



FIBERGLASS FABRIC

Fiberglass Fabric is precisely what the name says... fibers of glass. Fine fibers are spun from molten glass, gathered into yarn, and woven into a strong, pliable glass fabric. Fiberglass Fabric can be folded, rolled, or draped, like any other loosely woven fabric, and is chemically transformed into solid sheets of tremendous strength by the addition of polyester or epoxy resins. In fact, it is the Fiberglass Fabric, which produces the strength, not the resin.

'Glass' is used because it will not rot, rust, or corrode. Its fine fibers absorb resin. All TAP fiberglass fabrics are especially suited for glassing boats, laminating decks, lining tanks, and all applications requiring maximum resistance to moisture, impact, and abrasion. All are Volan-treated for maximum strength and ease of 'wetting out' (saturating). They feature a weave tight explicitly mentioned; otherwise, the fabrics below are made of "E" glass, by far the most plentiful glass used and the most economical.

FIBERGLASS CLOTH

DECK CLOTH: (1522) is another lightweight cloth, weighing 3.74 ounces per square yard. Deck Cloth is used when you want the natural wood surface to show and desire the durability of a fiberglass-reinforced surface. The weave of this lightweight cloth is easy to conceal (becomes transparent), so the wood surface's true beauty stands out. Sometimes, when sanding resin and fabric, the cloth is 'bruised,' sanded into, causing the weave to show. (Before applying the next coat or resin, wipe the 'bruised' area with styrene, and the pattern weave should disappear.)

"C" CLOTH (7533) is another lightweight cloth, and like Deck Cloth, it is well concealed when coated with TAP resins. This cloth is often used for decks, cabins, and other areas where a strong waterproof coating is desired. Excellent for low-powered boats or small sailing craft. "C" Cloth weighs approximately 6 ounces per square yard.

"D" CLOTH (7532) is a medium weight cloth used in areas where some structural strength and reduced weight are required. "D" Cloth is an open weave fabric and drapes well, conforming best to compound curves. "D" Cloth weighs approximately 7-1/2 ounces per square yard.

"A" CLOTH (7520) is a standard weight cloth commonly used on boats over 12 feet long or boats powered by more than a 15 HP motor. "A" Cloth is used in areas requiring maximum structural strength, such as walking areas on deck. "A" Cloth weighs approximately 9 ounces per square yard.

"H" CLOTH is a super heavyweight cloth used for construction where high strength and fast build-up are required...such as in building a canoe or kayak...wherever a high strength-to-weight ratio is essential. "H" Cloth weighs approximately 19 ounces per square yard.

STYLE 7725 - Modified Twill Weave This medium weight (8.9 oz) cloth uses a weave that is not the over and under a pattern of the plain weave cloths above. Each strand floats over two or more other strands and then goes under, creating a much more flexible fabric and readily conforming to compound curves.

WOVEN ROVING

“**ROVING**” is a course, open-weave, heavy fabric, woven similar to cloth. Roving gives high strength at a lower cost than a cloth laminate of equal thickness. Roving should not be used in areas where a smooth surface is desired because of its bold weave. Roving is more difficult to wet out than cloth or mat. Roving is often used in boat building and alternate layers of mat to build thickness rapidly and avoid a ‘resin-rich’ laminate. The opposite would be ‘resin starved’ areas.

TAP sells one weight of Woven Roving (and, like cloth, the weight is based on a square yard of material) -18.5 ounces per square yard.

FIBERGLASS MAT

FIBERGLASS MAT is a reinforcing material made of loose glass fibers pressed together and held with a binder that is soluble in resin. Mat works well in conjunction with Cloth or Roving. Mat is used between Cloth or Roving layers to increase the bond strength between the layers and when the thickness is required. Mat is not as durable as Cloth or Roving of equal weight.

Mat can be easily molded into complex shapes when it is wet out with resin, so it is often used for laying up unusually shaped objects and compound curves. The ‘binder’ used to hold the mat together does not dissolve in epoxy; therefore, polyester is recommended when using mat.

Mat Roller’s use dramatically improves the appearance and strength of a mat’ lay-up’ by eliminating excess resin and air pockets.

