



PRODUCT DATA SHEET

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COMPOSITE REINFORCING

Sika® CarboDur®

CARBON FIBER LAMINATE FOR STRUCTURAL STRENGTHENING

Description	Sika® CarboDur® is a pultruded carbon fiber reinforced plastic (CFRP) laminate designed for strengthening concrete, timber and masonry structures. Sika® CarboDur® is bonded onto the structure as external reinforcement using Sikadur®-30 epoxy resin as the adhesive.
Where to Use	<ul style="list-style-type: none"> ▪ External reinforcement of existing structures. ▪ Structures requiring additional loading capacity. ▪ Correct design/construction errors. ▪ Damaged structures from corrosion, fire, impact or aging. ▪ Change in use of buildings. ▪ Building code compliance. ▪ Modifications to structure (i.e. removal of slabs, wall or columns). ▪ Seismic upgrade.
Advantages	<ul style="list-style-type: none"> ▪ Very high strength. ▪ Lightweight. ▪ Non-corrosive. ▪ Unlimited lengths. ▪ Minimal preparation of laminates. ▪ Very easy to install, especially overhead. ▪ High modulus of elasticity. ▪ Outstanding fatigue resistance. ▪ Alkali resistant.

Technical Data

Packaging	Roll Thickness 1.2, 1.3, 1.4 and 2.5 mm (0.047, 0.051, 0.055 and 0.098 in) available in any length up to 250 m (820 ft)
Colour	Black
Shelf Life	Unlimited (no exposure to direct sunlight)

Properties at 23 °C (73 °F) and 50 % R.H.

Fiber Volumetric Content*	> 68 %	
Temp. Resistance	150 °C (302 °F)	
Sika® CarboDur®	Type S	Type M
Modulus of Elasticity*, GPa (psi)	165 (23.9 x 10 ⁶)	210 (30.5 x 10 ⁶)
Tensile Strength*, GPa (psi)	2.8 (40.6 x 10 ⁴)	2.4 (34.8 x 10 ⁴)
Elongation at Break*	> 1.7 %	> 1.35 %
Apparent Density, g/cm³ (lb/ft³)	1.5 (93.6)	1.6 (99.9)

*Mechanical value obtained from longitudinal direction of fibers.

Type	Width	Thickness	Cross Sectional Area
Sika® CarboDur® S, E-Modulus > 165 GPa (23.9 x 10⁶ psi)			
	mm (in)	mm (mils)	mm ² (in ²)
Sika® CarboDur® S1.525*	15 (0.59)	2.5 (100)	37.5 (0.058)
Sika® CarboDur® S2.025*	20 (0.79)	2.5 (100)	50 (0.077)
Sika® CarboDur® S512	50 (1.97)	1.2 (47.2)	60 (0.093)
Sika® CarboDur® S812	80 (3.15)	1.2 (47.2)	96 (0.149)
Sika® CarboDur® S1012	100 (3.94)	1.2 (47.2)	120 (0.186)
Sika® CarboDur® S1014*	100 (3.94)	1.4 (47.2)	140 (0.217)
Sika® CarboDur® S1214*	120 (4.72)	1.4 (55.1)	168 (0.260)
Sika® CarboDur® S1512	150 (5.91)	1.2 (47.2)	180 (0.279)

Sika® CarboDur® M, E-Modulus > 210 GPa (30.5 x 10 ⁶ psi)			
Sika® CarboDur® M614*	60 (2.36)	1.4 (55.1)	84 (0.130)
Sika® CarboDur® M914*	90 (3.54)	1.4 (55.1)	126 (0.195)
Sika® CarboDur® M1014*	100 (3.94)	1.4 (55.1)	140 (0.217)
Sika® CarboDur® M1214*	120 (4.72)	1.4 (55.1)	168 (0.260)

*Consult Sika Canada for product availability
Product properties are typically averages, obtained under laboratory conditions. Reasonable variations can be expected on-site due to local factors, including environment, preparation, application, curing and test methods.

HOW TO USE

Surface Preparation

Surface must be clean and sound. It may be dry or damp, but free of standing water. Remove dust, laitance, grease, curing compounds, impregnations, waxes, foreign particles, disintegrated materials, and other bond inhibiting materials from the surface. Existing uneven surfaces must be filled with an appropriate repair mortar (i.e. Sikadur®-30 with the addition of 1 part sand). The adhesive strength of the concrete must be verified after surface preparation by random pull off testing (ACI 503R) at the discretion of the engineer. Minimum tensile strength: 1.5 MPa (218 psi) with concrete substrate failure.

Planeness of substrate to be checked with a metal batten. Tolerance for 2 m (6.5 ft) length max. 10 mm (3/8 in), or 2.5 mm (3/32 in) for 50 cm (20 in) length respectively.

Concrete: Blast clean, shotblast or use other approved mechanical means to provide an open roughened texture.

Steel: Sandblast to white metal finish.

Timber: Plane, sand or grind. Remove all dust from the surface with an industrial vacuum cleaner.

CarboDur®: Surface should be wiped clean using an appropriate cleaner. Using a clean white cloth, wipe down the side receiving the adhesive (this side is not labeled) with acetone until all residual carbon dust is removed (i.e. white cloth remains white after wiping the laminate). In case where the design requires “stacking” of the strips, the bottom surface of the strip (labeled) should be lightly sanded (emery paper type 180) and wiped clean, prior to the second strip application.

Mixing

Consult Sikadur®-30 Product Data Sheet for information on epoxy resin.

Application

Apply the neat mixed Sikadur®-30 onto the concrete with a trowel or spatula to a nominal thickness of 1.5 mm (1/16 in). Apply the mixed Sikadur®-30 onto the CarboDur® laminate with a ‘roof-shaped’ spatula to a nominal thickness of 1.5 mm (1/16 in). Within the epoxy open time and depending on the temperature, place CarboDur® laminate onto the concrete surface. Using a hard rubber roller, press the laminate into the epoxy resin until the adhesive is force out on both sides. Remove excess adhesive. Glue line should not exceed 3 mm (1/8 in). The laminate must not be disturbed for a minimum of 24 hours. The epoxy will reach its design strength after 7 days.

Limitations

- Design calculations must be made and certified by an independent licensed professional engineer. Sika Canada cannot, and will not determine the locations, spacing and orientation of the CarboDur® System on the actual projects.
- Sika® CarboDur® has no plastic deformation reserve. Therefore, the maximum bending resistance of a strengthened section is reached when laminate failure occurs during steel yield and before concrete failure. The mode of failure is influenced by the laminate cross-section. To limit crack widths and deformation, the yield point should not be reached in the reinforcing bars in service conditions.
- Any shear crack must be prevented from causing displacement on the strengthened surface and shearing of the laminate. Stress and deformation calculations can be made by the normal methods. They should be verified in accordance with appropriate codes and standards.

Health and Safety Information

For information and advice on the safe handling, storage and disposal of chemical products, users should refer to the most recent SAFETY DATA SHEET containing physical, ecological, toxicological and other safety-related data.

KEEP OUT OF REACH OF CHILDREN
FOR INDUSTRIAL USE ONLY

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, within their shelflife. 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 recommendations, or from any other advice offered. The information contained herein does not relieve the user of the products from testing them for the intended application and purpose. 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 or may be downloaded from our website at: www.sika.ca

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