It is essential that the substrate is inspected before any work begins. The inspection should focus not only on the structural or static conditions of the construction, but also weather and environment-related influences. An important criterion is above all the intended chemical or mechanical use to which the flooring system will be put. Sufficient attention must also be paid to possible disruptive influences from the substrate, e. g. the use of concrete additives, PCC stopper masses, emulsion-based screeds, the application of wax or release agents on a surface, in order to avoid hardening problems or poor adhesion of the subsequent methacrylic coating. For more on this subject please refer to our technical information sheet **“The Substrate”.**

The building site must be inspected in the presence of the customer and applicator so that the right coating system and the associated thickness, colour, decorative effect and slip resistance can be selected, making due allowance for the anticipated mechanical and chemical strains and the condition of the substrate. This “General advice on application” is the result of our many years of experience and has been tailored to the application of our Silikal products. The terms are defined on the basis of Worksheet AGI “A80” of Arbeitsgemeinschaft Industriebau e.V., Ebertplatz 1, 50668 Cologne/ Germany and the “BEB Worksheets KH0 – KH6” of the Bundesverband Estriche und Beläge e.V., Industriestraße 19, 53842 Troisdorf/Germany.

Interior ventilation

When applying products based on methacrylic resins, you must remember that these binders are normally a fire hazard during application. It is therefore essential that you follow the safety advice in **“Safety advice and precautions”**. Adequate air inflow and outflow must be provided. We recommend that neighbouring people are informed of the possible odour pollution by means of an information sheet when the building site is erected. As well as the aspects of health and safety, good interior ventilation also has a significant influence on the quality of the flooring system. If there is insufficient fresh air coming in, hardening problems may occur on the surface. In simple cases this will result in later contamination, white discolouration under water strains, premature wear or yellowing. In the worst case, particularly on thinner coats, the resin may not harden at all but instead remain tacky. It is also important that objects, particularly packed or loose foodstuffs, are always stored elsewhere in consultation with the operator, as these can very quickly absorb the odour or taste. You must also ensure that sufficient time is allowed after the coating work for post-ventilation so as to get rid of any existing residual vapours before goods are brought back in.

Hot or cold

If methacrylic resins are processed at higher application temperatures, the reaction time shortens. Conversely, the hardening time is longer in cold temperatures. That makes it absolutely essential to observe the hardener dosage figures given in the tables of the relevant product data sheets as well as the minimum and maximum temperature of the substrate.

The application of cured coatings under different climatic conditions can be optimized by selecting resins accordingly. In the cold, e.g. deep-freeze stores or outside applications with cold winters, elastic or soft toppings should always be preferred. When heat is a factor, on the other hand, e.g. hot water systems, in the vicinity of boilers, smoking or baking ovens, harder toppings should be applied.

In both cases the only reason is the substantially greater coefficient of linear expansion of the reactive resin topping when compared with concrete. The right choice of resin type will reduce the danger of flaking, blistering and cracking in the event of high temperature differences.

However, this basic rule is often diametrically opposed to other physical requirements such as compressive strength, compression point load capability, ease of cleaning, slip resistance and crack bridging. Unlike concrete, toppings made from reactive resins should be thought of as similar to thermoplastics because they become softer as temperatures rise and harder as they fall.

Reactive resin coatings are usually used at ambient temperature. They can also – after allowing for the temperature-dependent compressive strength – be subject to the following stresses:

	Permanent temperature	**Transient, e.g. for cleaning purposes** **Complete heat penetration must be avoided!**
Systems A, B and C	0 °C to +60 °C	to +80 °C
System D	-25 °C to +45 °C	to +60 °C

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All other parameters that may be influenced must be considered on a case-by-case basis. The increasing softness at higher application temperatures can, of course, lead to greater dirt absorption, brake marks, gritting sand being pushed in (resulting in decreasing slip resistance), sharp-edged shelf or pallet feet sinking, etc. On the positive side, crack bridging, toughness under impact and substrate adhesion all improve.

There is no such thing as a reactive resin coating that retains all its physical properties in both cold and heat. Even so, a floor coating made from reactive resins is the best way of protecting the substrate in the majority of applications.

Coating thickness

The coating thickness will depend on the choice of binder in question, the evenness of the substrate and the mechanical stress. The general rule here is that all 3 influences have to be adapted to each other. In particular, you must make sure that the minimum and maximum thickness of each resin system are observed. Coats that are too thin could give rise to curing problems. On the other hand, coats that are too thick could become too hot while hardening due to the exothermic reaction and thereby bulge, tear off or remain tacky or soft. A multiple application of more or less pure layers of resin one on top of another, especially those with shore D of more than 70, causes higher stress that may lead to cracks and/or flaking off depending on the mechanical loads. That is why the coat thickness ranges for the individual systems are laid down in the corresponding product descriptions.