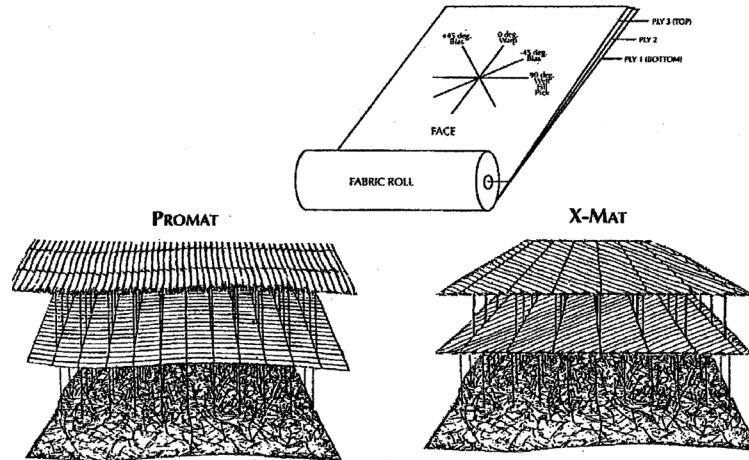
TAP Fiberglass Mat is available in three weights: 3/4 Ounce Mat, 1-1/2 Ounce Mat, and 2 Ounce Mat. Unlike Cloth and Roving, Mat is categorized by weight per square foot rather than per square yard.

SURFACING VEIL is an ultra-lightweight mat (3/4 oz./square yard). Its thinness and lightweight help block the fabric pattern of a regular mat or the weave of cloth and Roving from “reading” or showing through Gel Coat. It also provides a resin-rich layer near the object’s surface to minimize water penetration through the laminate. Surfacing veil uses a special corrosion resistant glass to combat water migration further.

KNYTEX

KNYTEX contains two layers of non-woven roving stitched to a layer of 3/4 ounce mat. The two roving layers are laid flat on each other (not woven as in regular cloth). Knytex provides a much flatter finish and stronger laminate than would be a combination of cloth and mat. Knytex requires less resin, thus providing higher impact resistance and weight savings. Knytex also wets out much easier than other comparable weight products. The ultimate results of using Knytex are more glass reinforcement, greater strength and impact resistance, reduced weight, and cost. TAP carries two types of Knytex:

X-MAT (DBM 1208 & DBM 1708) has the two layers of roving oriented at plus and minus 45 degrees to the fabric's direction. (Most fabrics orient the weave at 0 and 90 degrees.) This 45-degree pattern is ideal for tabbing and corner reinforcement since 100% of the fabric adds strength to the corner. X-mat is available in two weights: 19.3 oz/sq yd and 25.3 oz/sq yd.



'EXOTIC' FABRICS

TAP carries several fabrics that some people call 'exotic' because they:

- Are less frequently used than E glass
- Have exceptional qualities
- Are usually reserved for high-tech applications
- Cost more than E-glass

S-2 GLASS comes in two weights: 3.7 & 5.6 oz/yd. It is easily recognized because it is the only fabric we carry that is 30 inches wide. S-2 glass was first developed for military missile applications. It has a different chemical formulation than E-glass and is about 30% stronger and 15% stiffer. Most commonly used for high-performance surf and sailboards to provide greater strength with less weight than with E-glass.

ARAMID is an organic fiber that is very light and extremely strong. The most common brand name version of aramid is Kevlar. It is gold in color and is the most impact and abrasion-resistant fiber on the market today. It is used in everything from canoes to body armor. TAP carries it in 1.8 & 4.8 oz/yd. It is also available in a fabric combined with Graphite. It is best to use with vinyl ester or epoxy with aramid.

GRAPHITE (CARBON FIBER) This black fabric is available at 5.7 oz/yd. It also comes as a unidirectional tape (4.51 & 9.56 oz) and combined with Kevlar (7.5 oz.). Graphite is one of the strongest, stiffest, and lightest fabrics available. Its properties are used in race car bodies, aircraft wings, fishing poles, golf club shafts, tennis rackets, bicycles, etc. It works best with epoxy or vinyl ester.

KNYTEX

- Bias Ply fabric stitch-bonded with multi-directional mat
- Can be orientated any direction
- Faster wet-out
- Higher impact strength. Yarns used in knitting layers of KNYTEX provide rip-stops
- Less weight
- Reduced gel coat print through
- Hulls made with KNYTEX run as low as 40% resin vs. 70% with other fabrics
- No. 1708 (50" wide) 17 oz. glass roving with 3/4 oz. mat

S-2 GLASS Plain Weave

- Lightweight bi-directional fabric
- Improved tensile/flexural/compressive/impact/toughness properties over E-glass
- 30% stronger and 15% stiffer than E-Glass
- As strong as graphite but 30% heavier with only 25% the stiffness of graphite
- 50% the strength and stiffness of Kevlar but twice the weight
- High service temperature
- Style 4522(30" wide and 60" wide) .0055 thick at 3.7 oz/sq. yd
- Style 4533(30" wide) .010 thick at 5.6 oz/sq. yd

