Buildwise Magazine

Finishes edition

Shutterstock

Nov-Dec 2025

P08. Installing XL and XXL tiles

P14. Importance of pore fillers

P16. Bio-based polyurethane varnishes

Contents

Buildwise Magazine Nov-Dec 2025

04
Watertightness of the sill-joinery-ETICS connection: innovative solutions

06
Tips for ensuring stability when installing a shower tray

08
How to install XL and XXL tiles for a lasting result?

10
Space between outside tiles and façade: simple finish or essential detail?

12
Natural stone tiles: anticipate tolerances!

14
The importance of a pore filler when finishing certain types of wood

16
Bio-based polyurethane varnishes: fully-fledged alternatives

18
Save time and money thanks to new technologies

20
FAQ

21
Focus

Quality begins where you can't see it

Tinne Vangheel and Évelyne Nguyen lead engineers from the Technical Committee 'Hard Wall and Floor Coverings'

We all know that the success of a construction site depends on more than just the last lick of paint or the final tile being slotted into place. It starts way before that, in a place that you don't see: **the substrate**.

Whether you are working with natural stone tiles where every millimetre counts, large ceramic tiles that require a perfectly flat surface or painting wood, nothing is possible without a good base.

> The success of a construction site depends on what you can't see: the substrate.

When carrying out renovations, this is a challenge that arises on a daily basis. Old, irregular, deformed, unpredictable substrates: you know about these better than anyone. Before you carry out any finishing, there is an 'invisible' phase involving understanding, diagnosis and correction that you need to go through. All this requires **time, expertise and precision**: luckily, there is technology to help you with that.

With the new digital measurement and 3D scanning solutions, you can anticipate, document and guarantee the reliability of your work. Rather than replace the professional's trained eye or experience, these tools supplement them. They provide the **precision and traceability** which are essential for construction sites where tolerances are becoming stricter and stricter.

In this magazine, we delve deeper into these issues. We look at the challenges of ceramic large-format tiles (p. 8-9), the precision of natural stone tiles (p. 12-13), the natural irregularities of wooden substrates (p. 14-15) and how new technologies have redefined our quality requirements (p. 18-19).

> Before any finishing is carried out, understanding, diagnosis and correction are required.

That is because for finishes – and for companies in general – it is all about what you can't see: **the substrate, the preparation and the precision**.

Watertightness of the sill-joinery-ETICS connection: innovative solutions

Ensuring the watertightness of the connection between sill, joinery and ETICS is not always easy. That is because infiltrations can occur in these zones and repairs can end up being costly. Recent innovations have provided effective solutions that are easy to implement.

M. Lignian, Buildwise

Points for attention

The connection between the joinery, the sill, the lateral upstands, the roller shutter box guides and the external façade insulation (ETICS) presents a real challenge. A small opening is all that is needed for water to infiltrate into the façade, especially in the case of façades that are exposed to rain and wind. When carrying out both renovations and new construction projects, these connections are sometimes not approached in the right way. Before choosing a solution, it is important to ask yourself the following two fundamental questions.

1. **Is the watertightness of the whole sill-joinery-upstand (and possibly the guides for sun blinds or roller shutters) demonstrated by an approved test?** Different joinery manufacturers offer systems that are certified or tested in accordance with standard NBN EN 1027 (*) in order to guarantee the watertightness of windows and doors (see figure 1). This test simulates driving rain combined with increasing air pressure in order to simulate the effect of the wind. These systems are able to withstand **water pressure of at least 1,950 Pa** which corresponds to a wind speed of 200 to 220 km/h. They can absorb the thermal expansion of the sill without the watertightness being jeopardised. Make sure that the system is suitable for your project (the presence of roller shutter guides, insulation thickness, the slope of the sill, etc.) and that you follow the **manufacturer's recommendations** closely both in terms of the geometry and the materials used as well as the installation stages. Any change or replacement can jeopardise effectiveness. Finally, it is important to stress that the tests currently carried out by most sill manufacturers are only intended to demonstrate the watertightness of their systems and therefore they do not take into account the type of joinery or the composition of the façade.

1 Example of a certified or proven system for guaranteeing the watertightness of a window.

2. **Is an opening visible when the ETICS is being connected (a noticeable 'hole')?**

We distinguish three situations with appropriate solutions depending on the answer to these questions. We present these below and limit ourselves to metal sills since most principles can be applied to different types of sills.

Situation 1: watertightness is guaranteed and there is no visible opening

The manufacturer or joiner provides proof of the watertightness of the system that is formed by the joinery, sill, lateral upstands and guides for sun blinds or roller shutters. If no opening is visible when connecting to the ETICS, **no additional measures are required**.

(*) There are currently no official test standards or specific classifications for assessing the watertightness of the sill-joinery-ETICS connection as a whole.

In that case, you can install the ETICS in accordance with the applicable technical recommendations (see TINs 257, 274, 279 and 295), namely:

- the use of a sealing tape with putty or a specific profile at the location of the joinery
- the application of a sealing tape to the lateral upstands.

Situation 2: watertightness is not demonstrated or an opening is still visible

If the ETICS installer finds an opening or there is no proof of watertightness, then you will have to take precautionary measures. The installer must **inform the site manager** who will decide on the actions that must be taken: replacement/adjustment of the sills or sealing of the visible opening (injection of putty, resin or another suitable sealing product).

While sealing is a simple and cost-effective solution, it does require maintenance. You should therefore be extremely vigilant as an ETICS only provides a single-stage seal.

Situation 3: provide drainage from the design stage (preventive solution)

If, right from the start of the project, you expect the watertightness of the connections not to be guaranteed, the best solution is to provide a **specific drainage and discharge system**. This will make it possible to collect any water that has infiltrated under the sill and direct it outside via a drip moulding in the façade (see figure 2).

These systems are discrete, compact and easy to install before plastering. However, they should be designed in such a way that they ensure efficient drainage. In order to do that, no compressed sealing tape or façade putty (flexible joint) should be applied under the sill.

A watertight connection is then ensured by installing a water barrier or applying watertight plaster under the sill and connecting it to the ETICS. To stop water droplets seeping along the façade, you should add a façade profile with drip moulding.

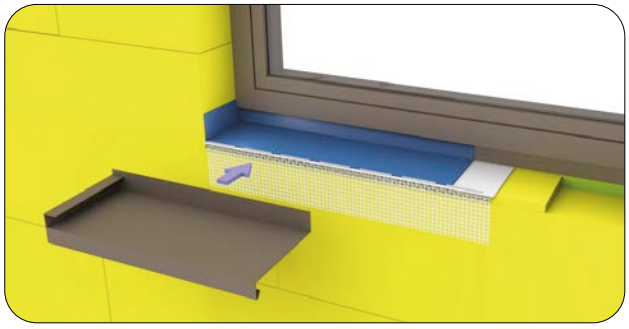
Other systems contain a specific **drainage module** that you need to fit underneath the sill at the location of the lateral upstands. These systems which consist of **preformed profiles with drip mouldings** (see figure 3) ensure that water is drained off directly and safely away from the façade.

The solutions for this third type of situation are strongly recommended in moisture-sensitive structures such as timber frame construction or buildings with more sensitive insulating materials (wood fibre, etc.).

