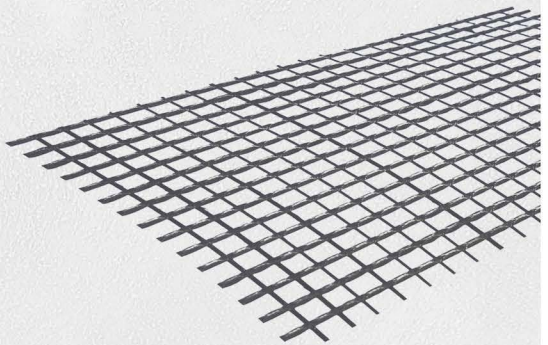
CARBOrefit®

German national technical approval /
General construction technique permit Z-31.10-182



Strengthening, renovating and repairing existing concrete structures with the high-performance composite carbon reinforced concrete

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DURABLE, HIGH-PERFORMANCE, SUSTAINABLE

The CARBOrefit®-procedure for structural strengthening using carbon reinforced concrete

Carbon reinforced concrete, a unique composite building material consisting of two high-performance components – fine-grained concrete and carbon reinforcing grids – is characterized by its extreme performance and durability. The carbon reinforcement carries tensile loads, while in retrofitting applications, the concrete cover ensures a strong bond with existing structures and is capable of withstanding compressive forces. The high chemical resistance of non-metallic carbon reinforcement eliminates the corrosion issue typically associated with steel reinforced concrete and shotcrete. With carbon reinforced concrete, this problem becomes a thing of the past!

The innovative CARBOrefit® strengthening procedure harnesses the exceptional advantages of high-performance composite carbon reinforced concrete, offering an effective solution for the preservation and sustainable development of concrete structures.

Existing concrete structures can be satisfactorily strengthened, renovated, or repaired by applying a carbon reinforced concrete strengthening layer to the surface of available steel reinforced concrete elements. Thanks to the high tensile strength and low density, as well as excellent corrosion resistance of carbon reinforcement, thin layers of just a few millimeters are fully sufficient to restore or even improve the strength of the original concrete elements. The need for over-dimensioned concrete cover for reinforcement protection becomes obsolete. In retrofitting applications, carbon reinforced concrete distinguishes itself by demonstrating excellent bonding behavior and minimal crack widths, leading to enhanced durability. Additionally, a high flexibility of the carbon reinforcing grids allows for effortless strengthening of various curved surfaces. The CARBOrefit®-procedure results in a non-destructive and delicate carbon reinforced concrete strengthening layer.

Thanks to its rapid construction process, outstanding durability, and a lifespan exceeding 100 years, it is also economically superior to other conventional measures presently in use. Another significant benefit of carbon reinforced concrete include substantial material and weight savings.

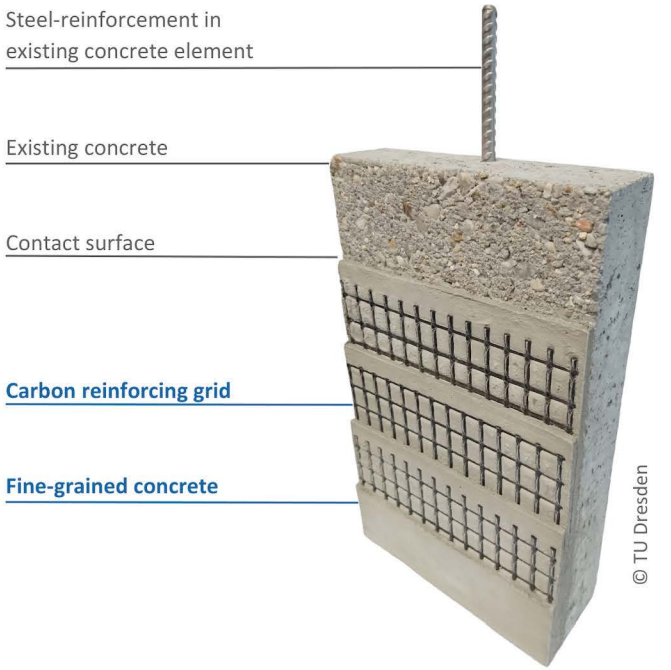
When applied to existing concrete structures for strengthening and renovation, a single 10 mm strengthening layer of carbon reinforced concrete can deliver a notable increase in load-bearing capacity, similar to what one would achieve with a 70 mm thick shotcrete application. This reduction in material usage not only minimizes stress on existing structural members but also preserve the structure's appearance.

