

SPORTS CARPET TECHNICALITIES

Sports carpets are extremely diverse in form and the constantly expanding choice available can be bewildering. However, we believe that there is nothing inherently mysterious or magical about sports surface carpets. An understanding of the way they are made and the materials used can help define precisely what is required in any particular circumstance.

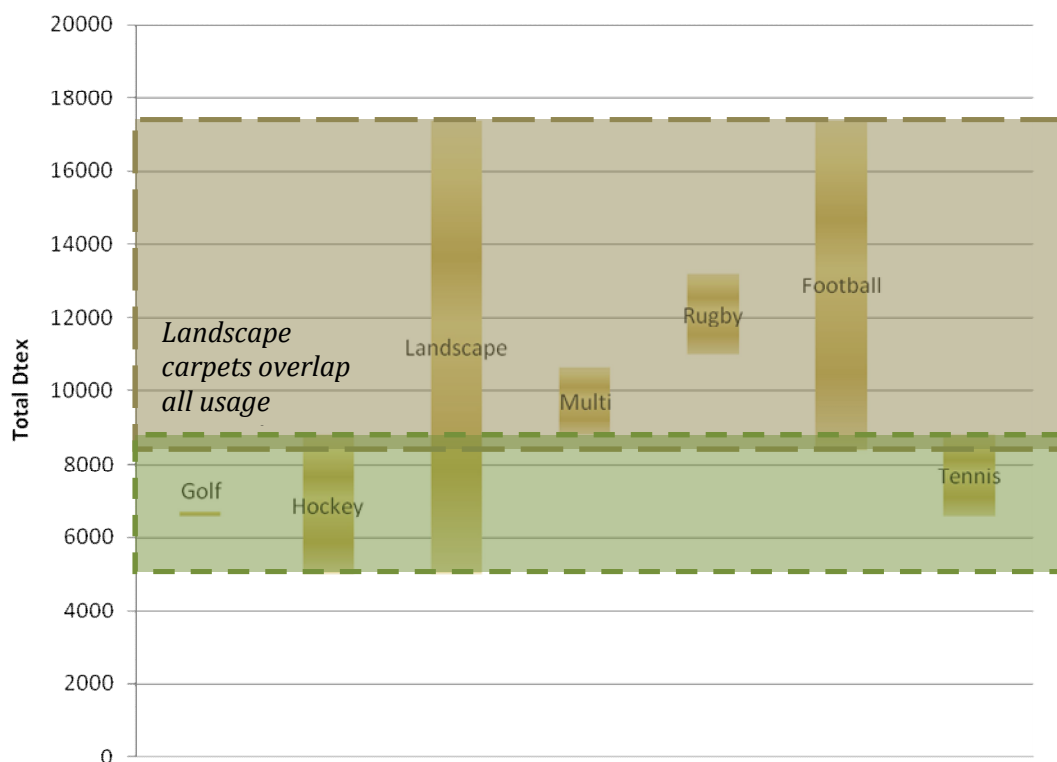
Technical terms in sports carpets

Yarn

Yarns tend to be formed from either polyethylene or polypropylene but very occasionally from more costly polyamide, a form of nylon.

DTex (DeciTex)

This refers to the weight or thickness of the yarn used. It is preferable to an indication of the diameter of the yarn because most yarns are not circular in cross section. DTex is the weight in grams of 10 000 metres of yarn. Typical values are between 5 000 and 18 000.



Fibrillated yarn

Fibrillated yarns tend to be flat in cross section and are deliberately frayed which gives rise to more 'ends' in the carpet than actually went through the tufting machine.

Monofilament yarn

Monofilament yarns produce one end for each yarn and they are not frayed. They produce the same number of 'ends' in the carpet that go through the tufting machine.