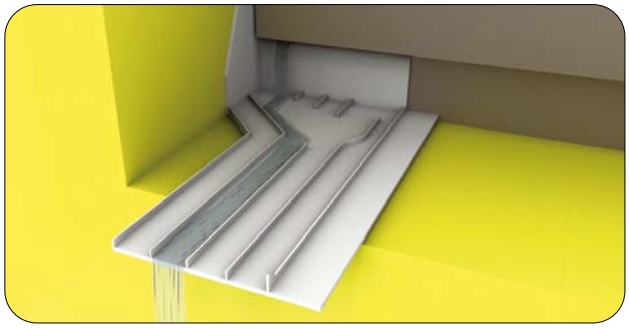
Responsibility and coordination: an essential prerequisite

The solutions presented in this article will only work if **all the parties involved work closely with each other**: architect, window manufacturer, general contractor, joiner and façade construction company. This coordination becomes even more crucial if the watertightness of the whole system (joinery, sills and upstands) is not guaranteed. In that case, you must take additional measures such as installing membranes or integrating drainage systems during the design phase. This requires precise organisation: often the sill cannot be installed at the same time as the windows which will mean that you have to adjust the site schedule. A sustainable connection is therefore created by **thinking ahead, collaborating closely and choosing the right solutions**.

This article was drawn up as part of the Standards Antenna 'Finishes' subsidised by NBN.



2 Sealing and drainage system under the sill.



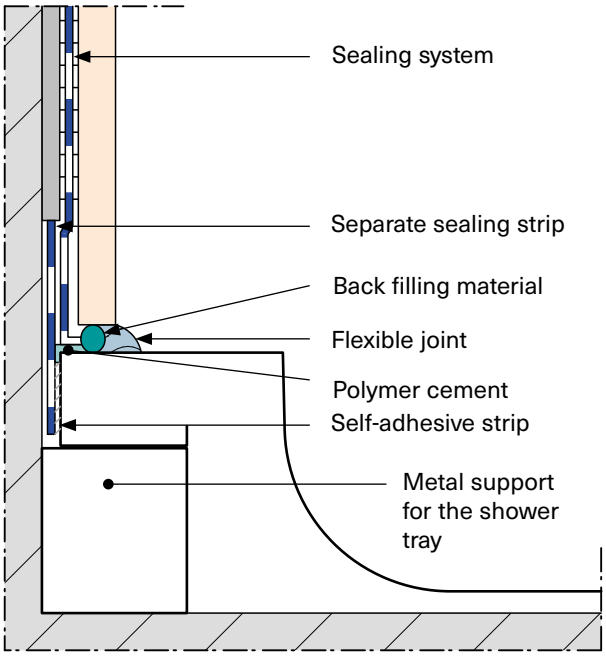
3 Drainage module consisting of preformed profiles with drip mouldings under the sill.

Tips for ensuring stability when installing a shower tray

If the edges of a shower tray can move under load (sag or bend), the flexible joint between the tiling and the shower tray will be repeatedly stretched and compressed in turn. Over time, this can lead to a break, allowing moisture to get behind this flexible joint. It is therefore essential to provide good support for the shower tray.

B. Bleys, J. Van den Bossche, Buildwise

To prevent moisture penetrating the tiled walls of a shower, you should apply a waterproof cement or a sealing system (see Buildwise Article 2024/03.06) behind the tiles. You should also make sure that there is a **durable watertight connection** between that sealing system and the shower tray by providing good support for the latter and installing a separate sealing strip. It is also important to carry out annual maintenance on the flexible joints between the tiling and the shower tray as they form the first moisture barrier.



1 Surface-mounted installation with full support.

If they are damaged, they must be replaced immediately (see also TIN 227 and Buildwise Article 2022/03.07).

Installation methods for shower trays

Surface-mounted installation with full support or raised design

With this traditional method of installation, the shower tray is placed **directly on a stable surface** and protrudes a few centimetres above the adjacent floor finish. The entire underside of the tray must then make contact with the floor. When this method is used, the tray is often placed on a layer of flexible mortar or adhesive. The edges of the tray must be continuously supported – by means of metal profiles, for example – which are fixed in the walls of the shower (see figure 1). The edges that are not adjacent to walls can be supported by blocks (e.g. bricks or cellular concrete blocks).

If the shower tray is sufficiently rigid, the full support can be replaced with **blocks** (e.g. bricks or cellular concrete blocks) which are placed underneath the shower tray. The edge of the shower tray is then supported in the same way as it is with full support.

Simply spraying with PUR is not a suitable method because it does not provide sufficient rigidity and support underneath the shower tray.

Built-in installation

Built-in installation involves **sinking** the shower tray (almost) completely **in the floor** so that the top is flush with the bathroom floor (walk-in shower). This method requires a

recess the size of the tray to be cut out in the screed with space for the drain underneath.

Installation using a mounting frame and/or on legs

For this method, the shower tray is installed on adjustable legs or a mounting frame. This frame consists of horizontal profiles that are supported by vertical supports at the corners and at fixed intervals as specified in the manufacturer's installation instructions (e.g. every 50 cm). This creates space for the trap and drain pipes underneath the tray without having to break up the floor.

Sufficiently rigid shower trays can also be solely supported by legs, without a horizontal mounting frame. When using this method, it is crucial for the tray to be level and to rest stably on all legs. The manufacturer's instructions must be followed here too.

Installation instructions

Installation instructions and the support required may vary depending on the type of shower tray. It is always recommended to follow the manufacturer's instructions. **Acrylic shower trays** are lightweight and quite flexible, for example, as a result of which they require good support. This can be provided using a mounting frame that bears the weight of the whole edge. **Steel or enamel shower trays** are more rigid and do not need to be supported at as many points.

When installing the shower tray, it is essential that the **surface is sufficiently stable** and that the loads transferred can be absorbed without creating indentations in the surface.

A **concrete surface** is extremely stable and retains its shape, thus making it suitable for heavy shower trays. However, a concrete floor is usually slightly less level.

A good (cement-based) **screed** provides a level and stable surface. It is important for the screed to be sufficiently thick and hardened so that it does not sag or crumble under the weight of the shower tray. If using insulating screeds and installing on legs, the legs must be placed on reinforcement (e.g. 10 x 10 cm slab) on top of the screed to prevent the legs from sinking.

Wooden floors (wooden joists with planks/OSB) are more susceptible to deflection. Additional reinforcement may be necessary.

Sometimes, a shower tray may be installed on an **existing tiled floor**. Although tiles can be hard and stable, you must ensure that the tiles adhere properly and that the underlay is firm.

A shower tray must never be placed directly on an **unpaved surface** such as sand.

A Pros and cons of the different installation methods.

Installation method	Surface-mounted installation	Built-in installation	Mounting frame and/or legs
Example	 Shutterstock	 Shutterstock	 MEPA
Accessibility	⚠ Limited	✓ Good	✗ Poor
Installation height	⚠ Limited	✓ None	✗ High
Accessibility of the pipes	✗ Difficult	✗ Difficult	✓ Good
Need for a level surface	✗ High	✗ High	✓ Lesser

How to install XL and XXL tiles for a lasting result?

With large tiles – XL (≥ 1 m²) or XXL (≥ 3 m²) – special attention needs to be paid to the flatness of the substrate, the dimensional tolerances of the tiles, the choice of adhesive, installation and the minimum joint width.

V. Claude, Buildwise

Preparing the substrate

The substrate should be clean, dry and cohesive and free from defects. Stricter **flatness tolerances** apply to floors and walls: a maximum of 3 mm under a 2 m batten. Use a suitable levelling product to satisfy these tolerances.

