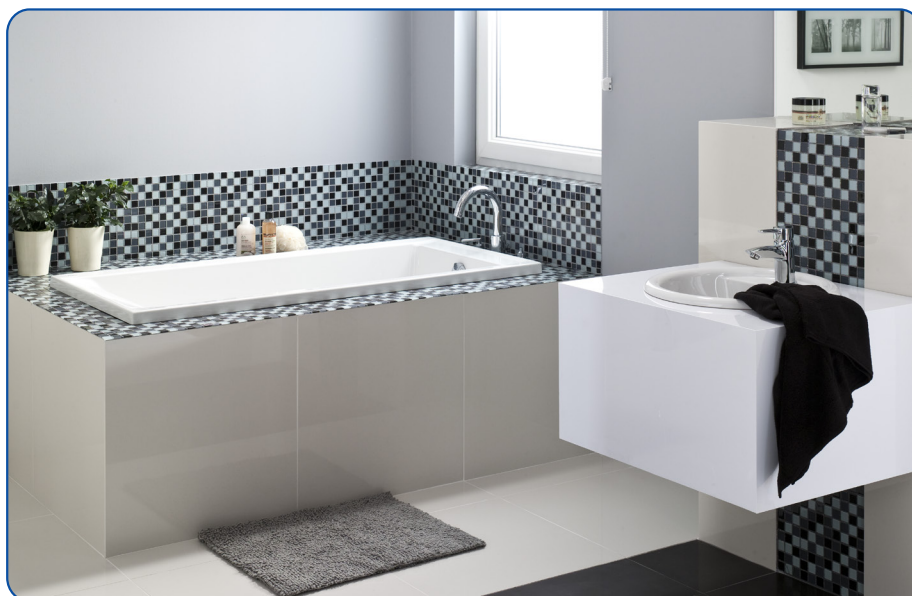


School OF TILING

Lesson 1

Substrate preparation before execution of finishing works in a bathroom.

Some time ago we provided the contractors with the "School of ETICS" brochure. **We have decided to continue the cycle and start new lessons entitled "School of tiling".** Although the topic seems familiar it will allow to systematize the knowledge, experience and information in this area. In the following lessons we write about substrate preparation, under – tile damp proofing, tiling and grouting as well as common mistakes.



BATHROOM IN THE PAST AND NOWADAYS

Probably there is no other room of such vertiginous career as bathroom. Except of ancient Rome times, where people paid some attention to hygiene and derived pleasure from bathing, for long centuries bathrooms were almost useless in human lives. Interestingly, even in huge palaces and residences, no importance was attached to hygiene keeping. The tendency was even opposite – frequent bathing was treated as a reason for illnesses, and people frequently taking a bath suspected of ignoble plans or even witchcraft. It was not until 19th century when the situation started to change slowly. Current bathrooms play increasingly utilitarian part and are not used for hygiene only. In bathrooms one can find nowadays materials previously not used – wood, glass, natural stone, sheet.

The process of execution of finishing works in a bathroom can be divided into some phases. It is important to start them after completion of raw state works, building stabilization (for new objects) and finishing any installation actions (water, sewage, electrical, heating). When having free access to a room designated for a new bathroom or a room under modernization, you should start with detailed cataloguing and measurement of particular elements. On this basis, not on the basis of schemes and dimensions listed in the building design, one can start the bathroom designing. The design should take into consideration the sanitary facilities arrangement - according to technical recommendations on distance between them, allowable distance and gradient of connections with lines as well as utilitarian and functional expectations of the investor. It should also consider the type and distribution of lighting, sockets and electrical switches. The design and arrangement of the room can be prepared by an architect, but more often it is done by a décor design consultant or tiler basing on the agreement with future bathroom users.

SUBSTRATE IS THE BASIS

Proper substrate preparation constitutes the basis for quality and durability of finishing works. Even the most expensive and effective cladding, when applied onto incorrectly prepared substrate, can crack or loosen. It is the same with other facings, but this aspect is particularly crucial for ceramic floor cladding, which, compared with the wall one, is exposed to much more intensive usage. That is why we are going to pay special attention to substrate evaluation and preparation during this lesson.

SUBSTRATES CLASSIFICATION

Substrates met in construction works can be divided differently. The main classification is based on the substrate age, i.e. time elapsed from its application. In this respect we can identify:

- NEW** – in newly erected buildings or objects under major modernization
- OLD** – in existing buildings in use

Substrate classification in respect of material type, which refers to classification above:

- Concrete monolithic walls, executed at construction site or of prefabricated elements;
- Raw walls (not plastered) of small – sized elements, ceramic bricks, ceramic hollow blocks, expanded clay – cement blocks, cellular concrete blocks, Pro-Monta gypsum blocks;
- Plastered walls – executed with the use of cement, cement – lime or gypsum plasters, sometimes with additional finishing coat (gypsum or cement);
- Cement floors or subfloors;
- Plasterboards or gypsum fibre boards;
- Difficult substrates (or critical) – old ceramic cladding, OSB boards, waterproof plywood, terrazzo.

The diversity of situations met in practice causes that, before commencement of works, one should thoroughly check the substrate using the guidelines listed below.

SUBSTRATES REQUIREMENTS

The first point is to define the substrate type including information provided above. Mineral substrates are prepared differently than wooden or difficult (e.g. terrazzo or old ceramic tiles) ones. Therefore different is also the range of necessary construction materials.

1. STABILIZED SUBSTRATE

After substrate type determining one should check when it was applied, e.g. in construction records, purchase invoices or by asking the investor. It allows to determine if the substrate is duly stabilized to air – dry state and if the finishing works can commence. Concrete layer, jointless floor or even thin leveling layer constituting the substrate must be duly set and dry, otherwise it can negatively influence the cladding. Time, which should pass from the substrate execution until tiles or other facing application, depends on some factors:

- type of material used
- material thickness
- conditions of setting

Concrete elements should be stabilized minimum 28 days, but some recommendations give even 3 months. Floors and cement subfloors as well as traditional plasters should dry approx. 7 days for each 10 mm of layer thickness (28 days recommended). This time can be shortened by using ready – to – use, fast – setting leveling mortars, for which the manufacturer sets shorter stabilization time. Example of such product is **ATLAS ZW 330** (further works after 5 h) or **ATLAS POSTAR 80** (further works after 24 h). Gypsum plasters set and dry within 14 days, but one should always remember that this time is given for stable conditions and it can be longer in different ones. It is advisable to note here that gypsum plasters should be used in places designated for tiles application and left without floating or floated rough.

ATLAS ZW 330

Package: 25 kg

Compressive strength: 20 N/mm²

Adhesion: 0.6 MPa

Consumption: 1.5 kg/1 m²/1 mm

Layer thickness: 3 – 30 mm

Tiling: after 5 h/5 mm of layer thickness



School OF TILING

Lesson 1

ATLAS POSTAR 80

Layer thickness depending on arrangement:

- bonded: 10 – 80 mm – good quality concrete, cement or anhydrite jointless floor (with or without floor heating),
- on separation layer: 35 – 80 mm: poor quality substrate, not guaranteeing proper adhesion – dusty, cracked, very absorbable,
- floating: 40 – 80 mm: applied onto thermal or acoustic insulation made of polystyrene,
- floor boards, hardened mineral wool panels, etc.,
- heating: minimum 35 mm – thickness above the heating layer



as resistance to dimension changes resulting from outside factors connected with, e.g. room utilization. As an example we can list floors made of OSB boards, floors executed on thermal insulation layer (so called floating) or plasterboard constructions. For such substrates one should check experimentally, if they bend or buckle under pressure, and boards are firmly and stably bonded to the substrate or fixed to the frame. In case of plasters a stable substrate should be understood as plaster fully bonded with substrate, not giving dull sound when tapped.

