MasterStrength LAM

Pultruded Carbon Fibre laminate for structural strengthening and Retrofitting Applications

Material Description

MasterStrength LAM is a ready to use pultruded, carbon fibre laminate, normally externally bonded to structures, to provide additional load bearing capacity. It provides a lightweight, high tensile strength material (higher than steel reinforcement used in the concrete industry) and is largely utilised for additional flexural reinforcement (ie plate bonding) of concrete and timber members, as part of the MasterStrength LAM system. MasterStrength LAM system is in compliance with AS 5100.8: 2017 .

Areas of Application

To add strength and reinforce structures with material that has a high tensile capacity, MasterStrength LAM enables the traditional technique of plating (with steel plates) to be replaced with extremely light materials, that are far easier to install, and to:

- Increase the flexural capacity of beams and slabs
- Increase the general load-bearing capacity (e.g. structural conversion following an increase in loading conditions)
- Help reduce deflection of the overall structural element (increase in rigidity)
- Help increase the fatigue strength (reduced maintenance)
- Help to increase the crack resistance of a structure (increase in durability)

Characteristics and Benefits

- Fast and easy installation - reducing overall installation cost of strengthening.
- Durable - non-corroding even if in contact with moisture.
- Thin section compared to traditional methods - low profile (thickness) does not impact on architectural aesthetics or reduce useable space.
- Simple design - enables the amount of reinforcement to be calculated in relation to the performance required or the flow of stress.
- Customisable - a range of sizes and grades available to optimize design requirements and suitable for near surface mounting in grooves.
- Laminates are supplied either with a protective peel-ply to both faces or as One sided- reducing preparation costs, whilst delivering better adhesion to the substrate and to any subsequent coatings.

Properties

Performance Properties	AS5100.8 A2.2.1 CLS (1/2)	MasterStrength LAM- 2 sided peel ply	MasterStrength LAM- one sided peel ply
Tensile Strength	2800	Mean 3100 Min 2800	Min 3100
Tensile Modulus	160	Mean 170GPa Min 163GPa	Min 165GPa
Ultimate Elongation (at break)	1.6%	Mean 1.9% Min 1.6%	Mean 2.1% Min. 1.6%
Volumetric fibre fraction	68%	68%±3	68-72
Glass transition Temperature	70°C	>80°C	>80°C

Dimensions

MasterStrength LAM [width/ thickness] CLS (1P: one siede)	Width (mm)	Thickness (mm)
CFRP High Strength ilaminates in typical width and thicknesses	50-150	1.4
Surface Mounted laminate	120	2.8
Near Surface Mounted laminate	15	2.5

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MasterStrength LAM [width/ thickness] CLS (1P: one siede)	Width (mm)	Thickness (mm)
CFRP high Modules laminates	80,100, 120,150	1.4

Note:
Other widths and thicknesses are available as made to order and subject to minimum order quantity.
Surface Mounted system at denser thickness offering reduced installation time and labour costs.
Near Surface Mounted installation in saw cuts.
High Modulus laminates type CLM (1&2) are available in various widths subject to minimum order quantity, and made to order.

Application

For detailed instructions, refer to the "Fibre Reinforced Polymer Composite Strengthening MasterStrength systems" document.

To ensure maximum adhesion, apply one coat of **MasterStrength PRI 3500** at a coverage of 6m^2/L by roller or brush.
If necessary, apply a coat of **MasterStrength 4000** or **MasterStrength1444** using a putty knife, to fill any blow holes or imperfections to the concrete or timber surfaces.
Remove the protective peel-ply film from one surface of **MasterStrength LAM** to be adhered. If the type of Laminate being used does not have a peel-ply surface, then wipe clean the Laminate surface with a suitable solvent (MEK or Acetone).
Apply one layer of **MasterStrength 4000** 1 – 1.5 mm thick on both the surfaces (concrete and Laminate). Apply Adhesive on the Laminate so that it is a minimum of 1 mm thick at each side, and 2 mm thick at the centre by using an appropriately shaped spatula.
Apply **MasterStrength LAM** and using the correct hard roller, exert a constant pressure by moving the tool backward and forward, in the direction of the fibres, along the centre-line of the laminate. Expel any excess **MasterStrength 4000** (and air) from under the Laminate, leaving a nominal 1-3 mm layer of adhesive.
Clean up the surfaces of the Laminate, taking care not to move the bonded material.

Packaging

All MasterStrength Laminate that are delivered in rolls, are provided with plastic straps. Unrolling should be completed by at least 2 persons.

Shelf life

MasterStrength LAM has a shelf life of 36 months and requires protection against heat, sun and weather.
They must be stored on a solid, flat and dry surface, inside a ventilated shelter. If stored in the open, protect with opaque waterproof covers.
Rolls must be stored only in the horizontal position.

Watchpoints - Design & Installation

Design and detailed specification should be carried out by appropriately qualified and competent person(s).
In the case of outdoor applications, the work must be protected from rain, sand, dust, etc. by using protective sheeting and other barriers until fully cured. The curing rate of the adhered FRP is temperature dependent.
If there is to be a top-coat application of a UV-stable acrylic paint (MasterShield AC 150/160).

Engineered Specification Clause

Utilise peel ply pultruded carbon fiber reinforced polymer (CFRP) laminates, complying in accordance to AS 5100.8: 2017 table A2.2.1, characterised as follows:

Type CLS (1&2) where tensile strength is the dominant required property;
Type CML (1&2) where tensile modulus is the dominant required property;

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These CFRP laminates are to be strategically integrated to augment load-bearing capacity and confer supplementary flexural reinforcement unto concrete and timber constituents.

For Exter applications and Surfaces exposed to U.V. rays should be protected within two days (maximum seven days) with a selected UV resistance product, in order to ensure perfect bonding between the protective layer and CFRP.

Illustrative Annotations on Engineering Drawings:
To facilitate clear communication and correct execution on engineering drawings. For example:

MasterStrength LAM 120/1.4 CLS
@ intervals of 300 centers every 6 meters
UV resistance coating for external areas : MasterShield AC 150/160

Installation should only be carried out by trained and experienced specialist contractors. Site quality control (including tensile bond testing), should be the responsibility of an independent organisation appointed by the client or his representatives.
Technical details of adhesives, primers and coatings can be found on the technical data sheets of the respective products.

Disclaimer

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