If the substrate is too absorbent or not absorbent enough and/or if prescribed by the adhesive manufacturer, you can also apply an **adhesive primer** before bonding (see Buildwise Article 2019/04.08).

With traditional cement-bound floor screeds, it is best to wait one week per centimetre of floor screed thickness before carrying out installation, with a minimum of 28 days. Use the carbide bottle to check that the **moisture content** is no higher than 2.5%. In the case of an anhydrite floor screed (calcium sulphate), the maximum permitted mass moisture content is 0.5%. That is because if the moisture content is too high, it can cause an undesirable chemical reaction as a result of which tiles may come loose. Therefore you should never install XL and XXL tiles on fresh floor screed.


Shutterstock

With non-adhesive floor screeds, you should provide **expansion joints** to absorb the stresses in the tiling (see TIN 237, figure 55). This is not usually necessary with adhesive floor screeds but it is recommended to provide **perimeter joints**, especially if there is a risk of relative movements between the wall and the floor.

Avoid installing XL and XXL tiles on parquet or wooden supporting structures due to dimensional movements.

When installing on **old tiling**, you should ensure that there is a good adhesive bond between the existing tiles and the substrate. Roughly sand the surface of old enamelled tiles to promote adhesion and always clean and degrease the tiled floor thoroughly. Applying a primer for 'closed' substrates provides an added advantage for good installation.

If **underfloor heating** has been installed, there is still a high risk of tiles coming loose and cracking, even if you comply with stricter guidelines for the moisture content of the floor screed (2% for a cement-bound floor screed and 0.3% for an anhydrite floor screed), provide a larger number of expansion joints (maximum area of 40 m² and maximum length of 7 m) and follow the startup protocol to the letter (see Buildwise Article 2024/06.04). In that case, it is safer to use smaller tile formats.

Tiles

Tiles with better dimensional tolerances than those required by the standard NBN EN 14411 are preferred. Technical Information Note (TIN) 237 recommends a maximum manufacturing tolerance of 0.2%.

Very thin tiles (less than 5 mm) are very susceptible to puncturing and therefore are only suitable for use on walls and not on floors.

It is also not recommended for XL and XXL tiles to be used in outdoor applications.

1 The use of suction cups and tile cutters is strongly recommended.

Application

Preferably work with **two people** and use **suction cups** in order to prevent breakage. Specific **tile cutters** should be used for XL and XXL tiles (see figure 1). Buildwise Article 2016/04.10 provides a number of useful tips on cutting techniques.

Adhesive

Use a **flexible mortar adhesive of the type C2S1 or C2S2**, possibly with additional characteristics (F, T or E). On absorbent substrates, it is often more practical to use a quick-hardening F-type mortar for faster application. If the laying surface has a reinforcement mesh, we advise you to choose a C2S2-type mortar.

Avoid D-type adhesives for XL and XXL tiles. On watertight substrates (old tiles, membranes or coatings), it is best to opt for a two-component adhesive consisting of a cement-bound powder and a polymer liquid that you must mix before use.

Always check to make sure that the mortar adhesive is suitable for use on an anhydrite floor screed.

Adhesive bonding

For XL and XXL tiles, **double adhesive bonding** is the only suitable technique for achieving a bonding surface of almost 100%. Apply the adhesive to the substrate and the underside of the tiles in a straight line, with adhesive beads running in the same direction and make sure that the edges and corners are well-covered (see figure 2).

Toothed spatulas of the type U10 to U15 are most commonly used but it is recommended that you always check the compatibility of the mortar adhesive with the comb that you intend to use.

Always discuss the location of expansion joints beforehand (see TIN 237, figure 55).

The joints should be at least 3 mm wide which permits maximum dimensional deviations of ± 1.5 mm. If there are greater differences in size, the joints should be wider. XL and XXL tiles are best installed with **wide joints** (> 6 mm) as this reduces the risk of differences in level. For the same reason, installation with staggered joints is advised against.

Once the adhesive has been applied, you should apply even pressure in a back-and-forth movement perpendicular to the adhesive beads. Then use a vibration tool or tap the tiles gently with a rubber hammer working outwards from the centre of the tile to remove any air.

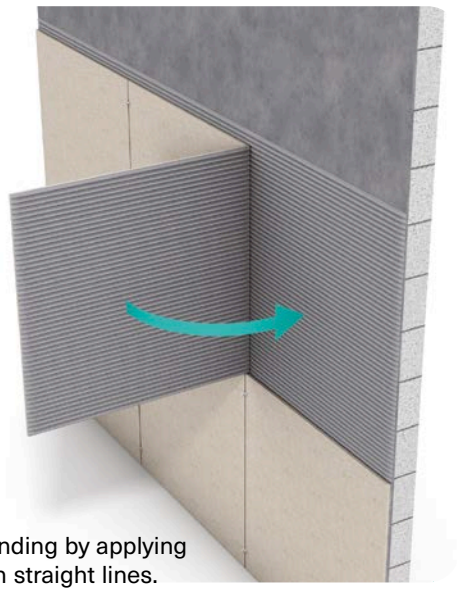
Check the flatness regularly and use levelling blocks and possibly tile spacers suitable for large formats. Any difference in level should be corrected immediately before the adhesive hardens completely.

Remove adhesive residue with a damp sponge as you go along.

Jointing

After laying the tiles, leave the mortar adhesive to cure for the period of time prescribed by the manufacturer (at least 24 hours). It is recommended to use **jointing mortar of the type CG2**.

This article was drawn up as part of the Standards Antenna 'Finishes' subsidised by NBN.



2 Double bonding by applying adhesive in straight lines.

Learn more about this topic in Buildwise Article 2025/06.02.
Subscribe to our newsletter to stay up-to-date with every edition.

Space between outside tiles and façade: simple finish or essential detail?

Terraces on tile supports are often chosen in order to create continuity between the internal and external lining. However, special attention should be paid to this connection since the space between the tiles, façade and sills will determine not only the appearance but also the watertightness and durability of the whole system. Poor design can lead to infiltrations or require more maintenance.

M. Van Beneden, Buildwise

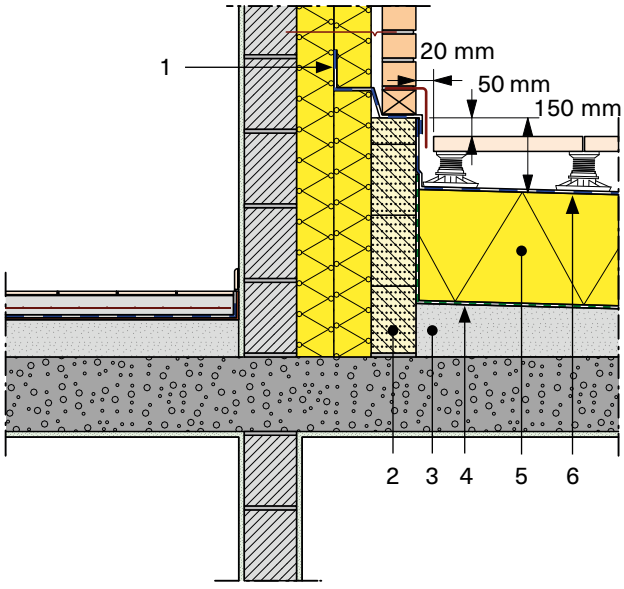
Space between the tiles and the façade

According to Technical Information Note (TIN) 244, it is best for you to provide **a space of at least 2 cm between the first tile and the base of the façade** in order to:

- prevent the accumulation of dirt
- guarantee effective water drainage
- limit the maintenance of wall bases and the terrace.