3. CRACK - LESS SUBSTRATE

Substrate should be **dry**. If it has not been primed, in order to limit absorption one can, directly before tiling, wet it with water. It must not be dump (do not leave puddles), it should be in matt – wet state.

4. CRACK - LESS SUBSTRATE

Substrate **should not be cracked**, and if such irregularities occur, one should use solutions leading the surface to the expected state. The repair actions type depends whether cracks are stabilized or working (it can be checked with a controlling glass, gypsum filling or open joint indicator). In case of stabilized cracks it is enough to widen and deepen them mechanically and then close with a cement mortar, e.g. **ATLAS TEN – 10**. In problematic cases it might be necessary to use additional support, local in a form of steel rods installed across the cracking or surface ones in a form of special meshes or crack – relief mats. Cracks should be repaired and filled before the whole surface leveling. Cracks of construction nature, threatening the building statics, should be consulted with a construction engineer in order to determine the reasons and repair methods.

5. CLEANED SUBSTRATE

The next, one would think obvious, issue – the surface must be cleaned. Any layers or substrate elements which may decrease the adhesion of freshly applied finishing coats should be removed. We mean here coating materials, such as paints and flooring adhesives remains, weakly adhering or dusting substrate elements, as well as standard dirt, dust. Impurities from adhesives should be hammered off, paints remains softened and scraped off with a float, and dusty elements cleaned with a card. If any biological contamination occurs, it should be removed, e.g. with ATLAS MYKOS preparation.

Allowable humidity depending on the substrate:

Substrate type	Humidity
Concrete, cement jointless floor, cement plaster	Not more than 3%
Gypsum plaster	Not more than 1%
Anhydrite subfloor	Not more than 1.5%

2. STRONG AND STABLE SUBSTRATE

The next thing is to check if the substrate is **sufficiently strong and stable** for application of subsequent layers – it is particularly important in case of substrates defined above as old. First recommendation refers generally to substrate strength – one must not use strong material, e.g. adhesive for terracotta on a substrate, which is weaker than the one, as it may lead to bond breaking. In case of floors compressive strength should be min. 12 MPa, and flexural strength min. 3 MPa. Weak, dusting plasters should be removed. Substrate stability (rigidity) should be understood

6. EVEN SUBSTRATE

The penultimate, but very important matter – the substrate should be appropriately even. It refers to whole planes, not only substrate elements. Too vast horizontal or vertical deviation can impede or even indispose tiling works without additional repair actions. According to guidelines the substrate evenness is checked with the use of two – meter – long reference rod. The guidelines accept vertical surface deviation not larger than 3 mm along rod length and in number not higher than 3 points. On the whole room height the deviation (up – down) must not be larger than 4 mm, and for horizontal surfaces – 5 mm along 2 m length. Adhesives for tiles can be used with set thickness, always written on the package. In this regards the type of adhesive is very important as it determines the method and scale of substrate leveling. It is not advised to level the substrate with an adhesive, although it is technically possible. Adhesive without supplementary leveling can be used onto appropriately even substrates only. On substrates of larger irregularities one should use additional leveling coat as well as general – use or thick – coat adhesive (only on floors). In both cases major cavities and irregularities should be filled first, so the final adhesive layer keeps relatively even thickness on the whole surface.

PRIMING

The primer should be used onto substrate leveled and cleaned from dirt, but it must not be treated as an antidote for any substrate imperfections. An important matter is the choice of priming agent – for absorptive substrates traditional priming emulsions penetrating the substrate and reducing its absorptiveness are used, e.g. **ATLAS UNI – GRUNT (AVAL KT 17)**.

On floors one can use deeply penetrating primers, e.g. **ATLAS UNI – GRUNT PLUS (AVAL KN 97)**. On smooth surfaces, such as con-

crete, OSB or old tiles, a so-called adhesion coat, for example Atlas Grunto-Plast, is used. It does not penetrate into the substrate, but creates a strongly adherent layer on its surface. In any case (on concrete, OSB or old tiles) the application of the primer allows to unify the parameters of the substrate on the entire surface – on the old substrate as well as on the points filled in. It is important due to the necessity of providing the same binding conditions for newly applied layers on the entire surface. Regardless the instructions above, one needs to remember about static-strength issues of the structural elements, onto which tiles are to be fixed, due to their importance for the quality and durability of work performed.

UNI-GRUNT PLUS (AVAL KN 97)

It is characterized by enhanced ability of penetration. Therefore, it suits perfectly for excessively absorptive and weakened substrates. The finishing coats can be applied just after 4 hours.



School OF TILING

Lesson 2

Execution of damp proofing

In this lesson we are going to focus on the following issues: where and why one should apply damp proofing and types of damp proofing products which can be used.

The bathroom, due to its utilitarian function in a facility, is a specific type of compartment. Its surface and volume are usually smaller comparing to other rooms, although, due to frequent use of water, the humidity and air temperature are higher there. Frequent use of water results in the production of large amount of water vapour and creates the possibility of splashing walls or floors. Because of that, it is required to use appropriate materials and technological solutions related to the following issues:

- construction (access to the separate ventilation ducts, air inlets in doors)
- material (use of materials resistant to water, use of additional materials that are damp-proof and waterproof and are not required in other types of rooms),
- hygienic (use of claddings that are easy to clean and resistant to biological contamination)
- installation (residual current protection, requirements for tightness of electronic installation device cases)

WHY TO USE UNDER-TILE INSULATION?

Under-tile insulation in bathroom works as a lightweight type of insulation and protects against unpressurized water load. Thus, coat (or more often coats) of damp proofing protects moisture-sensitive materials in walls and ceilings against long-term dampness, deterioration of thermal insulation quality and against the possibility of emergence and growth of biological contamination. Materials that are particularly sensitive to the negative effects of water presence are wooden, wood-based, porous mineral ones as well as products manufactured on the basis of gypsum binders, including plasterboards.

WHERE TO USE UNDER-TILE INSULATION?

There is no definition of a "wet" or "damp" room in standards as well as construction regulations regarding this subject. There is no official standard for division of bathroom into different zones depending on the degree of water load and there are even no recommendations for use of gypsum products (plasters, anhydrite screeds, plasterboards) in bathrooms. In standards of some

European countries these topics are described differently, so one can feel free in the selection of damp proofing solutions. Usually a wet zone, which is a place in a bathroom that can be washed over with water or where water may occur, is defined by:

- the entire floor surface with the adjacent strip of wall of height of minimum 10 cm (all over the perimeter of the room)
- the entire wall surface, from floor to ceiling, at the area of shower cabin, the borders of this area are determined by walls of shower cabin
- the entire wall surface behind and above the bathtub with the adjacent strip of wall of a minimum width of 50 cm
- the wall surface at the area of washbasin (under, behind and above it), together with the strip of wall of minimum of 50 cm adjacent to washbasin

Other surfaces of construction partitions, including the ceilings, in the bathrooms are thus assumed as damp zones and do not require installation of under-tile insulation.

TYPES OF DAMP PROOFING PRODUCTS

As practice shows, sealants made of single-component or two-component products are usually used in bathrooms. This results from the scope of and the way how water effects on the sealed surfaces. In a bathroom water acts without pressure, therefore there is no need to use two-component products, which are characterised by resistance to pressurized water.