Moreover, carbon reinforced concrete significantly reduces the environmental and climate impacts associated with the resource-intensive and emission-heavy construction industry. Beside the structural design, the transportation and on-site operations (workload per person, among others) are also positively affected. These attributes make carbon reinforced concrete a unique and sustainable solution, particularly for strengthening and renovation projects.

The CARBOrefit®-procedure is an exceptionally resource-efficient retrofitting solution that opposes demolition and promotes the preservation of buildings and construction works. Its multifaceted benefits can contribute significantly to the transformation of the construction industry towards sustainability.

Carbon reinforced concrete offers diverse applications in structural strengthening and renovation. As a thin, high-performance strengthening layer, it is an excellent choice for historic preservation, where it can be applied to protected historical objects with minimal impact on the original building contour. Furthermore, its potential extends beyond historic sites and can be used effectively in buildings, bridges, waterworks and underground constructions. Numerous practical projects have already demonstrated the feasibility and efficiency of CARBOrefit® (see References).

Let's take a step forward in building the future with CARBOrefit® - a minimally invasive method that saves construction works from demolition, conserves resources, and reduces carbon emissions!



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Strengthening

Enhancing the structural strength

Repair

Restoring the original structural strength

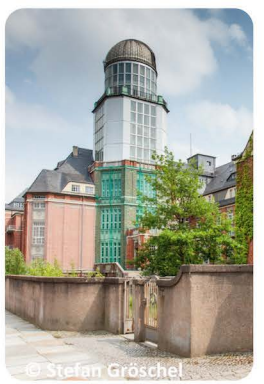
Renovation

Restoring the durability

References

Applications in historic preservation

Project: Hyparschale Magdeburg, Sachsen-Anhalt
Year of construction: 1969
Period of retrofitting activity: Feb. 2020 - Jul. 2021
Strengthening layer thickness: 1.0 cm, on the upper and lower surfaces
Number of carbon reinforcement layers: 1 layer, on the upper and lower surfaces



Project: Beyer-Bau Dresden, TU Dresden, Sachsen
Year of construction: from 1910 to 1913
Period of retrofitting activity: 2021 - 2022
Strengthening layer thickness: 1.0 - 1.5 cm
Number of carbon reinforcement layers: up to 2 layers

Applications in infrastructure

Project: High-way bridge Hessen (across the river Nidda)
Year of construction: 1971
Period of retrofitting activity: 2020
Strengthening layer thickness: 3.0 - 4.0 cm
Number of carbon reinforcement layers: 6 layers on the upper side and 5 layers on the lower side

CARBOCON

CARBOCON GMBH is a leading service provider in the field of carbon reinforced concrete.

Building on a strong base of civil engineering knowledge and solutions expertise, strategic partnerships and professional consulting services, we develop and introduce novel products and processes using carbon reinforced concrete. The company also provides support on the manufacture of components, as well as for projects of new construction and strengthening of existing and historic structures.

We initiate innovations to make building with concrete lighter, safer, more efficient and more reliable, while reducing emission and conserving natural resources.

Our growing team is committed to the sustainable transformation of the construction industry and plays an active role in shaping it.

Our innovative ideas have been honored with several awards: Innovative through research | DGNB Sustainability Challenge Audience Award | JEC Forum DACH Startup Booster | Top-Innovator | German Raw Material Efficiency Award | materialPrice | Innovation Construction Award (2nd Place)

CARBOrefit®

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