Thanks to this space, you can also limit the upstand of the seal to 5 cm above the tiles, instead of the usual 15 cm. However, you should always make sure that the distance between the top of the upstand and the substrate of the tiles on tile supports is at least 15 cm.

> The distance of 2 cm between the tiles on tile supports and the base of the wall allows the height of the upstand of the seal above the tiles to be reduced to 5 cm. If the upstand extends at least 15 cm above the surface of the tiles, you can reduce this distance. However, it is important to assess the consequences in terms of maintenance and the appearance of the base of the wall.



1. Draining water barrier
2. Insulating building block
3. Sloping layer
4. Damp proofing
5. Thermal insulation
6. Roof seal

1 Connection between outside tiles on tile supports and the façade in the case of a roof terrace.

Space between the tiles and sills

Window and door sills are sensitive zones. Here too, TIN 244 recommends leaving a space of 2 cm and an upstand of at least 5 cm above the level of the tiles.

In practice, this distance is often reduced in order to provide easy access for people. If you want to reconcile aesthetics, accessibility and drainage, you can install grates between the tiles and the window frame (or the sill) (see Construction Details Sheet 1347).

Reducing the space between the tiles and the façade

Users often choose a flat, continuous finish between the indoor and outdoor environment. However, there are certain risks associated with this change such as:

- the accumulation of dirt (leaves, twigs, dust, etc.)
- a greater risk of the seal being circumvented and therefore of **water infiltrations**
- wetting that **can affect the durability and the appearance of the base of the wall**.

So if you reduce this distance, you should reckon on more frequent maintenance of both the perimeter joints and the base of the wall which will become dirty more easily.

To reduce these risks, you are best to choose **less moisture-sensitive façade plinths** (natural stone, concrete or brickwork) and provide a **sufficiently large corbel**. To properly protect the connection from the rain, the length of the overhang should be equal to a quarter of the height between that overhang and the floor.

Whichever solution you choose, it remains essential to leave sufficient space between the tiles and the base of the wall in order to avoid direct contact.

Importance of tile stability

The space between the first tiles and the façade only makes sense if the tiles are stable as any movement can cause inconvenience during use. Because of that, you should always install a suitable wedge between the base of the wall and the tile.

You should also always check the alignment of the wall beforehand as this will influence the alignment of the tiles. Also make sure that the tiles never come into direct contact with the façade plinth or the window frame in order to allow for expansion.

2 Example of an unstable tile.

Reconciling comfort and durability: essential points

Terraces on tile supports offer considerable design freedom and meet the growing demand for continuity between the indoor and outdoor environment. However, it is still important to comply with the fundamental technical rules.

By having a distance of 2 cm between the tiles and the façade and a vertical upstand of at least 5 cm above the tiles, you can usually prevent problems such as infiltrations and aesthetic defects.

Reducing this distance will require analysis of the detail of the base of the wall (upstand of the seal), the choice of suitable materials and special attention to maintenance. You should therefore analyse the situation thoroughly prior to execution and consult with all parties concerned.

Natural stone tiles: anticipate tolerances!

Technical Information Note (TIN) 213 which is dedicated to internal floors made of natural stone is currently being revised. The permitted tile manufacturing tolerances according to standard NBN EN 12058 do not guarantee a finished floor without defects, especially in respect of the differences in level between the tiles or the width of the joints. So for installation with adhesive bonding, it is better to choose tiles with smaller actual manufacturing tolerances and strict flatness tolerances for the substrate.

M. Van Beneden, J. Van den Bossche, L. Lassoie, Buildwise

This article focuses on tiles more than 12 mm thick that are described in the standard NBN EN 12058. Table A provides an overview of the tolerances for this type of tile. We would like to point out however that they do not apply to naturally split elements. The new version of the TIN will no longer explicitly cover installation of the so-called marble type which requires very strict tile manufacturing tolerances and the full arrangement of the cladding which is rarely carried out on account of the very high costs of this work. For installation with very thin joints, you must calibrate the tiles in accordance with the approach discussed in this article.

Tile thickness tolerances

The thickness tolerances are quite high (see table A) because they take into account imperfections created when cutting the tiles. They can sometimes be problematic when bonding in a thin layer on a hardened floor screed. For more information on measurement methods and instruments, please refer to the page from the Standards Antenna 'Tolerances and appearance' on our website.

Tile flatness tolerances

Large-format tiles can have significant flatness tolerances: 1 mm for a length of 50 cm, 2 mm for 100 cm and 3 mm for 150 cm or more.

The flatness of the tiles has a direct effect on the **differences in level between adjacent tiles**, especially if they are installed with staggered joints. The future TIN will point out that the difference in level between two adjacent tiles must not exceed 1 mm.

We therefore recommend opting for the approach already applicable to ceramic tiles as discussed in Buildwise Article 2015/03.12. This involves defining the flatness tolerances of the tiles and the substrate according to the **desired tolerances on the finished floor**. For instance, the substrate must belong to flatness class 1 for a maximum difference in level of 1 mm between adjacent tiles for bonded installation (i.e. maximum 3 mm/2 m) and the flatness tolerances of the tiles must not be greater than 0.6 or 0.4 mm, depending on whether the joints run continuously (chequerboard pattern) or intersect each other (staggered joints). These

A Tolerances for tiles more than 12 mm thick (according to standard NBN EN 12058).

Thickness		Flatness	Length or width			
			< 600 mm		≥ 600 mm	
			Thickness of the tiles			
> 12 mm ≤ 30 mm	> 30 mm ≤ 80 mm		≤ 50 mm	> 50 mm	≤ 50 mm	> 50 mm
± 10%	± 3 mm	± 0.2% of the length of the tile (max. 3 mm)	± 1 mm	± 2 mm	± 1.5 mm	± 3 mm

B Flatness tolerances for floor tiles and permissible level differences between adjacent tiles.

Tolerance class	Tolerances on the finished floor		Requirements for the substrate, tiles and installation method		
	Flatness	Difference in level	Screed	Tolerance on the tiles (*)	Grouting pattern
Normal	± 4 mm/2 m	± 1.5 mm	• Flatness class 2 for tiles up to 300 x 300 mm² • Flatness class 1 for larger tiles	Max. 1.0 mm	Continuous joints
				Max. 0.8 mm	Intersecting joints
Strict	± 3 mm/2 m	± 1 mm	Flatness class 1	Max. 0.6 mm	Continuous joints
				Max. 0.4 mm	Intersecting joints
(*) Recommended flatness tolerance for tiles up to 1200 x 1200 mm².					

flatness deviations are much smaller than those permitted by standard NBN EN 12058 but, in our opinion, represent limits that should not be exceeded in practice if you want to avoid differences in level of more than 1 mm.

Tile dimension tolerances

The tolerances on tile dimensions can present a problem if you want to have thin joints, especially when working with tiles measuring 600 x 600 mm or more and/or more than 50 mm thick.

