

SILRES® BS

FOR FACADE IMPREGNATION

THE ELEMENT
OF SUCCESS

Long-Lasting

A

Aesthetics

Better

D

Durability

Improved

Ee

Energy
efficiency

SILRES®

CONSTRUCTION | SILICONE RESINS | HYDROPHOBIC IMPREGNATION

HYDROPHOBIC IMPREGNATION
WITH SILRES® BS

A close-up photograph of a brown, textured surface, likely a wall or ceiling, showing significant water damage. The surface is covered in numerous small, irregular water droplets and larger, more prominent stains. The water has a yellowish-brown hue, suggesting it may be contaminated or has been sitting for some time. The background is a lighter, possibly white or light grey, surface, which is also partially visible at the top of the frame.

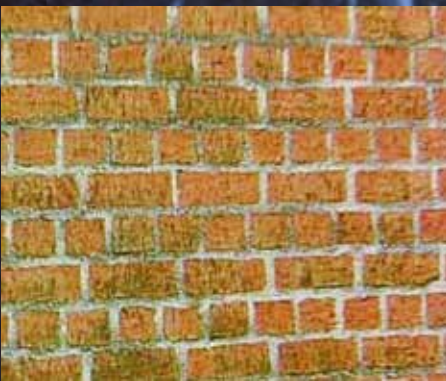
THE THREAT WATER DAMAGES BUILDINGS

Most structural damage around the world is caused by water and moisture. As the images show, there are many different kinds of damage. But there is usually one simple remedy: preventive protection against moisture by means of hydrophobic impregnation.

Impact of Water on Mineral Constructions



Water may cause efflorescence and salt damage due to hydration and crystallization.



Water promotes microbial attack by fungi, moss, lichen or similar.



Water reduces the insulation behavior of a facade. A dry facade helps to reduce energy costs.

Water's potential impact on buildings:

- Penetration of moisture through the wall
- Cracks caused by swelling and shrinkage
- Frost damage and freeze/thaw damage due to salt ingress
- Destruction of concrete caused by corrosion of the reinforcing steel
- Efflorescence and salt damage caused by hydration and crystallization
- Lime leaching
- Rust stains
- Dirt pick-up and stains
- Fungal, moss, lichen and algal growth
- Chemical corrosion, e.g. binder transformation caused by acidic gases (SO_2 , NO_2)
- Impaired thermal insulation

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THE ELEMENT OF PROTECTION

HYDROPHOBIC IMPREGNATION

Hydrophobic impregnation of a facade reduces maintenance and repair costs. Cleanability is improved and the value of the property is increased, while heating costs can be cut. SILRES® BS hydrophobic impregnations combine high technical performance with ease of application.

Significant Reduction in Water Absorption

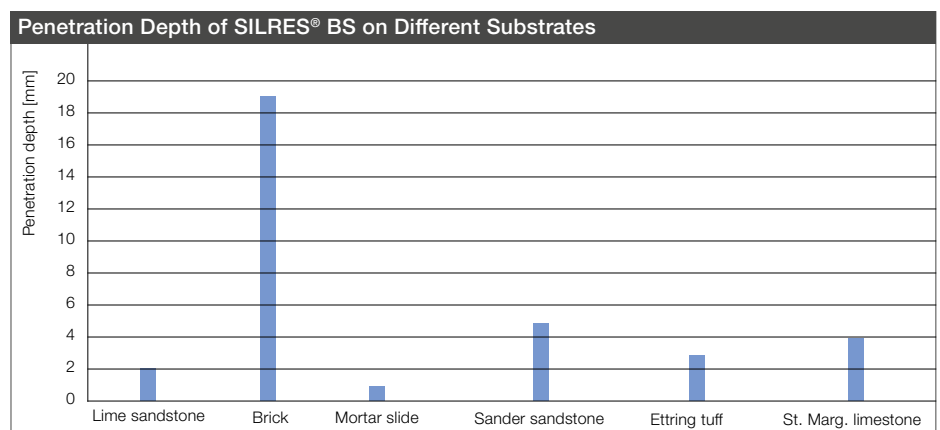
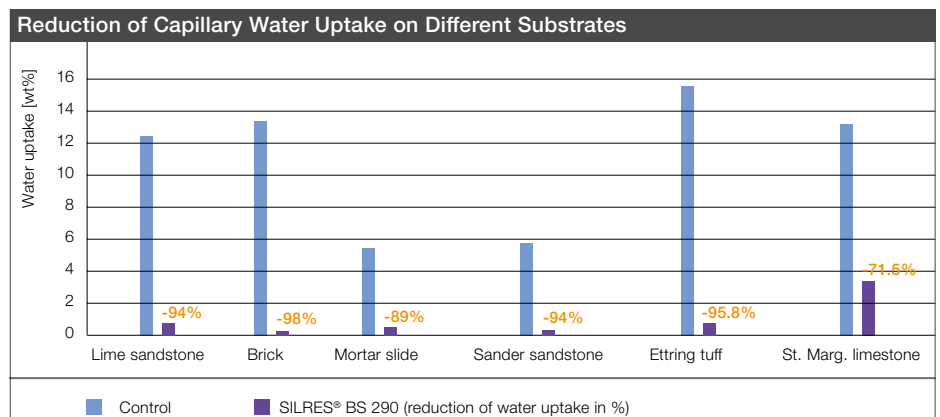
Reduction of capillary water uptake by at least 80%.

