MATERIAL

FASERFIX CONCRETE

NATURALLY SUSTAINABLE.
EXTREMELY TOUGH.

NEW:
Now reinforced with basalt fibres

hauraton

AT A GLANCE

FASERFIX
STRONG MATERIAL FOR RELIABLE AND LONG-LASTING DRAINAGE SOLUTIONS.

THE **FASERFIX** PRODUCT

Drainage channels have long been made of conventional concrete. HAURATON has been using fibre-reinforced concrete for channel production since the early 1970s.
Read in this brochure why this material is the perfect building material for drainage systems.

FASERFIX BIG
Channels for heavy duty traffic with ductile iron channel edge protection for maximum stability.

FASERFIX SUPER
Drainage channels for extreme loads and high dynamic forces.

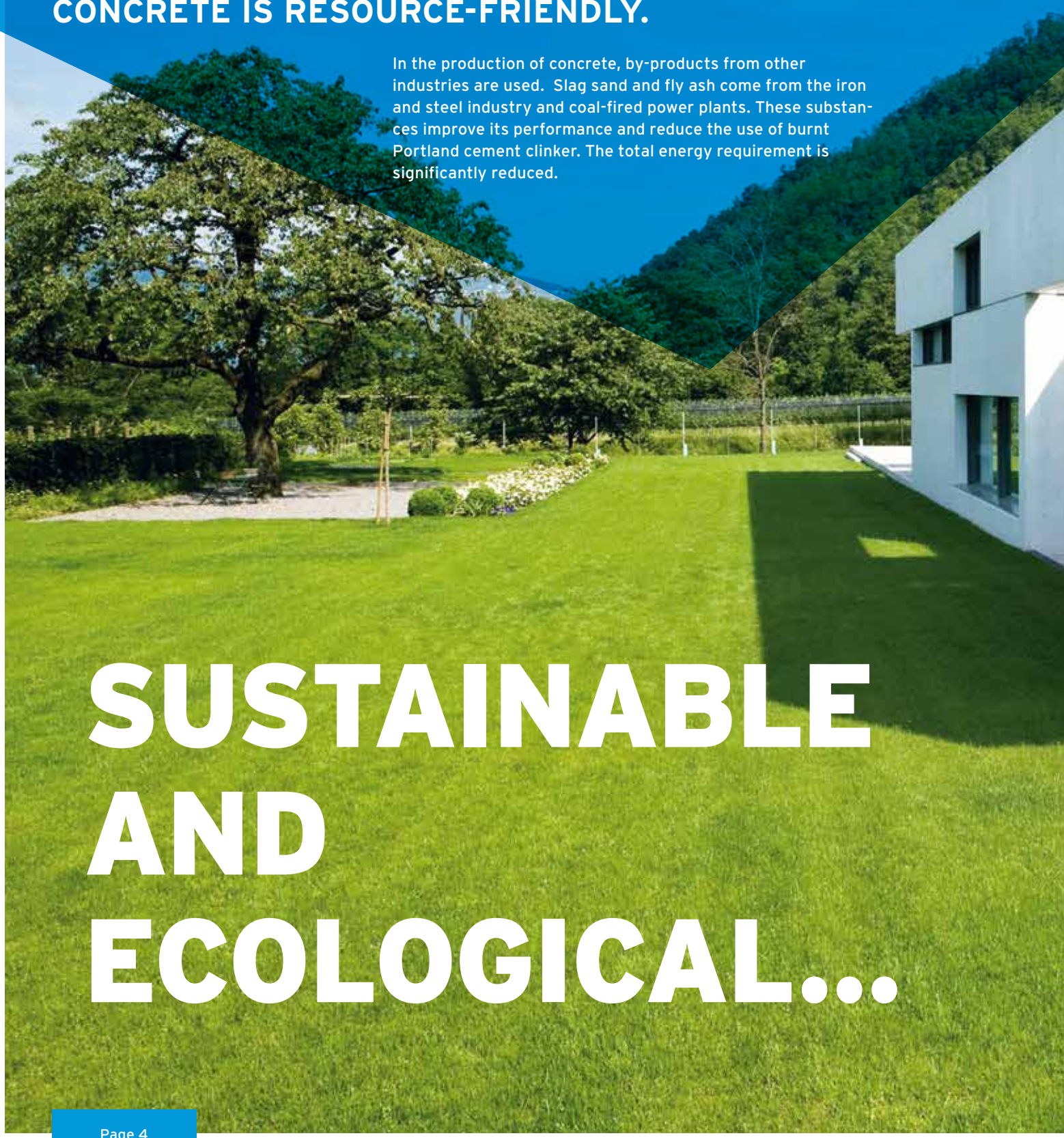
FASERFIX KS
Sturdy and efficient drainage channels for commercial and public areas.

CONCRETE IS A SUSTAINABLE MATERIAL.

Cement as an essential component of concrete is produced in compliance with the strict legal Federal Emmissions Control Ordinance BImSchV. HAURATON procures its cement exclusively from plants that also operate in voluntary environmental and energy commitment systems in accordance with ISO 14001 and 50001 and thus ensure the sustainable and energy-efficient production of the material. All aggregates used are also resource-friendly and ecological.

CONCRETE IS RESOURCE-FRIENDLY.

In the production of concrete, by-products from other industries are used. Slag sand and fly ash come from the iron and steel industry and coal-fired power plants. These substances improve its performance and reduce the use of burnt Portland cement clinker. The total energy requirement is significantly reduced.