Table D shows the permitted tolerances on joint width. We note that the overall tolerance can be considerable when the dimensional tolerances of the tiles themselves are also large. The **nominal width of the joints** should be agreed on beforehand (client, architect, contractor) and included in the contractual documents. It should never be less than double the deviation in respect of the dimensions of the tiles.

The joint width tolerance is ± 0.5 mm (installation tolerance) to which the dimensional deviation of the tile itself is added.

Let us suppose, for example, that the desired joint width is 3 mm and that the dimensional deviations of the tiles are 1 mm on average. In that case, the joint width may vary from 3 mm - 0.5 mm (installation tolerance) - 1 mm (tile tolerance) = 1.5 mm up to a maximum of 3 mm + 0.5 mm + 1 mm = 4.5 mm.

If you are using custom tiles cut to size rather than standard tiles, stricter requirements may be set for the manufacturing tolerances. It is important for this to be communicated before the tiles are installed.

This article was drawn up as part of the Standards Antenna 'Tolerances and appearance (eye precision)' subsidised by NBN.


Shutterstock

C Flatness tolerances of the floor screed as a function of the batten length.

Flatness class	Flatness tolerance for the floor screed
Class 2 (normal tolerances)	± 4 mm/2 m
Class 1 (strict tolerances)	± 3 mm/2 m

D Joint width tolerances.

Type of tiled floor	Customary nominal joint width	Joint width tolerances
Standard floor type	2 to 3 mm	Dimensional tile tolerance plus 0.50 mm

The importance of a pore filler when finishing certain types of wood

Certain types of wood have large pores that must be filled beforehand with a pore filler in order to guarantee the efficient and durable protection of the finish. If that is not done, the paint layer may be too thin in some places, allowing water to infiltrate easily and leading to premature damage.

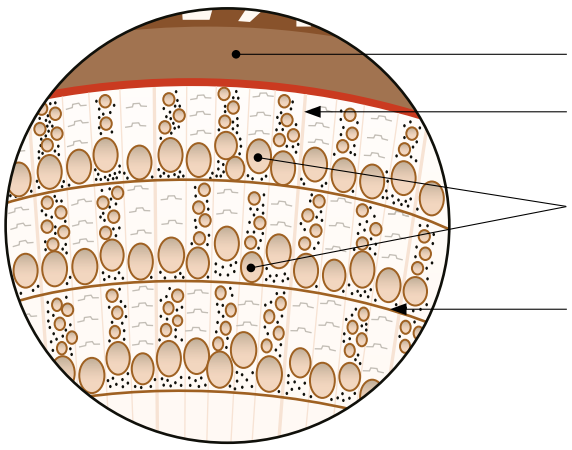
E. Cailleux, Buildwise

A pore filler is a product that is applied prior to finishing. It fills the pores in the wood, **evens out the surface and regulates the absorption of the coating**.

Wood can vary greatly in terms of structure: the size and arrangement of the cells, fibres and vessels have a direct influence on the appearance and texture of the wood (see figure 1). We generally distinguish between three categories:

- **fine-pore wood:** small (30 to 40 µm) and dense fibres and vessels with a regular and homogeneous distribution and a smooth surface (maple, birch, itauba, moabi, etc.)
- **medium-pore wood:** average texture (walnut, teak, African mahogany, sipo, chestnut, movingui, kanda, meranti dark red, jarrah, jatoba, kasai, etc.)
- **coarse-pore wood:** wide fibres and vessels with significant variations in dimensions (60 to 300 µm), a rougher surface (iroko, ash, oak, afzelia, wengé, padauk, robinia, limbali, merbau, etc.).

In the case of wood with large vessels (coarse-pore), the use of a **pore filler** is recommended in order to obtain a smooth and regular finish. That is because when they are cut, those fibres and vessels form pores and cavities that can reach considerable diameters (sometimes up to 0.3-0.5 mm). Some of them can penetrate several centimetres deep into the wood. They make the surface more absorbent in some places (see figure 2 on the next page) which not only causes variations in appearance but mainly leads to differences in the thickness of the paint layer or even to its complete absence in some places. In these zones, it is possible that the finish will not provide sufficient protection. That is because complying with paint thicknesses is one of the most important factors for guaranteeing performances and the protection of the paint in outdoor applications (see Buildwise Articles 2023/03.06, 2021/02.11 and 2020/04.08). If that thickness is not respected, then there is a risk of **greater water infiltrations** and **premature degradation** of the wood.



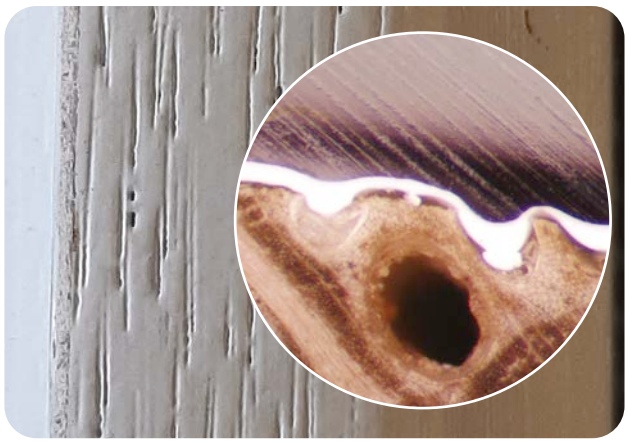
1 Internal structure of wood.

2 Example of over-painting coarse-pore wood without pore filler.

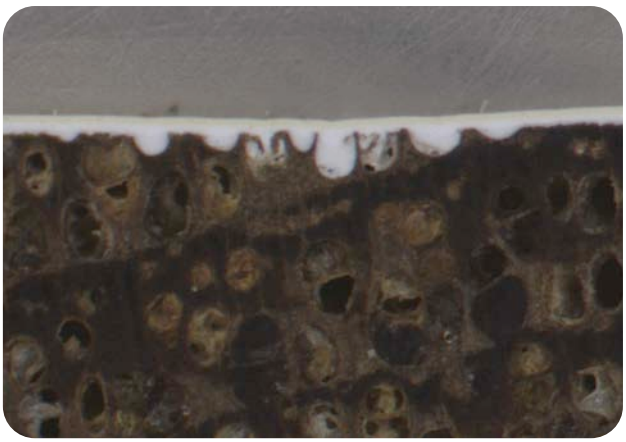
Coarse-pore deciduous trees (ash, iroko, oak, etc.) usually require a pore filler. This need also depends on the **absorption behaviour of the wood** (behaviour of the primer, macroscopic aspect, etc.). The number of vessels or pores on the surface can vary depending on the wooden element or the cutting method (crown, quarter, normal). Visual differences in the structure of the wood or the appearance of the finish during application may indicate the need for a pore filler (see figure 3).

Pore fillers are available in the form of pastes (putty or plaster) or liquid, often transparent products. Some are only suitable for indoor applications and not for outdoor applications. For plasters, the surface must be sanded using a fine grain after application and before painting. On surfaces with small dimensions or a lot of changes of angle (such as window frames), it is more difficult to use a pore filler in the form of a plaster (see figure 3). In that case, a liquid product is better. Applying a second coat of primer or an extra finishing coat can sometimes serve the same function as a pore filler and, on completion of the work, ensure more homogeneous and continuous coverage of the wood (see figure 4).

This article was drawn up as part of the Standards Antenna 'Finishes' subsidised by NBN. Some of the results were obtained as part of the thesis of Antoine Degrez in collaboration with Hout Info Bois.