Single-component damp proofing is available in the form of ready-to-use products (except of mixing in the packaging in order to unify the consistency, they do not require any further preparation). Other names that also can be used for this type of products are:

- liquid membrane
- jointless membrane
- sealing mass
- under - tile bonded sealant

Composition of single-component damp proofing is based on water dispersion of synthetic resins which constitutes a binder

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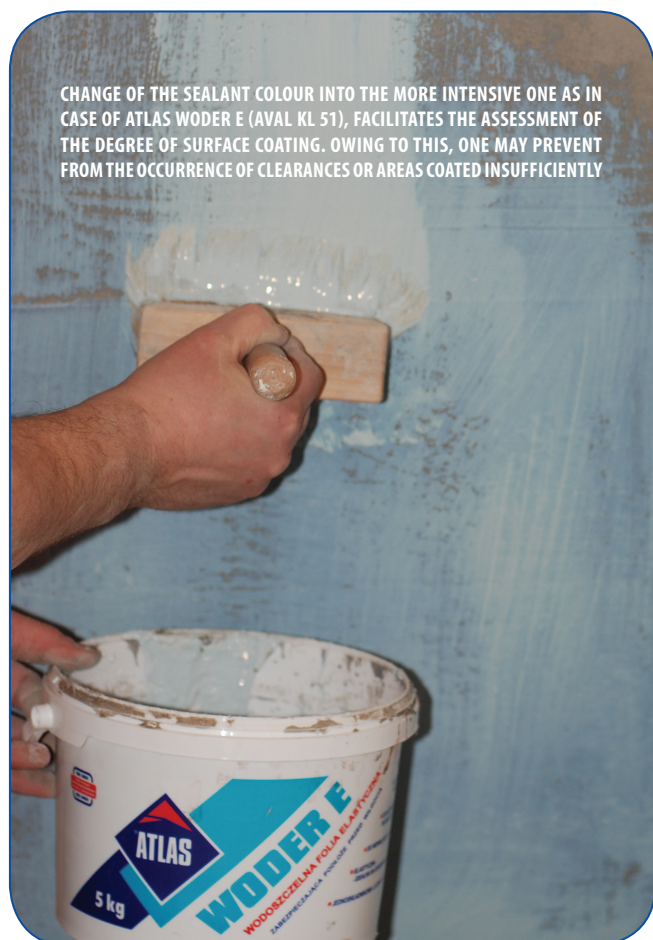
Lesson 2

and determines water tightness and adhesion to the substrate. The composition is complemented with dolomite powder fillers, talcum and chemical additives (antifoaming agents, dispersants, preservatives). Due to significant content of water dispersion of synthetic resins, the coating has a very high adhesion to the substrate - greater than $1 \text{ N} / \text{mm}^2$, it is flexible and can be used on floor or wall heating. The setting process of a liquid membrane is physical – it consists in evaporation of water, followed by an appropriate bonding, bridging of resin and hardening of the coat surface. **Atlas Woder W**, intended for indoor application, is an example of damp - proofing of this type. Another example of single-component damp - proofing is **Atlas Woder E (AVAL KL 51)** – this product is characterized by more universal range of use as it can be applied both indoors and outdoors.

Two-component damp proofing is formed by a combination of

two types of binders: cement and polymer. Therefore, the product is composed of two constituents - dry one (a mixture of cement, aggregates and additives) and liquid (water dispersion of synthetic resins). These two are jointed immediately before use allowing to obtain a construction material of very favorable technical and functional properties.

Atlas Woder Duo is an example of damp proofing of this type. The most important feature of this material is the resistance of finished coating to pressurized water, which allows to use it as a medium or heavy weight type of insulation, also in water reservoirs, swimming pools (it's resistant to chlorinated water), terraces, foundations, etc. A special type of damp proofing, mainly used outdoors, is **Atlas Woder S**, which requires mixing with water prior application.



School OF TILING

Lesson 2



TECHNOLOGY OF EXECUTION OF THE SEALING WORKS

1. SUBSTRATE PREPARATION

The first stage of works related to the assessment and proper preparation of the substrate was described in details in the previous lesson of this manual. In this lesson it should only be noted that in case of polymeric damp proofing the substrate must be in air-dry state, and in case of two-component insulation - it should be moist. If in doubt, one may perform a determination of moisture content or a simple "foil test". The test consists in fixing a piece of plastic foil (approx. 1 m² large) to the substrate (e.g. with a double-sided tape). If condensed water vapour appears on the inner surface of foil after several hours, it means that substrate is not prepared yet for execution of single-component damp proofing. In case of using two-component products, and also **Atlas Woder S**, it is recommended to moist very dry substrates in order to obtain matt-moist state (without puddles) short before the works commencement.

2. SEALING ACCESSORIES

The technology of application of one- and two – component damp proofing products is very similar. The work always begins with the installation of, so-called, sealing accessories. They are used in places which, due to their shape, location and technical or utilitarian function, may be a source of potential breaks of insulation. The most frequently used sealing accessories are:

- sealing tapes
- sealing flanges
- sealing corners

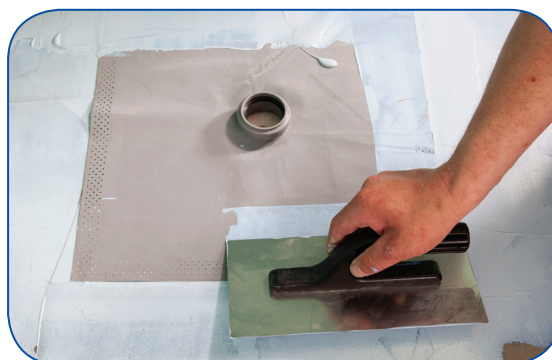
Sealing tapes are applied on the connection edge between walls and floors as well as on the corner between walls. Each of the surfaces above is an element of the building structure, therefore it is subject to certain deformations. As a result, these surfaces can slightly move in relation to each other. This can cause cracks in the joints of the surfaces, especially at places where the surfaces are in contact at right angles. In order to prevent situation where a crack developed at the joint during the building maintenance creates also a crack and leakage in the damp proofing coat, it is recommended to reinforce this place by embedding an additional element - a tape. Tapes compensate deformations and maintain the continuity and tightness at the joint. A similar effect is obtained by shaping a coved base, but due to the use of thin-coat adhesives this solution is not commonly used nowadays. All accessories are fixed, by pushing them with a float into freshly applied sealing mass, having in mind to embed the side, perforated strips of the tape carefully and tightly.



ONE SHOULD PREVENT SITUATION WHERE A CRACK DEVELOPED AT THE JOINT DURING THE BUILDING MAINTENANCE CREATES ALSO A CRACK AND LEAKAGE IN THE DAMP PROOFING COAT. IT IS RECOMMENDED TO REINFORCE THIS PLACE BY EMBEDDING AN ADDITIONAL ELEMENT - A TAPE. TAPES ARE MADE OF AN ELASTIC MATERIAL, THEY COMPENSATE DEFORMATIONS AND MAINTAIN THE CONTINUITY AND TIGHTNESS AT THE CONNECTION.



SEALING CORNERS ARE AVAILABLE IN TWO VERSIONS - INNER AND OUTER. THEY ARE APPLIED ON THE CORNERS OF WALLS AND EMBEDDED TO OVERLAP WITH A SEALING TAPE Laid ALONG THE EDGES. IT IS ADVISED TO COAT BOTH THE SUBSTRATE AND A SEALING TAPE WITH THE SEALING MASS. HOWEVER, ONE MUST REMEMBER TO REMOVE EXCESS OF MASS BY EXTRUDING WITH A FLOAT OR A SPATULA.



SEALING FLANGES (RINGS, CUFFS) ARE USED AT INSTALLATION PASSAGES. THEIR TASK IS TO STRENGTHEN THE SEALING AT THESE POINTS. PRIOR TO THE USE OF FLANGES, ONE NEEDS TO ENLARGE THE OPENING IN THE FLANGE BY CUTTING IT UNTIL AN OPENING SLIGHTLY SMALLER THAN THE OUTER DIAMETER OF THE PIPE THAT PASSES THROUGH THE SUBSTRATE IS REACHED.

