Product Data Sheet Edition 01/06/2011 Identification no: 02 04 01 01 004 0 000002 Sika® CarboShear® L

### Sika® CarboShear® L

Carbon fibre shear links for structural strengthening as part of the Sika® CarboDur® CFRP Strengthening System

## System Description

Sika<sup>®</sup> CarboShear<sup>®</sup> L are corrosion resistant carbon fibre shear links, designed for strengthening concrete structures in shear and to anchor Sika<sup>®</sup> CarboDur<sup>®</sup> plates at their ends. They are part of the Sika<sup>®</sup> CarboDur<sup>®</sup> CFRP Strengthening System.

Sika<sup>®</sup> CarboShear<sup>®</sup> L shear links are bonded as external reinforcement using Sikadur<sup>®</sup>-30 epoxy resin based adhesive for normal, or Sikadur<sup>®</sup>-30 LP epoxy resin based adhesive for elevated temperatures during application and / or service. For fixing into the anchorage holes, Sika AnchorFix<sup>®</sup>-3<sup>+</sup> can also be used.

Please refer to the relevant Product Data Sheet for more detailed information about each of these adhesives.

#### Uses

Sika® CarboShear® L profiles are used to improve, increase or repair the performance and shear resistance of structures for:

Increased Load Carrying Capacity::

- Increasing the load capacity of beams.
- For the installation of heavier machinery.
- For changes in building use.

Damage to structural elements due to:

- Deterioration of the original construction materials
- Steel reinforcement corrosion
- Accidents (Vehicle impact, earthquakes, fire etc.)

Improvement of serviceability and durability:

- Reduced deflection and crack width
- Stress reduction in the steel reinforcement
- Improved fatigue resistance

Change of the structural system:

- Removal of walls and / or columns
- Removal of floor and wall sections to create access / openings
- Changed design philosophy

To repair design or construction defects such as:

- Insufficient / inadequate reinforcement
- Insufficient / inadequate structural depth

#### Characteristics / Advantages

- Tested anchorage system.
- Non corroding
- Very high strength and durability
- Shear and bursting enhancement.



|                                    | ■ Well defined anchoring.  |   |                   |                   |  |  |  |
|------------------------------------|--|---|-------------------|-------------------|--|--|--|
|                                    | Lightweight.   | on he over sested   |                   |                   |  |  |  |
|                                    | Low overall thickness, ca  | an be over coated.  |                   |                   |  |  |  |
|                                    | Easy transportation.   | and in and in   | ctallation oquinm | ont               |  |  |  |
|                                    | <ul><li>Easy installation – no he</li><li>Outstanding fatigue resis</li></ul>  | · ·   | Staliation equipm | ent.              |  |  |  |
|                                    |  |   | uired             |                   |  |  |  |
|                                    |  | <ul><li>Minimal preparation of the shear links is required.</li><li>Minimal aesthetic impact.</li></ul> |                   |                   |  |  |  |
| Tests                              |  |   |                   |                   |  |  |  |
| Approval / Standards               | EMPA Test Report 169'219 E/1: Testing of CFRP shear strips on reinforced concrete T-beams T1 and T2, Swiss Federal Laboratories for Materials Testing and Research EMPA, 1998      |   |                   |                   |  |  |  |
|                                    | EMPA Test Report 169'219 E/2: Testing of CFRP shear strips. Flexural beam T3, Swiss Federal Laboratories for Materials Testing and Research EMPA, 1998                             |   |                   |                   |  |  |  |
|                                    | EMPA Test Report 116/7: Shear strengthening with prefabricated CFRP L-shaped plates, Test beams S1 to S6, Swiss Federal Laboratories for Materials Testing and Research EMPA, 2002 |   |                   |                   |  |  |  |
| Product Data                       | Sika <sup>®</sup> CarboShear L   | shear links   |                   |                   |  |  |  |
| Form                               |  |   |                   |                   |  |  |  |
| Appearance / Colour                | Carbon fibre reinforced pol  | ymer with an epoxy  | matrix, black     |                   |  |  |  |
| Packaging                          | Packs of 20 links, or individ  | Packs of 20 links, or individually  |                   |                   |  |  |  |
| Types                              | Sika <sup>®</sup> CarboShear L is a CFRP L-shaped plate with a 90° bend.   |   |                   |                   |  |  |  |
|                                    | Туре   | Leg length  | Width             | Nominal thickness |  |  |  |
|                                    | Sika CarboShear L 4/20/50  | 200 resp. 500 mm  | 40 mm             | 2 mm              |  |  |  |
|                                    | Sika CarboShear L 4/30/70  | 300 resp. 700 mm  | 40 mm             | 2 mm              |  |  |  |
|                                    | Sika CarboShear L 4/50/100   | ,   | 40 mm             | 2 mm              |  |  |  |
|                                    |  | 500 resp. 1000 mm   | -                 |                   |  |  |  |
|                                    | Sika CarboShear L 4/80/150   | 800 resp. 1500 mm   | 40 mm             | 2 mm              |  |  |  |
|                                    | The leg length can be cut to size (by saw, or preferably by diamond cutting disk). The inner radius of the bend zone is 25 mm for all sizes  |   |                   |                   |  |  |  |
| Storage                            |  |   |                   |                   |  |  |  |
| Storage Conditions /<br>Shelf Life | Unlimited, provided there is no exposure to direct sunlight (UV light), in dry conditions and at temperatures of max. 50°C   |   |                   |                   |  |  |  |
|                                    | Transportation: only in the original packaging, or otherwise adequately protected against any mechanical damage  |   |                   |                   |  |  |  |
| Technical Data                     |  |   |                   |                   |  |  |  |
| Density                            | 1.55 g/cm <sup>3</sup>   |   |                   |                   |  |  |  |
| Glass Transition<br>Temperature    | > 80°C (according to EN 61006)   |   |                   |                   |  |  |  |
| Fibre Volume Content               | > 56%  |   |                   |                   |  |  |  |

