

S&P C-Laminate

Carbon fibre polymer plates for structural reinforcement



A Simpson Strong-Tie® Company

DESCRIPTION

S&P C-Laminate is a prefabricated (pultruded), carbon fibre reinforced polymer for structural reinforcement of structures made from concrete, masonry, steel or wood.

The S&P C-Laminate is bonded with epoxy resin (S&P Resin 220) to the substrate as an external support element. The S&P C-Laminate can be slot-applied when bonded and anchored with an epoxy adhesive (S&P Resin 220 or S&P Resin 55 HP) in milling cuts in the concrete substrate.

WHERE TO USE

- Increasing the load
 - Increase of life or traffic loads for slabs, beams and bridges
 - Change of use of buildings
 - Installation of heavier machinery and equipment in the industry
 - Stabilisation of vibrations and oscillations
- Modification of the support system due to
 - Distance from columns and walls
 - Creating cut-outs in slabs
 - Increasing resistance to earthquakes
 - Project or building mistakes
- Damage to structural parts due to
 - Corrosion of steel reinforcement (rebar loss)
 - Ageing of building materials
 - Damage to the structure due to fire, earthquake, impact, etc.
- Increase the usability
 - Reduction of crack widths
 - Reduction of the deflection
 - Reduction of steel tensile stresses
 - Reduction of fatigue

PERFORMANCE FEATURES

- Very high tensile strength
- Corrosion resistance
- Low deadweight and building height
- Any delivery length (no overlapping required)
- Easy application (also overhead)
- Excellent behaviour in fatigue
- Simple, flexible and economic gain technology
- Easy installation of laminates in intersections
- Very short loss of use of the building
- No noise and no vibration during installation

PRODUCT DATA

Generic description

S&P C-Laminate

Appearance

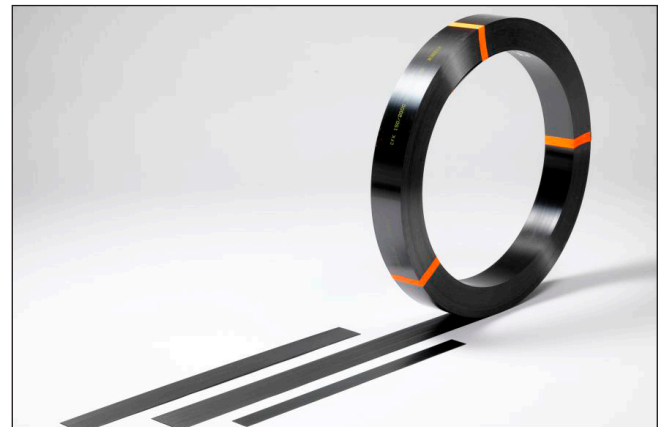
Black carbon fibre reinforced polymer (epoxy resin)

Size

Cut to size or 100/150 metre rolls
(from a width of 120 mm and a thickness of 2.5 mm:
roll length 100 m)

Storage

Store in a dry and safe place without direct sunlight at a maximum temperature of + 50 °C



Condition of the substrate

Before gluing the S&P C-Laminate, the flatness of the surface is to be checked with a metal bar. The maximum tolerance is 5 mm for a length of 2 m and 1 mm for a length of 30 cm. The temperature of the concrete ground should be at least 8 °C and at least 3 °C above the dew point.

The stability of the ground (concrete, masonry, natural stone) should be checked in each case. The tensile strength of the prepared concrete ground should be 2 N/mm² (minimum 1.5 N/mm²).

The concrete moisture must be < 4 % by weight.

Concrete and masonry

The ground must be load-bearing, dry, clean, and free of dust, loose particles, dirt, oil, grease and other separating substances.

The ground is prepared by suitable methods such as grinding, sand blasting or high pressure water jets (> 800 bar). Dust must be removed with a vacuum cleaner.

