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TMAC

THEW & McCANN GROUP

TMAC® TMAC COMPOSITE CROSS ARM

PRODUCT BRIEF

SINCE 1949

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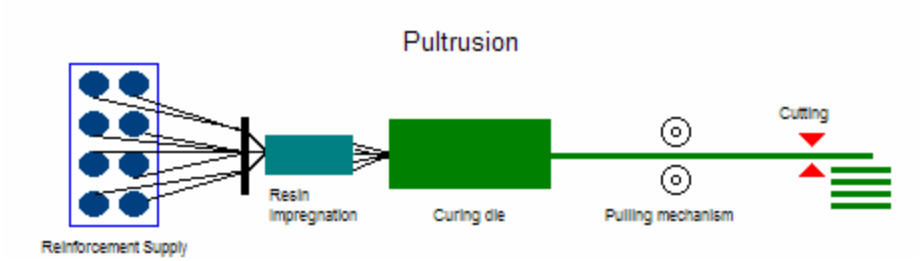
BACKGROUND – THE PULTRUSION PROCESS

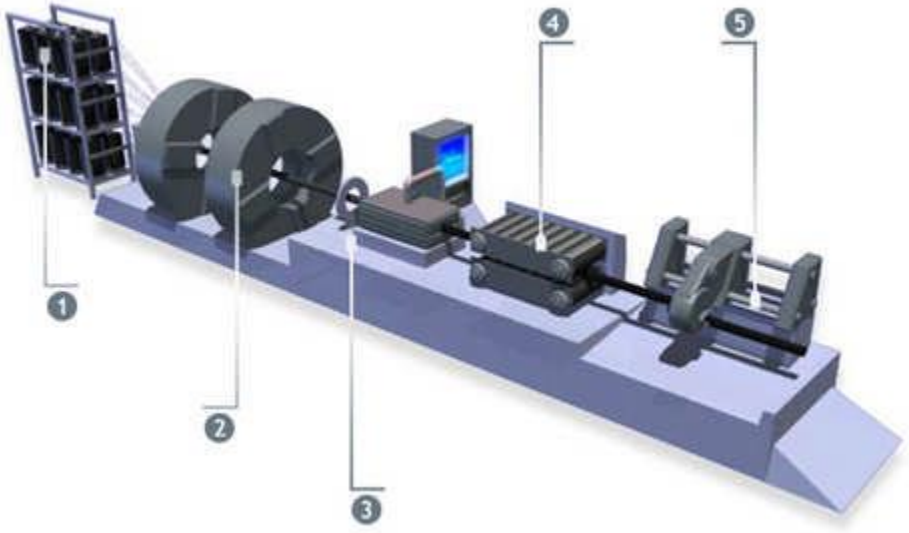
Pultrusion is a process for producing full or hollow shapes by continuous method where the Fibre is impregnated in resin.

Fibre impregnation options are:-

- Open Resin Bath rim
- Reaction Injection Moulding Pultrusion

With an Open Resin Bath the Fibre is pulled by rods that are placed in the resin bath where the impregnation is accomplished by guiding the Fibre strands into a bath through holes.
The RIM method lets the reinforcement become impregnated by the resin in a cavity in which the reinforcement is pulled through. After the impregnation, the material is pulled through a heated die to produce its final shape.





1. Reinforcement
2. Winding unit
3. Pultrusion unit
4. Pulling unit
5. Sawing unit

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MAIN FEATURES OF THE TMAC COMPOSITE FIBRE CROSS ARM

The **TMAC** Composite Fibre Cross Arms are intended as replacement for existing Hardwood Cross Arms in service and as the standard product for all new installations. The **TMAC** composite fiber Cross Arms can be used in urban and rural areas on the LV Network as well as 11kV, 22 kV, 33 kV and sub-transmission lines.
The **TMAC** Composite Fibre Cross Arms are compatible and interchangeable with current Cross Arms and applicable hardware can be screwed and/or bolted just as the existing Arms are. They are supplied pre-drilled with lengths to suit Utility providers as a finished item ready for installation.

The cross sections match the typical sections already in service and are suitable for use with all standard hardware and fittings.

