WATERPROOFING AND DAMP-PROOFING

Durable Protection with Remmers Systems
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Building waterproofing is a good investment.
REPAIR, PROTECT AND PRESERVE FROM THE BASEMENT TO THE ROOF.

Simple methods for difficult situations

From 1949 to the present day Remmers has grown from a small local business to a strong, international building chemicals company.

We are now a market leading company specialising in systems for the repair, protection and preservation of buildings and therefore their values. We waterproof and protect buildings with fully integrated and complementary, durable solutions – “from the basement to the roof”.

We are customer focussed and provide outstanding ‘added value’ with our free Consulting Service. We combine the best traditions of a family company with the technical innovation and customer support of an international market leader. We are now technology and market leaders in all of six of our core business areas:

- Basement and masonry waterproofing and refurbishment
- Concrete façade refurbishment and protection
- Stone heritage conservation and preservation
- Industrial and commercial resin flooring
- Wood protective coatings
- Wood preservation treatments

PROTECT FROM WATER AND PROTECT WATER

For nearly 60 years Remmers has been a recognised specialist for many different types of waterproofing including complete systems for both new construction and building refurbishment. Remmers provides waterproofing systems and products that are preventative and retrospective, horizontally and vertically applied, suitable for all different exposures from simple moisture and damp penetration, to water infiltration and water under hydrostatic pressure.

Remmers provides economic waterproofing systems and products, that have been proven in many thousands of applications, together with rapid installation and special systems for specific project solutions. These are all selected from the Remmers System Designer based on the results of a professional condition survey and analysis. Waterproofing solutions using Remmers systems are not only extremely durable and reliable; they are also ecological and safe, even approved for use in contact with drinking water in potable water retaining structures.

They also have high chemical resistance, which is demonstrated by their use in the waterproofing of sewage treatment plants, where they also help to protect ground water supplies by containing the effluent.

DRY AND WATERTIGHT LONG TERM

We demonstrate our confidence in our systems with the Remmers RSG 10 year System Guarantee!

This gives contractors, specifiers and their clients full security and confidence in Remmers as the ideal waterproofing and refurbishment partner (see P. 51).
PROTECTION AGAINST WATER IS A MUST

The causes and types of water damage to buildings

Water and waterborne salts cause the most building damage. Saturated masonry threatens the very fabric of a building and the health of its occupants. Hazards such as mould and fungal growth can also develop in wet and damp conditions.

There are also substantial energy losses through wet and saturated areas of a building envelope. Where people live and work, the walls and basement areas must be dry and waterproof. Defective, damaged or deteriorated building components or elements, such as leaking joints or roofs, can all allow water penetration which can then lead to one or more of the problems listed on the opposite page.
Water penetrates the masonry where the waterproofing is missing or defective.

Salts in the fabric of the wall have the capacity to absorb moisture from the atmosphere and the environment (hygroscopic salts) and absorb it into the wall.

Water vapour condenses forming water on the cold surfaces caused by thermal bridges in the wall.

Moisture penetrates the masonry and/or the floor slabs if the exterior waterproofing is missing or defective.

Moisture penetrates the masonry through a defective or missing horizontal damproof course and/or the exterior waterproofing. It then rises through the masonry by capillary action.

Harmful salts

As water and moisture penetrates the masonry, salts can also penetrate (i.e. Chlorides) or dissolve in the penetrating moisture (i.e. sulphates) and then form more damaging salts in the masonry, particularly at the points where the water evaporates.

In saturated masonry these salts are carried through into the external face of the walls with the water. The water then evaporates from the surface, but the salts remain in the masonry.

This continuous cycle can greatly increase the salt concentrations and thus in turn the hygroscopic action (the rate of water absorption from the environment): a vicious spiral.

