solidian

green building

sustainable structures with concrete

build solid.

Our earth is a unique ecosystem and a very complex habitat for us humans, the diverse plant and animal world. It offers us a retreat and a home on land, in the water or in the air. However, the progressive climate change due to CO_2 Emissions and the excessive overexploitation of almost all natural resources, force us to rethink - towards a more resource-saving, environmentally conscious way of life.

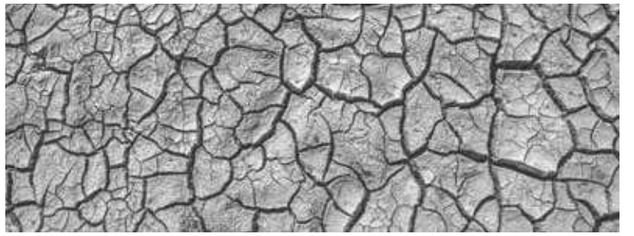
To stop climate change and to protect our planet, we all must change our behaviour.

READY
FOR THE
CHANGE?

The building sector is

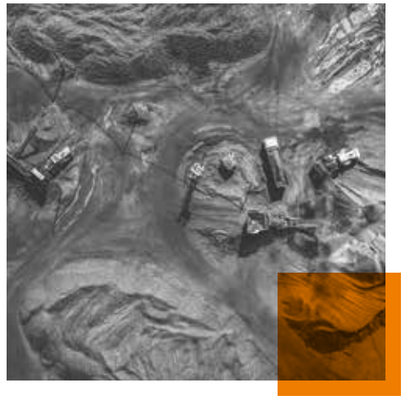
responsible for almost 40% of global CO_2 emissions and equivalent green house gases. A large part of this is due to the operation and use of buildings, but there are already many known solutions for optimising the energy efficiency of buildings. For example, by using more economical heating systems, better windows or additional insulation, they consume less energy and produce fewer CO_2 emissions.

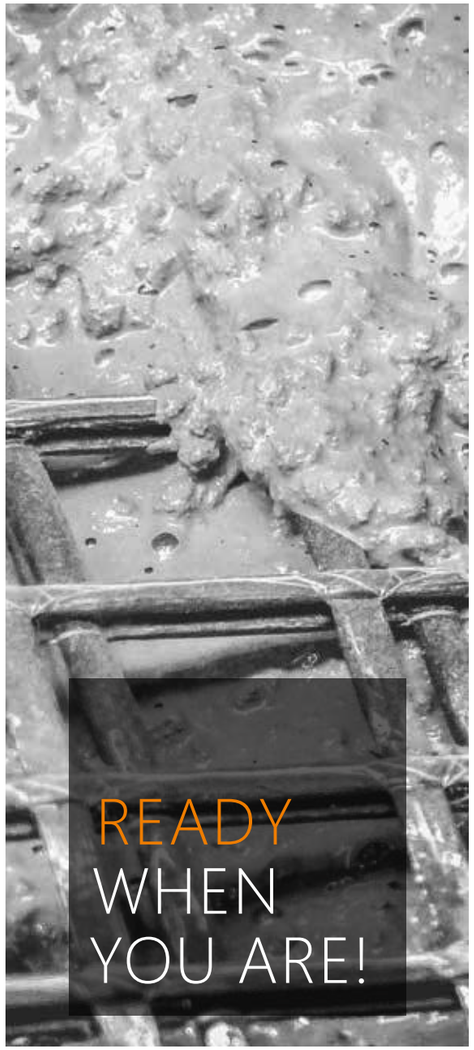
However, new construction accounts for 10% of global CO_2 emissions from the building sector. In addition, the production of cement for concrete construction accounts for 8% of global CO_2 emissions in the industrial sector. This corresponds to about half of the CO_2 emissions from transport.



If we want to stop climate change, every percent counts. That's why something has to be done about concrete as a building material - for building with concrete

non-metallic reinforcement is one solution!





LET'S MAKE CARBON CONCRETE THE GAMECHANGER.