- Low capillary water uptake is the most efficient protection against rain and humidity
- A hydrophobic impregnation reduces water uptake, without lessening water-vapor permeability

Durability

Extremely durable water protection due to:

- High penetration depth
- Sufficient resistance to alkalis
- UV stability



SILRES® BS

FOR FACADE IMPREGNATION

THE ELEMENT
OF SUCCESS

Good

Pd

Penetration
depth

High

Wp

Water-Vapor
permeability

Low

Lw

Water uptake

THE ELEMENT OF TOMORROW

LESS ENERGY CONSUMPTION AND HEALTHIER LIVING

Humidity Causes Energy Loss

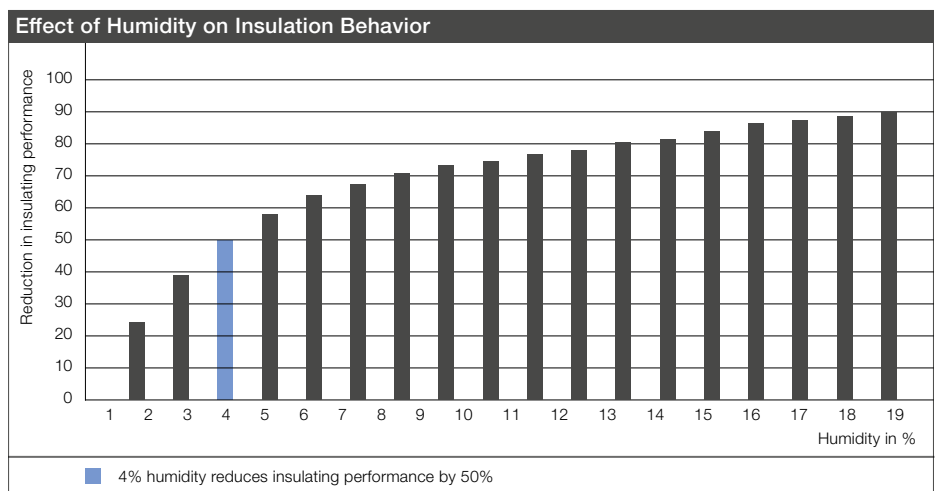
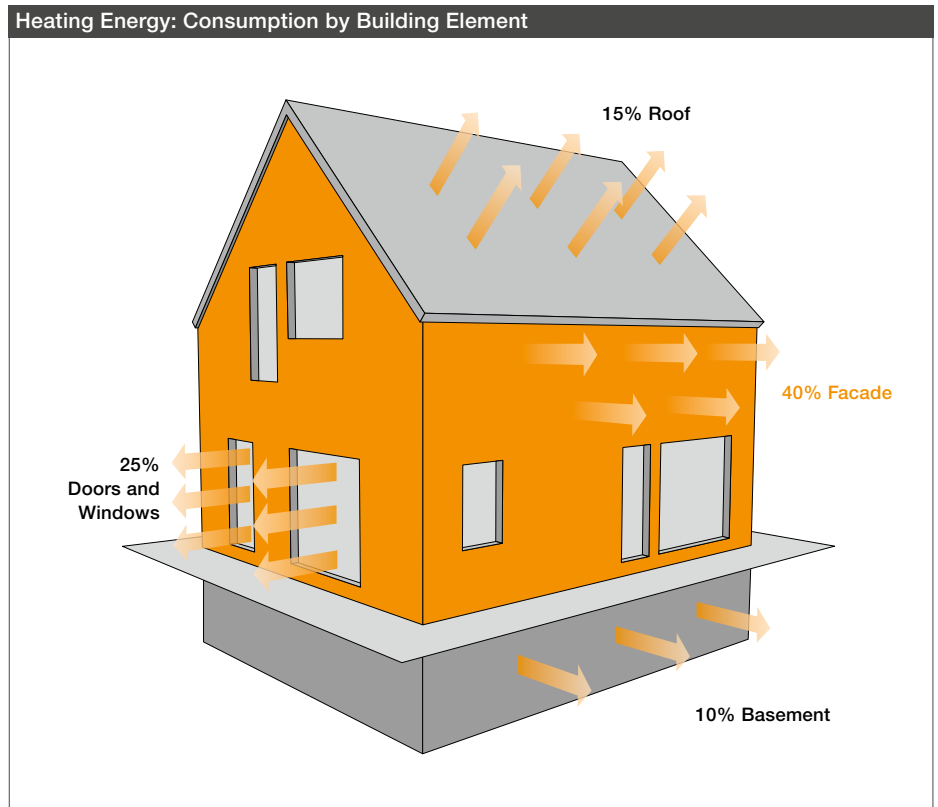
Damp facades restrict thermal insulation. Consequently, 2% humidity leads to an energy loss of 20%. 4% humidity means that 50% of energy will be lost.

Hydrophobic Impregnation Saves Energy

A hydrophobic impregnation reduces water uptake by at least 80%, thereby keeping the thermal insulation performance of a wall at a permanently high level.

