Construction

Sika CarboShear L

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

System Description

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

Sika CarboShear L shear links are bonded as external reinforcement using Sikadur®-30 epoxy resin based adhesive for normal, or Sikadur®-30 LP epoxy resin based adhesive for elevated temperatures during application. For fixing into the anchorage holes, Sika AnchorFix®-3+ 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.
- Low overall thickness, can be over coated.
- Easy transportation.
- Easy installation – no heavy handling and installation equipment.
- Outstanding fatigue resistance.
- Minimal preparation of the shear links is required.
- Minimal aesthetic impact.

Tests

Approval / Standards

Poland: Technical Approval ITB AT-15-5604/2011: Zestaw wyrobów Sika CarboDur do wzmacniania i napraw konstrukcji betonowych (Polish)

Poland: Technical Approval IBDiM Nr AT/2008-03-0336/1 „Płaskowniki. pręty, kształtki i maty kompozytowe do wzmacniania betonu o nazwie handlowej: Zestaw materiałów Sika CarboDur® do wzmacniania konstrukcji obiektów mostowych (Polish)

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

Form

Appearance / Colour

Carbon fibre reinforced polymer with an epoxy matrix, black

Packaging

Packs of 20 links, or individual pieces

Types

Sika CarboShear L is a CFRP L-shaped plate with a 90° bend.

Type	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	500 resp. 1000 mm	40 mm	2 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 / 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^3
Glass Transition Temperature	> 80°C (according to EN 61006)
Fibre Volume Content	> 56%

Mechanical / Physical Properties

CarboShear® L Properties

E-Modulus* (min value)	95'000 N/mm^2
Tensile Strength* (min. value)	> 1'350 N/mm^2
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 CarboShear – Design and Calculation for Shear Strengthening" Ref: 870 41 02

System Information

Sika CarboShear L & Sikadur®-30 (Sika AnchorFix®-3$^+$)

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^2
- Minimum: 1.5 N/mm^2

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 strengthening solutions are available: Please refer to the Product Data Sheet for SikaWrap® 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 / Limitations

Please refer to the relevant Sika epoxy adhesive Product Data Sheet for:
- Sikadur®-30
- Sikadur®-30 LP
- Sika Anchorfix®-3+

Application Instructions

Application Method / 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

Construction

Notes on Application / Limitations	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 +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 Services AG and your local Sika Technical Services Department
Fire Protection	Where required for local regulations, Sika CarboDur® plates can also be over coated with additional fire protection materials.

Value Base

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.

Local Restrictions

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.

Health and Safety Information

This product is an article as defined in article 3 of regulation (EC) No 1907/2006 (REACH). It contains no substances which are intended to be released from the article under normal or reasonably foreseeable conditions of use. A safety data sheet following article 31 of the same regulation is not needed to bring the product to the market, to transport or to use it. For safe use follow the instructions given in this product data sheet.
Based on our current knowledge, this product does not contain SVHC (substances of very high concern) as listed in Annex XIV of the REACH regulation or on the candidate list published by the European Chemicals Agency in concentrations above 0.1 % (w/w).

Legal Notes

Sika South Africa (Pty) Ltd
9 Hocking Place,
Westmead, 3608
South Africa

E-mail: headoffice@za.sika.com
Phone +27 31 792 6500
Telefax +27 31 700 1760
www.sika.co.za