- **More than 40 Years life expectancy**
- **Fire and corrosion resistant for harsh environments**
- **UV Resistant coating and UV inhibitors in profile**
- **Foam Filled**
- **Lightweight for easy installation and handling**
- **Ultimate load >17.5 kNm bending force**
- **Bolted Connections crush resistant to >140 Nm**
- **Water based touch-up kit for coating repairs**

SIZES AND DIMENSIONS AVAILABLE

TMAC Composite Fibre Cross Arms are supplied in accordance with the standard specifications for the drill holes but can be customised to customers' specifications.

APPLICABLE STANDARDS

The **TMAC** Composite Fibre Cross Arms supplied by Thew & McCann comply with the relevant sections of the following Standards and amendments.

STANDARD	TITLE
Eurocomp Design Code and Handbook	Structural Design of Polymer Composites
AS/NZS 7000	Overhead Line Design – Detailed Procedures.
AS 1931.1:1996	High-voltage test techniques Part 1: General definitions and test requirements
AS 1931.2:1996	High-voltage test techniques – Part 2: Measuring systems
AS/NZS 4676:2000	Structural design requirements for utility service poles
IEC 60721.2.1:2002	Classification of environmental conditions Part 2-1: Environmental conditions appearing in nature Temperature and humidity
JIS K 7015:1998	Pultruded Fibre reinforced plastics
ENA DOC 011-2006	Pole Supply and Performance Specification
ENA DOC 012-2006	Cross-Arm Supply and Performance Specification
ISO 9001	Quality management systems - Requirements

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ENVIRONMENTAL CONDITIONS

The **TMAC** Composite Fibre Cross Arms supplied under this specification is designed to be used in a hostile outdoor environment with the following anticipated characteristics:

CONDITION	ENVIRONMENTAL EXTREMES
Ambient Temperatures	50 deg. C Summer daytime / -15 deg. C Winter night time
Solar Radiation Level	1100 W/m^2 with high ultraviolet content
Precipitation	Annual rainfall range 0 – 2400mm
Humidity	Relative humidity from 10% to 100%
Pollution	Areas of coastal salt spray and/or industrial pollution
Isokeraunic level	Maximum of 60 thunder storm days per year.

TMAC Composite Cross Arms contribute to preservation of the ecology by reducing or eliminating the demand of Australian Hardwood Timbers

DESIGN AND CONSTRUCTION

DESIGN

The **TMAC** Composite Fibre Cross Arms are square hollow sections in 100 x 100 mm sizes. The external corners of the cross sections have a minimum radius of 6mm.

DESIGN LIFE

The design life is at least 40 years, in order to meet Durability Class 1 as specified in AS 1720.2 : 1990, clause 4.17. The statutory warranty period of the Cross Arm is 2 years

The end-of-life strategy for these products includes options to reuse or recycle, with disposal being the least attractive option.

MATERIALS FOR HOLLOW SECTION

The material is fiber reinforced polymer using E glass and the Cross Arms are manufactured using the pultrusion process. Boron free ECR Fibreglass (Electronic corrosion resistant glass) is used due to its acid resistance and high temperature resistance properties.

A thermosetting resin binder is used for manufacturing this product which includes epoxies, vinyl esters, polyurethane and phenolic. ***Thermoplastic resins are not used in the TMAC Composite Cross Arm***.

The resin contains additives that act as a flame retardant and provide low shrinkage. All adhesives, coatings and mechanical fastening systems are selected to ensure adequate performance for the entire service life of the Cross Arm.

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SURFACE TREATMENT

The external surfaces of the Cross Arm are protected with a special coating designed to reduce tracking and provide a high resistance to UV effects. Should the coating be scratched, a water based touch-up kit is used to repair the damaged surface

END CAPPING

TMAC Composite Fibre Cross Arms are supplied as a finished product with Nylon moulded end caps at both ends which are impact resistant, permanently secured and will not degrade during the service life of the Cross Arm.

BOLT HOLES FOR CROSSARM, POLE MOUNTED PLANT AND EYE BOLTS

The Cross Arms are pre drilled to accommodate loads at points of Conductor support, King bolt and Arm brace according to the requirements of drawings supplied by the end user. The Cross Arm supports barring loads at the bolt hole locations, commensurate with bending moment capacity and length of the Cross Arm.

Crush proof fibreglass inserts at bolt locations prevent Cross Arm crushing deformation due to the crushing forces exerted from bolt tightening with a rattle-gun.