3. MASS APPLICATION

After fixing all necessary accessories one can commence application of the sealing mass over the entire surface to be insulated. The principle, we all need to be guided by, is the application of at least two coats of sealant. The first one is always applied with a wide painting brush and rubbed firmly into the substrate. It aims to fill all the cavities (pores) of the substrate and to create a bonding layer prior to the application of the next, proper damp proofing coat. It is important to distribute the mass with a brush in different directions in order to rub it properly. The second and, optionally, subsequent coats can be applied not only with a brush, but also with a roller or a smooth stainless steel float. One can commence application if the previous coat dries completely (i.e. after approx. 3 hours). It is recommended to reach the total coats thickness of 1.5 mm in case of sealing executed in bathrooms. When the insulation dries completely one can apply the finishing layer, mostly cladding made of ceramic tiles. The finishing layer, apart from an aesthetic function, is responsible for the protection of the damp proofing against mechanical damages.

Atlas Gips Optimus

Atlas Gips Optimus is a finishing coat based on white cement, designed for outdoor application or for the compartments where gypsum finishing coats should not be applied. The way and convenience of application are similar to the parameters of gypsum finishing coats. The micro fibres that are contained in the product, additionally strengthen the resistance of wall against contraction cracks.



TECHNICAL PARAMETRES:

- open time: ca. 25 minutes
- pot life: ca. 2 hours
- consumption: ca. 1.5 kg/ 1m² / 1mm
- layer thickness: 1 - 5mm
- adhesion ≥ 0.5 N/mm²

AT AREAS WHERE THE SURFACE IS NOT EXPOSED DIRECTLY TO WATER, A TRADITIONAL CEMENT PLASTER MADE OF ATLAS PLASTERING MIX OR EVEN A THIN LAYER OF CEMENT FINISHING COAT (e.g. ATLAS GIPS OPTIMUS OR ATLAS REKORD) MAY BE USED AS A PROTECTIVE LAYER.

REMEMBER !

Execution of tight, under - tile sealing depends on many factors: surface preparation, appropriate quality of construction materials and careful performance. When applying the coats of damp proofing on surfaces, one must ensure that the surface is fully coated and the mass is evenly distributed. In addition, insulation coat must be of even thickness on the entire surface. Under - tile sealing should be jointless, all connections should be done on the fly with "wet on wet" method. One must also ensure the continuity of the applied coat. Next important issues are careful and proper sealing of corners, edges, expansion joints, passages of installation pipes and contact edges between floors and walls. These are critical places for the entire system. The rule here is as follows - the whole sealing is as durable as its weakest point.

§ Damp proofing in regulations

The standard EN 14891:2012 "Liquid - applied water impermeable products for use beneath ceramic tiling bonded with adhesives. Requirements, test methods, evaluation of conformity, classification and designation" divides the products for under - tile damp proofing into three groups:

- cement, polymer - modified
- dispersion
- based on reactive resins

Full labelling of products of this type consists of the type labelling, i.e. a letter symbol:

CM - cement, polymer - modified water impermeable product,
DM - dispersion water impermeable product,
RG - reactive resins - based water impermeable product
as well as letter labelling of class (or classes) for optional requirements:

P - if a product is resistant to chlorinated water.

O1 or **O2** - when a product during operation holds the ability of cracks bridging in low temperature, -5 °C (O1) or -20 °C (O2) respectively.

ABC ... GLOSSARY:

Water tightness - it is a material property that ensures execution of layer or coating which is not permeable to water.

Water resistance - a material characterized with this property may be under a long-term influence of water without deterioration of its technical and functional parameters.

School OF TILING

Lesson 3

Ceramic tiles in bathrooms

We have already done the stocktaking. At this stage: we have a bathroom planned, the substrate is evaluated and prepared, the under - tile damp proofing is executed. We are about to buy the tiles and to make preparations before they are fixed.

CHOOSING THE FACING TYPE

In bathrooms, due to the regulations and practical aspects of maintenance, it is recommended to choose facing made of materials resistant to water and moisture, easy to keep clean and slip resistant (floors). Therefore, the most commonly used facings are those made of ceramic tiles, as they meet these expectations at the highest level. However, over the recent years, a significant growth of popularity of other material solutions has been noted and wood or metal sheet facings, special wallpapers or paints resistant to moisture have become frequently used. Other, alternative methods of surface finishes for walls and floors in bathrooms, will be discussed later.

TYPES OF CERAMIC TILES

The tiles most commonly used in bathrooms are: ceramic (glazed, terracotta or gres), glass or stone mosaic, rarely stone ones. It is advised to avoid polished tiles, which are less resistant to dirt, as well as technical gres. Ceramic tiles are manufactured and classified according to the European standard EN 14411: 2009.

The standard provides several criteria for the classification of tiles, depending on:

- method of manufacturing and forming,
- absorption group,
- abrasion,
- slip resistance,
- additional features, such as: chemical resistance to acids, oils and other substances.

Taking into account the suitability for use in a bathroom, ceramic tiles should have at least the **PEI I or PEI II class of abrasion** (for use at areas of little traffic, at places of barefoot or soft shoes traffic) (Table 1) and be characterized by water absorption below 10%. However, the most important issue, when it comes to the tiles, is the slip resistance class (Table 2). It is a very important aspect with a view to the operational safety of floor ceramic tiles. Slip resistance is the ability to counter slip, that is, an uncontrolled loss of stability when moving over an area. According to the standard, resistance to slip is determined by the slip angle, which indicates a slope of a plane covered with tiles coated with oil (for rooms where footwear is used) or water (for rooms with barefoot traffic), at which a standing man begins to slide. The test is performed in a special harness protecting against

falling. In case of bathroom tiles, it is recommended to use the tiles of slip resistance of at least R10 class.

PEI I and II	For rooms of light duty wear, at areas of barefoot traffic or soft footwear use.
PEI III	For rooms of medium duty wear. For floors vulnerable to scratching with sand – kitchens, corridors, antechambers.
PEI IV	For rooms of increased and heavy duty wear, for floors which can be polluted. For garages, basements, workshops, shops, staircases.
PEI V	The highest possible resistance to abrasion. In practice only gres tiles reach this level of resistance. For application at industrial and public access facilities.

Table 1. Classes of abrasion of ceramic tiles according to PN-EN 14411

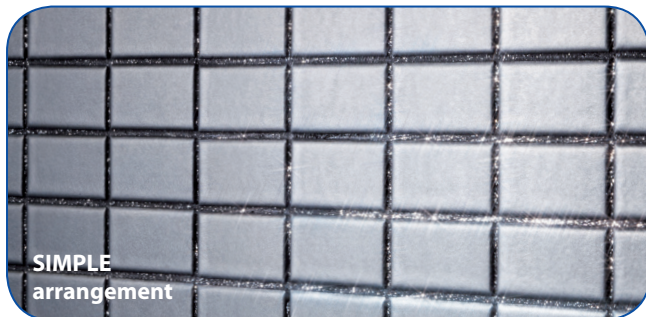
Resistance to slip is classified with five groups (from R9 to R13) for surfaces with footwear traffic and with three groups (A, B and C) for surfaces with barefoot traffic.	
Footwear traffic: R9 from $\geq 3^\circ$ to $\leq 10^\circ$ R10 from $> 10^\circ$ to $\leq 19^\circ$ R11 from $> 19^\circ$ to $\leq 27^\circ$ R12 from $> 27^\circ$ to $\leq 35^\circ$ R13 from $> 35^\circ$	Footwear traffic: R9 from $\geq 3^\circ$ to $\leq 10^\circ$ R10 from $> 10^\circ$ to $\leq 19^\circ$ R11 from $> 19^\circ$ to $\leq 27^\circ$ R12 from $> 27^\circ$ to $\leq 35^\circ$ R13 from $> 35^\circ$