No Sealing of the Wall

At the same time, a hydrophobic impregnation with SILRES® BS retains water-vapor permeability. In this way, there is nothing to stop moisture from escaping through the wall, which helps create a healthy indoor climate.



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FOR FACADE IMPREGNATION

THE ELEMENT
OF SUCCESS

Better

D

Durability

Increased

Vp

Value of the
property

Improved

Ee

Energy
efficiency

THE SOLUTION

BEATING PHYSICS WITH THE RIGHT CHEMISTRY

Mineral construction materials are open-pored. Contact with water produces the capillary effect. Large volumes of water can therefore penetrate into the building material within a short time. Using capillary-active forces to penetrate into the pores of the mineral building material, SILRES® BS is deposited on the pore walls. These siliconized pores are no longer wetted by water. Water-vapor permeability is unaffected.

Capillary Water Uptake



The untreated substrate absorbs water.



When a hydrophobic impregnation is applied, the water beads off.

Pores with a radius between 0.1 μm and 100 μm exhibit capillary action and result in the natural transportation of water into the building material. This capillary effect can be further intensified by hygroscopic effects.

Unlike various film-forming coatings, building materials that have undergone water-repellent treatment with SILRES® BS retain their breathability, because water-repellent agents based on organosilicon compounds do not block the pores on the surfaces of mineral construction materials. At the same time, water can no longer penetrate in liquid form into capillaries that have been rendered water-repellent, since, as a polar liquid, it is unable to interact with a non-polar, hydrophobic surface. In other words, pores which have been siliconized and are therefore hydrophobic can no longer be wetted by water.

Water-Vapor Permeability

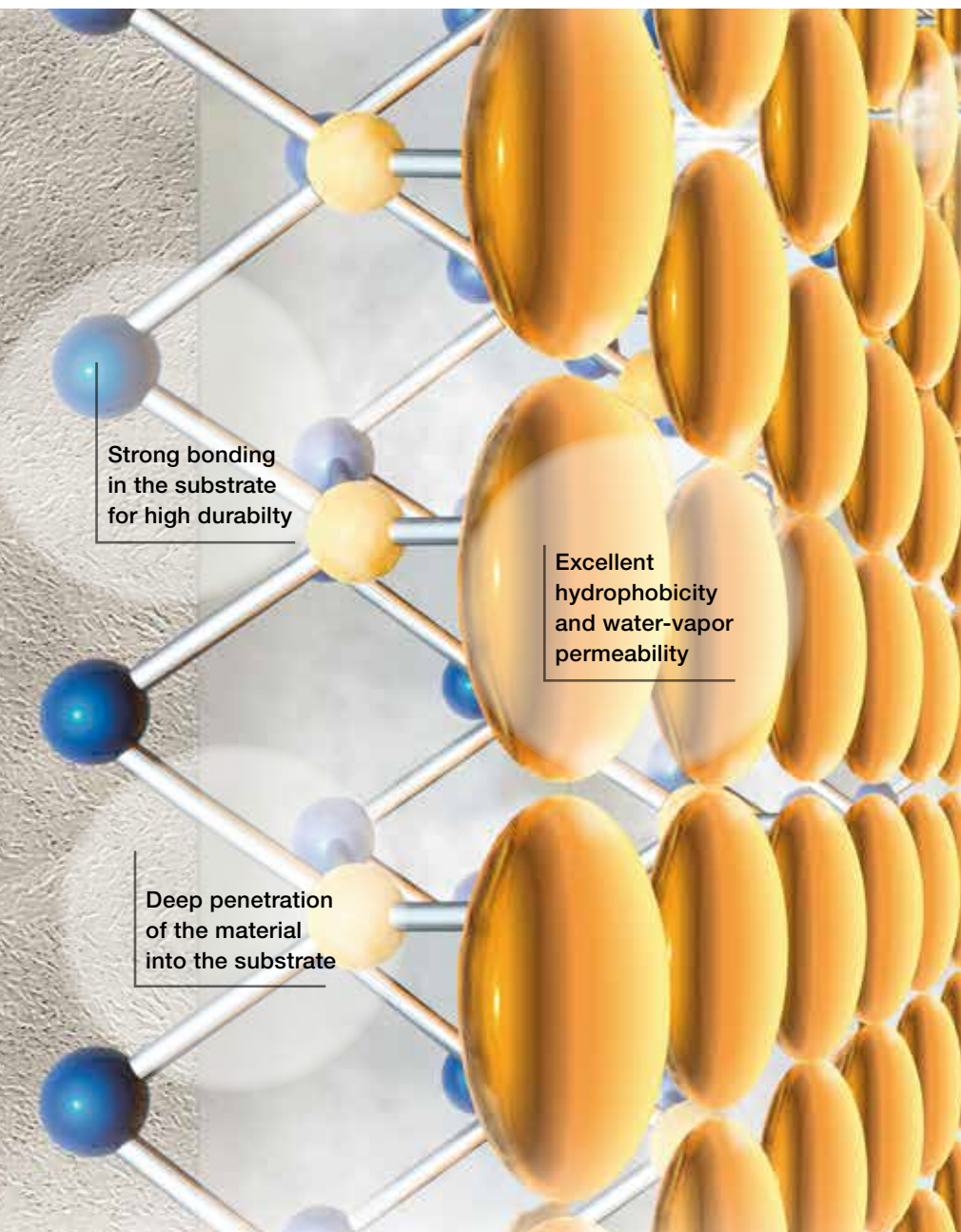


Film-forming systems (coating and impregnation) will not be permeable to water vapor. Damage enables water to penetrate and cause further damage.