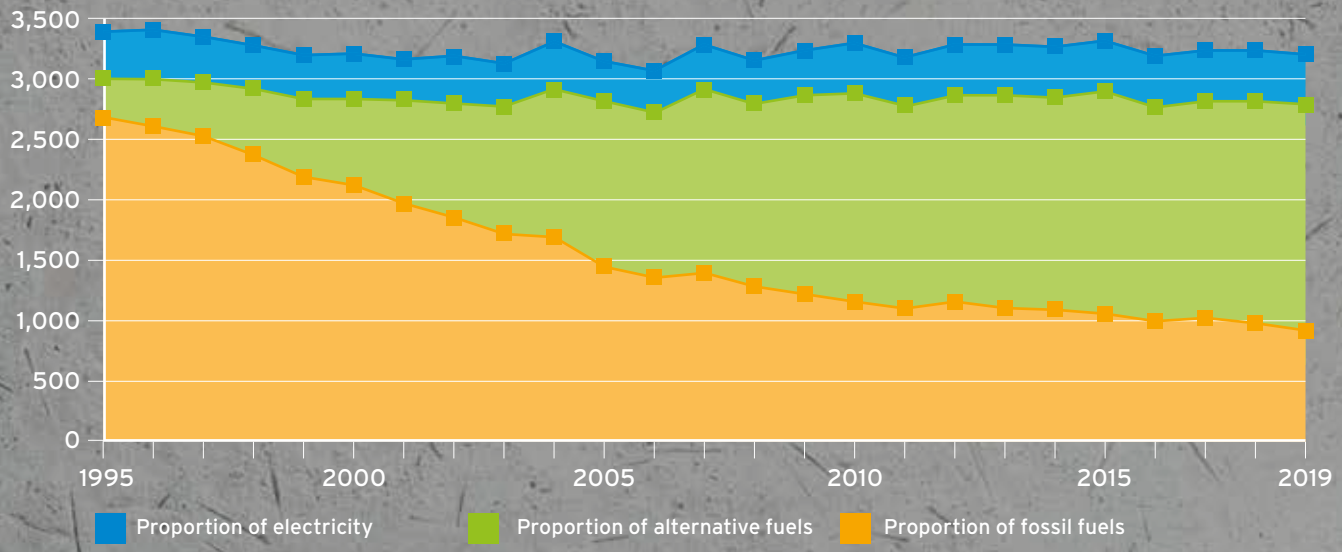


SUSTAINABLE AND ECOLOGICAL...

TODAY, CEMENT IS PRODUCED IN A SUSTAINABLE AND RESOURCE-FRIENDLY MANNER.

Primary energy sources (oil, coal, etc.) have increasingly been replaced by secondary fuels in recent years. This trend continues today.

Specific energy input in kJ/kg cement



Source: Association of German Cement Works, Cement Industry at a Glance 2020 brochure

Secondary materials in cement conserve natural resources.

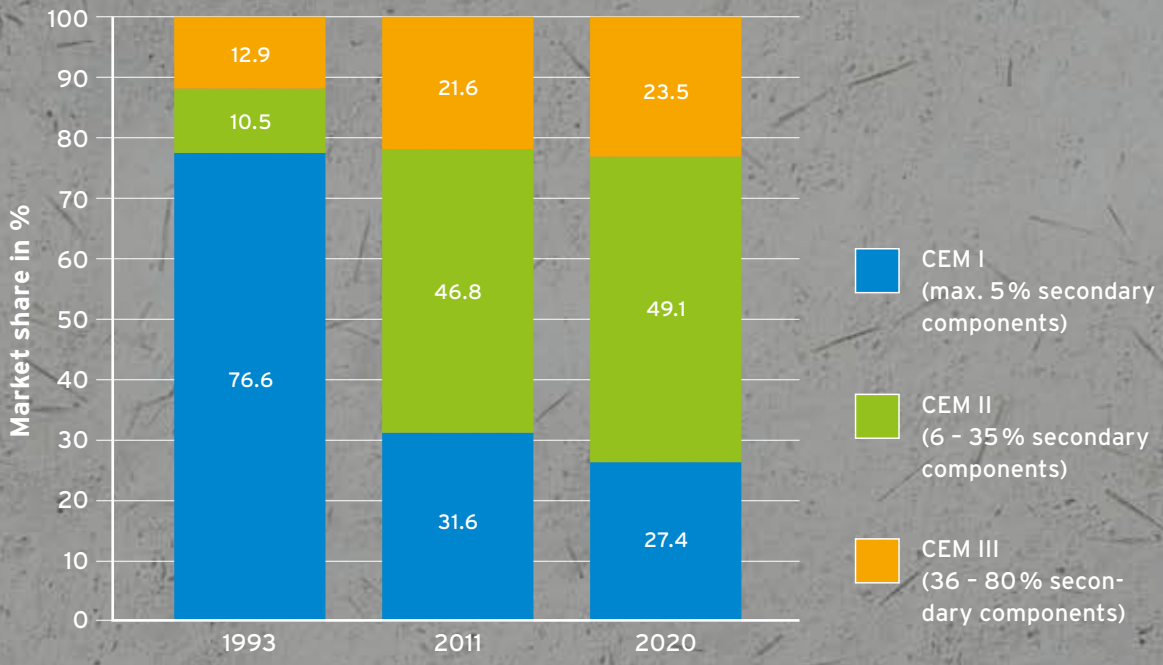
The following secondary materials are used in cement production:

- **FGD gypsum, as a solidification regulator for the cement from flue gas desulphurisation**
- Slag sand as a latent hydraulic binder from the steel industry
- Fly ash and trass flour as pozzolanic binders
- Rock flour as filler

The result: conservation of natural resources by approx. 10 million t/a with simultaneous relief and improvement of the concrete properties of the landfills by approx. 10 million t/a!