Table 2. Resistance to slip for ceramic tiles according to PN-EN 14411

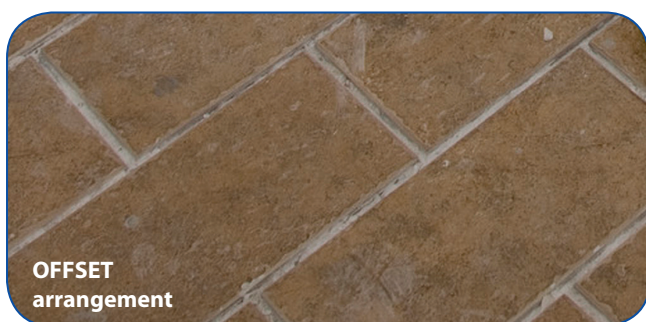
METHODS OF CERAMIC TILES ARRANGEMENT

Ceramic tiles can be arranged with one of five systems listed below, alternatively the systems can be mixed:

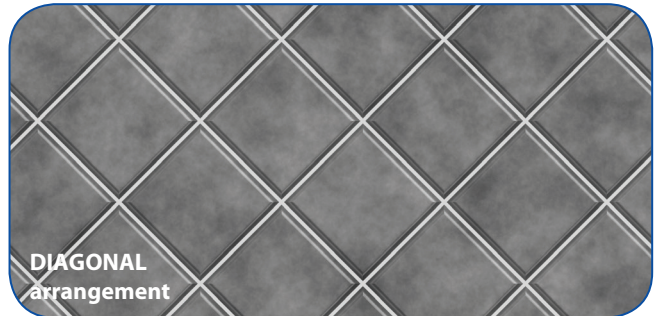
- simple (straight lay)
- offset (brick pattern)
- diagonal
- mixed
- modular



It is the most frequently used one. The joints between the tiles intersect at right angles and are parallel and perpendicular to the walls. It is the best solution for rooms of regular shapes and of angles maintained at the corners - cuts are reduced to minimum and depend on the size of surface to be covered with tiles.



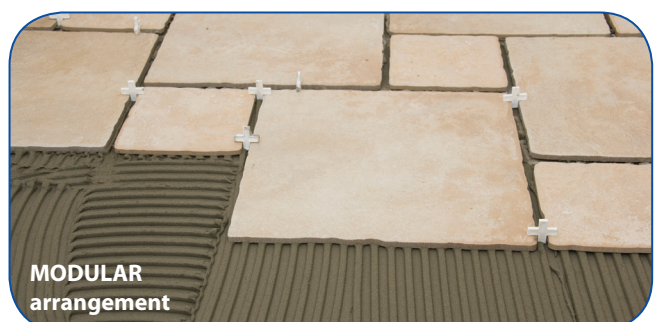
In this arrangement, joints between the tiles are offset from each other by approx. 1/3 of the tile width - a common solution for the rectangular tiles. It is also possible to shift joints of about half of the tile width - it is a, so-called, brick arrangement. However, this system is less preferred due to the possibility of impression of lack of flatness of the surface.



The joints intersect at right angles, but they are also positioned at 45° angle in relation to the edges determined by the walls of the compartment. This is the best solution for rooms of irregular shape, especially long and narrow ones. Regularity of tiles and intersected joints forms a grid that can enhance imperfections in the shape of the room - the diagonal arrangement minimizes this visual impression.



It is created by combination of tiles of minimum two different formats. It gives an effect of shifting in both directions.



It is used in large rooms where surface to be covered with tiles is vast and uniform. This system consists of tiles of various sizes formed in the module which is regularly repeated upon the entire surface.

On the walls - the simple arrangement is used only.
On the floors - depending on the shape and size of the room - all the arrangements can be used.

School OF TILING

Lesson 3

PURCHASE OF CERAMIC TILES

Ceramic tile is a facing material suitable for application on walls and floors. Tiles for horizontal surfaces usually have larger dimensions and are slip- and abrasion resistant. On the walls, where the facing is not exposed to such intensive use, the dimensions of the tiles are smaller and their technical parameters may be slightly poorer. If one plans to purchase ceramic tiles, some information is required - the exact dimensions of a room, the chosen tiles arrangement and format. On this basis, one can specify the required number of pieces. The principle is to buy more tiles than resulting from the calculation - it is assumed that for a simple arrangement one should buy approx. 7-10% more tiles. Approximately 12% tiles more must be bought when using the offset arrangement and even 15% more in case of the diagonal one. One should also remember that a smaller surface results in proportionally more cut tiles and material loss. After choosing the particular tiles type one also needs to check the symbols available on individual packaging and listing particular product features. The labeling should certify that purchased tiles have the same date of production, the same type and calibration.

RULES FOR CERAMIC TILES FIXING

The rule of symmetry

Ceramic tiles form an arrangement of very organized and geometric character. This arrangement results from repeated shape and dimensions of particular elements and is additionally emphasized by the regular joints pattern. Therefore, when planning the tiles arrangement, it is advisable to comply with the principle of symmetry which allows to maintain this arrangement - then the facing made of tiles looks the most harmoniously. Full tiles should



Photo 1. In offset arrangement, joints between the tiles are offset from each other by approx. 1/3 of the tile width - it's a common solution for the rectangular tiles. It is also possible to shift joints of about half of the tile width.

be fixed in the facing centre. At the sides, tiles should be cut symmetrically to the same width. It is advisable to start the planning of the tiles arrangement from the wall with windows, doors or the largest number of pipes passages.

Preparation of a drawing

It is recommended to prepare two drawings: the first one, e. g. on a diagram paper, is a drawing of a wall in the scale, the second one, on a tracing paper, shows the planned arrangement of tiles on a wall. By placing the tracing paper onto the first drawing, one may easily plan the optimal arrangement of tiles depending on the location of places requiring cut or matched tiles. The best solution is to place any installation passages exactly in the middle of the tile. In addition, one should maintain the arrangement of sanitation in regard to fixed tiles or joints. In practice, especially during renovations, one must face not only asymmetrical arrangement of passages, but also irregular shape of a room, lack of planes or not right-angled corners.

Fixing the tiles

Prior to fixing the tiles with simple or offset arrangement one needs to determine two perpendicular baselines across the center of the room in order to facilitate the appropriate placement of tiles. In case of fixing the tiles with diagonal system, the symmetrical arrangement obtained by placing the baselines in the center of the room can be used. The asymmetrical arrangement may be applied as well - then the baseline is the diagonal line connecting the opposite room corners. In all cases, the application of tiles starts at the intersection of the baselines. It is crucial to pay attention to careful placing of the first tile as it will affect all subsequent rows of tiles. At areas such as door frames, bathtub edges, etc. it is better to cut the full tiles to the shape and dimensions expected rather than to cover these areas with narrow strips which are more difficult to process with. If one cuts a hole in a tile, it must not expose the tile to damage during cutting - keep a safe distance from the edges to avoid potential material loss. When the height of facing is determined, it is the most convenient to start fixing the tiles from the top. It allows to fix cut tiles at the lowest point of the wall, making them less exposed. If the height of facing is not strictly determined, and if there are no differences in levels, it is recommended to start fixing the full tiles from the bottom. To avoid potential errors, it is convenient to arrange the tiles on the floor prior to fixing, taking into account the expected joint width. The tiles can be numbered in order to maintain the arrangement previously chosen as the best one.

SELECTION OF WIDTH OF JOINTS

The width of joint is chosen in relation to the dimensions of tiles, by following the rule that the larger the tile is the wider the joint should be. This relation is shown in the Table 3.

Length of a tile side [mm]	Width of joint [mm]
up to 100	ca. 2
from 100 to 200	ca. 3
from 200 to 600	ca. 4
more than 600	ca. 5 to 20

Table 3. Relation between the length of a tile side and the width of a joint.

From the practical reasons it is advisable to use wide joints in case of thick tiles – it allows to fill the space between the tiles with mortar in more accurate and easier way. From the technical point of view, the width of joint indoors has less importance than the outdoor one. However, even indoors, it is not advisable to fix the tiles without joints. The joints on a wall and on a floor should align accurately. If the tiles of different sizes are planned on these surfaces, one should arrange the joints so they align at regular clearances.

