Bridge Strengthening

Sika® CarboDur® Composite Systems

Flexural Strengthening
Shear Strengthening
Seismic Retrofitting
Bridge Strengthening with Sika® Carbo

System Solutions for Reinforced and Prestressed Concrete,

Reasons for Strengthening

▲ Corrosion of the reinforcement
▲ Corrosion of prestressing cables
▲ Increased traffic loads
▲ Inadequate design
▲ Modified Standards/Codes
▲ Excessive cracking of concrete
▲ Seismic retrofitting

Materials used

FRP Fabrics:
Uni- and/or bidirectional Fabrics with Carbon, Glass and Aramid Fibres. Mostly used for seismic retrofitting and shear strengthening.

CFRP Plates:
Carbon Fibre Plates produced by pultrusion process with precise material properties. Mostly used for flexural and shear strengthening of dynamic loaded structures such as bridges, etc.

Flexural Strengthening

Cover Pictures: Prestressed Concrete Bridge Sika® «World record» in Composite-Plate length, Australia
Steel-Concrete Bridge Sika® «Tailor made» Composite Plate, United Kingdom
Timber and Masonry Arch Bridges

Sika® System Solutions for:

**Flexural Strengthening with**
- Sika® CarboDur® CFRP plates
- Sika® CarboDur® prestressed CFRP plates
- SikaWrap® FRP fabrics

**Shear Strengthening with**
- Sika® CarboShear L® CFRP plates
- SikaWrap® FRP fabrics

**Seismic Retrofitting with**
- SikaWrap® FRP fabrics

All Sika® Composite Materials are bonded with Sikadur High Strength Epoxy Adhesives

Seismic Retrofitting

Timber Bridge

Prestressed Strengthening

United States

Switzerland

Germany
## System Components

### Sika® CarboDur® Plates

<table>
<thead>
<tr>
<th>Sika® CarboDur® Plates</th>
<th>Sika® CarboDur S</th>
<th>Sika® CarboDur M</th>
<th>Sika® CarboDur H</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-modulus</td>
<td>165'000 N/mm²</td>
<td>210'000 N/mm²</td>
<td>300'000 N/mm²</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>2'800 N/mm²</td>
<td>2'400 N/mm²</td>
<td>1'300 N/mm²</td>
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</tbody>
</table>

### Sika® CarboShear L®

- Min. Tensile load: 126KN/40mm
- E-modulus mean value: 120'000 N/mm²

### Sikadur® Epoxy Adhesives and Mortars

- Sikadur® -30:
  - E-modulus: 12'800 N/mm²
  - Bond strength on concrete: > 4 N/mm² (concrete failure)

- Sikadur® -41:
  - E-modulus: 9'000 N/mm²
  - Bond strength on concrete: > 4 N/mm² (concrete failure)

### SikaWrap® Fabrics

#### Dry Application
- SikaWrap® Hex-230C
- SikaWrap® Hex-103C

#### Wet Application
- SikaWrap® Hex-230G
- SikaWrap® Hex-100G

- Areal weight: 230 g/m², 430 g/m², 610 g/m², 920 g/m²
- Tensile modulus of fibres: 3'500 N/mm², 7'000 N/mm², 130'000 N/mm²
- Tensile strength: 2'250 N/mm², 2'500 N/mm², 2'700 N/mm²
- Viscosity: Pasty, Low viscous

### Approvals

- General construction approval for steel plate strengthening with SikaCarboDur and Icosit 277 by German Institute of Construction No. 7-36.1-30, Germany 07.04.95
- General construction approval for Sika CarboDur, Plates Typ S by German Institute of Construction No. 7-36.12-29, Germany 11.11.97
- Report/technical investigation for CarboDur, Plates Typ S and SikaWrap-230C fabric by SOCOTEC No. HX0823, France 07.08.00
- Evaluation Report for SikaWrap FRP Systems by ICB No. ER-5558, California, U.S. 01.04.00

### Also available from Sika

- Solutions with Sika Systems
- Tested and approved systems

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