The reinforcement is a composite material and consists of carbon or glass fibres with a coating, for example, an impregnation of epoxy resin. The building material can then contribute to a more sustainable use of our resources in the form of grids, mats or bars because it does not corrode and needs a much thinner concrete cover than conventional reinforcement.

The highly load-bearing and non-corrosive carbon reinforcement also has a significantly longer service life, so that new buildings can be used for much longer than it is possible with today's structures made of concrete and saving ressources at the same time. In addition, the building material can help to extend the useful life of existing buildings i n the renovation sector, which also helps to use ressources carefully. Instead of demo-lishing a structure and building a completely new one, a repair with carbon concrete can be sufficient.

Compared to existing concrete construction the use of carbon concrete can save up to

50%

of ressources and reduce CO_2 emissions by up to

30%

LIFE CYCLE ASSESSMENT BRIDGE

the key facts

- Span: . . . . . 15 m
- Use: . . . . . Pedestrians, cyclists, snow clearing vehicles vehicles up to max. 10t total weight
- Reinforcement: . . All reinforcements in the superstructure were made of carbon
- No surface protection is needed since no steel reinforcement is used

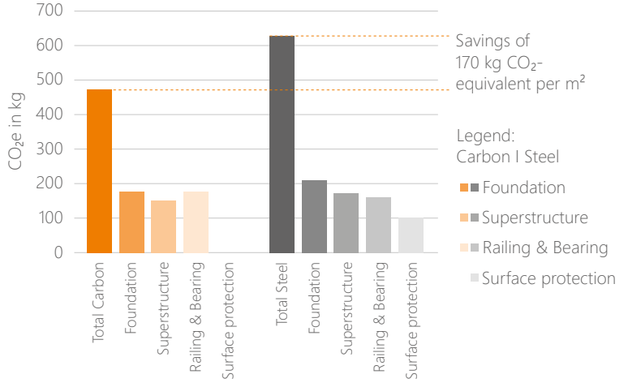
the study

- was carried out by LCEE Life Cycle Engineering Experts GmbH using the life cycle assessment method according to DIN EN ISO 14040 and 14044

LCEE Life Cycle Engineering Experts GmbH

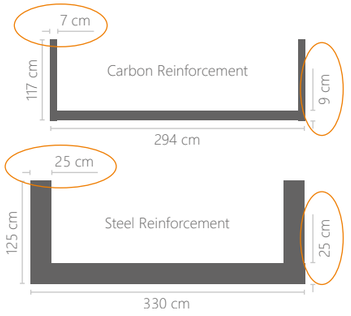
comparison CO_2 emissions

The CO_2 equivalent saving per m^2 of the reference bridge in our example is approx. 170 kg. For the entire bridge this means a total saving of roughly 7.5 tons of CO_2 equivalent. The savings in CO_2 emissions come from the use of less cement and other materials such as sand, water and steel. In addition, the elimination of a surface protection system, for example an asphalt road surface, can save a lot of CO_2.



constructional differences

The deck area can be reduced from 25 cm with steel-reinforced concrete to only 9 cm when carbon concrete is used. Due to the lower weight of the superstructure, the design of the abutments and foundations can also be made leaner. The material savings thus extend through all components of the bridge.



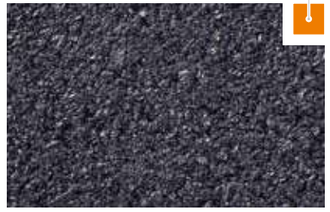
less ressources and material

By using approx. 330 m² or 190 kg of carbon reinforcement,
the following raw materials and materials could be saved:

Sand: ~ 21.000 kg
Water: ~ 4.000 kg
Steel: ~ 1.500 kg



Other materials:
Cement: ~ 7.500 kg
Asphalt: ~ 9.000 kg

SUSTAINABILITY
FOR ALL OF US



LIFE CYCLE ASSESSMENT FACADE

the key facts

Curtain wall facade with rectangular elements.

