

Beginner's Guide to Woven Rovings

Fabric Weaves for Composites

When talking about composites, it is important to remember that the material you are working with is fibre dominant. This means that when combining the fibre material and resin, the resulting composite part will largely take on the properties of the fibre material.

So what does this mean for fabricators? In the simplest terms, the fibre you decide to use will have a huge impact on the finished product. Before starting any project, fabricators must first decide which reinforcement has the properties that the best suit their project. Will Fibreglass work?

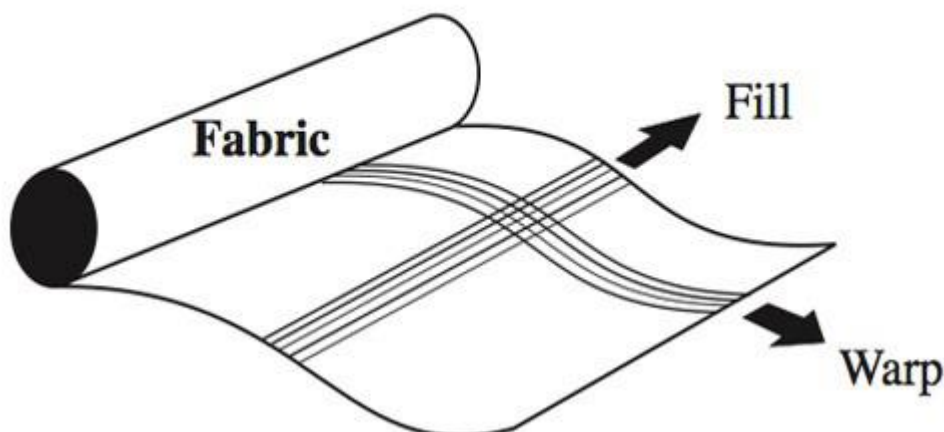
Is the added strength that comes with Carbon Fibre necessary? Will the ultimate impact and abrasion resistance from Kevlar be needed? Simply choosing your reinforcement isn't the end of your planning. Once you've decided on the form of reinforcement. This can refer to a few different factors, such as fabric count and weave style.

Fabric Thread Count

Fabric count refers to the number of warp and fill fibres per inch of your fabric. If you look at a roll of fabric, some of the fibres run in the direction of the roll and are continuous for the entire length of the roll. These fibres are known as the warp and are often referred to as ends. The shorter fibres that run crosswise along the width of the fabric are known as fill. And are often referred to as picks.

For example, a 24 x 22 fabric has 24 ends in every inch of fill direction, and 22 picks in every inch of warp direction. Note that you count warp fibres in the fill direction, and visa versa

Fill – Ends that run crosswise in a fabric.
Warp – Ends that run lengthwise in a fabric.



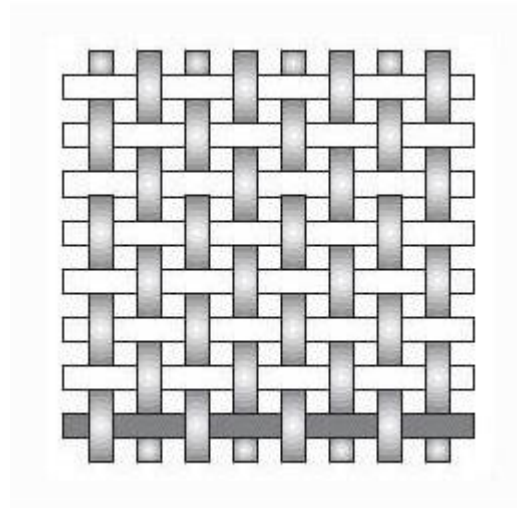
Fabric Weaves

You will find a variety of weaves that each serve a particular purpose. These weaves all behave differently, and it is important to look through your options before choosing one for your project. What one weave might be great at, a similar weave could perform very poorly at and vice versa. It's important to know and understand these characteristics before you start laying down fabric.

Plain Weave Fabric

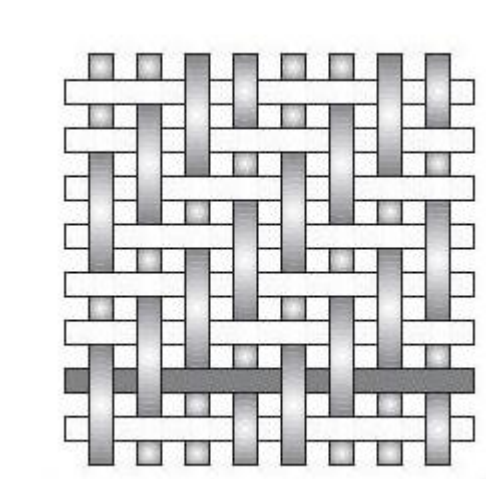
Plain weave fabric is one of the most common type of weaves you will find in composites. In a plain weave fabric, the warp and fill fibres interlace at every crossing, with the fibres alternating passing above and below each other.