Concrete repairs and uneven places must be equalised with the re-profiling mortar S&P Resin 230. Whenever possible working 'wet-on-wet'. If this is not possible, the surface must be roughened before the application of the laminates to guarantee a good adhesion between the S&P Resin 230 and S&P Resin 220.

For near surface (slot-applied) application

With a special concrete milling machine, mill slots of about 5 – 8 mm width and 12–15 mm depth (for 10 mm wide S&P C-Laminate), 17–20 mm depth (for 15 mm wide S&P C-Laminate) or 22–25 mm depth (for 20 mm wide S&P C-Laminate) need to be cut into the concrete substrate. The slot must be dry, free of dust and loose particles, dirt and other separating substances.

Steel surfaces

Degrease and prepare steel surfaces in the standard-grade Sa 3.0 (according to EN 12944-4).

Immediately after the above preparation, the steel surfaces must be protected against corrosion or the S&P C-Laminate must be applied. During the entire construction process, the dew point may not be reached.

Wood surfaces

Prepare the substrate by grinding or planing. Dust must be removed with a vacuum cleaner.

Adhesive surface primed with S&P Resin 55 HP immediately before bonding of the S&P C-Laminate.

Preparation of the S&P C-Laminate

Shortly before the application of the S&P Resin 220, the contact surface of the laminate must be cleaned with a white rag moistened with S&P Cleaner. Wait until the surface is dry (> 5 minutes) before installation.



Application conditions/limits

Please see the product data sheet of the chosen epoxy resin adhesive for details regarding the substrate temperature, air temperature, humidity of the substrate and the dew point.

Application instructions

Please see the product data sheet of the chosen epoxy resin adhesive for details regarding the mixing and mixing time.

Handling

Arrange the S&P C-Laminate on a clean surface (workbench) and clean the unlabelled side with a white cloth and S&P Cleaner. Wait at least 5 minutes to let the surface completely dry. Using the S&P adhesive-forming unit apply the well mixed S&P Resin 220 onto the S&P C-Laminate in a 'roof' shape. The edges of the S&P C-Laminate need an adhesive thickness of approximately 1 mm and the centre approximately 3 mm.

The S&P C-Laminate should be fixed with light finger pressure onto the prepared substrate and then pressed with a special roller until the adhesive squeezes out on both sides of the S&P C-Laminate. The excess adhesive is wiped off and can't be reused. The adhesive layer thickness should be approximately 2 mm thick. Adhesive residue on the facing surface of the laminates should be removed before the adhesive is allowed to cure.

Thanks to the excellent resistance of the adhesive, no tools are required to support the S&P C-Laminate during the curing period.

At intersections of two or more S&P C-Laminate, the already applied S&P C-Laminate is to be cleaned with S&P Cleaner.

When gluing more than one S&P C-Laminate above one another, both sides must be completely clean.

After the curing of the S&P Resin 220, the bond is tested by gently tapping and listening out for hollow areas.

To test the adhesion of the S&P C-Laminate with the substrate, we recommend to stick one or more test S&P C-Laminate pieces and to conduct at least 3 pull-off tests (according to EN 1542).

Required bond tensile strength:

- Average > 2 N/mm²
- Minimum > 1.5 N/mm²
- 100% concrete failure

Near surface (slot-applied) application of S&P C-Laminate

The clean and dry slots are filled with the homogenous S&P Resin 220 mixture with a putty knife or gun. In horizontal slots, it is also possible to pour in S&P Resin 55 HP. One or two lengths of S&P C-Laminate are inserted into the slot. The excess adhesive is removed with a spatula, to ensure that an even surface is achieved.