During the facing works in bathrooms there is always a necessity to cut the tiles to size or to process them. Depending on particular needs one may execute:

■ SIMPLE CUT

it matches the linear dimensions of tiles to the dimensions of place of their application. A traditional way to perform a simple cut is to make an appropriate scratch and then break the tile manually or with the use of a special tool (guillotine). More up to date solution is to cut a tile with the use of a diamond disc, in dry or wet conditions.

■ CURVE CUT

performed when tiles have contact with another floor material – floor panels, parquet etc. The curve cut may be performed manually, by drawing the shapes on the tiles and breaking these pieces with pliers, or mechanically – with special tools for performing curve cuts.

■ ROUNDING

the edges of tiles are rounded mechanically – the solution is applied, e. g. in case of window sills. Owing to that, the users are protected from accidental injuries caused by sharp edges. One performs the rounding with the use of sandpaper or an angle grinder.

■ BEVELING

performed by accurate polishing the edges of tiles, usually at an angle of 45°. Two tiles connected at beveled edges create a straight line. This solution creates a uniform facing appearance and releases the contractor from applying the edge trims. Beveling is executed with an angle grinder, more rarely with the use of special moulding machines.

■ HOLE DRILLING

technologically the most difficult tiles processing process. However, the holes are indispensable where pipes passages, switches and electric sockets occur. Particularly problematic is the execution of more than one hole in one tile. The hole saws or tungsten drills may be used for the hole drilling.

■ CUTTING ANY SHAPES, INSCRIPTIONS, DECORATIONS ETC.

this type of decorative elements is provided by the companies which have professional tools for cutting with water. Their possibilities of processing the tiles and curvilinear cutting are unlimited.

School OF TILING

Lesson 4 Fixing the tiles in bathrooms

This lesson of the School of tiling focuses on the adhesives for tiles. One can find here information on the technical requirements for adhesives, classification and labeling according to the standard as well as the criteria of the mortar selection.

From the history

Not long time ago, tiles used to be fixed with the use of cement or cement-latex mortars prepared at site from commonly available materials. Therefore, the thick layer method was mostly used (mortar thickness approx. 15 - 20 mm). The tiles were fixed with the patches of adhesive applied on the underside of the tile. Since the mortar was a mixture of binder and aggregate, without any additives regulating the processing parameters, the tiles (and sometimes also the substrate) were moistened with water before application. This process prevented from the excessive absorption of water from the mortar which might have weakened the bond. The thick consistency of the mortar resulted in uneven distribution of an adhesive beneath the tile. Therefore, some spots of the tile were not supported and water could accumulate there. It resulted in shorter life span, particularly in case of outdoor cladding. It was not until the end of 20th century when factory - made adhesives enriched with additives improving the processing parameters and performance characteristics appeared on the European market.

Adhesives are classified according to the EN 12004 + A1: 2012

standard "Adhesives for tiles. Requirements, evaluation of conformity, classification and designation". It is a harmonized standard which unifies the standards for products designed for ceramic tiles fixing in all European Union countries. The standard lists three types of adhesives for tiles, differing in the type of binder as well as in the setting and hardening method:

Cement – dry mixes, mixtures of hydraulic binders, aggregates and organic additives. **They require mixing with water before use.** Cement adhesives are the cheapest of the types shown and have the broadest range of application.

Dispersion – in the form of mass, mixtures of organic binders formed by water polymer dispersion, organic additives and fillers. They are available in a ready-to-use form and do not require further preparation. Dispersion adhesives are more expensive than cement ones, they bind longer and have limited range of use – they are especially suitable for wooden substrates.

Rbased on reactive resins – these adhesives include single or multi-component materials, mixtures of synthetic resins, fillers and organic additives. Adhesives based on reactive resins, usually epoxy ones, **should be treated as professional materials.**

In Europe, the cement adhesives are the most common ones. Dispersion adhesives are used more rarely. The adhesives based on reactive resins are the least popular.

WHAT ARE THE REQUIREMENTS DEFINED BY THE STANDARD?

For all three types of adhesives EN 12004 + A1: 2012 standard specifies two categories of requirements:

- basic, obligatory for all products,
- optional, which define special characteristics related to processing parameters and additional properties concerning the performance of a product.

In case of cement adhesives (type C) there are different classes corresponding with different performance levels:

- 1 – standard setting adhesives,
- 2 – adhesives of improved performance,
- F – fast setting adhesives,
- T – adhesives with reduced slip,
- E – adhesives with extended open time,
- S1 – deformable adhesives,
- S2 – highly deformable adhesives.

The product labeling should always be based on the **combination of these two elements, i.e. the type and the class of an adhesive.**

The standard for D and R – type adhesives limits the classes, according to which they can be classified.

WHAT ARE THE CRITERIA OF THE ADHESIVE SELECTION?

EN 12004 standard relates only to the adhesives for tiles and lists information mostly important for the manufacturers of construction chemicals and the construction supervisors. It does not give any executive recommendations on the selection of mortars for particular use or instructions regarding the selection of technology of the tiles fixing for specific cases. Thus, one should select the mortar and the way of its use on the base of recommendations and information given by the manufacturers of adhesives or tiles.

Factors which influence the selection of adhesives can be classified as follows:

- place of application of facing (indoor, outdoor, floor, wall)
- parameters of a substrate (type, evenness, stability)
- type of cladding (gres, terracotta, clinker, mosaic, stone)
- characteristics and format of tiles
- conditions of maintenance (subfloor heating, OSB or plasterboards)

WHICH NOTCHED TROWEL IS THE BEST?

The choice of a tool depends on the adhesive type and the tile format, according to the principle that the bigger the size of the tile is, the bigger the trowel notch should be (see Table 1 and 2). By profiling the adhesive applied with a notched trowel, one achieves an uniform coat of proper thickness over the entire surface - the excess of an adhesive is cleaned when moving the trowel, whereas the notches define the thickness. It is recommended

WHAT ADHESIVE TO CHOOSE?

One may use either C1 or C2 type of adhesive in the bathrooms. Typical building substrates (cement - lime plasters, cement and lime screeds or concrete) do not require any special actions. One can apply onto them the C1 adhesives, for example ATLAS Plasticised Adhesive (AVAL KM 11Plus). The use of C2 adhesive, e.g. ATLAS Plus (AVAL KM 17) is reasonable in case of repairs - onto old substrates, directly onto the surface of the old facing, onto OSB (after proper preparation) and onto surfaces that can get deformed (e.g. plasterboards). If the substrate is coated with damp proofing, the rules given by the membrane manufacturer should be followed. Usually, there are no contraindications for the use of C1 adhesives, but, due to the operational factors, it is advisable to choose C2 adhesives. We particularly recommend the use of adhesives with reduced slip. Thus, the tiles can be applied from the top to the bottom of a wall, without cutting the tiles at the most visible areas. In case of use of materials of high water absorption (marble, polished gres tiles) it is advisable to use the mortars based on white cement - in order to avoid discoloration which can occur when using the mortars based on grey cement.

to use the trowels with straight notches for the tiles of small and medium format as well as for mosaics. Trowels with semicircular notches are used for large format tiles. The semicircular notches have low profile and wide spacing which makes it easy to profile thicker adhesive coat and increases the contact surface of an adhesive with the pressed tile. The direction of the adhesive profiling is particularly important on the walls - the notches should be moved vertically, as it prevents the tiles from slipping.

Tile size [cm]	Size of notches [mm]	Shape of notches
Mosaic (up to 2x2)	4	Straight
Small format (up to 10x10)	4 to 6	
Medium format (up to 30x30)	6 to 8	
Large format (more than 30x30)	more than 10	

Table 1. Selection of a notched trowel in relation to the tile format (thin coat adhesives)

Tile size [cm]	Size of notches [mm]	Shape of notches
Medium format (up to 30x30)	8 to 10	Straight
Large format (more than 30x30)	more than 10	Semicircular

Table 2. Selection of a notched trowel in relation to the tile format (thick coat adhesives)

School OF TILING

Lesson 4



Photo 1. It is recommended to use the combined arrangement for the floor tiles fixing.