SILRES® BS results in a good penetration depth. It is not film-forming and therefore allows water vapor to escape.

Quartz is the basic material for the production of silicone resin. The molecular structure of the organo-modified silane and siloxane is compatible with the silicate matrix of a mineral substrate. This accounts for the extraordinary efficiency of hydrophobic impregnation.



Chemical Reaction

The organic groups are oriented toward the center of the capillaries and pores. The active ingredient reacts there with the silicate matrix of the building material and reduces the surface tension within the capillaries and pores such as to stop capillary activity. The result is long-lasting hydrophobicity.

Effects

- Low water uptake
- High water-vapor permeability
- Barrier against harmful water-dilutable salts
- Extremely high durability of the hydrophobic impregnation against cold and heat, and UV light

THE ELEMENT OF SUCCESS

SILRES® BS: MILESTONES IN HYDROPHOBIC IMPREGNATION

SILRES® BS water-repellent impregnations are among the world's most successful building protection agents and have achieved milestone after milestone in recent years.

The first silicone resins for building protection originated from WACKER laboratories. Today, we provide you with a time-tested portfolio that includes four product groups, each with specific advantages.

SILRES® BS Creme

SILRES® BS Creme reduces water uptake extremely effectively. It also ensures very good penetration depth and easy application. The product does not drip, and you can readily apply it overhead and see where the impregnation has already been applied.

- SILRES® BS Creme F

Water-Based SILRES® BS Grades

They are free of solvents and a perfect choice for absorbent substrates:

- SILRES® BS 1001
- SILRES® BS 3003
- SILRES® BS 4004

Solvent-Based SILRES® BS Grades

They are very efficient on absorbent substrates and even on non-porous ones:

- SILRES® BS 290
- SILRES® BS 280

SILRES® BS Silicone Microemulsion Concentrate (SMK)

The concentrates save you transportation and storage costs. Diluted in water, the product yields extremely small particle sizes, which penetrate well.

- SILRES® BS SMK 1311

Microemulsion
Sr
Storage-cost reduction

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Solvent-based grades
E
Efficient

Cream
Vi
Viscosity

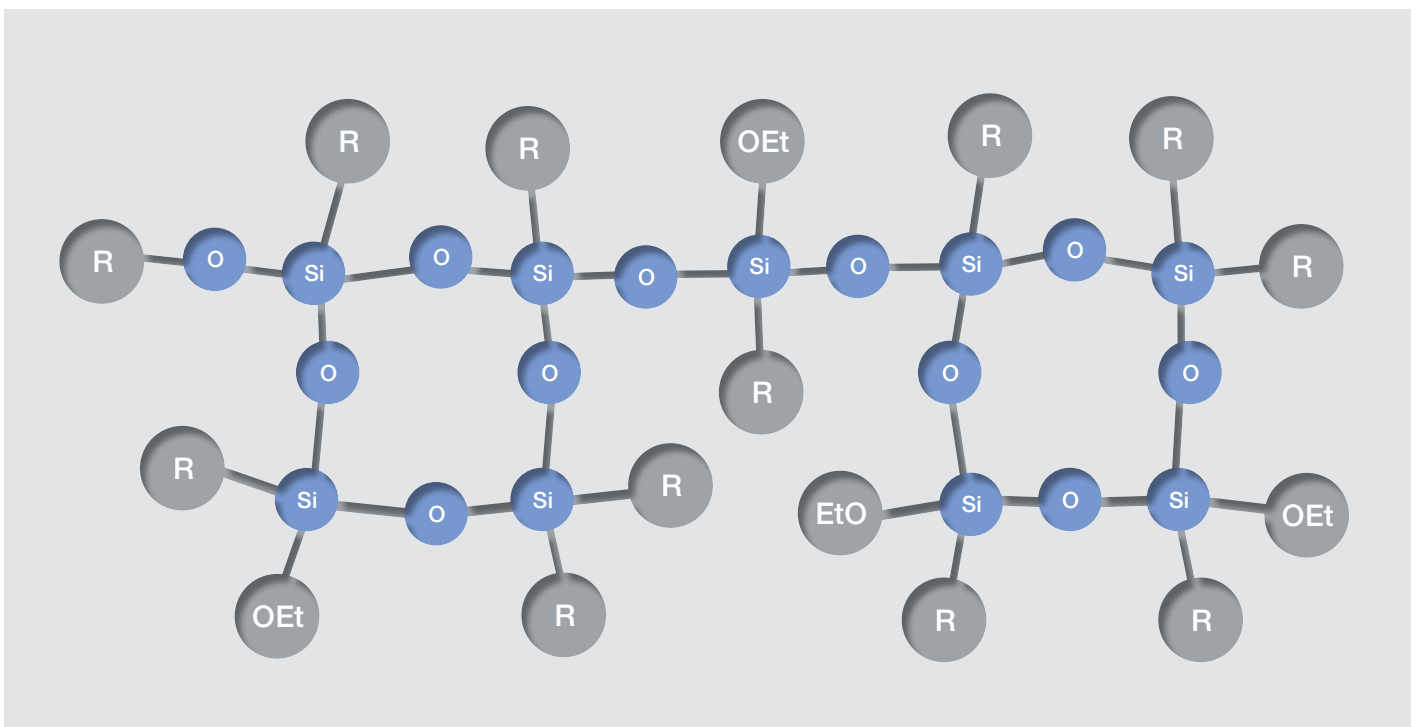
Water-based grades
Sf
Solvent-free



SILRES® BS Creme F is easy to apply and penetrates deep into the substrate.