Crimping

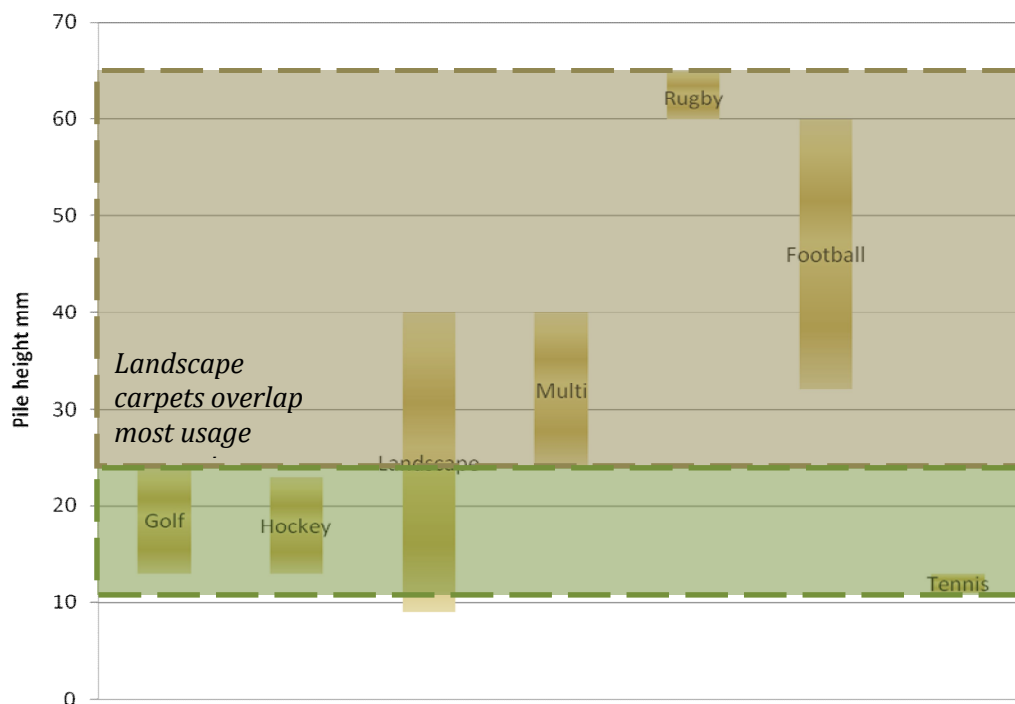
Like hair, yarns can be *crimped* at a particular stage in the manufacturing process. This can cause the yarns to stand more upright and apart from one another in the carpet, creating more loft. It may also cause the carpet to retain fill material more securely.

Cross section

The yarn may also have a characteristic *cross section*. It may be flat, circular or triangular in section or it may be v-shaped or have a central, thicker, rib. All these factors affect how the yarn lies in the carpet.