Salts and their typical sources

- Sulphates, e.g. dissolve in the moisture through contact with gypsum plaster
- Chlorides, e.g. penetrate in the water from de-icing salts exposure/splashes etc
- Nitrates, e.g. dissolve in the moisture from urea de-icing solutions or from leaking drains

The resultant salt damage can include:

- Mechanical damage due to crystallisation and hydration
- Mechanical damage due to frost/freeze thaw action
- Further increases in the moisture content of the masonry and floor slabs
CORRECT DIAGNOSIS FIRST

Building condition survey and analysis

In a professional condition survey, all of the damage to the building must be examined in detail, evaluated and measured. It is very important to include a moisture and harmful salts assessment and to evaluate the specific conditions of exposure with actual and potential points of water ingress. After collating the results of all of these analyses, sustainable and economic refurbishment specifications can be developed. The decision can also be made on whether horizontal or vertical waterproofing is necessary, whether vertical waterproofing should or can be installed internally or externally and what methods can be used for any additional horizontal waterproofing or other project specific details and requirements. Where necessary, waterproofing must also comply with the latest Building Regulations for thermal insulation and to prevent Condensation within the masonry fabric of the structure.

Correct diagnosis first

Definitive results require appropriate sampling. The sample quantity and type to be taken obviously depends on the objectives and test methods. The number of samples must allow for the various types of damage, materials and building components involved. The samples size and quantity must be large enough to fully represent the size and nature of the structure, plus the full cross section and composition of masonry and other areas of the building envelope. Analytical results from undersized samples or insufficient quantities of samples can often be misleading and differ considerably from the real typical characteristics. For assistance in precisely defining the correct requirements for your structure please contact Remmers Technical Service Department.

Sample as many aspects and elevations as possible

Individual samples are generally analysed to determine the moisture and salt content of a building section or component with as many samples taken as agreed to be necessary, according to the visible assessment and extent of any damage. The samples are taken at different heights and depths the sampling method, the date and the weather conditions are all recorded, as is the location of each sampling point.

Note: It is important that the sample materials characteristics must not be changed by its packaging, transport or storage (e.g. special attention must be paid to conservation of the moisture content by vapour tight sealing).

Typical sample sizes

- Core Ø 5 cm, length ≥ 12 cm (without centre hole): To determine strength properties
- Core Ø > 3cm, length ≥ 5cm (without centre hole): To analyse the microstructure and determine the moisture and salt contents

Taking cores to determine moisture and salt contents
Moisture content

The moisture content of the sampled materials can be determined by two methods:

**Darr’s method**
The samples are dried in a drying cabinet at 105 °C until they a constant weight. The moisture content is then calculated mathematically.

**CM (calcium carbide) method**
The sample is prepared and mixed with calcium carbide and a quantity of acetylene gas (C₂H₂) equivalent to the moisture content is released and measured according to a table.

Determining the root causes of damage

Test methods do not reveal the source or the root cause(s) of the moisture or the penetration level. Further data and references are needed for this, including determination of:

- Maximum capillary water absorption
- Maximum water absorption (saturation moisture content)
- Hygroscopic moisture absorption
- Condensation formation

Maximum capillary water absorption
The maximum capillary water absorption is an important characteristic. It is the maximum quantity of water, which a dried material sample can absorb through capillary action due to its dried voids content and voids geometry.

Maximum water absorption (saturation moisture content)
To determine the maximum water absorption, the full dried void content of the sample is filled with water under pressure.

Hygroscopic moisture absorption
Moisture penetration levels do not provide reliable results on the causes of moisture penetration.

It is not easy to detect whether the moisture has migrated by capillary action from the liquid phase or whether it has also been absorbed hygroscopically from the atmosphere – or at least partially. Confirmation of this is only possible by the so called ‘exclusion’ method: The hygroscopic moisture absorption is measured at one or more points by exposing dried material samples to a specific relative humidity at a constant temperature in a climate chamber for a given length of time.

The hygroscopic moisture absorption value is then obtained from the weight increase observed.

Microscopic examination of a material sample
SUCCESS THROUGH MEETING AND EXCEEDING STANDARDS

BS 8102 plus German Standard DIN 18195 and the WTA Directives

Note: In the UK the Building Regulations require foundations and below ground structures to be waterproofed, but they do not stipulate how this is to be achieved. British Standard BS 8102, is actually a Code of Practise referring to the requirements for waterproofing below ground basements and other structures.

German Standard DIN 18195, Part 1, section 4.1

The performance and the durability of waterproofing naturally depend on its correct design and installation, but also on functional design and construction of the building and the components on which the waterproofing is applied.

German Standard DIN 18195 is therefore directed at both the specialist waterproofing contractor and those responsible for the overall design and construction of the building. Every designer is required to exercise the greatest care in the design of the waterproofing and to use reliable and proven approaches.