3 Local lack of paint on a window frame on account of pores in the wood: the finish does not form a continuous layer.



4 Application of two coats of primer: the pores are filled and the paint forms a continuous, regular and homogeneous coating.

Bio-based polyurethane varnishes: fully-fledged alternatives

Nowadays, water-based polyurethane varnishes for parquet and wood in indoor applications are also available in bio-based versions. These products contain up to 30% and 45% bio-based carbon respectively. Analyses show that they have the right properties for them to be used correctly and that their technical performances are in no way inferior to those of traditional alternatives.

T. Haerinck, E. Cailleux, Buildwise

Today, contractors are seeing a lot of bio-based coatings (paints, varnishes and stains) appear on the market. Unlike classic petrochemical products consisting of petroleum polymers, these are manufactured partly or entirely based on **polymers derived from biomass**. The ambition of most manufacturers is to develop bio-based variants that match their traditional counterparts as closely as possible in terms of workability, performances and production process (see Buildwise Article 2024/06.05).

We put this to the test as part of the ongoing 'UP Plastics' study. We studied the composition, workability and performances of commercially available bio-based and petrochemical parquet and wood varnishes (interior joinery such as doors) based on a water-based polyurethane binder (PU).

Composition

The overall composition (proportion of binder, solvent and fillers/pigments) displays a lot of similarities between the bio-based and petrochemical variants for both the parquet and wood varnishes. With the petrochemical parquet varnishes, we do find a number of products with a **higher solvent content** (> 10%) which is not the case with the bio-based versions.

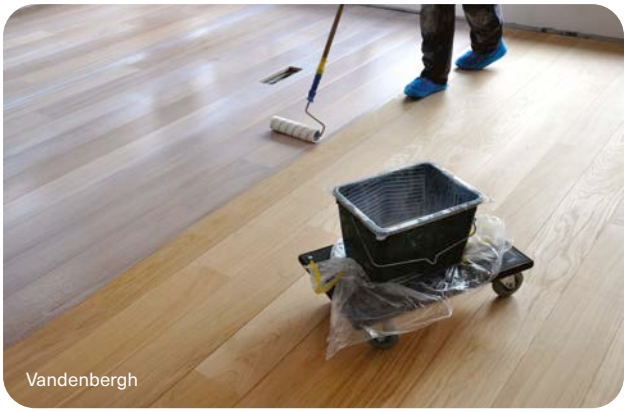
The **chemical nature** of the PU binders used also seems to be similar for both product types. All the cases studied involved aliphatic polyurethane with relatively good UV resistance. We also find both pure and (acrylate- and/or alkyd-)modified PU binders. Pure formulations were slightly more common in the bio-based parquet varnishes while no clear difference was observed in the wood varnishes.

The proportion of renewable raw materials is 20 to 30% for the parquet varnishes studied and up to 45% for the wood varnishes (organic carbon content according to the C14 method, see Buildwise Article 2024/06.05).

Properties

The **workability** of the varnishes was assessed based on viscosity, minimum film formation temperature (MFFT) and drying time. The analyses show that the bio-based products are suitable for the intended use, namely parquet and wood in indoor applications.

With the parquet varnishes, the bio-based versions display **lower shear thinning**: they flow well when applied with a roller or spread but remain quite liquid thereafter. As a result, the maximum layer thickness is limited which means in practice that an extra layer is needed more often in order to achieve the desired dry film thickness.



Vandenbergh

A Comparison of the performances of bio-based and petrochemical wood and parquet varnishes.

Performance	Wood varnishes		Parquet varnishes	
	Bio-based	Petrochemical	Bio-based	Petrochemical
Abrasion resistance	Less than with petrochemical varnishes	Limited to very good	Very good	Usually very good
Flexibility and elongation properties	Similar tensile strength and elasticity for bio-based and petrochemical varnishes		Ductile, high formability and considerable tensile strength	• Single-component varnishes: less elastic • Two-component varnishes: ductile
UV resistance	Very good – no difference in colour or gloss	Good – limited difference in colour in the case of one acrylate-modified PU varnish	Very good – no difference in colour or gloss	Good – limited discolouration in the case of alkyd-modified PU varnishes
Chemical resistance	Good – slight discolouration possible after exposure to substances that can stain	Good – slight discolouration possible after exposure to substances that can stain	Very good	Good – limited discolouration in the case of modified PU varnishes

Performances

In order to assess performances, abrasion resistance, flexibility, elongation properties, chemical resistance and UV resistance were studied. The results confirm that the **bio-based varnishes perform just as well as the petrochemical ones** (see table A).

Abrasion resistance

The **two-component products perform significantly better** than the single-component variants (see also TIN 269, § 3.7.3). No significant differences were found between the bio-based and petrochemical single-component varnishes. The only bio-based two-component parquet varnish tested scored particularly well.

Flexibility and elongation properties

In the case of parquet varnishes, the bio-based versions are characterised by **high formability and considerable tensile strength**, resulting in ductile films ideal for use on wooden parquet floors.

In the case of the petrochemical varnishes, there is a **clear difference** between the products based on a pure PU binder which are also ductile and those with a modified PU binder which have a more brittle character and more limited formability. This increases the risk of cracks forming if the wooden substrate warps significantly.

In the case of wood varnishes, the **elongation properties are very similar**. However, we note that a bio-based alkyd-modified variant exhibits the least deformation and is slightly less elastic.We merken wel op dat een biogebaseerde alkydegemodificeerde variant de minste vervorming en een iets minder elastisch karakter vertoont.

The composition of the binder (pure PU or acrylate- or alkyd-modified variant) **therefore seems to have a strong influence on the flexibility of the coatings.**

Chemical resistance and UV resistance

The chemical resistance and UV resistance of the bio-based parquet varnishes studied are excellent across the board. The bio-based wood varnishes are also **very UV-resistant**. However, with the products with modified PU binders, **slight discolouration** does occur after exposure to substances such as coffee, wine, oil, vinegar and solvent.

In the case of the petrochemical varnishes, the **results are similar**: most products score very well although some modified PU formulations also exhibit slight discolouration after accelerated UV ageing or contact with substances that can stain.

The chemical composition of the binder therefore seems to be more important than the origin of the raw materials.

This article was drawn up as part of the EFRO 'UP Plastics' project subsidised by the European Union and Wallonia.

Save time and money thanks to new technologies

The construction sector is evolving rapidly and new technologies are finding their way into every phase on site. Let Buildwise guide you through these innovations and help you implement them in your everyday work in a simple and practical manner.

N. Sanchiz, Buildwise

Technologies that are already making a difference

Measurements in the blink of an eye

Have you ever had to go back to a construction site because a measurement was missing or incorrect? Thanks to **tablets with LiDAR sensors** and certain **applications**, you don't have to do that anymore. A quick scan can deliver a reliable 2D/3D model in a matter of seconds. These tools detect doors and windows automatically and even correct any errors with the help of a Bluetooth laser distance meter. The result: fast and accurate measurements that you can share.

