MATERIAL

FASERFIX® CONCRETE

NATURALLY SUSTAINABLE.
TOUGH IN SERVICE.

hauraton

AT A GLANCE

FASERFIX®
STRONG MATERIAL FOR RELIABLE AND LONG-LASTING DRAINAGE PRODUCTS

THE FASERFIX® PRODUCT RANGE

For a long time drainage channels have been manufactured from conventional concrete. Since the 1970s, HAURATON has been using fibre-reinforced concrete for channel production. This brochure highlights why this material is perfect for manufacturing drainage products.

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.

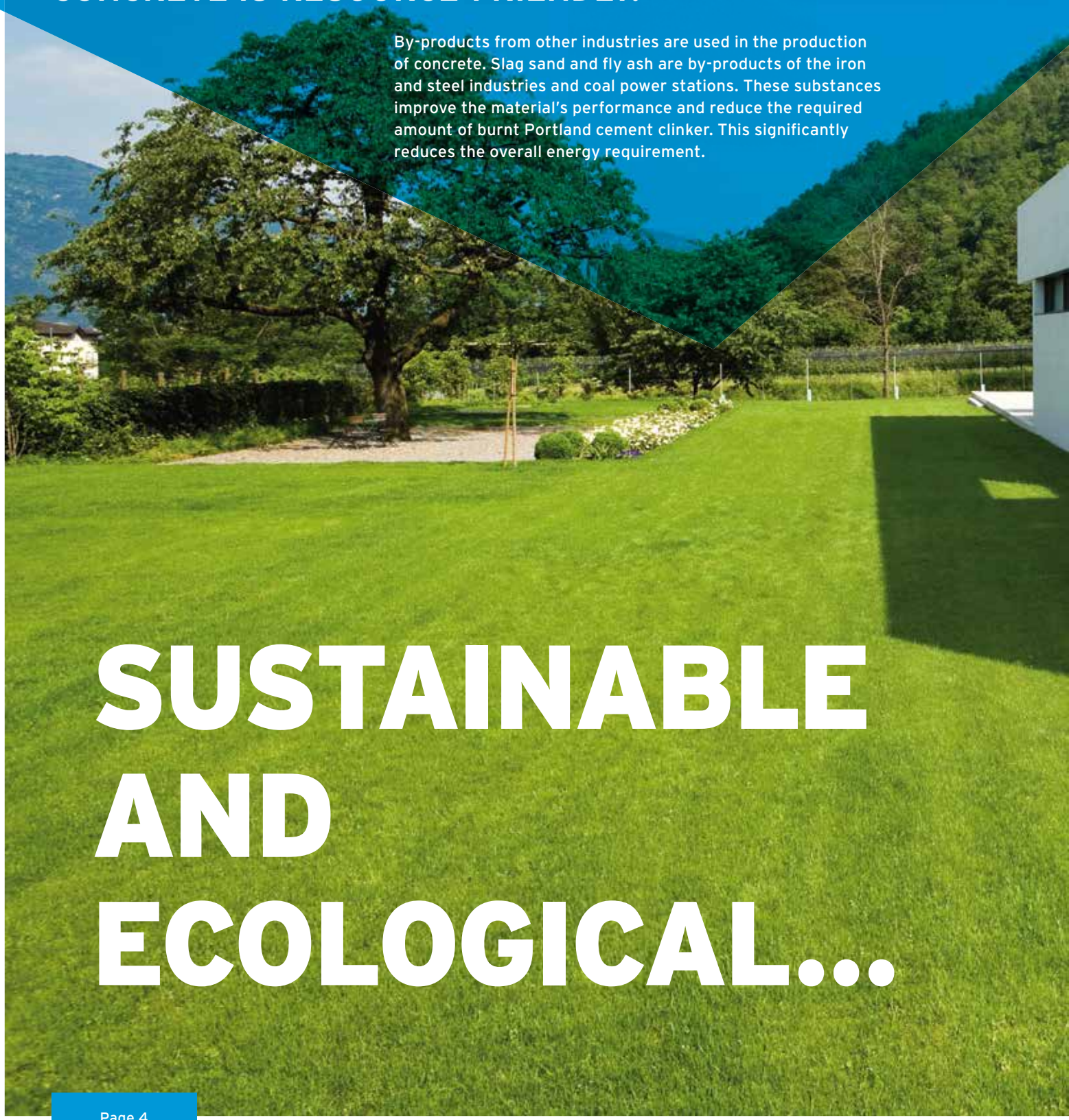
FASERFIX®KS
Robust, efficient and aesthetic drainage channels for commercial and public areas.

CONCRETE IS A SUSTAINABLE MATERIAL

Cement is an important component in concrete and is produced in compliance with strict statutory regulations specified in the Federal Emissions Protection Ordinance (BImSchV). HAURATON purchases its cement exclusively from factories which, in addition, apply voluntary environmental and energy management systems in accordance with ISO 14001 and 50001 and thereby ensure the sustainable and energy-efficient production of the material. The aggregates used to make concrete are also sustainable and ecological.