WHAT ARE THE TILING METHODS?

Adhesives for ceramic tiles must be applied in accordance to the technology recommended by the manufacturer. In practice there are two technologies used:

- Basic, in which the adhesive is spread on the substrate with a smooth float and then profiled with a notched trowel. Next, a tile is fixed onto the prepared mortar and lightly pressed with sliding. This method provides a strong bond between the adhesive and the substrate and results in uniform thickness of an adhesive and appropriate interlayer adhesion. The standard calls this method the **"floating method"**.
- The second possible solution consists in the application of an adhesive onto both surfaces - the substrate and the underside of a tile. For this method it is important to apply the adhesive so its total thickness does not exceed the thickness recommended by the manufacturer. It is called the **"floating and buttering method"**, commonly also called the **"combined method"**. This solution is recommended for fixing floor tiles indoors and for fixing wall and floor tiles outdoors - it helps to keep the total filling of space between the substrate and the underside of a tile and its steady support over the entire surface.
- The application of an adhesive on the underside of tiles only (so-called **"buttering"**) is incorrect and not recommended. It is acceptable in exceptional cases only, e.g. when fixing narrow strips of tiles from the bottom of walls, executing plinths or replacing one tile of the entire cladding.

HOW TO ARRANGE MOSAIC?

- When fixing small pieces, like in case of mosaic, a proper preparation of the substrate is essential. Due to a small size of individual tiles the substrate must be perfectly even.
- The mosaic is applied on a very thin coat of an adhesive distributed with a trowel with small notches. **Too thick coat of an adhesive may cause immersing of mosaic pieces**, flowing of mortar from the joints and the effect of corrugated surface, which will not form an ideal plane.
- Mosaic of natural stone and clear glass should be fixed with white adhesive, e.g. ATLAS Plus White (AVAL KM 15).



Photo 2. Too thick coat of an adhesive may cause immersing of mosaic tiles, flowing of mortar from the joints and the effect of corrugated surface, which will not form an ideal plane.

WHAT TECHNIQUE OF FIXING SMALL AND MEDIUM SIZE TILES SHOULD ONE CHOOSE?

- In case of fixing the tiles on walls, it is recommended to apply the adhesive onto the substrate, fixing the tiles on floors imposes application of an adhesive both on the substrate and the tile.
- When fixing the tiles on walls, the adhesive is applied with a smooth side of a float firmly pressed against the substrate, so the adhesive is rubbed into the substrate. Next, profile the adhesive with a notched trowel at an angle of approx. 60 degrees in relation to the substrate. If possible, it is recommended to **move the float in one direction** - this allows to remove air from the beneath when pressing the tile.
- When applying an adhesive onto the underside of a tile, use the smooth side of a float. When applying an adhesive onto the substrate, use the smooth side of a float and then a notched trowel to profile the mortar.
- An adhesive should be distributed in a single application onto an area allowing to fix the tiles before the outer surface of applied mortar coat dries. The dry coat makes the continuation of works impossible.
- A simple way to check whether one can still fix the tiles is to touch the applied adhesive with hand - if the adhesive does not make the hand dirty, it means that the coat should be removed and fresh mortar applied.
- The parameter which determines how long an adhesive retains its properties after application onto the substrate is the **open time**. Cement adhesives are characterized by an open time at the basic level (min. 20 minutes) or the extended one (min. 30 minutes – E labelling according to the standard). One should be aware that this period may vary depending on the work conditions.
- A tile must be pressed when placed on the applied adhesive. For the next few minutes it is possible to correct the position of each tile but it should not be changed after more than 10 minutes.



Photo 4. When the substrate is coated with damp proofing, the rules given by the membrane manufacturer should be followed. Usually, there are no contraindications for the use of C1 adhesives, but, due to the operational factors, it is advisable to choose C2 adhesives

HOW TO FIX LARGE FORMAT TILES?

- In case of large size floor tiles and/or those with highly profiled underside it is advisable to use thick coat adhesives with self-spreading ability, e.g. ATLAS Plus Mega.
- The consistency of the mortar with self-spreading ability is thinner, thus after the tile placing the adhesive spreads beneath it and fills the space between the substrate and the underside of the tile.
- Full support of the tile over the entire surface is very important due to operational issues – **the tile breaks at points of lack of the support**.
- An interesting feature of the thick coat adhesives is the ability to regulate their consistency depending on the needs as well as to profile a slight slope.
- The technology of application of thick coat adhesives does not differ substantially from the one used for thin coat adhesives. These adhesives are applied with a smooth steel float and then spread with a notched trowel. However, it is recommended to use trowels with semicircular notches, as their shape provides more uniform and tight distribution of an adhesive beneath the tile than in case of straight ones.



School OF TILING

Lesson 5 Grouting

Our bathroom is almost ready. It is time for the final touches. In the last lesson we are going to grout the facing and give its final appearance. So get to work!

Grouting is the final stage of execution of ceramic cladding. During this operation, one fills the spaces between adjacent tiles with the use of grouting mortars.

The grout fulfills two functions - technical and decorative:

1. Technical function relates to:

- physical filling the space between the tiles,
- compensation of the effects of deformations resulting from the changes of temperature and humidity of the surroundings

2. Decorative function relates to:

- colourful complement of the composition formed of ceramic tiles which have factory-made colours

Grouts similar in colour to tiles blur the boundaries between them. On the other hand, grouts chosen so as to contrast with colour of tiles emphasize the grid of facing. Depending on the format of the tiles used, one may visually reduce or enlarge the room.



Photo 1. Selection of joints with a view to the colour depends on the functional issues. At the stage of colour matching it is recommended to keep in mind the place of installation. On the floors it is better to use darker tones, which are less likely to get dirty. In contrast, on the walls and decorative elements the colour of grouts may be lighter.

TYPES OF GROUTS

Grouts are classified according to the EN 13888:2009 "Grout for tiles. Requirements, evaluation of conformity, classification and designation" standard.

This standard specifies requirements for two types of mortars which may differ in the type of binder, properties and bonding and hardening system:

CG - cement

RG - reactive resin.

Cement mortars are produced in the form of dry mixes of white Portland cement, aggregate, pigments and modifying additives. They can occur in different classes corresponding to the basic or optional requirements, listed by the standard.

Classes are identified as:

CG1 – cement grout of standard bonding strength

CG2 – cement grout of enhanced parameters

In case of CG2 mortars there is also a letter labeling indicating the fulfillment of additional requirements:

A - increased resistance to abrasion (twice as high as in case of mortars without this label)

W - reduced water absorption (twice as low as in case of mortars without this label).



Photo 2. The cement mortar is prepared for use by mixing with water in the ratio listed on the packaging. Inadequate amount of water results in improper mortar setting - the mortar will not reach the intended technical and performance parameters, including the colour shade.

Mortars based on reactive resins are produced as two-component products:

- the first component contains the binder (usually an epoxy resin), aggregate and additives. It is distributed in the form of plastic mass,
- the second component is the hardener. It is a thick liquid and its aim is to activate the chemical reactions which trigger bonding.

Mortars based on reactive resins are more expensive than cement ones, but they have more favorable technical parameters – they are more stable and have several times higher mechanical strength, very high resistance to dirt and almost non - absorptive surface (**water absorption is 50 to 100 times smaller** than for cement mortars). The standard for mortars based on reactive resins does not provide a division into additional classes or types.



Photo 3. In case of epoxy grout one must wash joints and tiles with a cellulose sponge, soaked and well wrung, to remove visible dirt or dulling formed on the tiles surface. The final cleaning is carried out when the mortar hardens - after approx. 24 hours, one must wash the tiles with warm water with detergent or alcohol.