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| Mechanical / Physical Properties        |   |   |  |  |
|---|---|---|--|--|
| CarboShear <sup>®</sup> L               |   |   |  |  |
| Properties                              | E-Modulus* (min value)  | 90'000 N/mm²  |  |  |
|   | Tensile Strength* (min. value)  | > 1'350 N/mm²   |  |  |
|   | Strain at break* (min. value)   | > 1.30%   |  |  |
|   | * Mechanical values obtained from longitudinal direction of fibres, considering a nominal thickness of 2 mm   |   |  |  |
| Design                                  | For design details, please refer to the separate documentation provided: "Technical Documentation Sika <sup>®</sup> CarboShear – Design and Calculation for Shear Strengthening" Ref: 870 41 02                             |   |  |  |
| System<br>Information                   | Sika <sup>®</sup> CarboShear <sup>®</sup> L & Sikaduı   | r <sup>®</sup> -30 (Sika AnchorFix <sup>®</sup> -3 <sup>+</sup> ) |  |  |
| Application Details                     |   |   |  |  |
| Consumption                             | Please refer to the "Method Statement Sika® CarboShear® Externally Bonded Shear Reinforcement" Ref: 850 41 06   |   |  |  |
| Substrate Quality                       | Recommended minimum concrete pull-off strength after surface preparation - Mean: 2.0 N/mm <sup>2</sup> - Minimum: 1.5 N/mm <sup>2</sup>   |   |  |  |
|   | The effective concrete pull-off strength after surface preparation has to be checked and confirmed  |   |  |  |
|   | When the concrete pull-off strength is below the stated minimum requirements, alternative Sika <sup>®</sup> strengthening solutions are available: Please refer to the Product Data Sheet for SikaWrap <sup>®</sup> fabrics |   |  |  |
|   | Concrete must generally be older than 28 days (dependent on curing conditions and the type of concrete etc.)  |   |  |  |
| Substrate Preparation                   | Please refer to the "Method Statement Sika® CarboShear® Externally Bonded Shear Reinforcement" Ref: 850 41 06   |   |  |  |
| Application Conditions / Limitations    |   |   |  |  |
| Application Conditions /<br>Limitations | Please refer to the relevant Sika <sup>®</sup> epoxy adhesive Product Data Sheet for: - Sikadur <sup>®</sup> -30 - Sikadur <sup>®</sup> -30 LP - Sika <sup>®</sup> Anchorfix <sup>®</sup> -3+                               |   |  |  |
| Application<br>Instructions             |   |   |  |  |
| Application Method /<br>Tools           | Please refer to the relevant Product Data Sheet for: - Sikadur®-30 - Sikadur®-30 LP - Sika® AnchorFix®-3+   |   |  |  |
|   | Please also refer to the "Method Statement Sika® CarboShear® Externally Bonded Shear Reinforcement" Ref: 850 41 06  |   |  |  |

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A suitably qualified Structural Engineer must be responsible for the design of the strengthening works.

Additionally as this application is structural, great care must also be taken in selecting suitably experienced and trained specialist contractors.

Sika CarboShear® strengthening systems with Sika® CarboShear® L profiles must be protected from permanent exposure to direct sunlight, moisture and/or water. Please refer to the relevant Method Statement and Product Data Sheets for the selection of suitable over coating materials in situations where systems will be fully or partially exposed.

Maximum permissible continuous service temperature is approx. +50°C. Note: When using the Sika® CarboHeater® for curing Sikadur®-30 LP to be used at elevated temperatures, the maximum continuous service temperature can be increased to max. +80°C. Please refer to the Sika® CarboHeater Product Data Sheet for further information.

Please also refer to the "Method Statement Sika® CarboShear® Externally Bonded Shear Reinforcement" Ref: 850 41 06 for further limitations and guidelines

Detailed advice can always be obtained from Sika<sup>®</sup> Services AG and your local Sika Technical Services Department

#### **Fire Protection**

Where required for local regulations, Sika<sup>®</sup> CarboDur<sup>®</sup> plates can also be over coated with additional fire protection materials.

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| All technical data stated in this Product Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.   |
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| Please note that as a result of specific local regulations the performance of this product may vary from country to country. Please consult the local Product Data Sheet for the exact description of the application fields.  |
| For information and advice on the safe handling, storage and disposal of chemical products, users shall refer to the most recent Material Safety Data Sheet containing physical, ecological, toxicological and other safety-related data.  |
| 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 accordance with Sika®'s recommendations. 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 user of the product must test the product's suitability for the intended application and purpose. Sika® reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request. |
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