CONCRETE IS RESOURCE-FRIENDLY.

By-products from other industries are used in the production of concrete. Slag sand and fly ash are by-products of the iron and steel industries and coal power stations. These substances improve the material's performance and reduce the required amount of burnt Portland cement clinker. This significantly reduces the overall energy requirement.

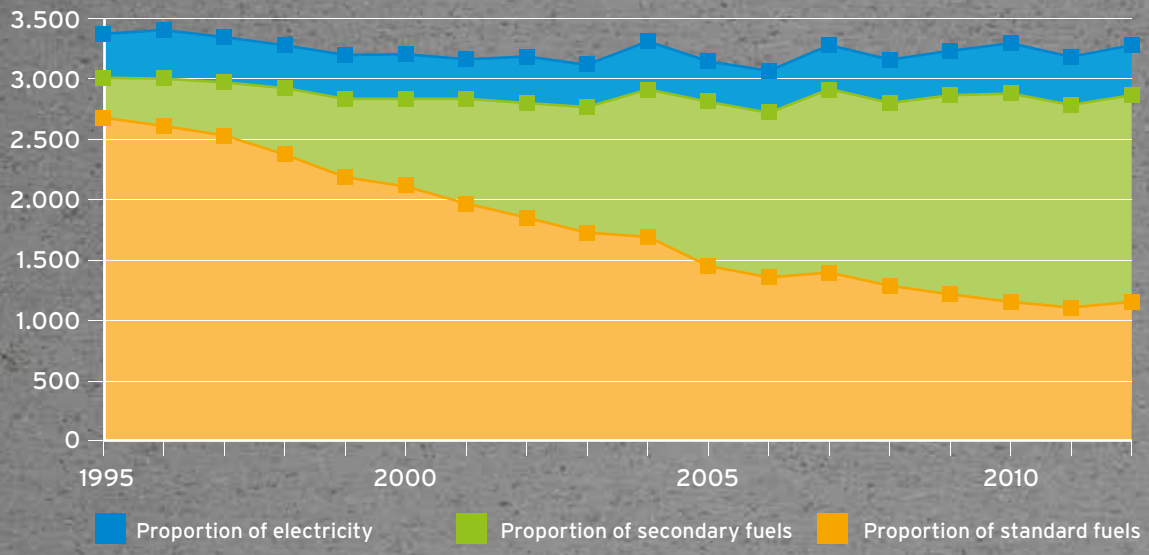


SUSTAINABLE AND ECOLOGICAL...

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

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 have increasingly been replaced by secondary fuels.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

Specific use of energy in kJ/kg of cement



Source: Association of German Cement Works
Brochure: Overview of cement industry, 2012

Secondary materials in cement preserve natural resources.

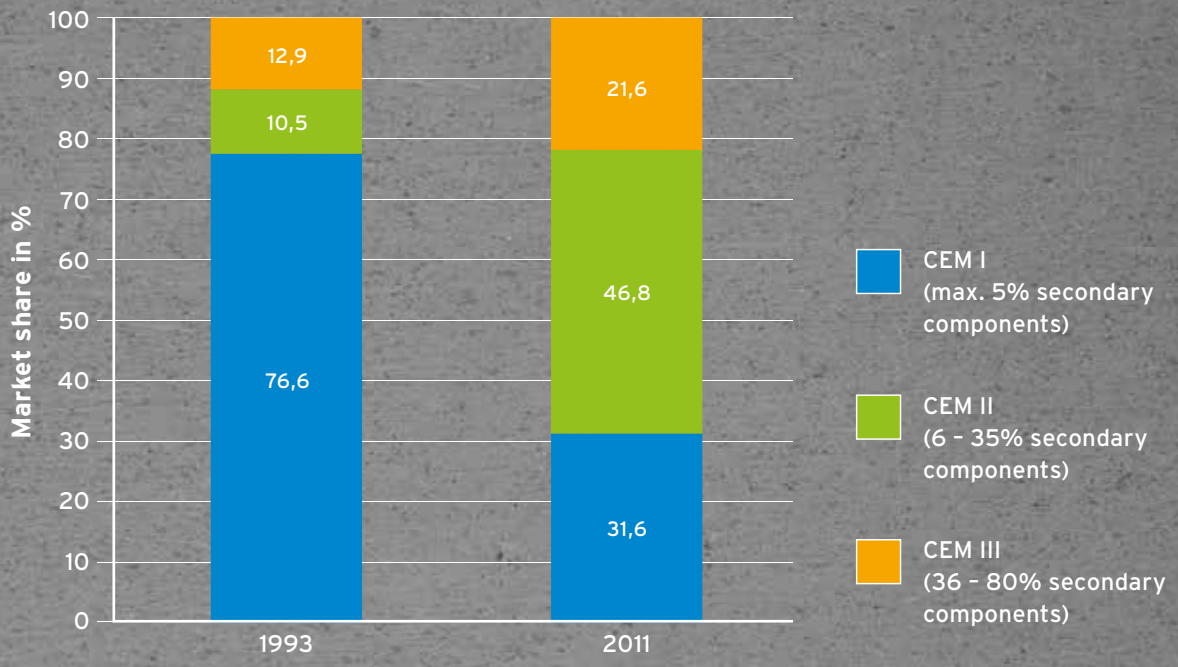
The following secondary materials are used in cement production:

- **REA gypsum as a curing controller for cement from flue gas de-sulfurization**
- **Slag sand as a latent hydraulic binder from the steel industry.**
- **Fly ash as a pozzolanic binder is a by-product of coal incineration.**
- **Microsilica is produced by production of silicium metals.**

The consequence: preserving natural resources by using approx. 10 million tonnes per annum (t/a) less, while at the same time also reducing the quantity of landfill material by approx. 10 million tonnes per annum (t/a).

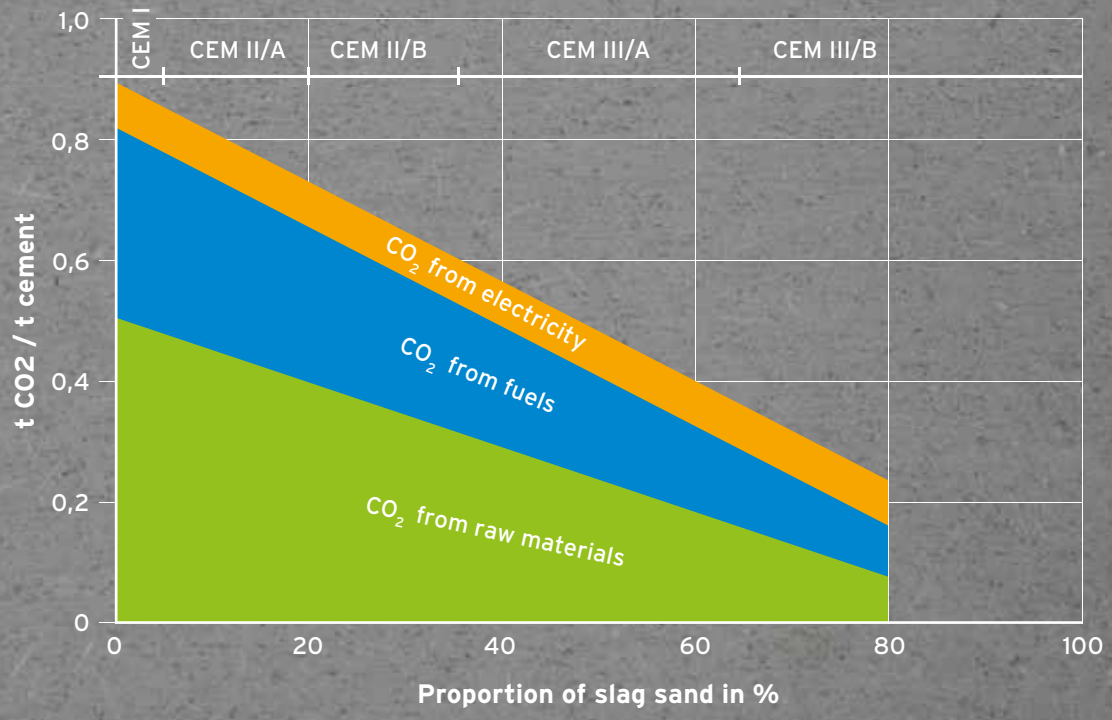
Sustainability through the use of by-products, for example from the steel industry.

The market share of cements with secondary materials is continually rising; as a result, CO2 emissions are significantly decreasing.