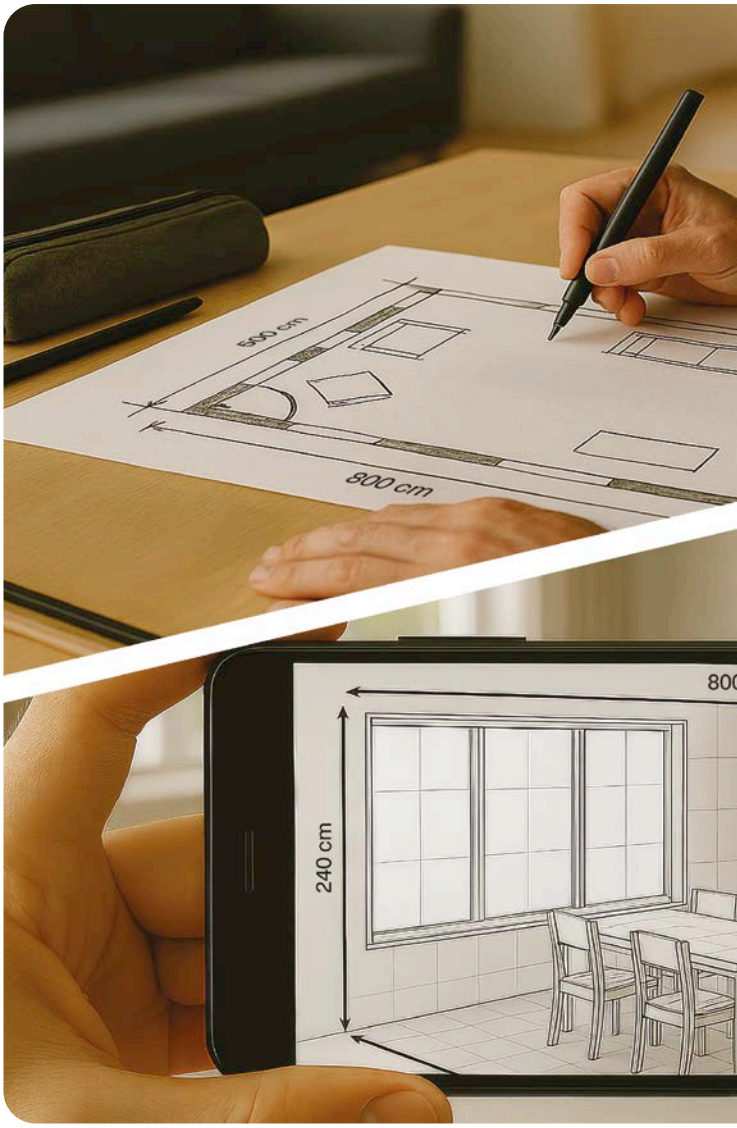
Convincing virtual tours

With a **360° camera**, you can capture an entire room in a matter of minutes and then use those images to make a virtual site visit.

This type of camera can serve as a powerful tool for communicating with your clients and subcontractors, enabling them to see the progress of the work or aesthetic choices as if they were at the construction site themselves. No need for lengthy explanations, a single image says it all.

Lighter repetitive tasks

The work carried out on site is often physically demanding. Certain repetitive tasks such as painting a ceiling or installing plasterboards can put strain on the shoulders, back and joints. Did you know that more than half of the

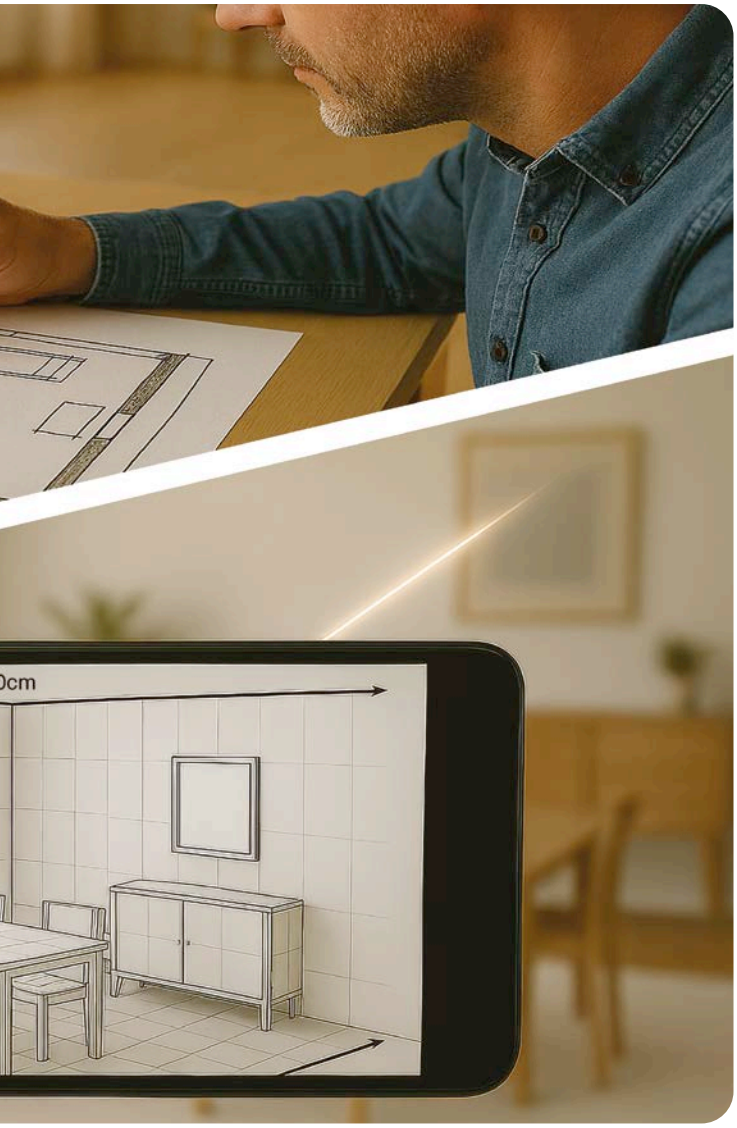


health problems in the construction sector relate to muscles and bones?

Exoskeletons provide an innovative solution that has also become much more accessible. They support your movements, reduce fatigue and increase productivity. Less pain also means less time off work due to illness and better well-being at work.

Buildwise is ready to help your company

Using a new technology can be a daunting prospect: what tool should you choose? Is it really cost-effective? How do you use it in practice on site? What are the pros and cons? These questions are precisely what Buildwise can help you with.



Test Before Invest

Naturally, before you invest you want to see **how a technology works in practice**. With Test Before Invest, a Buildwise expert will come to your site and show you how to use a tool such as a 360° camera, scanner or LiDAR tablet. So you can see the benefits directly in your own work environment.

Borrowing toolkits

Do you need more time to assess the relevance of a tool? At Buildwise, you can borrow various 'Toolkits' containing **professional equipment** such as 360° cameras with accessories, measuring equipment, scanners, LiDAR tablets and laser distance meters and try them out over a number of days or weeks on your projects. More than 120 contractors have already made use of this facility. So find out for yourself how efficient and user-friendly they are.

Personal support

Every business is unique – the needs of a tiler are different to those of a plasterer or painter – and that is why Buildwise also offers **tailored support**. We analyse your work methods, typical projects and priorities in order to identify the most suitable technologies and help you implement them.

Whether you are looking to save time on measurements, improve the way you communicate with your clients or reduce physical strain, Buildwise can help you find concrete solutions that will make a difference.

This article was drawn up as part of C-Tech Technological Services, subsidised by the Brussels Capital Region (Innoviris).

Interested? Want to find out more?

If you are looking for support or want to try out a new technology, please contact us at info@buildwise.be. You can also visit the page about digitalisation in construction on our website for more information.

