



A Simpson Strong-Tie® Company

S&P C-Laminate



Quality built into the very fibre of everything we design, test and manufacture.

“Quality is built into the very fibre of everything we design, test and manufacture.”

In the absence of a harmonised European standard for the use of carbon fibre polymers in concrete reinforcement applications, we choose to set the most rigorous standard for ourselves.

Premium quality material, thoughtful design, meticulous testing and class-leading manufacturing processes ensure that quality is built into the very fibre of everything we design, test and manufacture.





Our production facility at Elvas in Portugal, began producing carbon fibre laminates in 2009. Since then our fibre laminate has been used to reinforce numerous structures including the Maracanã Stadium in Rio de Janeiro, the Vasco da Gama bridge in Lisbon and the Deutsche Bank Headquarters in Frankfurt am Main.

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

These products are manufactured to the highest quality standards and are available in a standard modulus (SM) and high modulus (HM). These two different types of laminates possess different E-Modulus and elongation break. Depending on the application, S&P offer several standard widths and thicknesses.

Part of the Simpson Strong-Tie Family

In 2012 S&P was acquired by Simpson Strong-Tie® (SST), one of the worlds leading manufacturers of construction solutions, with regional manufacturing and distribution centres. Each location operates under the same Quality Management System and is supported by documented processes and procedures, addressing their unique operations and needs.

Together, SST and S&P strive to help people design and build better, safer structures.

Call us at **+41 41 825 00 70**
or visit sp-reinforcement.eu.

Manufacturing Quality

All our products are designed and tested to meet standards. Through our manufacturing and quality processes, we are committed to delivering structural systems solutions that are reliable, cost-effective and easy-to-install.

Our products:

- Meet their stated specifications.
- Are tested to recognised standards representing their intended application.
- Are consistent in appearance, dimension, and performance; any inconsistencies in product quality are immediately researched and appropriately addressed.

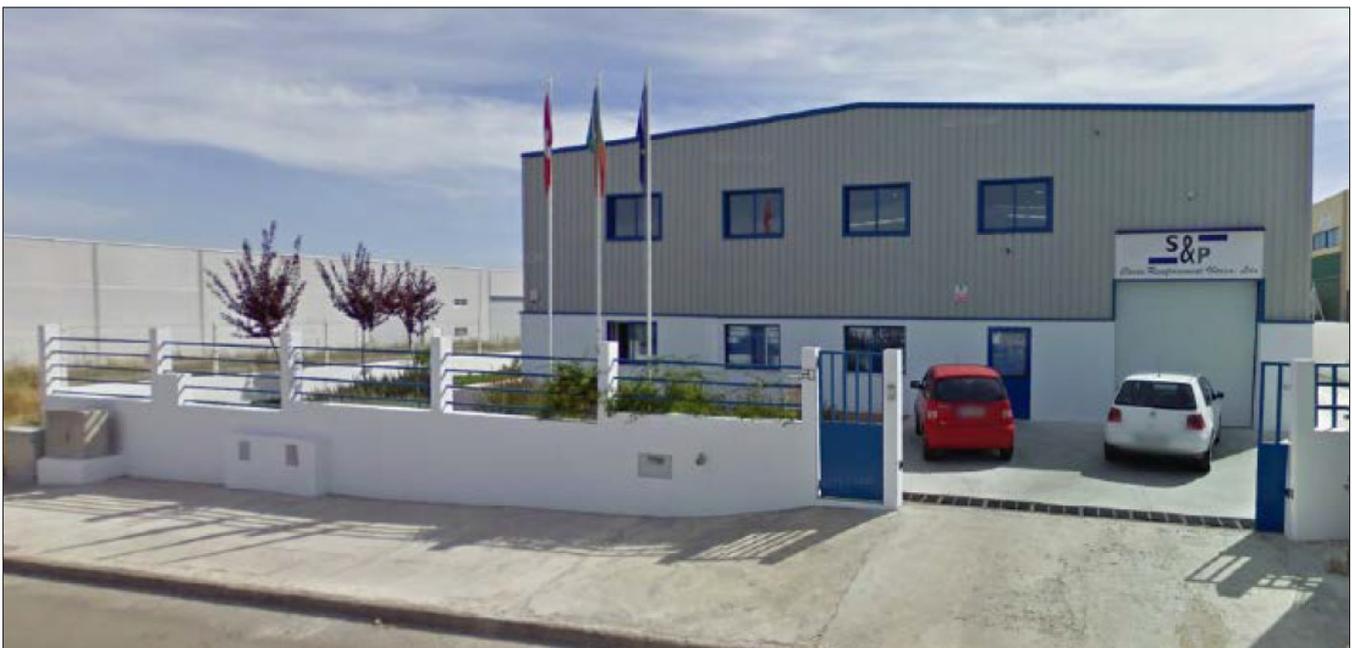
We ensure that anything with our name on it reflects our quality standards.