APPLICATION



Surface applied S&P C-Laminate

| S&P C-Laminate type | Cross section | Tensile strength at 6 ‰ elongation | Tensile strength at 8 ‰ elongation |
|--|-----------------|---|---|
| SM * (150/2000) Modulus of elasticity: ≥ 170 kN/mm ² | mm ² | Theoretical tensile strength for the design: 1050 N/mm² | Theoretical tensile strength for the design: 1400 N/mm² |
| 50 / 1.2 | 60 | 63.0 kN | 84.0 kN |
| 50 / 1.4 | 70 | 73.5 kN | 98.0 kN |
| 60 / 1.4 | 84 | 88.2 kN | 117.6 kN |
| 80 / 1.2 | 96 | 100.8 kN | 134.4 kN |
| 80 / 1.4 | 112 | 117.6 kN | 156.8 kN |
| 90 / 1.4 | 126 | 132.3 kN | 176.4 kN |
| 100 / 1.2 | 120 | 126.0 kN | 168.0 kN |
| 100 / 1.4 | 140 | 147.0 kN | 196.0 kN |
| 120 / 1.2 | 144 | 151.2 kN | 201.6 kN |
| 120 / 1.4 | 168 | 176.4 kN | 235.2 kN |
| 150 / 1.2 | 180 | 189.0 kN | 252.0 kN |
| 150 / 1.4 | 210 | 220.5 kN | 294.0 kN |
| HM * (200/2000) Modulus of elasticity: ≥ 205 kN/mm ² | mm ² | Theoretical tensile strength for the design: 1250 N/mm² | Theoretical tensile strength for the design: 1650 N/mm² |
| 50 / 1.4 | 70 | 87.5 kN | 115.5 kN |
| 60 / 1.4 | 84 | 105.0 kN | 138.6 kN |
| 80 / 1.4 | 112 | 140.0 kN | 184.8 kN |
| 90 / 1.4 | 126 | 157.7 kN | 207.9 kN |
| 100 / 1.4 | 140 | 175.0 kN | 231.0 kN |
| 120 / 1.4 | 168 | 210.0 kN | 272.2 kN |

Near surface (slot-applied) S&P C-Laminate

| S&P C-Laminate type | Cross section | Tensile strength at 10 ‰ elongation |
|---|--------------------|---|
| SM * (150/2000) Modulus of elasticity: ≥ 170 kN/mm ² | [mm ²] | Theoretical tensile strength for the design: 1650 N/mm² |
| 10 / 1.4 | 14 | 23.1 kN |
| 10 / 2.8 | 28 | 46.2 kN |
| 15 / 2.5 | 38 | 61.9 kN |
| 20 / 1.4 | 28 | 46.2 kN |
| HM * (200/2000) Modulus of elasticity: ≥ 205 kN/mm ² | [mm ²] | Theoretical tensile strength for the design: 2050 N/mm² |
| 10 / 1.4 (upon request) | 14 | 28.7 kN |
| 20 / 1.4 | 28 | 57.4 kN |

General properties

| Mechanical/Physical property | Unit | SM * (150/2000) | HM * (200/2000) |
|------------------------------|--------------------|-----------------|-----------------|
| Density | g/cm ³ | 1.6 | 1.6 |
| Fibre volume content | % Vol. | > 68 | > 68 |
| Tensile strength | N/mm ² | ≥ 2800 | ≥ 2800 |
| Modulus of elasticity | kN/mm ² | ≥ 170 | ≥ 205 |
| Elongation at break | ‰ | > 16 | > 13.5 |

* SM = Standard modulus of elasticity / HM = High modulus

CONSUMPTION

| Surface applied method | |
|------------------------|-------------------|
| S&P C-Laminate type | S&P Resin 220 |
| 50 mm | Approx. 350 g/m |
| 60 mm | Approx. 450 g/m |
| 80 mm | Approx. 550 g/m |
| 90 mm | Approx. 650 g/m |
| 100 mm | Approx. 700 g/m |
| 120 mm | Approx. 850 g/m |
| 150 mm | Approx. 1.05 kg/m |

| Near surface (slot-applied) method | |
|------------------------------------|-----------------------|
| S&P C-Laminate type | S&P Resin 55 HP /220 |
| 10/1.4 or 10/2.8 | Approx. 80 / 120 g/m |
| 15/2.5 | Approx. 110 / 160 g/m |
| 20/1.4 | Approx. 130 / 200 g/m |

The material consumption depends on the flatness and roughness of the substrate and on the intersections when more than one S&P C-Laminate is used. Therefore, the actual consumption could vary.



