, e.g. the binder Keralastic from the Mapei company.

4.14. Installation of glued wall tiles

The weight of the tiles from a Technistone[®] product and its mechanical-physical characteristics, especially the thermal expansion, have to be taken into account during the installation of the glued wall tiles.

It is recommended to install the tiles at the total height higher than 2.5 m above the level of solid base by means of anchored or grate systems.

During the preparation and usage of the base and adhesives the above-mentioned principles are to be followed.

During the application of the adhesives it is necessary to use the system of double-coating, see section 4.8.

It is necessary to apply a penetration primer to the base (e.g. Primer G from Mapei company) to absorbent bases; other types of penetration according to the absorption capacity of the base. New bases must be properly matured.

The gluing is necessary to be performed by using the adhesive binder Elastorapid from the Mapei company or AD 570 from Lasselsberger company.

Installation of tiles is to be done piece by piece. The tiles should be pressed carefully into their required positions; distance segments can be placed in the corners.

The installation of the tiles should be started at the floor plane and if this base is not horizontal, then from a lath batten, which temporarily replaces a solid line. During the installation the horizontal and vertical flatness is to be checked.

After the adhesive is dried-up, the possible wooden lath, which replaced the first line of tiles, should be removed and the installation of the remaining line should be done.

The joints should be filled with a suitable jointing material by using a rubber or plastic spatula. The Technistone silicone sealant or Mapesil LM is recommended.

Afterwards, the installed tiles should be firstly cleaned by a wet sponge and then careful cleaning is to be carried out by means of recommended cleaning agents.

4.15. Product installation – quick guide

Only general hints are introduced here, because the manufacturer of the engineered stone has no influence on the individual building conditions and performance.

Product installation – subfloors

All subfloors on which the product is installed must be dry, stable, solid, compression-resistant, sufficiently flat and cleared from removable particles, dry surface „cement grout“, dust, fats, oils, wax, paints, dismantled chemical agents and everything that could decrease their adherence!

Product installation – general hints

1. The prepared adhesive is firstly well rubbed as a thin layer (cca 1 mm) to the base by a smooth spatula to build a quality transition between the base, the adhesive and the tile. Only such an area will be prepared, which prevents drying of the surface layer of the adhesive at those places, where the tiles were still not installed. Afterwards the layer of the adhesive is spread on the base by a toothed spatula. The toothed spatula also delimits the thickness of the adhesive layer and by its individual teeth it creates a space for the uniform spread of the adhesive after the tile is laid down (10-15 mm layer according to tile dimension).
2. It is necessary to use the **system with double coating** of adhesive in such a manner that 100 % of the tile surface is glued-on. A continuous 1mm layer of the adhesive is applied on the bottom face of the tile and only after that the gluing of the tile to the tooth-formed adhesive applied to the base will be accomplished.

3. Tiles are fixed to subfloor, with proper joints. The tiles should be installed by keeping joints from 3 up to 7 mm. Dividing joints in squares 7x7m for standard and 4x4m for heavy traffic floors should be realized. It is necessary to keep the dilatation joints near the wall connections, columns and other constructional parts passing through the floor (peripheral joints).
4. Flatness and rectangularity have to be controlled continuously.
5. It is necessary to wait before the start of the jointing (cca 24 hours according to recommendation of adhesive producer). The cementing jointing materials are always spread over the whole tile. After the setting of the material in the joint starts, the surface of the joint is prepared (smoothed) with a moistened sponge and the remains of the jointing material are rubbed down from the tiles. The final cleaning of the surface by using recommended cleaning agents is done after the setting of the material in the joints is finished.