The S&P Clever Reinforcement Ibérica factory is one of the ISO 9001 certified companies.

The quality management standard EN ISO 9001 is the most widespread and most important standard in quality management both nationally and internationally. It forms the basis for the continuous improvement process of the company's internal quality management system. We thus fulfill the tested process and quality standards on which you as our customer can always rely.

As a certified manufacturing plant, each single batch is constantly subjected to rigorous testing carried out at our integrated laboratories. This is part of our commitment to continuous improvement and quality. The results can be seen not only in our products but also in the satisfaction of our customers.

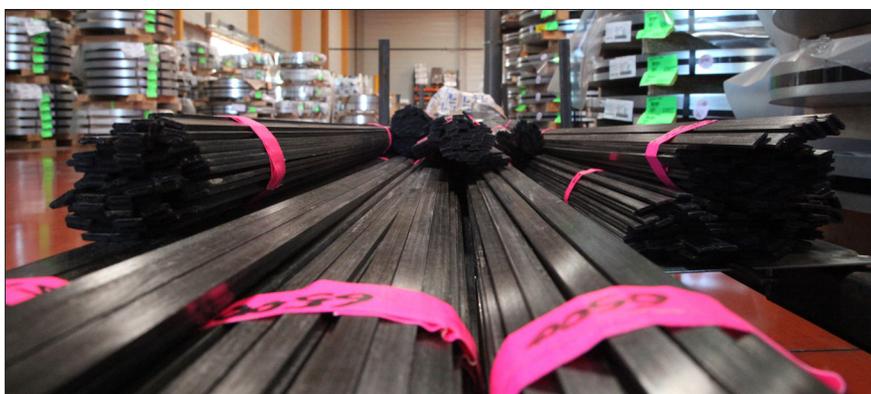


Purpose-built laminate production facility at Elvas in Portugal.

Premium Materials

We use high-quality raw materials such as carbon fibres and resin components to manufacture these products. They are sourced from reliable suppliers in markets based in Asia and Europe. We ensure that the raw materials we use are fully documented so that we can trace them directly back to their suppliers and sources.

This is how we ensure that the quality standards of our range are at least equivalent to international quality norms and standards. In addition, we take environmental, health and energy management very seriously, ensuring that our production complies with all international guidelines.



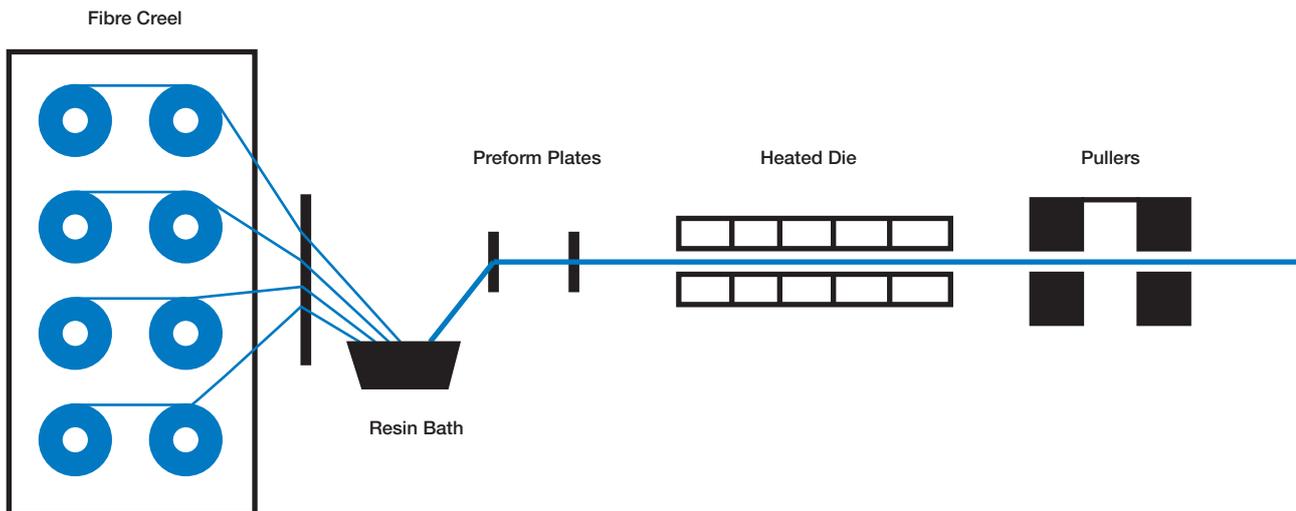
We take pride in exceeding our customers' expectations and we guarantee that everything we make complies with the most rigorous international guidelines and specifications. Several internal and external audits performed at the manufacturing branch every year.