TESTING

All technical data stated in this product data sheet are based on laboratory tests. Circumstances beyond our control may lead to deviations of actual values.

Please contact us if you require any information regarding tests that have been conducted. Test reports may be available.

CLEANING

Tool cleaning

Equipment should be cleaned immediately after use with S&P Cleaner. Material that has hardened can only be removed by mechanical means.

INDICATIONS

Reinforcing works should be carried out by well-trained and experienced specialists.

For the functionality of the S&P C-Laminate, any kind of damage must be avoided. In particular, the CFRP system must be protected against direct sunlight (UV).

During the application, the pot life of the epoxy resin must be observed.

When cutting an S&P C-Laminate, protective clothing, gloves, goggles and mouth protection is necessary.

After cleaning with S&P Cleaner, the S&P C-Laminate can be coated with a paint or coated with an adhesive bridge (S&P Resin 55 HP + quartz sand) for application of plaster.

S&P provides a special software for flexural and shear design of S&P CFRP systems.

For a detailed consultation, please contact our technical services.

S&P Cleaner

For cleaning and degreasing of the S&P C-Laminate prior to bonding, as well as cleaning of the tools.

S&P Press roller

For pressing of the S&P Laminate in 3 different widths (60, 90, 130 mm). Available piecewise.

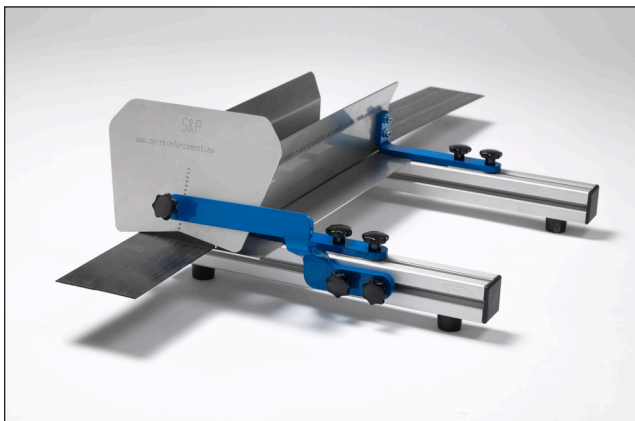
S&P Adhesive-forming unit

For a dosed and roof shape application of the adhesive on the S&P C-Laminate. Optimised adhesive required for all types!

S&P Roll dispenser

For controlled / safe rolling and cutting of the S&P C-Laminate on site. Adaptable for all types of S&P C-Laminate.

ACCESSORY PRODUCTS



FIRE PROTECTION

If necessary, the S&P C-Laminate can be protected with fire protection plates. Depending on the requirements of the fire resistance, there are various alternative solutions. Please contact our technical services.

HEALTH & SAFETY

Important safety instructions

For detailed safety information, we recommend that you see the current safety data sheet which is available on www.sp-reinforcement.eu or you can contact us on +41 41 825 00 70.

S&P's range of products are for industrial use. They must be installed by specialised personnel and competent professionals with adequate training. The installation instructions must be followed and can be found in S&P application manuals and several "Guideline" documents / existing technical notes.

The information in this technical data sheet is valid for products delivered by S&P Clever Reinforcement Company AG, Switzerland. Please note that the information in other countries may differ, and always use the local product data sheet in each respective country. The information and data in this technical data sheet serve to ensure the normal intended use and normal application suitability; the information and data are based on our knowledge and experience. They do not absolve the user from their own responsibility to check the suitability and application method.

The rights to make changes to product specifications are reserved. Furthermore, our general sales and delivery terms apply. The current, most recent product data sheet is valid, and should be requested from us.

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