A plain weave fabric will be very stable, and offer strength equally in both directions. However, when using a plain weave fabric it is important to keep in mind that it will not conform to complex shapes with ease (or, at times, even at all)



Twill Weave

In a twill weave, one or more fibres alternately pass over and under a designated number of fibre bundles. For example, a 2 x 2 twill weave will have fibres that pass over two bundles, then under two bundles, thorough the length of the fabric. Adjacent parallel fibres are offset by one fibre bundle which creates a "herringbone" pattern throughout the fabric.



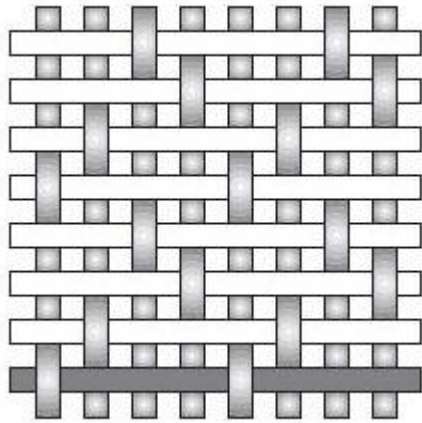
Satin Weave

Satin weave fabric is constructed in such a way that a fibre bundle passed over a designated number of bundles (determined by the particular weave) and then under one bundle repeatedly. The total number of fibres involved is referred to as the harness.

In a 8 harness satin weave fabric, a fibre bundle will pass over seven bundles, then under one, over and over ($7 + 1 = 8$, thus why we call it a 8 harness)

For satin weaves, this is produced a much flatter fabric that is easily used to form complex shapes that even twill weave might struggle to obtain. Satin weaves will deliver a slight edge in strength over its plain and twill weave counterparts, but this form of fabric is unbalanced.

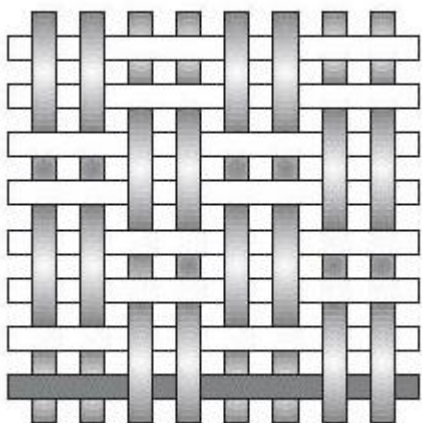
This means that one side of the fabric will be mostly warp or fill, while the other will be the opposite. Fabricators usually have to invert half of the piles within a lamination in order to produce a symmetrical part.



Basket Weave

A basket weave is essentially a plain weave with, rather than one over one interlacing, two or more warp fibres interlace with two or more fill fibres. As you might have guessed, that would be known as a 2 x 2 basket weave.

Basket weaves do not need to be symmetrical, it is possible to have an 8 x 2 basket weave, depending on your needs. Basket weaves are flatter and slightly stronger than plain weaves, but are less stable.



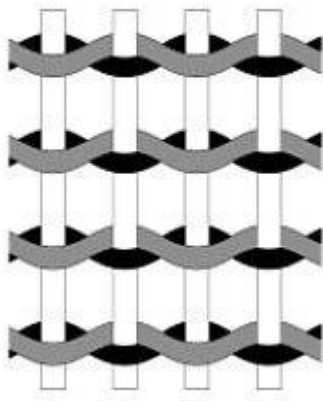
Leno and Mock Leno Weave

Less used, the Leno refers to a form of plain weave fabric in which adjacent warp fibres are twisted around consecutive fill fibres in order to form a spiral pairing. This effectively locks the fill fibres into place within the fabric.

This type of fabric is often used in conjunction with other fabrics, as the open weave style does not generally produce an effective composite.

Mock Leno weaves are another version of a plain weave fabric in which occasional warp fibres, at regular intervals but usually sever fibres apart, deviate from the alternate under – over interlacing and instead interface every two or more fibres.

This happens with similar frequency in the fill direction, and the overall effect is a fabric with increased thickness and a rougher surface.



Patterned Weave

Patterned weaves refer to weaves that are more specialty and not have a widely known industry specification. Because they are not widely known, it can be difficult to determine their physical properties. The particular pattern style will have a cosmetic feature, such a cool or interesting pattern, but said pattern will also have an effect on the fabrics characteristics.

For example, our #3222 Wasp – 3K, 12 x 18 Carbon Fibre Fabric has a hexagon pattern that will give parts a honeycomb or reptile scale like finish. Because of this pattern, the #3222 has a heavier filling density which will ultimately offer a higher tensile strength in the fill axis.



Style Numbers

When working with reinforcements, you will often notice style numbers. These numbers refer to specific fabrics that have a weave, weight, and end/pick ratio that fabricators can rely on. As an example, a Style 7781 E Glass will always be a 9 ounce per square yard, 57 x 54, 8 harness satin weave fibreglass fabric.

Stitched Fabrics

Finally, there are a number of products on our website known as "stitched fabrics". These fabrics consist of several layers of unidirectional fibres in different orientations, including 0 degrees, 45 degrees and 90 degrees. Fibres are stitched rather than woven together, which helps to avoid crimping and make for increased fibre strength for parts. In practice, these fabrics will be handled in much the same way as woven fabrics.

[» Back to Top](#)

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