Source: Association of German Cement Works

CO2 emissions from cement production



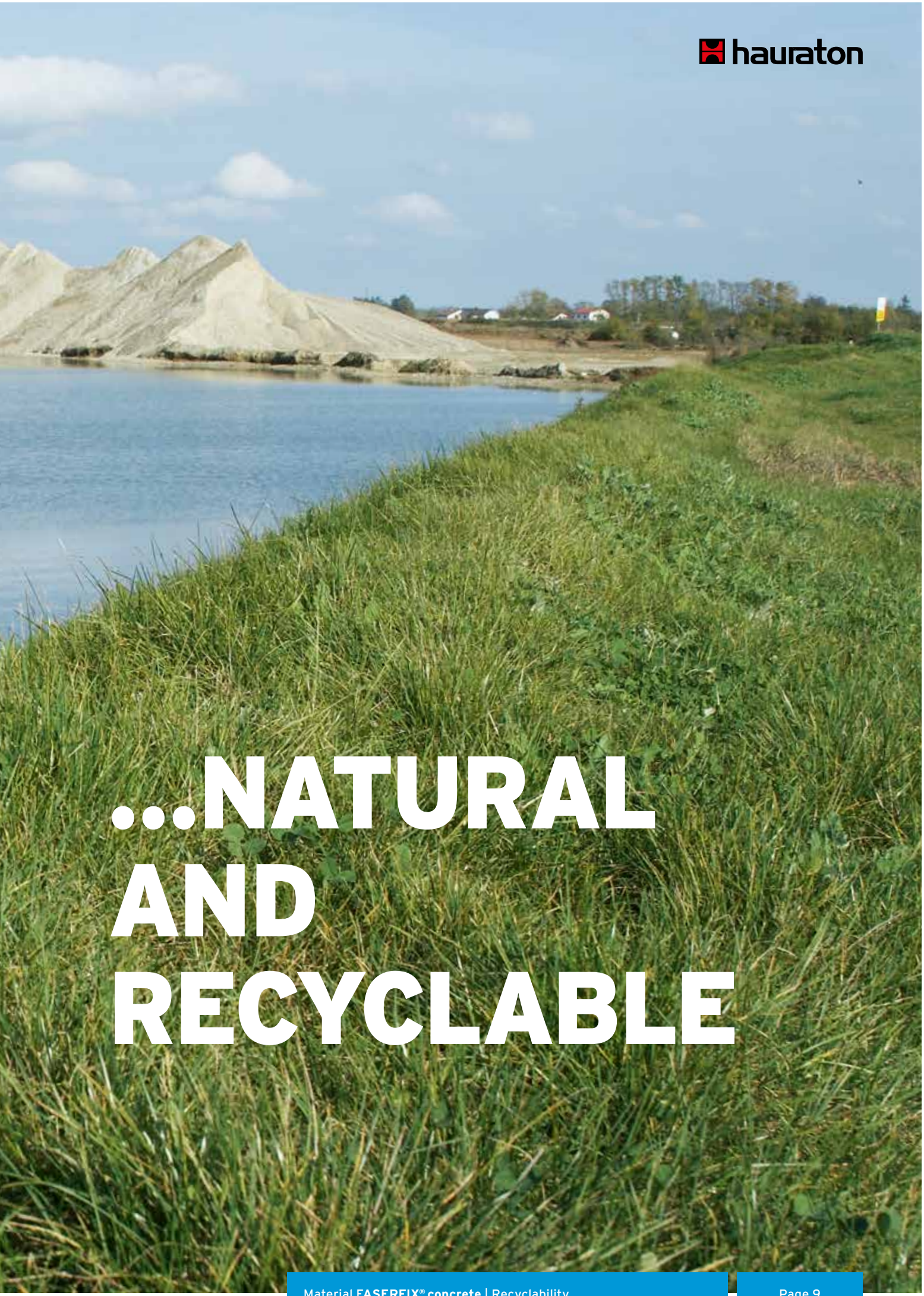
Source: Association of German Cement Works

CONCRETE IS FULLY RECYCLABLE.

Demolition concrete is prepared by crushing and sifting. The resulting materials are concrete grit and crushed sand. These materials can be used as an aggregate in concrete, as a secondary raw material in cement, used loosely in road construction, or as a binder to absorb oil spillage following an accident.

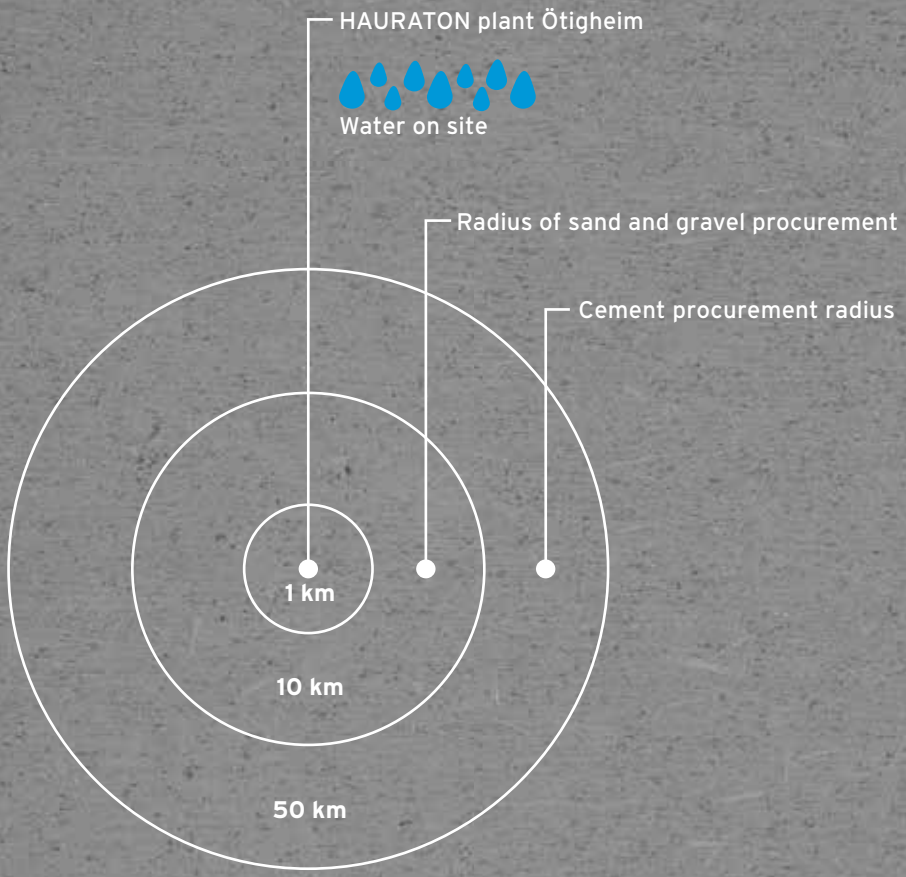
CONCRETE IS NATURAL.