FAQ

Find out the most important questions and answers on finishes below.

Can you expect ceramic floor tiles to be **perfectly flat**?

No. After all, you have to take into account both the tolerances in respect of installation (which is and remains manual work) and the tolerances in respect of the flatness of the tiles themselves. We also wish to point out that the tile flatness tolerances according to European standard NBN EN 14411 are reasonably generous (especially for large-format tiles). It is therefore advisable to opt for tiles with stricter flatness tolerances than those specified in the standard.

For more information, see Buildwise Article 2015/03.12.

Is a fire door with a **fire resistance rating of EW 30** suitable for the Belgian market?

No. According to European standards NBN EN 13501-2 and NBN EN 1634-1, the door must belong to class EI_1 30 or EI_1 60. Class EI_1 is stricter than classes EI_2 and EW which are primarily used abroad (in Germany and the Netherlands in particular). Besides adequate fire resistance, the door must also meet the minimum criteria for a 'good, functional door' from the Royal Decree dated 13 June 2007 (published on 18 July 2007).

For more information, see Technical Information Note (TIN) 234 (§ 4.3.2).

Is a painter able to eliminate all **defects in the substrate**?

No. Even if painting has been carried out to the highest standard, you should expect very minor imperfections that are inevitably noticeable in oblique light or with indirect lighting. In addition, the application of a thin layer of plaster by the painter when carrying out the necessary preparations will not significantly improve the general flatness of the substrate.

For more information, see Technical Information Note (TIN) 249.

Read more about this and discover similar FAQs for your field.

Focus

on the pointing of brickwork and on façade cleaning.

Everything you need to know about the pointing of brickwork in one document!

Technical Information Note (TIN) 297 covers the pointing of brickwork in new construction and renovation projects. The subjects covered include the following:

- functions of pointing
- jointing mortars and their components (homogeneous mixes prepared on site or factory-premixed compositions based on sand, binders and possibly additives and/or pigments)
- execution of pointing
- aspects requiring special attention (appearance, i.e. mainly the colour and structure of the joint, dimensional tolerances, mechanical properties of the joints and the frost resistance of the mortar joints).

TIN 297 tells you everything you need to know about pointing brickwork.

A new Technical Information Note on façade cleaning!

In Technical Information Note (TIN) 296, contractors, architects and clients will find an overview of all relevant information on façade cleaning in Belgium. This richly illustrated reference work covers both the reasons for façade cleaning (aesthetic and technical) and the various façade materials (natural stone, brick, concrete, plaster, paint, pointing, etc.) and types of contamination (dust, soot, biological attack, stains).

The TIN also takes an in-depth look at the main façade cleaning techniques. The right technique to be selected will depend on the material, the type of contamination and the state of the façade. This document emphasises the importance of preliminary tests and the protection of surfaces not to be cleaned. Finally, a number of specific cases (such as the removal of graffiti or the cleaning of metal surfaces) and the relevant Belgian legislation are also discussed.

Interested? If so, download TIN 296 now!

Focus

on peeling paint, microcracks at the top of walls and the warping of wooden boarding.

Pathologies sheet 127

Peeling of paint on external woodwork: pay attention to connections!

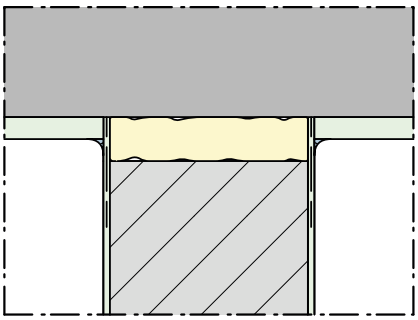
Is the paint on your external woodwork peeling at the connections?

Pathologies sheet 127 reveals the hidden mechanisms behind the premature peeling of finishes on woodwork: infiltrations via the end grain, trapped moisture, stresses in the substrate, etc.

Learn all about good practices for design, the choice of finishes and maintenance in order to guarantee durable, aesthetic and strong wooden constructions – even in the most exposed zones.

Pathologies sheet 109

Microcracks at the connection between walls and ceiling



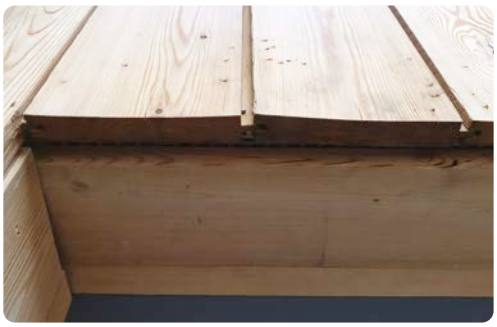
Have you had cracks appear at the connection between wall and ceiling?

Pathologies sheet 109 discusses the movements that make the layer of plaster on gypsum block walls vulnerable at the connection to the ceiling. This document provides simple solutions to prevent peeling, microcracks and costly repairs.

This sheet guarantees you a clean, durable finish with no nasty surprises!

Pathologies sheet 101

Warping of wooden boarding



Is your wooden boarding warped?

Gain insight into the causes of bending, open joints and detachment and discover simple solutions for attractive, stable and durable façade cladding.

Pathologies sheet 101: an essential sheet for successful wooden façades.

Buildwise Zaventem
Registered office
Kleine Kloosterstraat 23
B-1932 Zaventem
Tel. 02/716 42 11
Email : info@buildwise.be
Website : buildwise.be
- Technical advice – Publications
- Management – Quality – Information technology
- Development – Valorisation
- Technical approvals – Standardisation

Buildwise Limelette
Avenue Pierre Holoffe 21
B-1342 Limelette
Tel. 02/655 77 11
- Research and innovation
- Training
- Library

Buildwise Brussels
Rue Dieudonné Lefèvre 17
B-1020 Brussels
Tel. 02/716 42 11

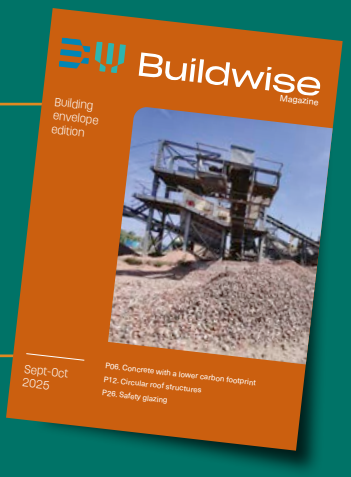
Colophon

A publication of Buildwise (formerly the Belgian Building Research Institute), an institute approved through application of the legislative order dated 30 January 1947.

Responsible publisher : Olivier Vandooren, Buildwise,
Kleine Kloosterstraat 23, B-1932 Zaventem

Translation: Communicationwise
Layout: J. Beauclercq and J. D'Heygere
Illustrations: G. Depret and Q. van Grieken
Photographs Buildwise: D. Rousseau, M. Sohie et al.

Also interested in the ‘Building envelope’ or ‘Technical installations’ editions?



‘Building envelope’ edition

Published in April and October and distributed exclusively to:

- general contractors
- rough structure contractors
- joiners and glazing companies
- sealing and roofing contractors

‘Technical installations’ edition

Published in August and distributed exclusively to:

- heating, ventilation and air-conditioning installers
- sanitary installers

General contractors also receive this edition.

Buildwise

Would you like to receive other editions too? You can! Scan this QR code and fill in the online form. You can also sign up to receive our digital newsletter via this QR code.

buildwise.be