WTA Directives: The design of the waterproofing approach and system

The WTA (German Technical Committee for Building Conservation and Heritage Preservation) promotes building conservation in dialogue with all of the professional parties and responsible organisations involved. Remmers are a permanent member of this well established and respected technical committee.

Not all of the waterproofing systems proven in the field are yet covered by the DIN standard. Clear information on the correct procedure from condition survey to specification and materials selection, through to the waterproofing systems installation procedure, are given in the WTA Directive “waterproofing of building components in contact with the ground”. 

In Germany waterproofing with polymer modified, high-build bitumen coatings (known as KMB) is covered by the German Standard DIN 18195 in Parts 4, 5 and 6.
The KMB (polymer modified bitumen) Directive

The directive for the design and installation of waterproofing of building components in contact with soil, using polymer modified, high-build bitumen coatings (KMB), also describes their detailed installation procedure. This is in a clear and understandable way for the both the designer and the contractor, thereby providing an effective ‘code of practice’ which supplements the standard DIN 18195.

Well and truly proven: The waterproofing products in the Remmers Kiesol system

Remmers waterproofing with polymer modified, high-build bitumen coatings (KMB) in the Kiesol system were and still are, well ahead of the standard. Based on many years practical experience – in the right applications the undisputed advantages of these slurry sealing coating seals are already fully utilised by Remmers. With the Remmers systems as described on the following pages, designers and contractors select reliable waterproofing technologies, which have been proven over and over again. This is also ensured for our customers, by the Remmers System Guarantee (RSG, see P. 51).

Extensive independent test reports, certificates, assessments, product reviews, expert analyses, patents and our external monitoring to DIN, European and ISO regulations, all confirm the high quality and reliable performance of both the individual Remmers products and when they are combined together as the systems.

GUARANTEED DRY AND WATERTIGHT FOR 10 YEARS
DEPENDENT ON THE WATER INGRESS AND EXPOSURE POTENTIAL

The Specific Waterproofing Requirements

Selection of the right waterproofing system depends on the type of water ingress and exposure anticipated. Durable, functional waterproofing can only be achieved by correct classification of this exposure. DIN 18195 divides water exposure into the following four conditions in its Parts 4-6:

In contact with ground water (Part 4)
Ground water is the water which is capillary bound in the soil. It can also move against gravity by capillary forces. Ground water is always present in the soil to some degree and represents the minimum level of waterproofing exposure.

This minimal load condition can only be assumed if the site consists of non-compacted soil down to a sufficient depth below the base of the foundation, and this also applies to the backfill: for example, sand or gravel with a minimum hydraulic conductivity (K) of \( K > 10^{-4} \) m/s. Surface and storm water can then seep down into the open water table without exerting hydrostatic pressure on the waterproofing.

Infiltrating water not under pressure (Part 4)
Infiltrating water not under pressure places the same stress on the waterproofing as the ground water exposure load condition outlined above. To withstand this exposure long term, a drainage system conforming to DIN 4095 must be installed in or around the external walls and floors.

This should usually consist of a ring drainage system, installed in conjunction with building regulations and the drainage system for the roof and walls, this will then also act as protection for the external waterproofing system.
**Infiltrating water intermittently under pressure (Part 6)**

Intermittent infiltrating water under pressure creates hydrostatic pressure on the waterproofing system. The water cannot percolate quickly enough down to the water table i.e. through dense or compacted soil; therefore it builds up with increasing pressure from below. The maximum foundation depth for this classification is 3 m below the ground level.

The designed permanent ground water level for this classification must be at least 300 mm below the bottom of the floor slab. This should be determined from the regional and site records over many years and as close to the actual site as possible.

**Water under external hydrostatic pressure (Part 6)**

External water pressure represents the same exposure load on the waterproofing system as intermittently infiltrating water under pressure. The difference is that the normal water level is expected to be less than 300 mm below the bottom of the floor slab. As polymer modified bitumen systems (KMB) are not yet approved for this exposure condition in DIN 18195, in Germany for their use a building regulations variation agreement under VOB Part C is necessary. However polymer modified bitumen systems (KMB) have actually already been used successfully for this exposure classification for many years.
External waterproofing for ground water contact – durable protection
TIME PROVEN TO BE WATERPROOF FOR MANY YEARS

External waterproofing for ground water contact

Remmers Kiesol systems have become synonymous with durable waterproofing.