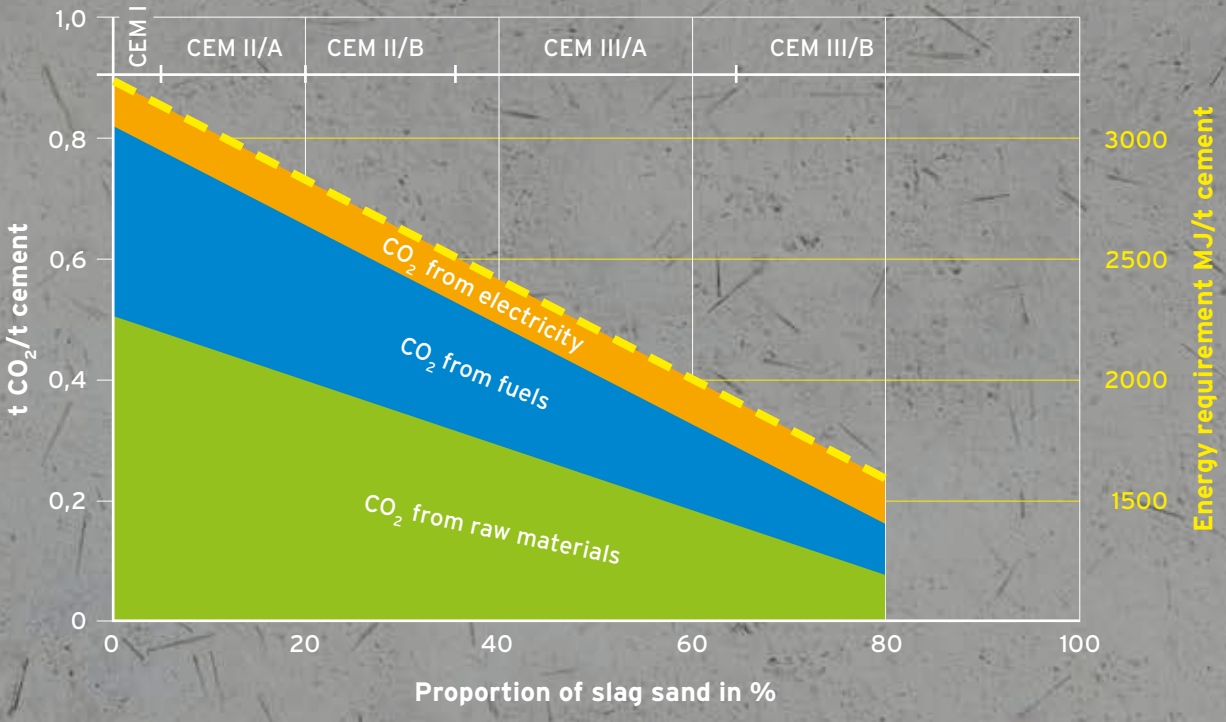
Conservation of resources through the use of by-products, e.g. from the steel industry.

The market share of cements with secondary materials is continuously increasing and CO_2 emissions are decreasing significantly as a result.



Source: Association of German Cement Works

CO_2 emissions and energy consumption in cement production



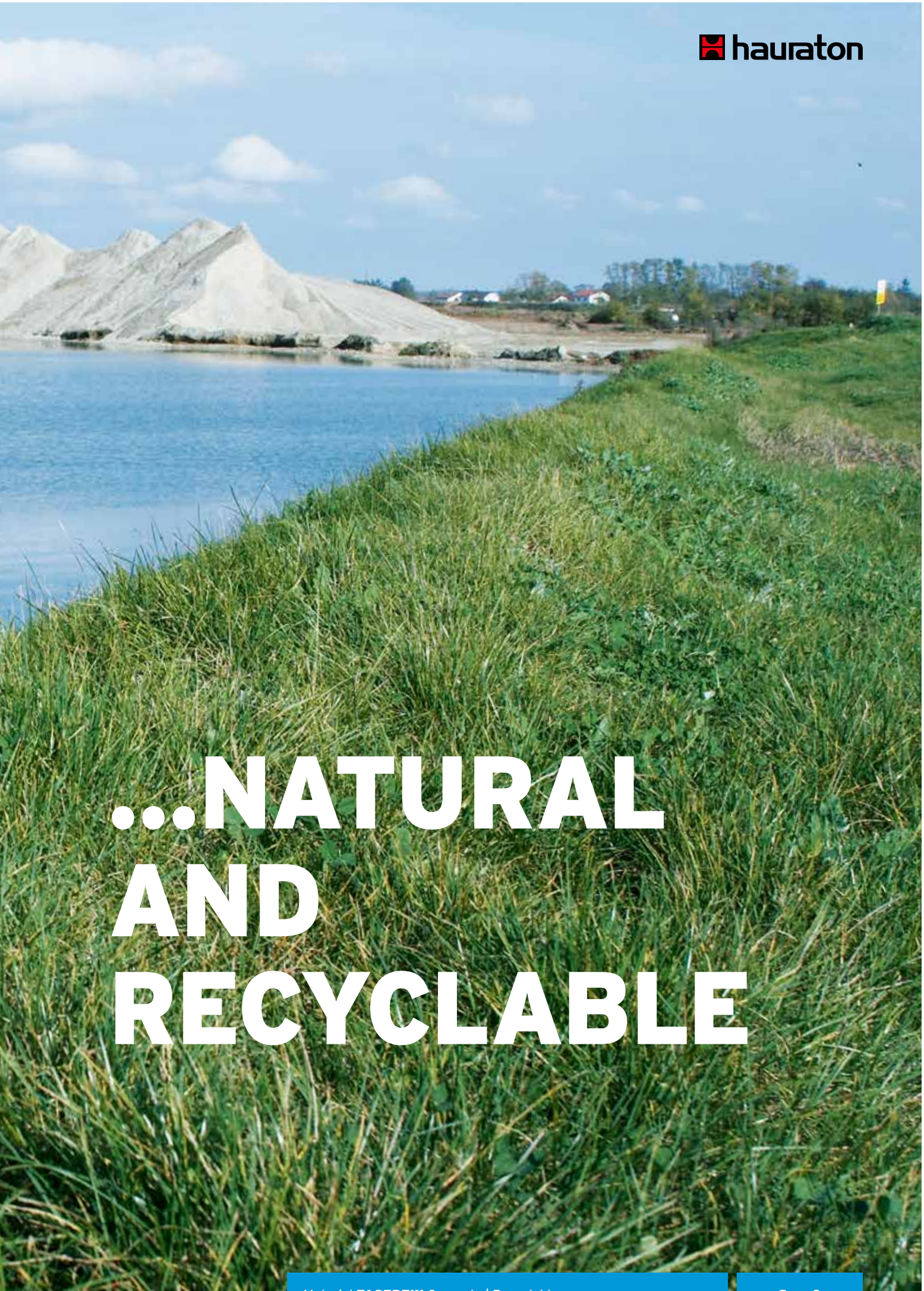
Source: Association of German Cement Works