MADE TO MEASURE SILRES® BS PRODUCT OVERVIEW



The active ingredient in SILRES® BS products is composed of organo-modified silanes and low-molecular-weight siloxanes.

These molecules carry reactive alkoxy groups. The release of alcohol forms permanent bonds with the silicate building material.

Product Overview							
	Cream	Water-Based			Solvent-Based		SMK
Product	SILRES® BS CREME F	SILRES® BS 1001	SILRES® BS 3003	SILRES® BS 4004	SILRES® BS 290	SILRES® BS 280	SILRES® BS SMK 1311
Appearance	White to yellowish cream	Milky, white	Milky, white	Milky, white	Colorless, hazy	Colorless, hazy	Clear, yellowish
Silicone base	Silane	Silane/siloxane	Silane/siloxane	Silane/siloxane	Silane/siloxane	Silane/siloxane	Silane/siloxane
Diluting agent	Undiluted	Water	Water	Water	Solvents	Solvents	Water
Solids content	25%	50%	60%	50%	100%	100%	100%
Shelf life (months)	12	9	9	9	12	12	12
Density (g/cm³)	0.8426	0.95	0.95	0.95	1.05	1.05	0.90
Viscosity [mm²/s]		12	12	12	15–19	15–19	4
Flash point [°C]	75	>100	>100	>100	42	42	74
Application Area							
Clay brick	•••	•••	•••	•••	•••	•••	•••
Sand-lime brick	•••	•••	•••	•••	•••	•••	•••
Sandstone	•••	••	••	••	•••	•••	•••
Mineral plaster	•••	•••	•••	•••	•••	•••	•••
Concrete*	••	••	••	••	•••	••	•••
Porous limestone	•	•	•	•	••	•••	•
Key characteristics	Easy to apply	Can be used as a primer (acrylate)	High efficiency	Strong beading	High efficiency	Specifically for limestone	SMK technology

• Well suited •• Very well suited ••• Ideal

* Outside EN 1504-2



Effectiveness of WACKER Products

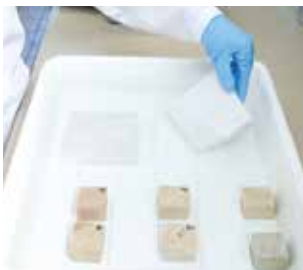
	Dilution	Absorption of Impregnating Agent [g/m ²]	Penetration Depth [mm]	Beading	Water Uptake [%] after 24h
Sand-lime brick					
Untreated	–	–	–	5	12.90
SILRES® BS CREME F	None	200	4	1	0.62
SILRES® BS 3003	1:7	677	2	2–3	0.88
SILRES® BS 4004	1:6	575	1–2	1	0.83
SILRES® BS 290	1:12	454	2–3	1	0.74
SILRES® BS SMK 1311	1:11	271	2	2–3	0.94
Clay brick					
Untreated				5	18.20
SILRES® BS CREME F	None	200	25	4	0.58
SILRES® BS 3003	1:7	713	6–12	3	0.47
SILRES® BS 4004	1:6	270	5–10	2–3	0.42
SILRES® BS 290	1:12	680	15–25	1–2	0.19
SILRES® BS SMK 1311	1:11	319	6–11	2	0.52
Clinker brick					
Untreated				5	2.60
SILRES® BS CREME F	None	200	8–12	1–2	0.12
SILRES® BS 3003	1:7	124	6–11	3	0.13
SILRES® BS 4004	1:6	115	4–8	2	0.21
SILRES® BS 290	1:12	125	5–10	2	0.09
SILRES® BS SMK 1311	1:11	101	4–8	3	0.16
St. Margaret limestone					
Untreated				5	9.60
SILRES® BS CREME F	None	200	25	2	1.63
SILRES® BS 3003	1:7	315	11–20	3	2.15
SILRES® BS 4004	1:6	265	8–15	2	1.88
SILRES® BS 280	1:19	437	15–22	2	0.47
SILRES® BS SMK 1311	1:11	298	10–18	3	2.84
Ettring tuff					
Untreated				5	5.80
SILRES® BS CREME F	None	200	4	1	0.95
SILRES® BS 3003	1:7	213	2–3	2–3	0.67
SILRES® BS 4004	1:6	352	1–2	1–2	0.86
SILRES® BS 290	1:12	873	3–5	1	0.78
SILRES® BS SMK 1311	1:11	528	1–3	2–3	1.40
Burgpreppach sandstone					
Untreated				5	5.80
SILRES® BS CREME F	None	200	8	1	0.48
SILRES® BS 3003	1:7	580	5–7	2	1.38
SILRES® BS 4004	1:6	327	3–6	1–2	0.89
SILRES® BS 290	1:12	370	4–8	1	0.34
SILRES® BS SMK 1311	1:11	297	2–6	2–3	1.06
Mortar slabs (water/cement ratio 0.5)					
Untreated				5	6.90
SILRES® BS CREME F	None	200	3	1–2	0.61
SILRES® BS 3003	1:7	205	2	2	0.48
SILRES® BS 4004	1:6	350	1–2	1–2	0.51
SILRES® BS 290	1:12	233	3	1–2	0.59
SILRES® BS SMK 1311	1:11	164	2	2	0.68

