Bridge Strengthening
Sika® CarboDur® Composite Systems

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

System Solutions for Reinforced and Prestressed Concrete, T Greece Indonesia China

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.

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

Flexural Strengthening
Dur® Composite Systems

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
# Bridge Strengthening

**Sika® CarboDur® Composite Systems**

## 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>
</tr>
</tbody>
</table>

### Sika® CarboShear L®

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

### Sika® Epoxy Adhesives and Mortars

<table>
<thead>
<tr>
<th>Sika® Epoxy Adhesives and Mortars</th>
<th>Sikadur® -30</th>
<th>Sikadur® -41</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-modulus</td>
<td>12'800 N/mm²</td>
<td>9'000 N/mm²</td>
</tr>
<tr>
<td>Bond strength on concrete</td>
<td>&gt; 4 N/mm</td>
<td>&gt; 4 N/mm</td>
</tr>
</tbody>
</table>

## Test Reports

- **Fatigue and Failure Test**
  - Sika CarboDur Structural Strengthening System, Bonding of CFRP strips under dynamic load
  - Sika CarboDur Structural Strengthening System, Bonding of CFP plates under dynamic load
  - EMPA Test Report No. 170'569e-1
  - EMPA Test Report No. 418'931E

## Approvals

- **General construction approval for steel plate strengthening with Sikadur-30 and Icosit 277**
  - German Institute of Construction No. 7-36.1-30, Germany
  - 07.04.95

- **General construction approval for Sika CarboDur, Plates Typ S and SikaWrap-230C fabric No. HX0823, France**
  - Germany Institute of Construction No. 7-36.1-30, Germany
  - 11.11.97
  - SOCOTEC, France
  - 07.08.00

- **Evaluation Report for SikaWrap FRP Systems**
  - ICB No. ER-5558, California, U.S.
  - 01.04.00

## Also available from Sika

- SikaWrap® Fabrics
- Sikadur® Epoxy Adhesives

## Your Local Sika® Company

The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika’s current knowledge and experience of the products when properly stored, handled and applied under normal conditions. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users should always refer to the most recent issue of the Technical Data Sheet for the product concerned, copies of which will be supplied on request.

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