CONCRETE IS FULLY RECYCLABLE.

Concrete demolition waste is processed by crushing and sifting it. Concrete chippings and crushed concrete sand are produced. The aggregates can be used, among other things, bound as aggregate for concrete, as a secondary raw material in cement and unbound in road construction or as a binder in oil spills.

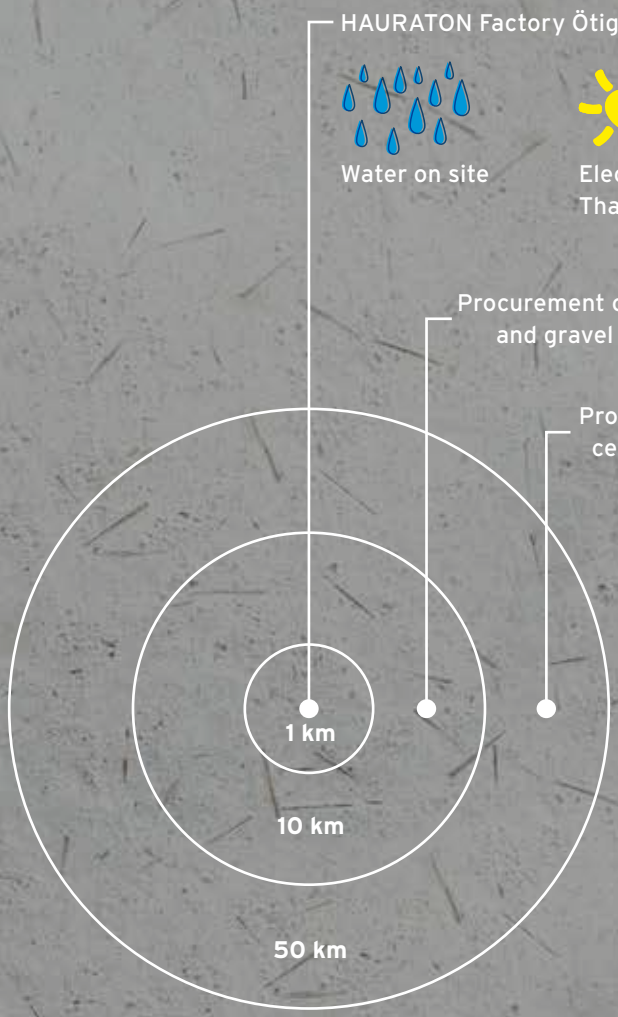
CONCRETE IS NATURAL.

What is needed to produce concrete is supplied by nature. The main ingredients are sand, gravel, water and cement. Cement consists mainly of limestone or chalk and clay and, together with water, forms the cement paste that binds the aggregate together and creates an extremely hard and robust composite material. At HAURATON, these raw materials are sourced from local producers using short transport routes.


hauraton
...NATURAL
AND
RECYCLABLE

CONCRETE IS SUSTAINABLE AND CAN BE RECYCLED.

The raw materials for FASERFIX concrete are procured from sustainable producers using short transport routes.



Concrete is a fully recyclable material.

- Concrete demolition is crushed and sifted.
- The aggregates are reused in the construction industry.
- In 2018, **93.9%** of the construction waste generated (of which **77.9%** was recycled) and more than **97.5%** of road demolition waste (of which **93.2%** was recycled) were recycled! *
- Pure mineral concrete mix.