TOLERANCES

According to JIS K 7015:1998, the following tolerances apply for a Pultruded Glass Reinforced Plastic with and the TMAC Cross Arm exceeding this standard:-

Type of tolerance observed	Tolerance value
Dimensional of external form	± 2.5 mm (max.)
Degree of flatness	0.8 mm or less
Degree of squareness	± 2.0 degrees
Degree of curve	4.5 mm or less (L=2700mm) 3.5 mm or less (L=2100mm)

UV PROTECTION

The **TMAC** Composite Fibre Cross Arms have UV inhibitors in the resin and Fibres plus a UV resistant coating material which is capable of remaining intact for a minimum period of 40 years (service life) under the service conditions encountered Australia Wide

STRENGTH

The **TMAC** Composite Fibre Cross Arms offer mechanical strength properties with regard to transverse, longitudinal, vertical and bearing at the king bolt at least equal to F17 hardwood Cross Arm assessed in accordance with AS 1720.1 : 1997 in section sizes of 100x100 mm.
Where the loads are defined as follows:

- Transverse The horizontal side load resulting from wind on the wires and/or deviation angles.
- Longitudinal The tension in each wire in the direction of the wire.
- Vertical The vertical load as a result of the weight of the wire.

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- King Bolt Load The resultant load at the King Bolt due to the combined forces on each of the wires.

ELECTRICAL PROPERTIES

The Cross Arms are designated as being “electrically insulating” and meet the following minimum conditions, in accordance with ENA Power Poles Committee Specification Clause 4.3.

ELECTRICAL RESISTANCE

Minimum electrical resistance of 1 x 10 ^ 5 ohms per metre.

BASIC INSULATION LEVEL (BIL)

Minimum impulse flashover strength of 300 kV/m under wet and dry conditions.

COLOUR OF SURFACE MATERIAL

The colour of the surface material is grey.

IDENTIFICATION AND MARKING

The Cross Arms are supplied with **TMAC** branding stencilled on the front and back surfaces. The batch identification and customer code can be stencilled on the Cross Arm also.

PERFORMANCE

RESISTANCE TO CORROSION

The pultrusion process uses materials that provide the best corrosion performance in both acidic and alkaline environments. The chemical composition of the Cross Arm is designed to cope with typical atmospheric conditions prevalent in Australia.

FIRE PERFORMANCE

The Cross Arms have excellent resistance to both bushfires and pole top fires.
Tests conducted on Fibreglass Cross Arms to compare fire performance with untreated durability class 2 hardwood Cross Arms as per ASTM E84 and ASTM D635 show results that indicate the time taken by composite Cross Arms to ignite is comparable to hardwood timber and the burning rate.

Composite materials do not sustain a flame when the heat source is removed.

The TMAC Cross Arms have ASTM E84 and ASTM D635 certification as per MSDS.

RESISTANCE TO POWER ARCS

Cross Arms are resistant to lightning and power arcs and do not suffer any decrease in their mechanical or electrical strength when subjected to lightning and power arcs.

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DEFLECTION & BENDING MOMENT CAPACITY OF CROSS ARM

The information below shows the tested bending load vs. deflection performance of the TMAC Composite Fibre Cross Arms with a bending moment > 17.46 kN-M

ACCELERATED AGEING TEST

The **TMAC** Composite Fibre Cross Arms have been tested for exposure to intense UV radiation and moisture condensation and do not show degradation in strength, modulus, and deflection to failure as well as no visible changes.

The Cross Arm's have been tested in a QUV accelerated weather meter in compliance with ASTM G 154-07 for a minimum of **5122** hours.

The QUV accelerated weather meter, subjects the samples to 8 hrs of extremely intense UV exposure at a temperature of 60° C, followed by a water spray cycle of 0.25 hrs followed by a condensation cycle of 3.75hrs at 50°C.

QUALITY ASSURANCE

The **TMAC** Composite Fibre Cross Arms are manufactured under a quality system conforming to ISO 9001:2008.

Documentary evidence for Quality System Certification associated with the manufacturing can be provided on request.

PACKAGING AND MARKING

Composite Cross Arms are supplied in packaged condition similar to wood Cross Arms. Extreme care is taken to ensure the surface coating is not scratched or damaged during packing, transport and storage. Plastic straps with protective packing are used for securing the bundles.

TESTING RESULTS

All tests including, Electrical – Power Arc, Lightning Impulse, Glow Wire Test, UV Aging Test and a full raft of mechanical tests for Intermediate, Strain and Termination configurations has surpassed all the testing to date.

TMAC is committed to continually developing the Cross Arm to meet and exceed customers' specifications.

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