THE ELEMENT OF RELIABILITY

OUR SERVICE FOR YOUR SUCCESS

The building-protection criteria to be met by a brick building in Amsterdam are not the same as those of a sandstone house in Bangkok. This is why we decided early on to set up regional technical centers that help you find the best solution for your individual needs. These technical centers carry out, on your behalf, standardized tests on regional building materials and provide you with comprehensive advice.

Selection of Typical Tests Conducted at Our Technical Centers



Capillary Water Absorption

Capillary water absorption is measured via immersion test according to DIN 18180, EN 15148:2002. A treated test sample is immersed into a water bath for 24 hours. The weight gain of the material is then measured to determine how much weight (e.g. water) has been gained.



Measurement of Penetration Depth

Measuring the penetration depth of the hydrophobic impregnation provides an indication of the durability of the hydrophobic effect. To determine durability, the product is applied to test samples. After storage, the samples are broken apart down the middle and colored water is applied to the fracture. The white areas did not absorb the colored water, showing how deep the impregnation has penetrated the substrate.



Beading Effect

The beading effect is measured by determining the contact angle of a water droplet on a substrate. Five different classifications have been defined, ranging from very good water repellency ($>130^\circ$) to slight to complete wetting ($<30^\circ$).



Measurement of Water-Vapor Permeability*

Fill a saturated solution into a PE cup and store the assembled cups with coated frit under standard climate conditions. Weigh the cups after defined periods of time to calculate the amount of water that has escaped through the frit.

* Image shows visualization of water-vapor permeability, not the test.

Din EN
Tr
Tested results

Worldwide
Ts
Technical support

SILRES® BS
FOR FACADE IMPREGNATION
THE ELEMENT
OF SUCCESS

²¹
Tc
Technical centers

Technical Centers in Europe, Asia,
the Middle East, LATAM and Australia:

Europe

Burghausen, Moscow

Asia

Mumbai, Kolkata, Shanghai, Seoul, Beijing,
Singapore

Australia

Melbourne

Middle East

Dubai

LATAM:

Sao Paulo

THE ELEMENT OF TRADITION SOMETIMES THE BEST ARGUMENT IS AN OLD ONE

WACKER is one of the world's largest silicone producers and is an expert in silicone-based building protection. Since the 1950s, we have been developing and optimizing solutions in partnership with, and on behalf of, customers across the globe.

Treated in 1954: even after more than 50 years, water does not penetrate into the substrate.



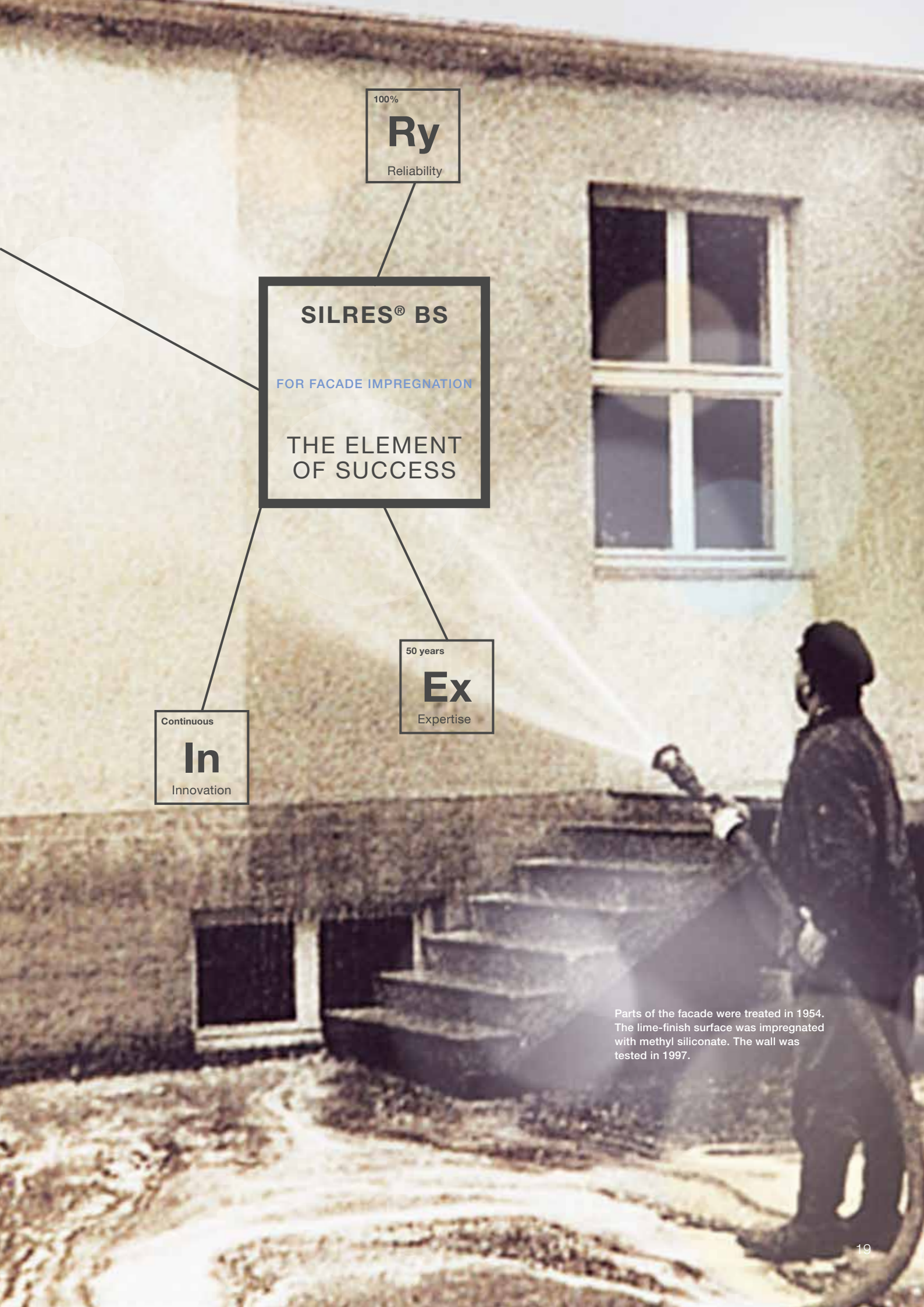
Using the Karstens Tube Method to Test the Same Plaster for Water Repellency in 2008