Pultrusion Production - The Choice for Quality

Uni-directional laminates are manufactured via a pultrusion method. Pultrusion is a continuous moulding process whereby reinforcing carbon fibers are saturate with a liquid polymer resin and then carefully formed and pulled through a heated die to form the required shape and cross section.

Pultrusion is a process that enables continuous production of composite profiles with constant cross sections and material properties tailored to specific purposes.



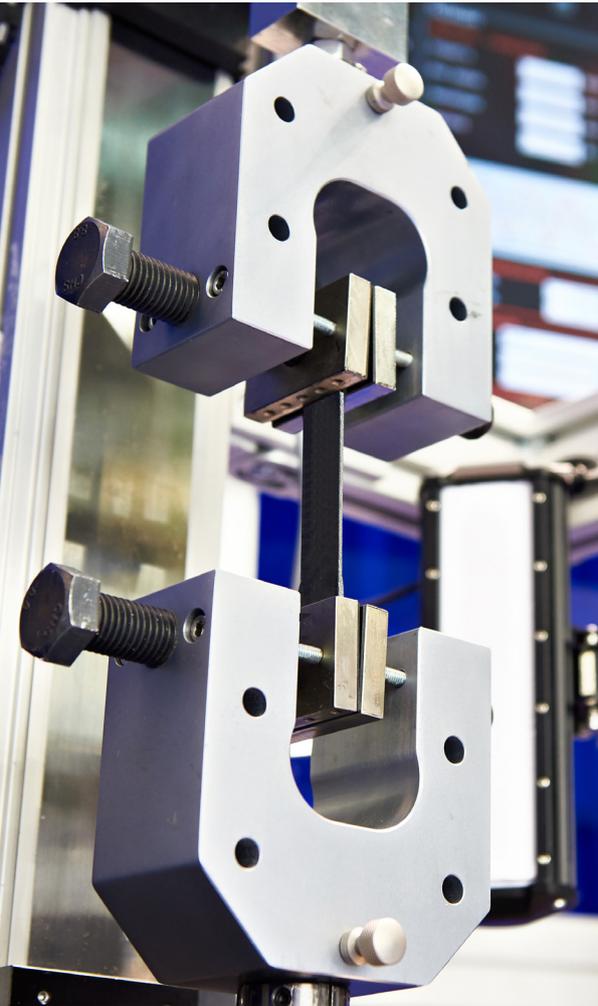
Pultrusion process (left to right).

“... the only method that can guarantee an industrial quality production and a high % of fibre in the cross-section”

S&P decided to produce S&P C-Laminate by pultrusion because it is the only method that can guarantee an industrial quality production and a high percentage (> 68%) of fibre into the cross section. In addition, it also give a high glass temperature (T_g) of the S&P C-Laminates polymer matrix due to the fact that being produced at high temperatures gives a high glass transition temperature to the produced composite laminates matrix.

Internal Quality Test

Currently there is no CE mark on our S&P C-Laminate because there is not a harmonised norm for those specific materials. No CE mark does not mean no quality control at all; there are testing procedures for those materials place. We possess an in-house testing laboratory, where the quality controllers take extreme measures to stringently test the products on the basis of various parameters before getting them delivered.



© S&P | FR-FRP-QUALITY-EU 2020

The characteristics are controlled via factory and laboratory quality tests an S&P quality control process described below. The whole production process is controlled by 29 calibrated measure instruments, which are certificated and calibrated on an annually basis by external organism like ISQ, TAP, Zwick etc.

Since the start of production, a sample of each individual C-Laminate produced and the associated test results have been stored in an archive.

Every single component used for the production process is recorded in a product register. This means that based on the unique batch number it is always possible for us to track back each single used raw material down to the selected supplier.