SELECTION OF MORTARS

When choosing the grout, one must consider three aspects: **the type, the colour and the range of use recommended by the manufacturer.**

Technical regulations usually do not specify conditions on the choice of the mortar appropriate for specific applications (indoors, outdoors, on terraces, in bathrooms, etc.), therefore the selection should be made on the basis of the recommendations of the manufacturer:

- It is recommended to use CG1 cement mortars in residential compartments and indoors.
- For outdoor use and in wet compartments (bathrooms, toilets) it is advisable to use CG2 mortars with additional requirements or RG mortars. Both mortars can be applied on surfaces with underfloor heating.

1. The selection of mortars in view of the width of grouts depends on the dimensions of tiles in accordance with the principle that the longer side of the tile is, the wider grout one applies.

School OF TILING

Lesson 5

Length of tile side [mm]	Width of grout [mm]
up to 100	ca. 2
from 100 to 200	ca. 3
from 200 to 600	ca. 4
more than 600	ca. 5 - 20

Table 1. Recommended joint width.

- The selection of grout in respect of the colour depends on the functional issues. Factors resulting from the utilization of the facing can cause gradual change of the grout colour and appearance. Therefore, it is recommended to take into account the installation site already at the stage of the grout selection. On floors, it is advisable to use darker colours, which are less vulnerable to dirt. In contrast, on walls and decorative elements the grout colour may be lighter.

CLADDING PREPARATION FOR GROUTING

- One can commence grouting when the adhesive used for the tiles fixing is set, that is after approx. 4 - 48 hours (depending on the adhesive type). Insufficiently set adhesive can cause discoloration of the finished grouts.
- Joints need to be cleaned of residues of the adhesive and need to keep uniform depth along the whole section.

When using cement mortars it is recommended to moisten joints and tiles edges with water, especially if they are absorptive. However, in case of mortars based on resins the joint should be dry. In both cases, before commencing the works, one needs to check (at a spot of cladding which is less visible or on a piece of tile not fixed yet) whether the mortar causes discolouration of the tile surface. The sample surface cleaning will give an answer whether the pigment can cause permanent, indelible discolouration of the tile.

The rule is to apply only mortars of the same production date and batch number on a single surface.

TECHNOLOGY OF GROUTING WITH CEMENT MORTARS

Cement mortars are prepared for use by mixing them with water in the ratio indicated on the packaging. Inadequate amount of water results in improper mortar setting - the mortar will not reach the intended technical and performance parameters, including the colour shade. The method of the joints filling depends on the mortar type (traditional or self-leveling) and the mass consistency.

Most grouts available on the market, e.g. ATLAS Grout, AVAL Extra grout or ATLAS ARTIS grouts are designed for traditional application:

- the prepared mass is applied on the tiles, and then carefully, deeply and tightly introduced into the joints,
- tool (a rubber spatula or a float for grouting) must be at an angle of approximately 45° and diagonally in relation to the direction of joints - this will ensure more accurate and easier filling,
- after filling the joints, one should wait until the initial mortar binding ends, which is when the grout becomes matt,
- then the tiles should be cleaned of the mortar residues.

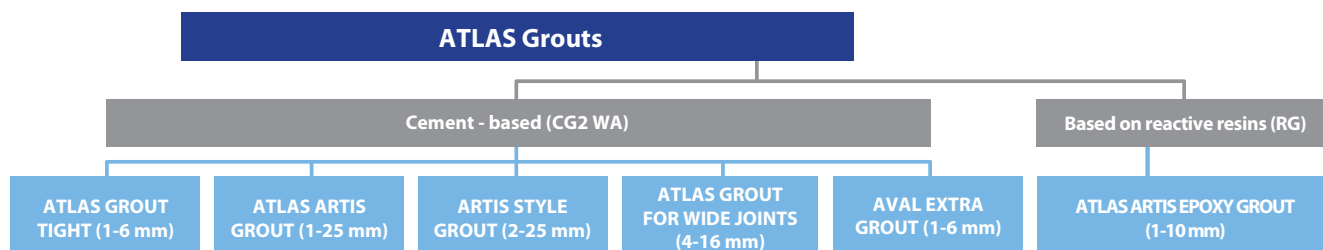


Photo 4. The float for grouting must be at an angle of approximately 45° and diagonally in relation to the direction of joints - this will ensure more accurate and easier filling. After filling the joints, one should wait until the initial mortar binding ends, which is when the grout becomes matt.

Mortars of liquid consistency can be applied in two ways:

- Pour the mass from a container (preferably with a spout) directly into the joints. This is the best technique for the tiles of irregular shape or with very large dimensions.
- Pour the mass directly onto the tiles and then spread it over the entire surface with a wide rubber float with a long stem. This method is recommended for grouting large surfaces.

Cement mortars require curing, that is, spraying the surface with clean water for several days after their execution. Moistening the mortar provides optimum binding. Thus, it reaches the assumed strength parameters, is more stable and does not tend to rub off, moreover the obtained colour is uniform along joints length.



Grouts in ATLAS portfolio

TECHNOLOGY OF GROUTING WITH MORTARS BASED ON REACTIVE RESINS

Mortars of this type are more demanding than the cement ones in regard to the installation issues and the conditions of use. This is due to the properties of the binder and the nature of the bonding process. During the preparation and use of epoxy mortars there should be appropriate **temperature provided - above + 10°C**. The cleaning of the cladding should be executed as fast as possible.

1. In order to prepare the mortar one should carefully mix both components – the compound and the hardener. The hardener should be poured from the vertically positioned bottle into the container with compound until the flow of the hardener freely stops (if there is some hardener left in a bottle it should be left and not poured into the container). Then, one should stir the mix well. Use a grouting float or a rubber spatula to fill the joints.
2. Mortar is applied on the tiles, and then introduced tightly and deeply into the joints, similarly to the cement grouts application.
3. The first cleaning should be performed after a few minutes after grouting with the use of a hard sponge soaked with cold water.
4. Then the grout and the tiles should be washed with the use of a soaked and well wrung cellulose sponge in order to remove visible dirt or dulling formed on the tiles surface.
5. The final cleaning is carried out after the complete mortar setting – after approx. 24 hours – one should wash the tiles with warm water with detergent or alcohol.



Photo 5. Decorative grout ATLAS/AVAL Artis Style (with glitter effect) perfectly matches with ceramic and glass mosaic. Glitter is present in the entire mass of the grout, therefore is clearly visible.

FINISHING ELEMENTS FOR CERAMIC CLADDING

Complementary elements which are used for the facing installation are:

- finishing strips,
- tiling strips,
- hardware fittings at the edges,
- expansion joint beads.

They protect the tile edges against chipping and provide an aesthetic finish of the cladding at places where it connects to another construction element, e.g. a door jamb, parquet, etc. Moreover, they make it easier to keep the surface clean and well maintained. Currently, the use of strips and other finishing elements is becoming quite rare. A more up-to date solution is **to grind the tiles edges at an angle of 45°**, so as to join them at the corners accurately. This ensures nice and neat finish of the edges and uniform appearance of the cladding. Note however, that at points where the cladding meets the elements of bathroom equipment, e.g. around showers, bathtubs, sinks, bathroom furniture and in the corners of walls and floors, one should use the filling made of permanently flexible mass, e.g. sanitary silicones resistant to fungi and mould.

ACCEPTANCE OF TILING WORKS

The most important aspects for the work acceptance are:

- confirmation of the compliance of the executed cladding with the one agreed by the parties (contractor, investor, designer),
- check whether the materials used have formal documents required for construction products,
- check the adhesion of the cladding (cladding must not provide thuds when tapped),
- deflection of the surface from the plane (deflection should not be greater than 3 mm at 2 m batten),
- accuracy of the grout execution measured with a batten to the nearest 1 mm,
- the thickness of the adhesive coat (in accordance with the manufacturer's instructions determined on the basis of consumption),
- width of grouts (Table 1).

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