In the Karstens tube test, the untreated plaster absorbs 5 ml of water in 10 minutes, while the water-repellent surface absorbs practically nothing – an amazing finding after more than 50 years! These examples go to show that silicone resins – the active agents on which all established organosilicon water repellents are based – are able to protect buildings and structures against water and attendant damage for decades thanks to their excellent chemical and physical stability.

Untreated: water travels very readily into the substrate.



Using the Karstens tube method to test the same plaster for water repellency in 1997.



100%
Ry
Reliability

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OF SUCCESS

Continuous
In
Innovation

50 years
Ex
Expertise

Parts of the facade were treated in 1954. The lime-finish surface was impregnated with methyl silicate. The wall was tested in 1997.

REFERENCES

SILRES® BS products have been applied around the world to protect buildings and to preserve them for future generations.

Kaiser Wilhelm Memorial Church,
Berlin.



**Kaiser Wilhelm Memorial Church,
Berlin**

When the modern church on the Kurfürstendamm boulevard weathered badly and – together with the old sandstone tower – was in need of renovation, the building specialists relied on SILRES® water-repellent agents to treat the surface and strengthen the stonework.

Town Hall, Bruges

SILRES® water repellents and stone strengtheners were applied to protect Bruges's town hall from bad weather.

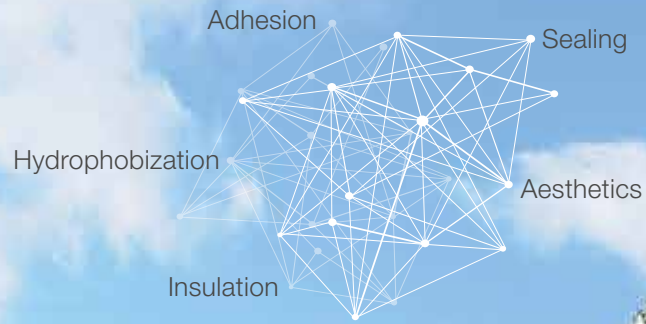
Monument to the Discoveries, Lisbon

The Monument to the Discoveries is located close to the sea with extreme exposure to salt water. It has been treated with SILRES® BS to prevent water damage.

Alte Pinakothek Art Museum, Munich

When the district buildings office in Munich was seeking to repair the damage that weather had caused to the building over the past years, it was decided to apply SILRES® water-repellent agents to protect the building against water ingress over the coming years.





Go for the Optimum!

Polymer and silicone chemistry have changed the construction industry worldwide. WACKER offers you this expertise in a unique way. WACKER is:

- A global leader in polymer binders for construction materials
- One of the largest silicone producers worldwide
- Close to you, with local, expert staff
- And offers individual technical assistance and training courses through our technical centers and WACKER ACADEMY in all key regions.