UNIDIRECTIONAL GRAPHITE

- Unidirectional carbon fibers stitched in place with polyester yarn
- Exceptional stiffness to weight ratio in the direction of the carbon fibers
- Carbon fibers are thermally and electrically conductive
- Excellent for use with Epoxy
- Style GA045 (12" wide) .008 thick at 4.51 oz/sq. yd
- Style GA090 (12" wide) .013 thick at 9.56 oz/sq. yd

HYBRID KEVLAR 49 GRAPHITE Plain Weave

- Unidirectional graphite for stiffness woven at 90 degrees to Kevlar 49
- Carbon fibers are thermally and electrically conductive
- Kevlar 49 provides resistance to impact and fatigue damage
- 45 % carbon and 55 % Kevlar
- Use in high-stress areas
- Style XC1168 (50" wide) .012 thick at 7.5 oz/sq. yd

CARBON FIBER Plain Weave

- High strength to weight and stiffness to weight ratio
- Carbon fibers are thermally and electrically conductive
- Low thermal expansion
- Excellent fatigue resistance
- Lightweight
- Impact resistance, however, is less than most other composite materials
- Style 282 (42.5" wide) .0072 thick at 5.7 oz/sq. yd

Coremat®

Coremat® is a polyester nonwoven that contains microspheres. It is used as a thin core (bulker mat) or print blocker (liner) in fiber-reinforced laminates, manufactured in Hand Lay-Up or Spray-Up processes. Coremat should always be thoroughly impregnated with resin; the microspheres in Coremat prevent excessive resin uptake.

The most important reasons to use Coremat are:

- Weight saving
- Resin and glass saving
- Stiffness increase
- Fast thickness build-up
- Excellent surface finish
- Width: 39"
- Weight: 1.8oz/sq yd
- Thickness: 2mm

KEVLAR 49 Plain Weave

- Extremely strong and tough
- Lightest structural fiber available
- Superior resistance to fatigue/vibration/impact
- Style 120 (38" wide) .0045 thick at 1.8 oz/sq. yd

ATTRIBUTES				
	BEST	➡	➡	WORST
Cost	E-Glass	S-2 Glass	Kevlar	Graphite
Weight (Density)	Kevlar	Graphite	S-2 Glass	E-Glass
Stiffness	Graphite	Kevlar	S-2 Glass	E-Glass
Heat	S-2 Glass	E-Glass	Kevlar	Graphite
Toughness	Kevlar	S-2 Glass	E-Glass	Graphite
Impact Resistance	Kevlar	S-2 Glass	E-Glass	Graphite

GLOSSARY

BINDER - A bonding agent used to adhere to the various fibers together in the manufacturing of fiberglass materials, especially mat.

CLOTH - A woven fabric made from fine yarns of fiberglass.

DRAPEABILITY - The ability of fiberglass material to conform to contours, corners, and shapes when saturated with resin.

DRY SPOT - Area of low resin content in a fiberglass and resin composite or laminate. It is also referred to as a 'resin starved' area.

FIBERGLASS - Fiber similar to those of other fabrics, but made from glass. Materials made from fiberglass fibers in boat work include cloth fabrics, rovings, and woven rovings, unidirectional rovings, and various mats.

FILAMENT - A hair-like particle or 'rod' of glass used to make fiberglass yarns and threads. A fiberglass filament can be made in virtually a continuous length.

FINISH - The surface cleaning treatment applied to the glass fibers after weaving them into cloth to allow the resin to flow freely around and adhere to them. The finish determines the quality of the adhesion between the glass and the resin. The common finish for fiberglass in boat work is chrome or 'Volan' finish.

LAMINATE - A material or composition made from successive layers of resin and fiberglass materials bonded together.

LAMINATION - The laying on of layers of fiberglass materials and resin, much like the build-up of plywood laminations. The layers of material are bonded together with resin to form the laminate.

MAT - Randomly oriented strands of glass fibers formed into a felt and held together with a binder, usually of thinned polyester resin in a powder-like form. Most mat material used in boat work is the chopped strand type.

RESIN RICH - An area, especially in a laminate, where too much resin has been applied to the fiberglass reinforcing material. The opposite of DRY SPOT or 'resin starved' area. It is also referred to as a 'resin pocket' and 'resin streak.'

ROVING - Continuous strands of glass fibers grouped to form an untwisted yarn or rope. Rovings are commonly used for chopper gun spray-up laminates and to form woven rovings.

SIZING - The surface treatment on glass fibers during the fiber-forming operation, which aids in machine manufacture, as well as allowing the resin to adhere to the fibers in use, as is the case with mats and rovings. Sizing is similar to FINISH for cloth, but because mats and rovings are not 'dirtied' by the weaving process, no finish is required.

SURFACING MAT - A lightweight but rather stiff mat used next to the gel coat in a female mold to improve the surface appearance of the final product as well as to minimize water absorption.