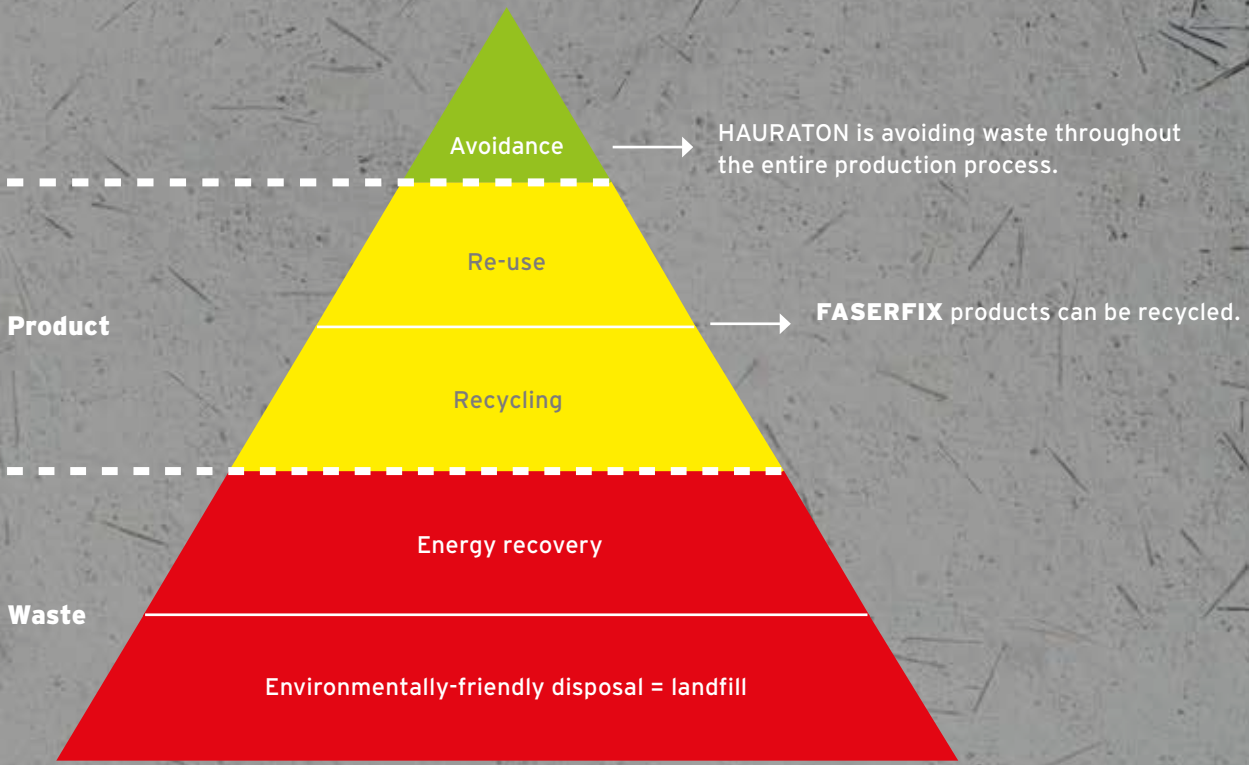
* **Source:** 12th Monitoring Report 2018 -Kreislaufwirtschaft Bau

Concrete recycling, re-use e.g. in road construction.

FASERFIX is a recyclable raw material according to the European Waste Hierarchy.

The Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste establishes the legal framework for the management of waste in the European Community. It contains important concepts such as waste, recovery and disposal, and contains important principles such as an obligation to manage waste in a way that does not harm the environment or human health.

The top priority is to avoid waste. If this is not possible, materials should be recycled. This is possible with **FASERFIX** concrete.



CONCRETE IS STRONG

CONCRETE KEEPS ITS SHAPE.

Once concrete has been cast into a shape, it will retain this shape permanently. It will not shrink, remains reliably stable and can withstand heavy loads.

CONCRETE IS A DURABLE MATERIAL.

Concrete is particularly durable and robust; concrete buildings hundreds of years old are still in use today. Durable lime mortar was used for building as long as 14,000 years ago.

Burnt lime was already used in the construction of the pyramids in Egypt. Later, the Romans developed the opus caementitium, from which the word cement is derived. Among other things, it was used to make the aqueducts and the dome of the Pantheon in Rome which spans 43 metres unsupported and is still well preserved today.

The Pantheon in Rome, built in 125 A.D.

FASERFIX CONCRETE PARTICULARLY STRONG DUE TO FIBRE REINFORCEMENT.

As early as the Middle Ages, clay was mixed with plant fibres and used for building houses. The great stability of fibre-reinforced concrete is based on this principle. As with trees, plants or bones, the fibres form an interwoven network that gives the concrete the highest degree of stability.

Clay wall reinforced with plant fibres.

Wood fibre boards get their high stability from a densely woven fibre network.

The special properties of **FASERFIX** concrete:

- Natural fibres from basalt
- Increased cohesion and stability
- Increased impact and shock resistance
- Better wear resistance

Macro view of **FASERFIX** concrete.
The fibres that give the material its high strength are clearly visible.

Cement

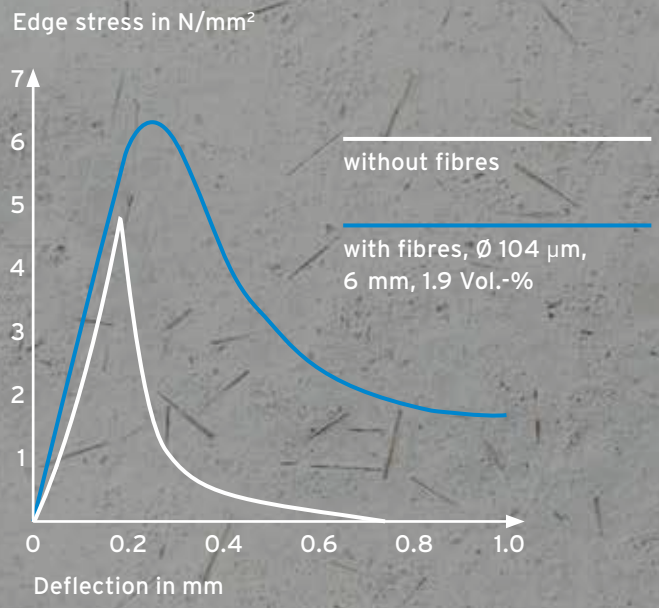
Basalt fibres

FASERFIX concrete – an ideal material for drainage channels in the heavy-duty sector.

So strong is **FASERFIX** concrete:

FASERFIX concrete achieves compressive strength class C 50/60 and far exceeds the requirements of EN 1433 (C 35/45).

Through the use of fibres, concrete achieves a significantly higher bending tensile strength than concrete without fibres.