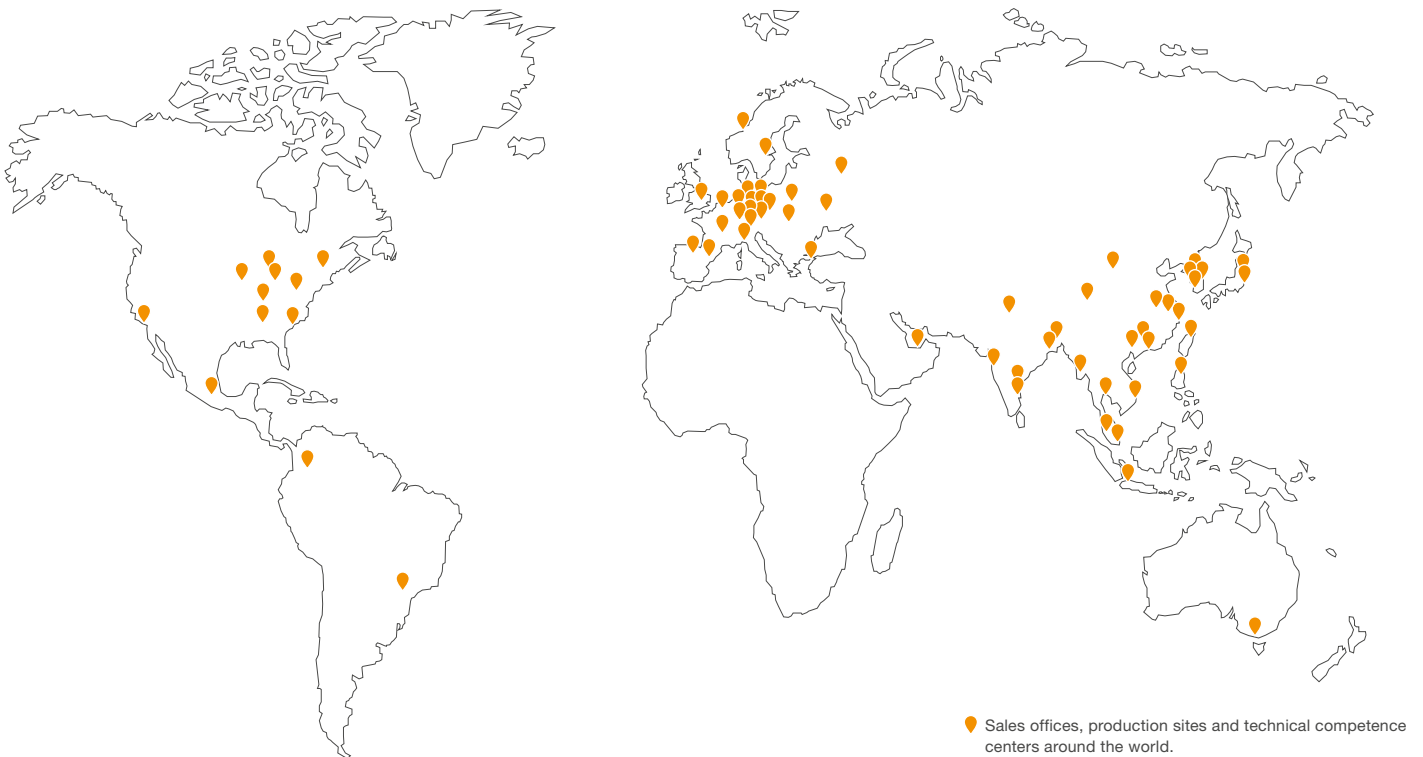
Profit from a Comprehensive Portfolio

Our diverse product portfolio and know-how in organic and inorganic chemistry enables us to recommend and develop optimum customized solutions independent of technologies.

Find out more about our solutions for the construction industry at www.wacker.com/construction



EXPERTISE AND SERVICE NETWORK ON FIVE CONTINENTS



WACKER is one of the world's leading and most research-intensive chemical companies, with total sales of €4.98 billion. Products range from silicones, binders and polymer additives for diverse industrial sectors to bioengineered pharmaceutical actives and hyperpure silicon for semiconductor and solar applications. As a technology leader focusing on sustainability, WACKER promotes products and ideas that offer a high value-added potential to ensure that current and future generations enjoy a better quality of life, based on energy efficiency and protection of the climate and environment.

Spanning the globe with 4 business divisions, we offer our customers highly-specialized products and comprehensive service via 24 production sites, 22 technical competence centers, 13 WACKER ACADEMY training centers and 50 sales offices in Europe, North and South America, and Asia – including a presence in China. With a workforce of some 14,500, we see ourselves as a reliable innovation partner that develops trailblazing solutions for, and in collaboration with, our customers. We also help them boost their own success. Our technical competence centers employ local specialists, who assist

customers worldwide in the development of products tailored to regional demands, supporting them during every stage of their complex production processes, if required. WACKER e-solutions are online services provided via our customer portal and as integrated process solutions. Our customers and business partners thus benefit from comprehensive information and reliable service to enable projects and orders to be handled fast, reliably and highly efficiently. Visit us anywhere, anytime around the world at: www.wacker.com



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The data presented in this medium are in accordance with the present state of our knowledge but do not absolve the user from carefully checking all supplies immediately on receipt. We reserve the right to alter product constants within the scope of technical progress or new developments. The recommendations made in this medium should be checked by preliminary trials because of conditions during processing over which we have no control, especially where other companies' raw materials are also being used. The information provided by us does not absolve the user from the obligation of investigating the possibility of infringement of third parties' rights and, if necessary, clarifying the position. Recommendations for use do not constitute a warranty, either express or implied, of the fitness or suitability of the product for a particular purpose.