Hard or flexible

The question often arises as to which resin is the best for a particular case. There are a number of ways of looking at this, but two have proven to be applicable to the use of methacrylic resins: Elastic systems are used for outdoor applications and for very durable floors which are exposed to significant shocks and impacts as well as strong movements. By contrast, hard systems are preferred for floors with high static bearing capacity, scratch resistance and resistance to chemicals. What is interesting is how soft and hard coats can be combined. Normally the softer type is laid at the bottom, the moderately elastic type in the middle and the hard type above. An extremely hard coat should never be laid on an extremely soft coat, as otherwise hairline cracks can arise in the surface, particularly when thermal stresses (hot water or outdoor applications) occur.

Soft or moderately elasticized systems tend more towards contamination and increased braking mark problems. Extremely hard types, on the other hand, can tend to flake if the coats are too thick. Hard binders usually develop a higher reactivity and must also not exceed the recommended coat thickness ranges due to the shrinkage. One notable exception to this rule is our reactive resin mortar SILIKAL® R 17.

Flexible types tend more to curing problems at temperatures exceeding the maximum temperature recommended by Silikal.

Solvent-based products

Silikal methacrylic reactive resins do not contain solvents. However, some 1-component and multi-component binders contain organic solvents. Drying is either physically by evaporation of the solvent and/or as a result of a chemical reaction. Unlike 100 % reactive systems, these solvents pollute the environment. For this reason solvent-free products are preferred. If, however, a solvent-based resin absolutely has to be used, much greater attention needs to be paid to intensive interior ventilation. In addition, the substrate and the coat must not contain any solvent residues after drying has taken place if they are to be covered with other, thick-coated materials. Drying out also depends heavily on the depth of penetration into the substrate, the coat thickness and the ambient temperature. Solvent-based coats must never be applied on methacrylic reactive resins, since the solvents could otherwise penetrate the layer underneath and no longer be able to dry. If solvents are to be added, it is essential that you consult Silikal before selection.

Impregnations

Thin liquid impregnations are initially applied excessively until saturation is reached and spread evenly to the intended thickness by means of a paint roller or brush. You must not allow puddles to form, especially with solvent-based products. An impregnation is not usually worked over and serves instead as a simple concrete coat or to reinforce the surfaces of porous substrates.

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Scratch slurry

A stonechip-filled stopper is very useful for compensating for minor unevenness, structured surfaces or deep-lying voids. Based on a coating resin, e. g. SILIKAL® RU 727 or SILIKAL® RV 368 resin in combination with SILIKAL® Filler SL and some anti-flow additive if necessary in a 1:1 (resin/filler) ratio, the stonechip-filled stopper is spread over the largest particles by means of a trowel. The trowel must be applied several times back and forth in both directions so that deeper lying cavities are completely closed up. The sluggish filler enables craters and pores to be sealed without any air bubble inside it being able to force its way out during hardening. This prevents what are known as pinhole craters, which can occasionally occur with self-levelling coatings on very porous substrates. The previous application of a low-viscosity primer can bring about a further improvement.

Primers

Primers are in principle applied in one operation to fill up pores until the substrate is saturated. If the primer resin is completely absorbed by the substrate, primer must be applied again wet-in-wet before the first coat hardens until an integral resin film remains. No puddles must be left behind on very uneven surfaces, as this could lead to an overreaction due to the excessive coat thickness. Normally about 10 kg of primer is mixed with hardening powder and this is then poured out in rows onto the floor. The primer is initially spread without great pressure by means of rubber blades, or even better by the rubberized toothed edge of the blades, and worked over evenly crosswise with the varnishing (paint) roller. It can be very useful to carry out spot checks of the consumption rate. To ensure better adhesion between layers, SILIKAL® Filler QS 0.7 – 1.2 mm should be sprinkled loosely into the primer before it hardens.

Top coats

There are two types of top coats. On the one hand there are thin resin films, applied in one or two coats, which cannot be coated over and represent a separate, low-cost coat protecting against abrasion or chemicals. On the other hand they may refer to a top coat on a thicker topping. In this case it also fulfils the function of a scratch or chemical-resistant surface. Only paint rollers of medium hair length are suitable. The absolute absence of fluff must be ensured. Again, the coat may initially be spread with the rubber blade and worked in crosswise using the roller. The roller should cover large distances each time, preferably across the working direction, in order to avoid blobs when starting off. To ensure that the roller can be used for a long time, it must be squeezed out down to the roller core after every new resin mixture, as otherwise hardening will begin too quickly from inside. Great care must be taken if the sealing film is to be applied properly. If the paint roller is rolled into the thin coat too often and too late, hardening problems or visual defects will occur because this will interrupt or destroy the paraffin film that forms on the surface of the resin. To avoid shiny patches or yellowing in the surface, do not allow puddles to form.

Hard top coats must never be applied directly on very elastic coatings, e. g. SILIKAL® RV 368 or SILIKAL® R 61 HW resin or the like. In these cases a moderately elasticized intermediate coat made from SILIKAL® R 61, R 62 or R 81 resin must be applied, as otherwise movement caused by temperature will lead to hairline cracks forming in the last coat.