Everything needed for the manufacture of concrete is supplied by nature. The main components are sand, gravel, water and cement. Cement consists mainly of limestone or chalk and clay, and together with water forms the cement paste which binds the stone aggregate and turns the mixture into an extremely hard and robust compound material. HAURATON procures these raw materials from local suppliers, keeping transport distances to a minimum.


hauraton
...NATURAL
AND
RECYCLABLE

CONCRETE IS SUSTAINABLE AND CAN BE RECYCLED.

Raw materials for FASERFIX concrete are procured from suppliers of sustainable materials using short transport routes.



Concrete is a fully recyclable material.

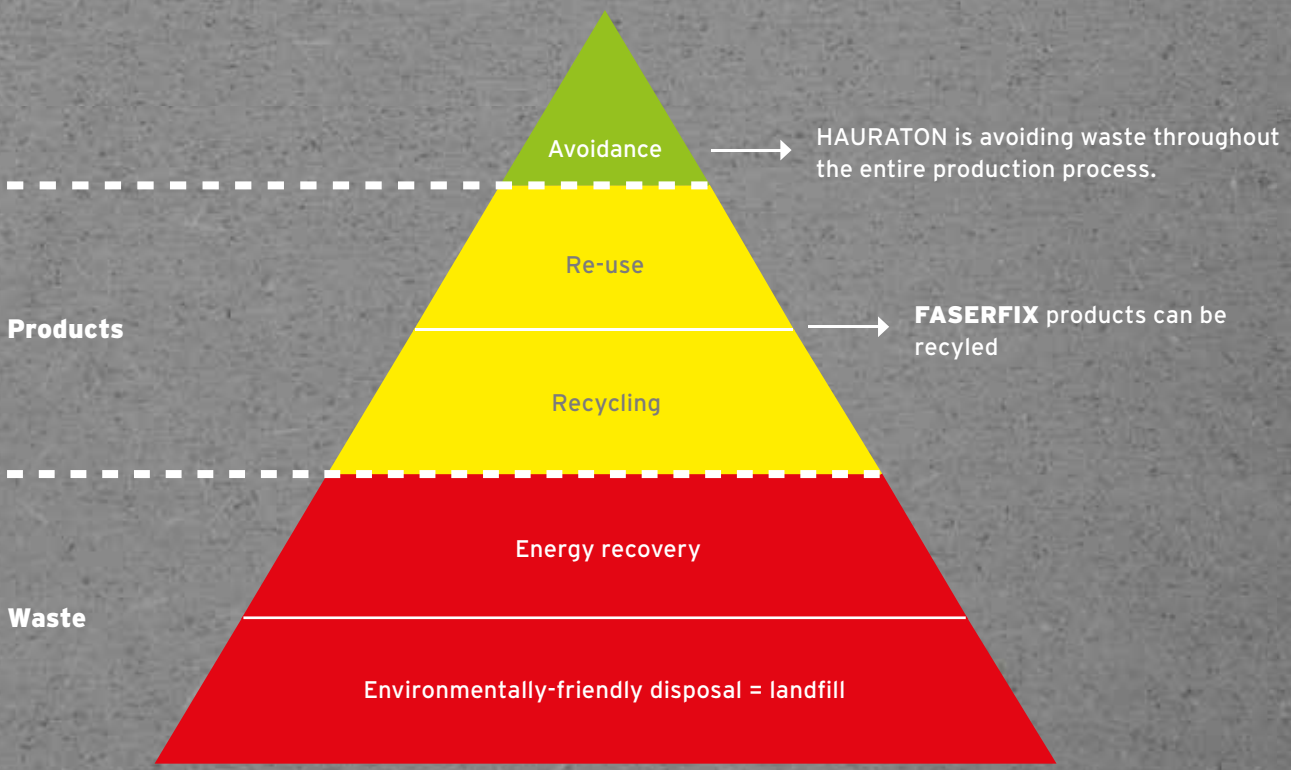
- Demolition concrete is crushed and sifted.
- The recycled products are used in the construction industry.
- In 2010, more than 78.4% of construction rubble and more than 95% of road demolition material was recycled!