Source:
Institute for Materials in Construction, University of the Federal Armed Forces Munich, brochure Special Concretes Fibre Concrete, spring trimester 2010. The load deflection of concrete beams without fibres was tested in comparison to concrete beams with DOLANIT fibres.

Sand

THE MATERIAL BASALT

How is basalt created?

Basalt is a volcanic rock. It is formed from glowing hot magma. Around 10,000 years ago, magma rose to the earth's surface during a volcanic eruption. It came from at least 40 kilometres below the surface and had a temperature of up to 1200 degrees. As it cooled, the magma solidified into basalt rock. This has been happening for many geological eras - and is still happening today.

BASALT – FROM VOLCANIC ROCK TO **FASERFIX** CONCRETE

Where is basalt found?

Basalt is found all around the world. Wherever there are active or extinct volcanoes, as in Iceland. Basalt even exists on Mercury, Venus and Mars, on the moon and on meteorites. But there is also a lot of basalt in Germany. It is mined, for example, in the Eifel and in the Rhön. Basalt occurs frequently and is a purely natural product.

Basalt is formed a thousand times more each year than we can use it. The raw material is particularly sustainable when mining and processing are close together and long transports are not necessary.

Use of basalt

Roads, pathways, floors, solid structures, facades, stairways, rail beds, space travel ...

Properties of basalt

Since basalt is formed on the earth's surface by rapid cooling and without pressure, it has a fine-grained and stable structure without crystals. This is what makes it so hard and resistant. Basalt fibres are incredibly flexible and resilient. It copes well with tension and pressure, with cold and heat, moisture and chemicals. But how does rock become fibre?

Basalt fibre production

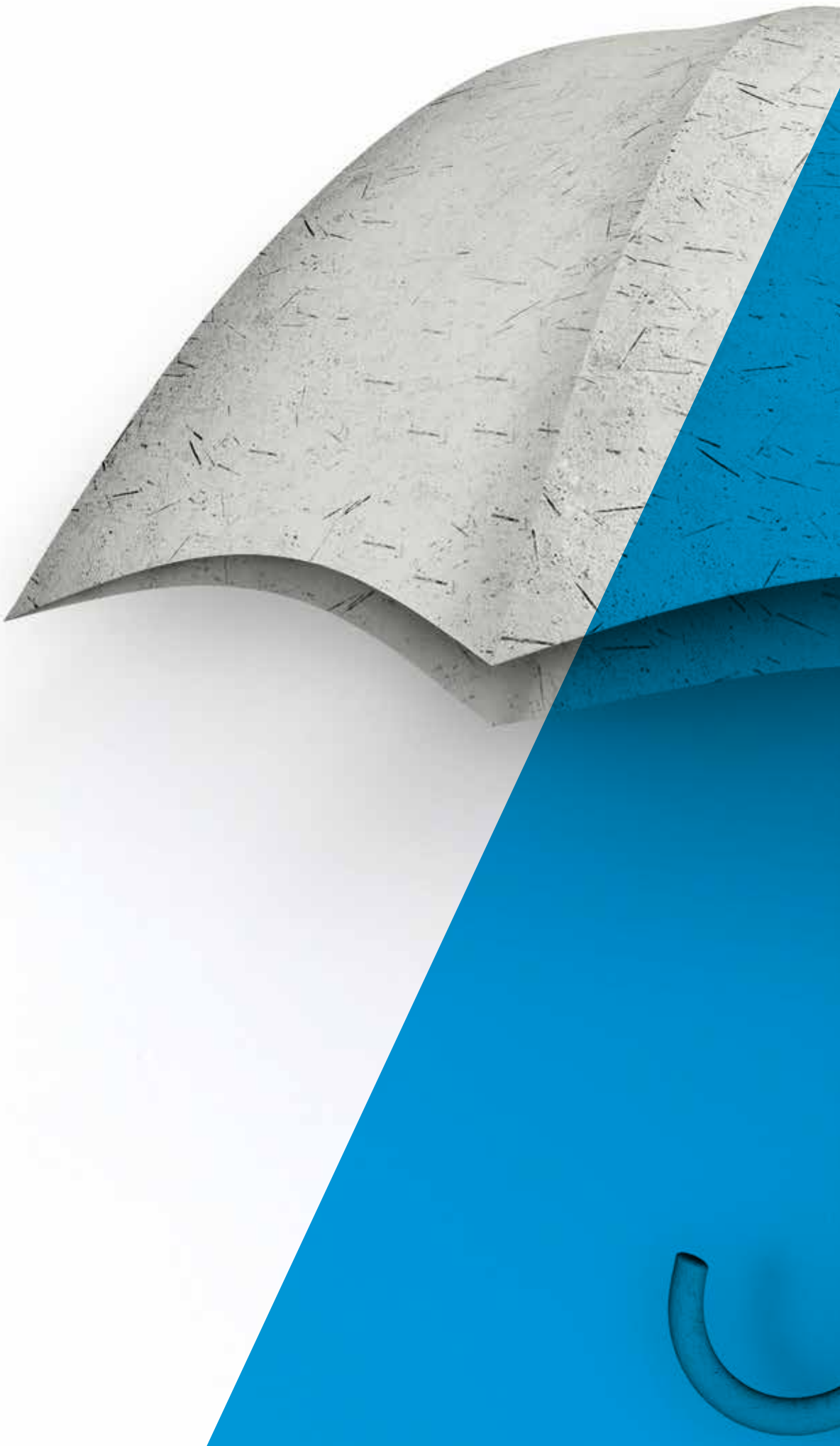
The production of basalt fibres begins with the crushing and cleaning of the raw basalt. Then it goes into the melting furnace. The glowing melt is pressed through nozzles and drawn into thin threads with a diameter of 10 to 20 micrometres. This creates fibres that can be bundled and spun either into a long yarn or into short fibres.