Coatings without any top coat do often not have a satisfactory view, especially when using resins with good self-levelling properties (e. g. SILIKAL® R 62 resin) on substrates with slope.

Important information about top coats:

If different batches of a Silikal product are used (particularly in the case of top coats), slight variations in colour or gloss may occur within a surface due to the batches. We recommend that the complete surface is applied with material coming from one and the same production batch; this applies to the pigment and the hardening powder as well as the resin. Should it not be possible for various reasons to work with material from just one batch, the material from the different batches should be mixed together, taking care to keep the quantities in the right proportions.

Example:

On the building site are 2 drums of SILIKAL® R 71 resin of batch xxx and 3 drums of SILIKAL® R 71 resin of batch yyy. The mixture to be produced must then consist of 40 % SILIKAL® R 71 resin of batch xxx and 60 % SILIKAL® R 71 resin of batch yyy plus pigment and hardening powder.

Exact observance of the mixing ratio and the stirring time when pigmenting the binder and the subsequent addition of the hardening powder will ensure that colour variations within a surface are kept to a minimum.

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Coatings

(0.3 – 2 mm)

Self-levelling coatings are applied by means of a smoothing trowel, pointed trowel or doctor blade. They are then finished with a top coat.

Toppings/Coatings

(2.0 – 6.0 mm)

Toppings are generally rather thicker coatings. The same applies for coverings as for coatings. Smoothable coatings require particular skill if trowel marks are to be avoided. The desired coating thickness is first achieved roughly with a blade and then compressed and smoothed manually with the smoothing trowel.

Screed, mortar, stopper masses

Because of their liquidy consistency, Silikal mortars are self-compressing and can also be regarded as self-levelling. They do not therefore require any special application equipment. Scrapers and smoothing trowels are all the tools required. Recesses of more than 10 mm should preferably be filled only with SILIKAL® R 17 mortar. Unevenness of 2 – 10 mm, on the other hand, can be levelled out on the basis of SILIKAL® R 61, R 62, R 68, RV 368 or RU 747 resin with the addition of e. g. SILIKAL® Filler SL. On coats above 5 mm, 20 % SILIKAL® Filler QS 0.7 – 1.2 mm or 1.2 – 1.8 mm in size can be added to the standard mixtures if discribed in the datasheets.

Decorations

The decoration is critical if an attractive and suitable surface is to be achieved. A distinction is made between the colour, slip resistance and structure. The shade is primarily provided by the pigment, in the shape of a powder, particles or coloured flakes. The slip resistance, by contrast, depends on the size of the macroparticles used. Structures are generated by the form and nature of structural elements used. Specifically, these could be universal smooth or coarse shades, salt-and-pepper effects through the combination of various coloured quartz (mixed in or sprinkled) or through the colour variation of structural elements such as coloured flakes, foil punchings, paint spray fibres or drops of spray. Only in a few cases are the natural colours of the fillers accepted as they are. It is recommended that particles, sprinkling sand, coloured flakes or spray fibres are worked over with colourless sealant afterwards.

Non-slip surfaces

Open areas or wet rooms must often be made non-slip. According to the stipulations of the German Employers' Insurance Association Institute for Occupational Safety, there are several classes of slip resistance, all designated with the letter "R". Different slip resistances can be achieved through the size of the sprinkling particles and/or the quantity of oversealant used. Please note the specifications of our test certificates and coating systems.

Special advice

For sprinkling, Silikal recommends the use of a minimum particle size of 0.7 – 1.2 mm in principle. If the particle size is finer, unfavourable conditions can lead to the risk of slight curing problems in the uppermost layer. If all application guidelines are followed, there is no reason not to use finer sand, e. g. SILIKAL® Filler QS 0.2 – 0.6 mm or 0.3 – 0.8 mm. To be on the safe side, in this case the quantity of hardener should be increased by 0.5 – 1 % on the quantity recommended in the table.

Mixing

Because of their low viscosity, all Silikal systems can be stirred together in a sufficiently large mixing container by means of an electric hand agitator. Depending on the size of the building site, primers and top coats are mixed in batch sizes of 5 – 10 kg, coatings and mortars roughly in sizes from 20 – 50 kg. The mixed mass can be poured directly onto the floor in combination with several containers in circulation. From about 20 kg in content, the mixing container should be moved around on small trolleys. After it has been emptied, it is recommended that the bucket-walls are scraped, both to avoid any premature polymerisation on the walls and to save on solvents for cleaning.

Storage, particularly at low temperatures over lengthy periods of time, can lead to small quantities of dissolved paraffin separating out on the surface of the resin. In these cases it is essential to stir before use.

Cleaning the tools

Simple cleaning in an unhardened state is best done by using organic ester or ketone-based solvents (e. g. acetone, MMA cleaner). Solvent residues must be wiped away before further use. **Solvents must not be used to dilute the mixtures.** Solvents are also covered by the safety regulations such as explosion protection or MAK specifications.

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