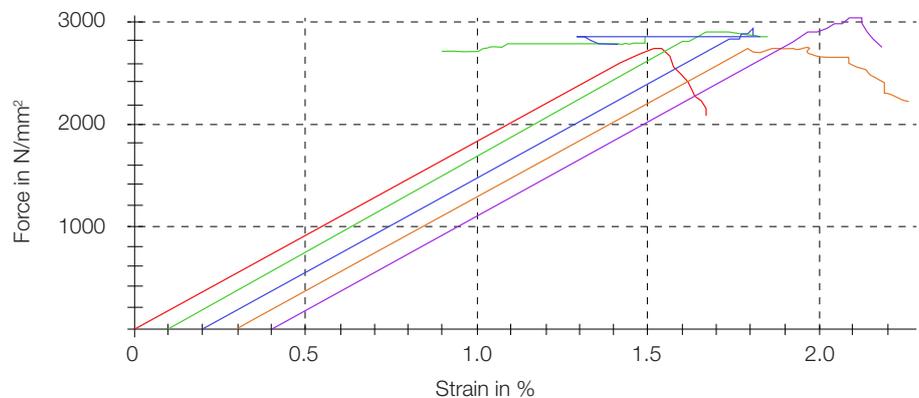
Tensile Tests: E-Modulus and Elongation Break

For the determination of tensile properties of our S&P C-Laminate, we test them according to the test method ISO 527. We precisely use the two below parts of the ISO 527 norm:

- ISO 527-1:2012 specifies the general principles for determining the tensile properties of plastics and plastic composites under defined conditions. Several different types of test specimen are defined to suit different types of material, which are detailed in subsequent parts of ISO 527.
- ISO 527-5:2009 specifies the test conditions for the determination of the tensile properties of unidirectional fibre-reinforced plastic composites, based upon the general principles given in ISO 527-1. The test method is suitable for all polymer matrix systems reinforced with unidirectional fibres and which meet the requirements, including failure mode, set out in ISO 527-5. The method is suitable for composites with either thermoplastic or thermosetting matrices. The reinforcements covered include carbon fibres, glass fibres, aramid fibres and other similar fibres.

We check the modulus of elasticity and the tensile strength at break at the beginning of each production batch.

Additional E-modulus control tests are performed and documented approximately every 600 ml (depending on the roll length).



Dimension of the C-Laminate

The dimensions are controlled by the roll inspection process with a digital pachometer with a criteria of acceptance of $\pm 5\%$.

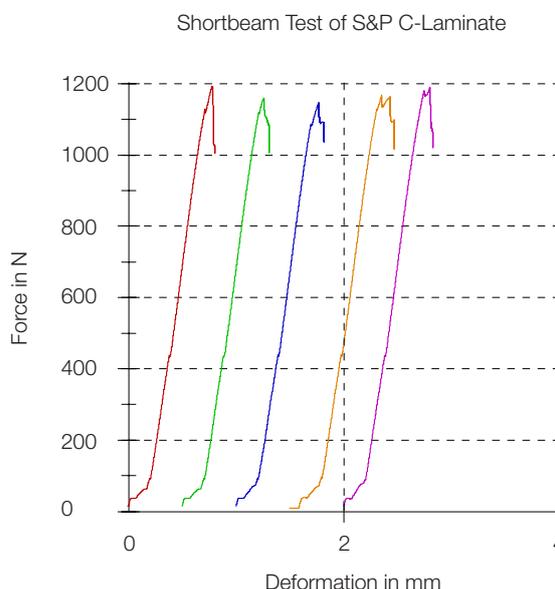
Interlaminar Shear Strength

The ISO 14130 is a testing standard designed to measure the apparent interlaminar shear strength of fibre-reinforced plastic composites with a thermoset or a thermoplastic matrix by the short-beam method.

Although the quality of the laminate in the cross direction has no direct influence on the effective quality of the reinforcement, S&P has decided to check it in order to guarantee the quality on the construction site.

A good resistance in the cross direction allows a good application on the jobsite and avoid laminate break in the longitudinal direction.

We check the interlaminar shear strength at the beginning of each production batch.



Glass Transition Temperature (Tg)

The Glass Transition Temperature (Tg) is one of the most important properties of any polymer and is the temperature region where the polymer transitions from a hard, glassy material to a soft, rubbery material. As polymers are thermosetting materials and chemically cross-link during the curing process, the final cured polymer material does not melt or reflow when heated (unlike thermoplastic materials), but undergoes a slight softening (phase change) at elevated temperatures. We check the S&P C-Laminate Transition Glass temperature at the beginning of each production batch.

Traceability of C-Laminate

Every single raw material has a batch number and together with the internal manufacturing number, we are able to track back each single product used for production of S&P C-Laminate.

After the quality inspection, each roll is marked with a product label outside and inside the roll. In addition, the type number of the S&P C-laminate is stamped along the entire length of the roll during ongoing production at intervals of approx. 4 metres.





A Simpson Strong-Tie® Company



Since 2012, S&P has been a part of Simpson Strong-Tie®, a world wide organisation committed to helping people design and build better, safer structures.

We look forward to working with you on your next project.

Contact us: +41 41 825 00 70 www.sp-reinforcement.eu

S&P Clever Reinforcement Company AG
Seewernstrasse 127, CH-6423 Seewen

