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Case study.

**A durable solution to reinforcement corrosion**

**Glass fibre composite replaces steel: Schöck Combar reinforces emergency walkway in motorway tunnel**

**Baden-Baden, Germany, October 2022 - Conventional steel reinforcement inevitably corrodes over time due to the ingress of condensate containing chloride. This results in spalling in the concrete, which allows chloride-laden condensate to penetrate through to the steel reinforcement even faster. In its advanced stage, corrosion also compromises the load-bearing capacity of the reinforcement. Repairing corroded reinforced concrete components is time-consuming and expensive. Schöck Combar is a reliable and durable solution to corrosion. This concrete reinforcement is made of glass-fibre reinforced plastic (GRP), is chemically resistant and does not rust. The South Bavarian branch of Autobahn GmbH has used this material for the first time to construct an emergency walkway in the Tutting motorway tunnel.**

The A94 motorway passes through a tunnel in Tutting, a district of the Lower Bavarian municipality of Kirchham not far from Passau, Germany. This tunnel is being built as a water-impermeable concrete structure. It is approximately 450 metres long and has two emergency walkways, one for each carriageway on either side of the road. The tunnel is scheduled to open at the end of 2023.

**Concrete spalling due to corroded reinforcement**

Reinforcement corrosion is a persistent problem for concretors. The durability of structural elements reinforced with conventional reinforcing steel is often impaired when exposed to chloride. One reason for this is that cracks typically form in reinforced concrete when used as a building material. Water containing de-icing salts can enter cracks only 0.1 millimetres wide, penetrate through to the reinforcing steel and attack it. The onset of corrosion generates rust and the resulting increase in volume can lead to spalling of the concrete above the reinforcement. This opens up a path for water containing de-icing salts to penetrate to the reinforcing steel.

Emergency walkways in tunnels must be checked regularly for damage to ensure that they can be safely used at all times. DIN 1076 prescribes a structural inspection every three years so that those responsible can react quickly if necessary. Experience has shown that corrosion damage to emergency walkways with conventional reinforcement is usually so extensive after only 15 to 30 years that there is no other option than to demolish and completely replace it. However, such repairs are time-consuming and expensive.

**Corrosion-resistant, durable, sustainable**

In search of a durable and reliable solution, the South Bavarian branch of Autobahn GmbH (Germany Federal highway authority) opted for Schöck Combar glass-fibre reinforcement to construct a groundbreaking new tunnel in Tutting. The emergency walkway will run for around 225 metres and is being constructed using Combar, a product with unique material properties.

The coated reinforcing bar consists of longitudinal glass fibres embedded in a vinyl ester resin matrix. The high glass fibre content of Combar and the linear parallel arrangement of the fibres makes Combar extremely durable, strong and rigid.

The glass-fibre reinforcement made by Schöck is also reliably resistant to corrosion. It does not even corrode when exposed to de-icing salts. The service life of Combar in concrete is 100 years as tested by the German Institute for Building Technology (DIBt). The use of rustproof reinforcement reduces repair costs, increases the durability of building components and so makes an important contribution to sustainable construction.

**Easy to handle, simple to install**

A further advantage is that Combar is much lighter than steel. The reinforcement was therefore installed in the Tutting tunnel emergency walkway without a hitch. Johann Anetzberger, senior site manager at the construction firm Mayerhofer Hoch-, Tief- und Ingenieurbau GmbH from Simbach, confirmed how easy the material was to work with: "The reinforcement cages were delivered to the construction site ready to use. As Combar is much lighter than steel, it is much easier and less tiring to work with and we make fast progress."

Another benefit of this alternative reinforcement made of GRP is that Schöck Combar is currently the only fibre-reinforced composite material on the market to be approved by the building authorities. Its durability also makes it a very economical solution.

**Schöck Combar endurance test**

Using Combar to reinforce the emergency walkway is part of a pilot project of Autobahn GmbH. An endurance test is currently underway to investigate the potential service life of an emergency walkway. The test is being supervised by the Munich engineering office Schiessl Gehlen Sodeikat GmbH and the results will then be evaluated. Dr Angelika Schiessl-Pecka, an expert in concrete construction, explains: "We have had major problems with reinforcement corrosion in recent years using the traditional standard construction method. We chose glass-fibre reinforcement to eliminate any future problems related to durability."

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**Project information**

**Construction period:** 2018 - expected 2023

**Principal:** Autobahn GmbH des Bundes, South Bavarian branch, Deggendorf, Germany, www.autobahn.de

**Construction firm:** Mayerhofer Hoch-, Tief- und Ingenieurbau GmbH, Simbach am Inn, Germany, www.mayerhofer-bau.de

**Planning consultants:** Ingenieurbüro Schiessl Gehlen Sodeikat GmbH, Munich, Germany, [www.ib-schiessl.de](http://www.ib-schiessl.de)

**Product:** Schöck Combar

**Info box**

**Combar integrated in FRILO structural analysis software**

Schöck Combar is the first fibre composite reinforcement material and has been integrated into the FRILO B2 module. This means that the glass fibre composite material can now be sized in the familiar software environment as longitudinal reinforcement or as stirrup reinforcement. A wide variety of cross-sections (rectangular, circular and T-beam cross-sections) is available for straightforward dimensioning of Combar in various structural and civil engineering applications.

**Images**

**[Schoeck\_Notgehweg-Tunnel-Tutting-1]**



*The South Bavarian branch of Autobahn GmbH has chosen Schöck Combar, the concrete reinforcement made of glass-fibre reinforced plastic, to reinforce the emergency walkway in the Tutting motorway tunnel.*

*Photo: Schöck Bauteile GmbH*

**[Schoeck\_Notgehweg-Tunnel-Tutting-2]**

Ein Bild, das Person enthält.

Automatisch generierte Beschreibung

*Schöck Combar is not only corrosion-resistant, but also much lighter than steel. This makes the product easier to handle and less physically demanding for installers.*

*Photo: Schöck Bauteile GmbH*

**[Schoeck\_Notgehweg-Tunnel-Tutting-3]**



*Schöck Combar is being used as reinforcement over a tunnel length of around 225 metres.*

*Photo: Schöck Bauteile GmbH*

**[Schoeck\_Notgehweg-Tunnel-Tutting-4]**



*The GRP reinforcement made by Schöck is durable, extremely strong and reliably corrosion-resistant. It does not even corrode when exposed to de-icing salts.*

*Photo: Schöck Bauteile GmbH*

**[Schoeck\_Notgehweg-Tunnel-Tutting-5]**



*The service life of Combar in concrete is 100 years as tested by the German Institute for Building Technology (DIBt). Currently, it is the only fibre composite material on the market to be approved by the building authorities.*

*Photo: Schöck Bauteile GmbH*

**About Schöck:**

Schöck Bauteile GmbH is a company of the international Schöck Group that has more than 1100 employees and is active in over 40 markets. It has its headquarters in Baden-Baden at the feet of the Black Forest where the company's success story began in 1962. Company founder Eberhard Schöck used his knowledge and experience of building sites to develop products that simplify the construction process and solve the physical problems of construction work. This mission has remained the foundation of the company’s philosophy to this day, a philosophy that has allowed Schöck to become the leading provider of reliable and innovative solutions to reduce thermal bridges and impact sound, for thermally insulating façade connections and reinforcement technology. Schöck products facilitate a more rational approach to construction and safeguard the construction quality in the long term. Our focus is on the building-physical benefits and energy efficiency. Schöck is driving the digitalisation of the work flow from planning to the building site to support the construction work of tomorrow.

**For any questions, please contact:**

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