Concrete being recycled for use in road construction etc.

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

Directive 2006/12/EC (dated 5 April 2006) issued by the European Parliament and Council regarding waste materials defines the legal framework for handling waste in the European Community. It contains definitions of important terms such as "waste", "recycling" and "disposal" and includes important principles, for example the duty to handle waste materials in a manner than does not impact negatively on the environment and human health.

A top priority is to avoid waste. Where 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 maintain this shape permanently. It will not shrink, remains reliably stable, and can withstand heavy loads.

CONCRETE IS A DURABLE MATERIAL.

Concrete is hard-wearing 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 had already been used for the construction of pyramids in Egypt. Romans developed the opus caementitium, from which the word “cement” originates. Cement was used to build aqueducts and the dome of the Pantheon in Rome, which has a clear span of 43 metres and is well-preserved to this day.

The Pantheon in Rome, built in 125 AD

FASERFIX® CONCRETE
PARTICULARLY STRONG DUE TO FIBRE REINFORCMENT

As far back as the Middle Ages clay was mixed with plant fibres and used in building construction. Fibre-reinforced concrete uses the same principle to achieve its great strength. As with trees, plants and even bones, fibres form an interlinked network which gives enormous strength to FASERFIX concrete.

Clay wall reinforced with plant fibres.

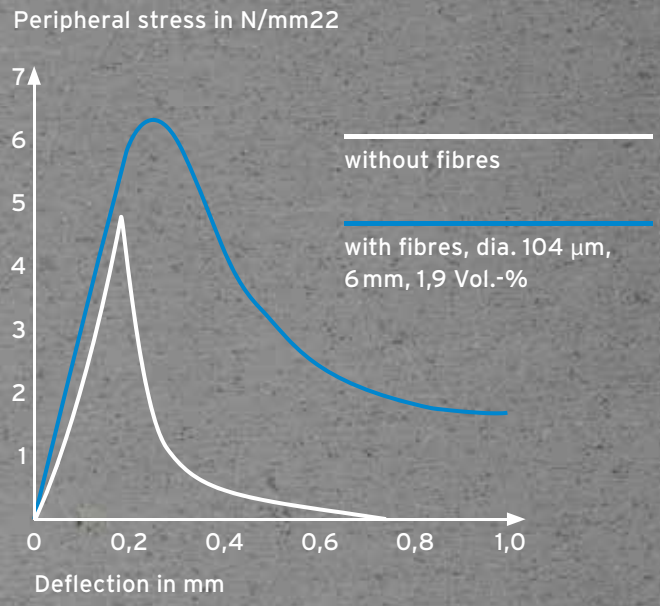
Woodchip board achieves its great strength with the help of a closely interlinked fibre network.

The special properties of FASERFIX® concrete:

- micro-reinforcement consisting of twisted polyolefin fibres
- increased cohesion and strength
- increased impact resistance
- improved wear resistance

Enlarged view of FASERFIX concrete. The photograph clearly shows the fibres which give the material its great strength.

With the addition of fibres, concrete achieves significantly higher tensile strength compared to concrete without fibres.



Source:
Institute for Construction Materials, University of the Federal Forces, Munich, brochure "Special types of concrete – fibre concrete", spring term 2010. The test was carried out to check the deflection of concrete beams without fibres compared to concrete beams with DOLANIT fibres

CONCRETE IS A WATERTIGHT AND RUST-FREE MATERIAL.

WATERTIGHT AND DOES NOT RUST

With suitable mixes, concrete can also be used in applications where aggressive substances are involved. It has high resistance to petrol, diesel and traces of oil and is therefore very suitable for installation in fuel filling stations and logistics facilities. Concrete channels are continually durable and reliable over time, even when permanently exposed to corrosive elements, such as saline environments in coastal locations.

FASERFIX® concrete can be used in diverse and extreme environments.

For decades concrete products have been used for storage, transfer and draining of water; for example in concrete pipes, chambers and channels. Concrete is the ideal material for such systems: it is watertight, durable, strong and reliable.

Concrete is used in dam construction. Structures are required to withstand immense forces and need to be fail-safe and totaly reliable.

Concrete is a strong, durable, watertight and cost-effective material. This explains why concrete is used extensively in the construction of modern infrastructure (roads, airports, ports, water industry projects etc).

Concrete is an ideal construction material for water-industry projects (eg. facilities managing potable water)

Ideal for corrosive coastal environments.

Used in areas subject to immense wear and tear.

Commonly used on roads and highways; with high resistance to frost and salts apparent in colder climates.

CONCRETE IS EMISSION-FREE AND FIRE-PROOF.