- element dimensions: . . . . . .2.5 m x 3.4 m
- element area: . . . . . .8.5 m²
- total facade area: . . . . . .1,635 m²

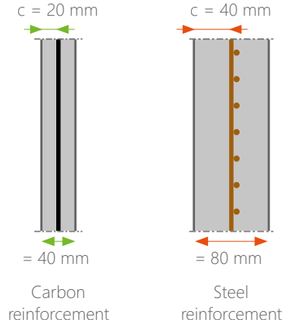
the study

- was conducted by LCEE Life Cycle Engineering Experts GmbH using the life cycle assessment method according to DIN EN ISO 14040 and 14044.

LCEE Life Cycle Engineering Experts GmbH

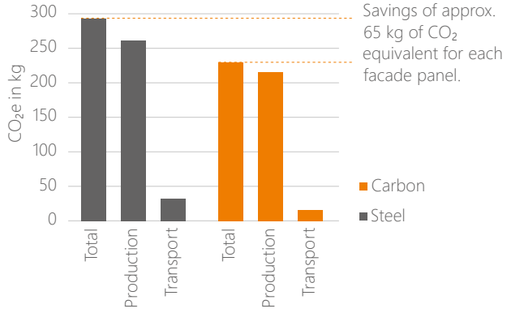
constructional differences

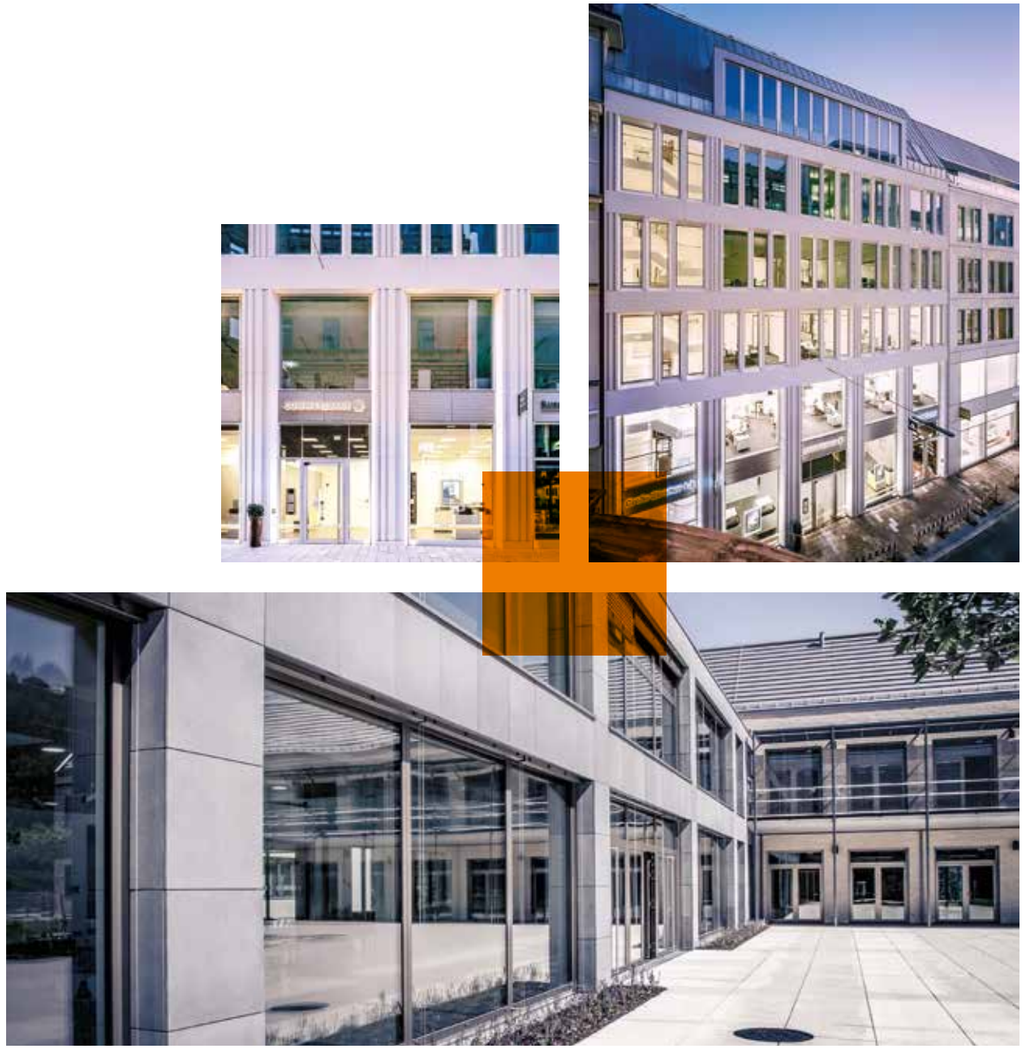
The thickness of the facade panel can be reduced from 80 mm to just 40 mm. With carbon reinforcement, a concrete cover of just 20 mm is required, while 40 mm is needed with steel reinforcement.