They have proved themselves over many years for all load and exposure conditions and all types of structures. The Remmers systems provide a reliable solution for every substrate.

The mortar levelling systems and slurry coats for masonry substrates are highly sulphate resistant. Additionally the bitumen based bond coats and high polymer content slurry systems, have proved highly effective for many years in refurbishing and re-waterproofing old bituminous substrates.

All Remmers slurry, levelling and high-build coating systems use 'state of the art' material technology. They are extremely easy to apply, manually or by machine. They are reliable and very economic in use.

Many impressive references and numerous test certificates and waterproofing system inspection reports confirm the strengths of the Remmers solutions:

- Usable on damp substrates
- Extremely high pressure resistance of the polymer modified bitumens
- Reinforcing is not necessary for any exposure condition
- Rapid drying and curing
- Economic with high solids contents (approx. 90%)
- Ecological: solvent free and environmentally safe
- Resistant to corrosive substances (conform to DIN 4030)
- Maximum security due to excellent substrate and intercoat adhesion

WHEN THINGS LOOK BLACK, INSIST ON REMMERS FOR CLARITY

When a leaking basement is exposed, an old black coating is often revealed. What is it? Tar or bitumen?

This must be determined by testing. This is because durable refurbishment is only possible on bituminous substrates.

Only limited adhesion can be obtained on tar based materials – never durable waterproofing!

Therefore:
Tar must be removed – sound bitumen can usually remain.

A quick ‘on the spot’ test:

It is easy to establish whether a material contains tar or bitumen with petroleum spirit:
- If the material easily dissolves, it is bitumen
- If the material is resistant or only slightly dissolves, then it is tar

For your additional security: You can send a sample to our laboratories for confirmation testing.
If there is no existing waterproofing, the substrate only requires cleaning. Surface defects of 5 to 50 mm are levelled and sealed with the Kiesol mortar and sealant system in one operation. There are standard and quick setting versions, both highly refined and shrinkage compensated for total crack resistance. Small and large areas can be waterproofed very economically manually or by machine, which makes it even faster.

Two additional factors must also be taken into account for the thermal insulation of a basement: Firstly, the “Minimum thermal insulation” required by the German building regulations (LBO) must always be achieved. These requirements are given in the Technical Construction Regulation (TBB) – DIN 4108-2. Secondly, the energy-saving thermal insulation specified in the Energy Saving Directive (EnEV) must be met. Condensation protection to DIN 4108-3 must also be provided.
THE SEQUENCE OF OPERATIONS

How this waterproofing system is achieved

PREPARATION AND CLEANING

Any edges or corners on the foundations are chamfered so that there are no sharp arrises. The surfaces are cleaned and any loose or friable particles or other contaminants are removed, by using a grinding machine or Rotec technique.

PRIMING WITH KIESOL

The Kiesol primer is applied uniformly by spray. Highly absorbent substrates are pre-dampened to reduce suction.

BOND COAT WITH SULFATEX GROUT

Within the Kiesol open time, the bond coat of Sulfatex Grout is applied by brush.

LEVELLING WITH WATERPROOFING FILLER

All rough areas and surface defects are filled and levelled with Waterproofing Filler, 'wet on wet'.

FORMING A SEALING FILLET WITH WATERPROOFING FILLER

A corner sealing fillet is also formed with Waterproofing Filler 'wet on wet', using a special coving trowel.

APPLYING THE 1ST WATERPROOFING LAYER WITH PROFI TIGHT

The 1st waterproofing layer of Remmers polymer modified bitumen is applied by brush trowel or spray.

APPLYING THE 2ND WATERPROOFING LAYER

As soon as the 1st layer has dried, the 2nd layer of Profi Tight can be applied (Coverage, layer thickness etc. are dependent on the anticipated exposure conditions and must be detailed in the specifications of the project).

FIXING THE PROTECTION SYSTEM CLIPS

The clips are fixed into the substrate waterproofing with screws above the ground level.

PROTECTING THE CURED WATERPROOFING SYSTEM

When the waterproofing system has completely dried (confirmed by the control samples), it must be protected with Remmers protection system prior to back filling.