EMISSION-FREE

Products made of concrete are inert, i.e. they do not release any harmful chemical substances. Concrete products are therefore suitable for surface water drainage of areas where rainwater is returned to its natural cycle.

FIRE-PROOF

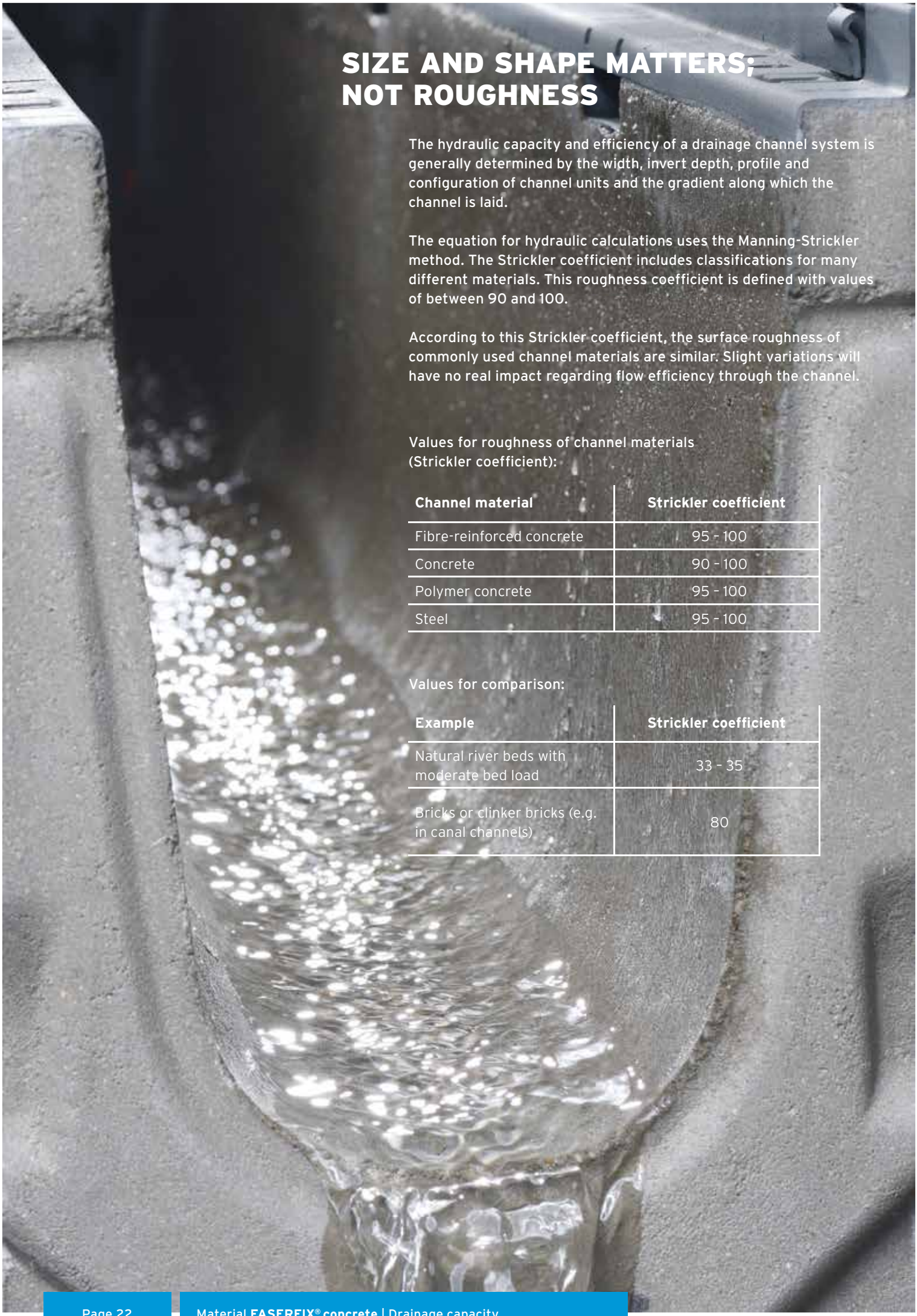
Concrete offers effective fire protection. Concrete is non-combustible and maintains structural integrity even if subject to high temperatures. Building components made from concrete offer higher fire resistance compared with alternative materials and can help control the spread of fire.

Fire protection classes to DIN 4102:

Concrete = A1 non-combustible

As concrete has an "A1 non-combustible" fire protection classification (DIN 4102), FASERFIX channels are suitable for areas where fire safety and protection is important, for example in tunnel construction.

As concrete does not release any harmful substances the material is particularly suitable for areas in which rainwater is returned to its natural cycle.



SIZE AND SHAPE MATTERS; NOT ROUGHNESS

The hydraulic capacity and efficiency of a drainage channel system is generally determined by the width, invert depth, profile and configuration of channel units and the gradient along which the channel is laid.