BASALT FIBRES IN **FASERFIX** CONCRETE

It is precisely these basalt fibres that we find today in **FASERFIX** drainage channels. After decades of proven use in in products and materials for space travel, they now also reinforce the **FASERFIX** concrete at HAURATON.

Why is that? Because our **FASERFIX** drainage channels have to withstand heavy traffic, the effects of weather and chemicals.

FASERFIX concrete is a fibre-reinforced material that was previously reinforced by plastic fibres. With basalt fibres, production and recycling are much more environmentally and climate friendly. At the same time, the basalt fibre makes the **FASERFIX** concrete even more durable and safe.



CONCRETE IS A WATERTIGHT AND RUST-FREE MATERIAL.

WATERTIGHT AND DOES NOT RUST

With suitable formulations, concrete can also be used when aggressive substances are involved. It is resistant to petrol, diesel and leaking oil and is therefore well suited for use in petrol stations or logistics areas. Concrete channels are continually durable and reliable over time, even when permanently exposed to corrosive elements such as saline environments in coastal locations.

For many decades, concrete products have been used for the drainage or storage of water, for example in the form of concrete pipes, cisterns or drainage channels. Concrete is the ideal material here: watertight, durable, strong and reliable.

FASERFIX fulfils all requirements of the following exposure classes of DIN EN 206-1:

Type of attack	Class	Environmental condition	Application example
Concrete attack by frost with and without de-icing agent	XF4	High water saturation with de-icing agent or seawater	Road surfaces treated with de-icing agents, components in the splash water area of de-icing agent-treated traffic surfaces, scraper runways of sewage treatment plants, seawater components in the water exchange zone
Concrete attack due to chemical attack of the environment	XA3	Chemically aggressive environment	Industrial waste water plants with very chemically aggressive waste water
Concrete corrosion due to alkali silica reaction	WA	Concrete that is frequently wet or wet for a long time during use and is also exposed to frequent or long-term alkali exposure from the outside (wet + alkali exposure from the outside)	Structural elements exposed to seawater, structural elements exposed to de-icing salt without additional high dynamic stress (e.g. splash water areas, driving and parking areas in multi-storey car parks), structural elements of industrial buildings and agricultural structures (e.g. slurry tanks) exposed to alkali salts
Concrete attack due to wear stress	XM3	Extreme wear and tear	Coverings of surfaces that are frequently used by tracked vehicles (barracks yard), hydraulic structures in watercourses that are exposed to bedloads (headwaters of rivers, stilling basins)

For use in corrosive seaside environments.

Concrete: perfect for contact with water,
e.g. drinking water reservoirs.

Concrete is a watertight material and is therefore used for the main surfaces in our current transport infrastructure (roads, airports, WHG surfaces, LAU facilities...).

CONRETE IS EMISSION-FREE AND FIREPROOF.

EMISSION-FREE

Products made of concrete are inert, which means that they do not give off any harmful chemical substances. They are therefore particularly suitable in areas of surface drainage where rainwater is returned to the natural cycle.

FIREPROOF

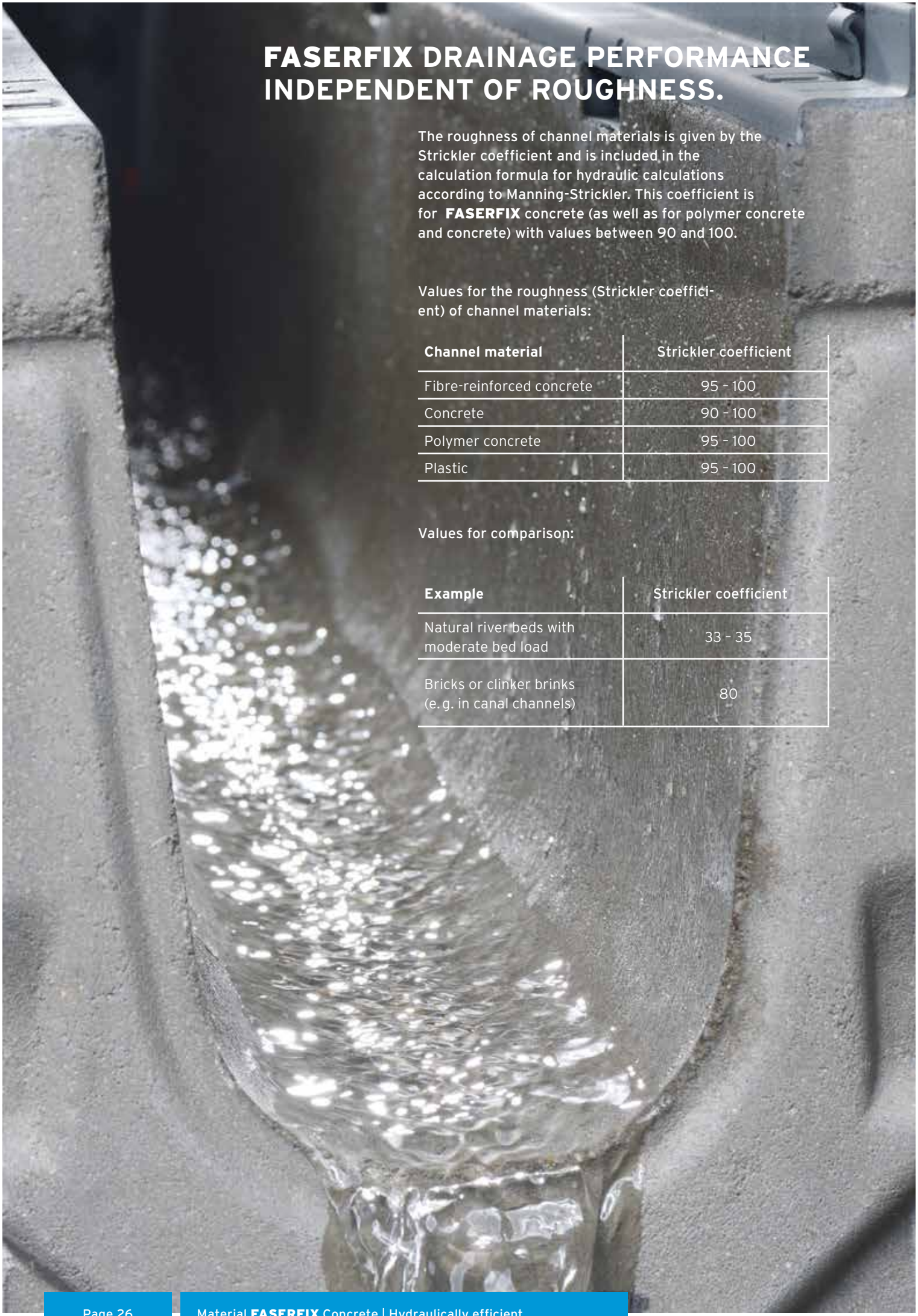
Concrete offers effective fire protection. It cannot burn and does not melt even when exposed to high temperatures. In the event of a fire, concrete components therefore offer maximum safety and can contain or prevent the spread of fires.