comparison CO_2 emissions

Due to the lighter weight of carbon reinforcement, CO_2 could also be saved on the transport distance of approx. 300 km. The concrete grade C35/45 was used for the steel-reinforced concrete and C50/60 for the carbon concrete. The panel thickness was 80 mm for the steel-reinforced panel and only 40 mm for the carbon reinforced panel. In this reference project example we saved with that key figures aprox. 65 kg of CO_2 equivalent for each facade panel with 8,5 m².
In addition, a common anchoring system was used.





RECYCLING OF CARBONCONCRETE

Demolishing

In carbon reinforced concrete construction, the coarse foreign matter is also removed first, the structures are crushed into pieces, the concrete is separated from the carbon fibre reinforcement in crushers, and the concrete fraction is further crushed.

Breaking

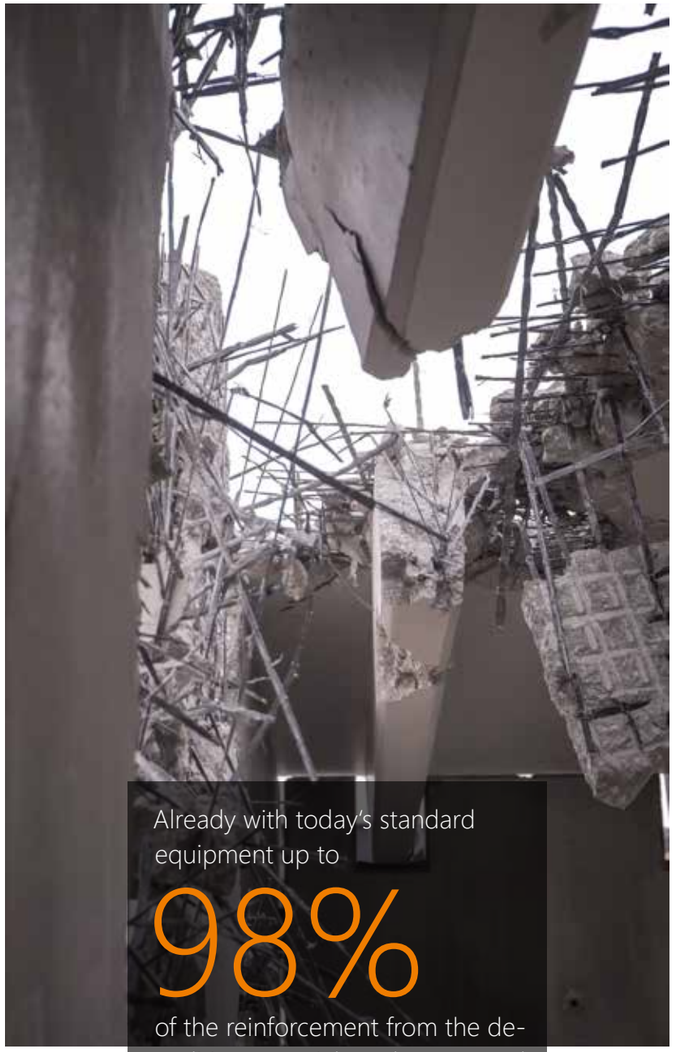
Unlike steel, carbon is not magnetic, so that the two fractions cannot be separated using magnetic separators. Instead, alternative sorting processes (camera-based processes etc.) are used, similar to those used for sorting plastics or glass.