The equation for hydraulic calculations uses the Manning-Strickler method. The Strickler coefficient includes classifications for many different materials. This roughness coefficient is defined with values of between 90 and 100.

According to this Strickler coefficient, the surface roughness of commonly used channel materials are similar. Slight variations will have no real impact regarding flow efficiency through the channel.

Values for roughness of channel materials (Strickler coefficient):

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

Values for comparison:

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

FASERFIX® HAS A POSITIVE ENERGY BALANCE.

A comparison with other building products.

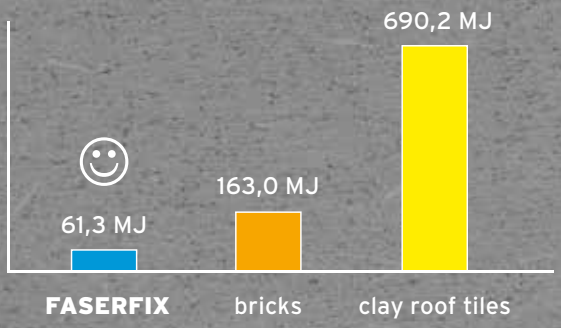
Energy requirement and emission of CO_2 for the production of:

1 m FASERFIX KS 300, **weight 117 kg:**
- cement content: approx. 18 kg

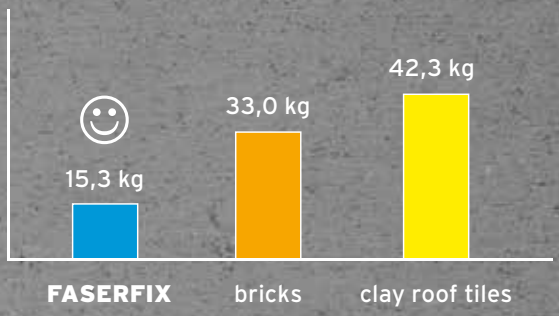
117 kg bricks*

117 kg clay roof tiles**

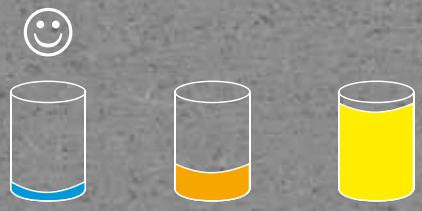
Energy requirement (Mega-Joule)



CO_2-emission (kg)



This corresponds to a quantity of:



Sources:
www.bau-umwelt.com
*Environmental Product Declaration exterior and interior wall tiles
**Environmental Product Declaration clay roof tiles

PRODUCTION AT THE FASERFIX® PLANT ÖTIGHEIM.

MADE IN GERMANY: **FASERFIX** channels are produced at the HAURATON plant in Ötigheim using certified processes under controlled conditions.

QUALITY: The plant provides carefully controlled conditions (temperature, humidity etc.), which achieves consistent and high product quality.

FASERFIX channels are certified to DIN EN 1433, and also in accordance with the more sringent German standard DIN V 19580. Products are CE Marked which represents full standards compliance and quality assurance.

Production in Ötigheim.

FASERFIX® IN SERVICE.

FASERFIX drainage channels are strong and durable. Evidence of this can be seen regarding the previewed projects, where FASERFIX channels have been installed for more than ten years. To this day, **FASERFIX** systems continue to provide safe and reliable drainage in extreme conditions.

FASERFIX®SUPER
Reuchlin School, Bad-Liebenzell

1998

FASERFIX®SUPER
EXPO 2000, Hanover

1999

2013

2013

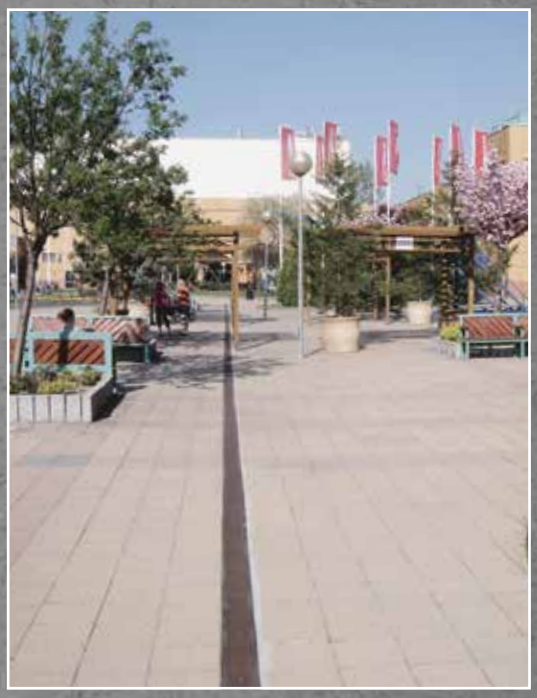
FASERFIX®BIG
Max Bahr, Hagen

2003

2013

FASERFIX®KS
Campona Shopping Centre, Budapest

2003



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