

Alternative reinforcement

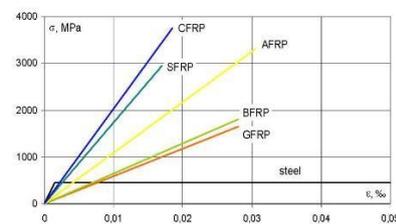
In regular concrete, approximately 20% of CO₂ emissions are attributable to the reinforcement. The implementation of alternative reinforcement like basalt and glass fibre reinforcement has the potential to result in a CO₂ reduction of up to 50% for the share of the reinforcement. In addition structures can potentially be designed thinner. The following section presents a comparative analysis of the advantages and disadvantages associated with alternative reinforcement.

PROPERTIES, ADVANTAGES AND DISADVANTAGES OF BASALT AND FIBERGLASS REINFORCEMENT

The most common alternative reinforcement is made of basalt or glass fibre (BFRP/GFRP). These can be applied as bars, similar to traditional reinforcement. However, both materials can also be applied as constructive (macro) fibres, similar to traditional steel fibres. Thus, constructions can also be hybrid reinforced.

Pros

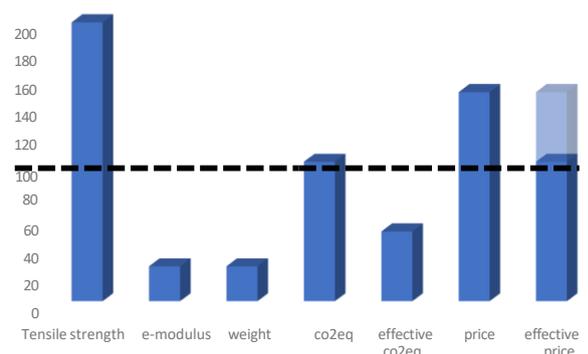
- + The material is resistant to corrosion, which prolongs its useful lifespan, and has an advantage on specifications for crack width and coverage.
- + Tensile strength is about twice the strength of steel.
- + Basalt or glass fibre has good strength properties until approximately 400 °C, in case of fire.
- + Hybrid constructions are easy to realize, which can lead to lighter and thinner structures with both less reinforcement and concrete.
- + Alternative reinforcement weighs a quarter of steel reinforcement.
- + Per kg, CO₂ emissions are not much better than steel. But because of its low weight and high strength, far fewer kilograms of alternative reinforcement required, which effectively results in a lower amount of CO₂-emissions.
- + The products are stony and therefore recyclable without additional measures, although not high-grade (as bars).



Stress strain diagram of types of alternative



Various alternative reinforcement



Schematic representation of characteristic values of alternative reinforcement versus steel.

Cons

- Alternative reinforcement is not (yet) part of the Eurocode.
- The modulus of elasticity, at approx. 50,000 N/mm², is significantly lower than that of steel, which may lead to wider cracks and deflection. This may be a concern.
- The adhesive between the fibres loses its cohesion at approx. 100 °C. For specific fire requirements, this must be taken into account.
- The rods cannot be bent and must be ordered in advance in the correct shape to size.
- Reinforcement nets do not yet exist.
- The price per kg is about one and a half to two times higher as steel reinforcement. But, because alternative reinforcement is lighter, in specific cases the effective price is comparable. This will increase when the impact of the tax on CO₂ increases.



Contact

Jasper van Alphen

+31 26 368 35 27 / +31 6 82 05 39 89

j.alphen@abt.eu

abt.eu