Fire protection classes according to DIN 4102:

Concrete = A1 non-flammable

Due to their classification in fire protection class A1, **FASERFIX** channels are particularly suitable for areas of application where fire protection plays a very important role, e.g. in tunnel construction.

The emission-free properties of concrete make the material particularly suitable for areas where rainwater is returned to the natural cycle.



FASERFIX DRAINAGE PERFORMANCE INDEPENDENT OF ROUGHNESS.

The roughness of channel materials is given by the Strickler coefficient and is included in the calculation formula for hydraulic calculations according to Manning-Strickler. This coefficient is for **FASERFIX** concrete (as well as for polymer concrete and concrete) with values between 90 and 100.

Values for the roughness (Strickler coefficient) of channel materials:

Channel material	Strickler coefficient
Fibre-reinforced concrete	95 - 100
Concrete	90 - 100
Polymer concrete	95 - 100
Plastic	95 - 100

Values for comparison:

Example	Strickler coefficient
Natural river beds with moderate bed load	33 - 35
Bricks or clinker brinks (e.g. in canal channels)	80

FASERFIX CONCRETE HAS A POSITIVE ENERGY BALANCE.

Here is a comparison with other building products.

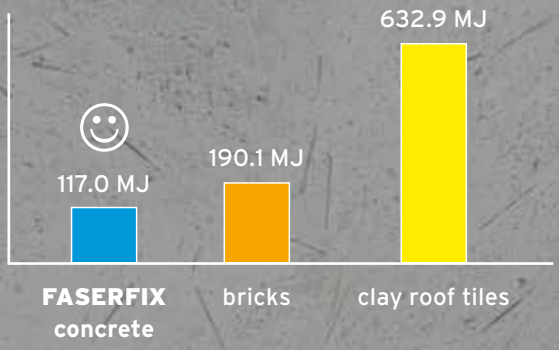
Energy demand and CO_2 emission for the production of:

FASERFIX concrete with 117 kg (corresponds to a FASERFIX KS 300)

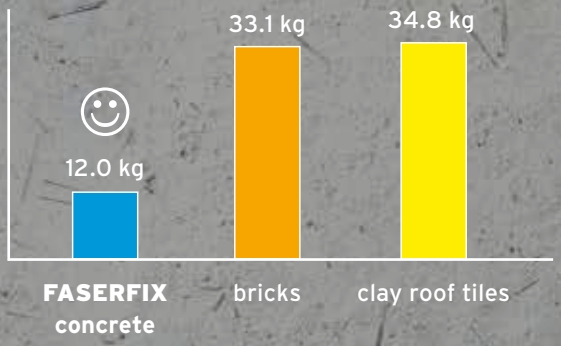
117 kg bricks

117 kg clay roof tiles

Energy requirement (Mega-Joule)



CO_2-emission (kg)



This corresponds to a quantity of:

The reduction is primarily due to the new recipe, in which less cement is used!

Sources:
- FASERFIX concrete: In-house calculations according to EN 15804
- Bricks: www.bau-umwelt.com
- Clay roof tiles: www.ibu-epd.com | https://epd-online.com

PRODUCTION IN THE **FASERFIX** FACTORY IN ÖTIGHEIM.

MADE IN GERMANY: FASERFIX channels are manufactured in certified processes under controlled conditions at the HAURATON factory in Ötigheim.

QUALITY: The factory environment offers consistent conditions (temperature, humidity, etc.) and ensures a consistently high quality of the products.

FASERFIX channels not only comply with EN 1433, but also the requirements of the much stricter German DIN 19580. CE marking, external monitoring and performance declaration in accordance with the EU Construction Products (BauPVO) guarantee the highest technical standard.

FASERFIX IN USE.

FASERFIX drainage channels are particularly durable and permanently stable. This is proven by these locations in which **FASERFIX** channels were installed more than 10 years ago. Under the highest loads in daily use, they still perform their function safely and reliably to this day.

FASERFIX SUPER
Reuchlin School, Bad-Liebenzell

1998

2020

FASERFIX SUPER
EXPO 2000, Hanover

1999

2020

FASERFIX BIG
Max Bahr, Hagen

2003

FASERFIX KS
Campona Shopping Centre, Budapest

2003

2020

2020

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