Sorting

The broken material is conveyed on a belt in the sorting plant, the reinforcement elements are detected on the basis of different colour and geometry and blown out by targeted air blasts. With the plants commonly in use today, up to 98 % of the reinforcement can already be removed from the demolition material.
The C^3Association was able to prove this in 2019 within the context of its "C^3 – Carbon Concrete Composite" project.

Recycling material

As with steel reinforced concrete,the concrete is recycled. The valuable carbon fibres are already being extracted from the recovered carbon fibre reinforcements and reused for new products.



ENVIRONMENTAL PRODUCT DECLARATION (EPD)

- Ecological footprint of our products is presented transparently
- The EPD serves as the data basis for evaluations of components and buildings as well as sustainability certification systems for buildings
- High potential for saving resources and raw materials in buildings and components lead to a reduction in CO_2 equivalents of up to 30 %
- Despite high CO_2 equivalents of the carbon reinforcement solidian GRID, massive reductions of the CO_2 equivalents in the building components can be achieved (see the life cycle assessment examples on the pages before)

THE WORLD'S FIRST EPD FOR CARBON GRID REINFORCEMENT

MATERIAL CYCLE OF CARBON REINFORCEMENT

The resulting carbon fiber recycled material can be reused in the following applications, for example:

- As aggregates for PVC/compound applications
- As use of short fibers in Nonwoven-Textiles (e.g. for vehicle construction)
- For the production of new recycled yarns with similar properties as from new fibers

The demand for recycling currently exceeds the recycling capacities still massively. We have made it our task to find a sustainable solution and we have succeeded in doing so. We can name a partner who can supply your recycling material to new material cycles and not only just dispose it..

WE OFFER YOU A SOLUTION WITH A PARTNER WHO CAN ALSO GIVE YOUR RECYCLING MATERIAL INTO NEW MATERIAL CYCLES.

WE ARE COMMITTED

as a member of organizations for sustainable building

CARBOrefit® designates a general building authority approval for reinforcing, repairing and refurbishing with the high-performance material carbon concrete. Existing concrete structures can be refurbished with the reinforcement from solidian within the scope of the approval.

The German Sustainable Building Council - DGNB e.V. is a non-profit and nongovernmental organization whose mission is to develop and promote ways and solutions for sustainable design, construction and use of buildings.

The C³ - Carbon Concrete Composite project is currently the largest research project in the German construction industry. Since 2014, with the help of a consortium of over 140 partners, the composite material carbon concrete has been researched and developed in 61 joint projects and over 300 individual projects and has been increasingly used in practice since 2006.

CU Bau as a supra-regional specialist network of Composites United e.V. promotes the acceptance and widespread use of fibre-reinforced materials in the construction industry for its members from industry and science.

CARBOrefit®

DGNB
Deutsche Gesellschaft für Nachhaltiges Bauen
German Sustainable Building Council

C3 Carbon Concrete Composite

COMPOSITES UNITED | BAU

Keep a piece sustainability in your hands with this printed brochure. Sustainably produced on:

enviro®top recycling paper [content 170g/m²]
Cradle to Cradle Certified® Silver
FSC® Recycled, EU Ecolabel, Blue Angel

WestRock KraftPak® [cover 225g/m²]
100% PEFC™ certified BV/CDC/0575784

solidian

build solid.

Sigmaringer Straße 150
72458 Albstadt
Germany - EU
+49 7431 10 31 35
info@solidian.com

Dr. Slavka Rozgaja 3
47000 Karlovac
Croatia - EU
+385 47 693 300
sales@solidian.com

DEVELOPED AND MADE IN EU

ISO 9001 - ISO 14001
BUREAU VERITAS
Certification