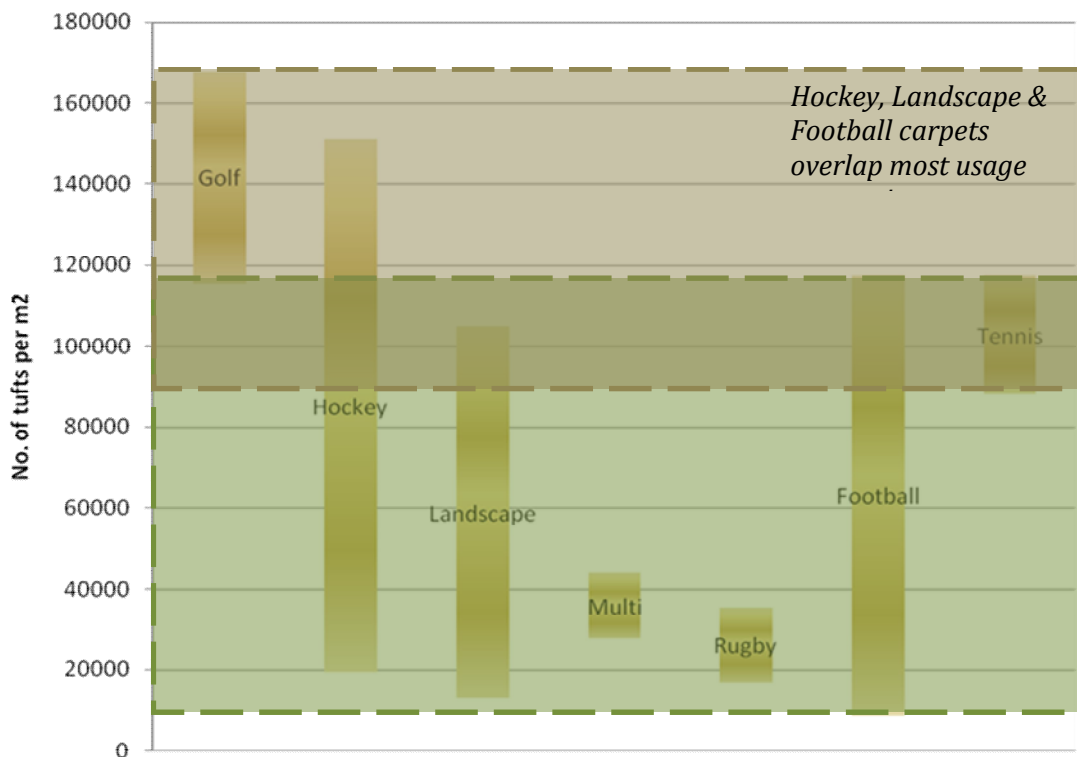
Pile height

The performance of the surface with respect to individual sports varies greatly in relation to the pile height. Short carpets (around 9 mm) are used for some landscaping purposes and for tennis while rugby requires pile heights around 65 mm. Hockey pitches are generally between 13 and 23 mm and football 50 to 65 mm. Dual or multi-use pitches often represent a compromise between the optimum performances of the sports concerned and such compromises often fail to meet the requirements set down by one or more of the relevant sporting bodies. The nature and the manner of incorporation of the fill material(s) is significant here and may allow one carpet to achieve dual or multi use while another will not.



Tuft density

With tufted carpets (see below) stitches are inserted in the backing material a certain distance apart, the stitch length. For sports carpets this is usually between 2 mm and 10 mm, depending on the purpose of the carpet. Across the machine the needles are set a certain distance apart. These distances, 'stitch width', range from around 2.5 mm to 18 mm. The overall effect is to produce a particular density of tufts. So a stitch length of 10 mm and a stitch width of 10 mm will produce 100 x 100 tufts in a square metre or a tuft density of 10 000 tufts/m². A stitch length of 3 mm and a stitch width of 5 mm will produce a 333 x 200 tuft density, 66 000 tufts/m².

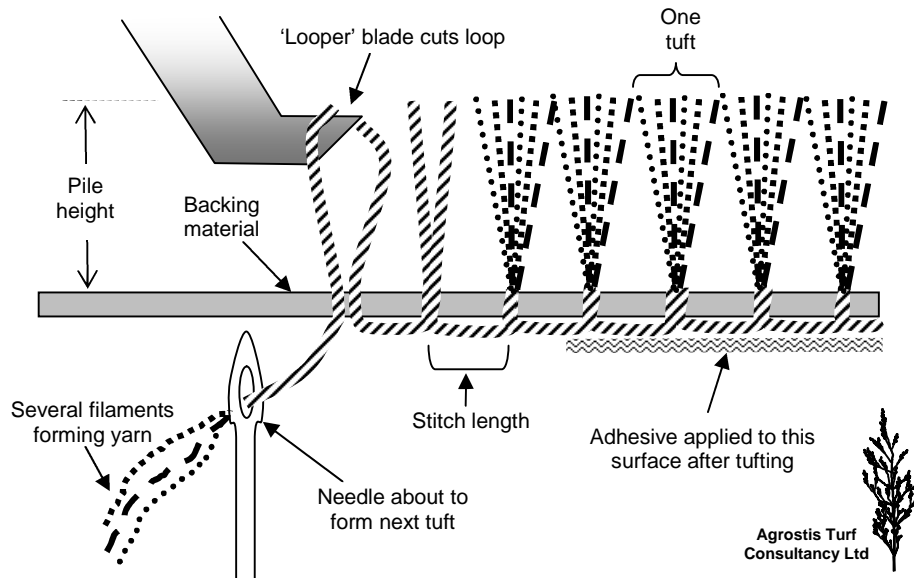


Methods of carpet manufacture

Sports carpets are produced by three main techniques; tufting, weaving and needle punch, described below.

Tufting

Yarn is stitched through a backing material by what are basically gigantic sewing machines with hundreds of rows of needles, creating thousands of tufts made of looped yarn. Cutting the loop immediately after it has been created forms 2 yarns to emerge from the backing material in each tuft. The backing material is then coated with an adhesive to lock the tufts in place.



Tufting - method and terms

A yarn may be made up of more than one *filament* so several filaments may be threaded onto each needle. Two filaments in a yarn would then make four filaments per tuft, three filaments six and so on, increasing the total density of filament ends in the surface. After incorporation into the backing material, yarns open up into their component filaments. This is why the number of filaments per tuft is a fundamental characteristic of the carpet. It will always be twice the number of filaments in the yarn.

Because there can be more than one filament in a yarn, it is also possible to incorporate different types or colours of filament in the same yarn. Note that the DTex of a yarn usually refers to the total weight of all the filaments making up the yarn. The number of filaments in each yarn is not usually published by the manufacturers so you have to count them to determine this.

Woven

With woven carpets the backing material forms an integral part of the carpet structure. This provides a significantly greater resistance to carpet delamination. The method also offers the most precise control over tuft density, but the carpets can only be manufactured to a maximum pile height of around 18 mm. Therefore, their main applications are cricket, bowls and golf.

There are two main methods for manufacturing woven carpets and both are identical to the production of domestic woven carpets.

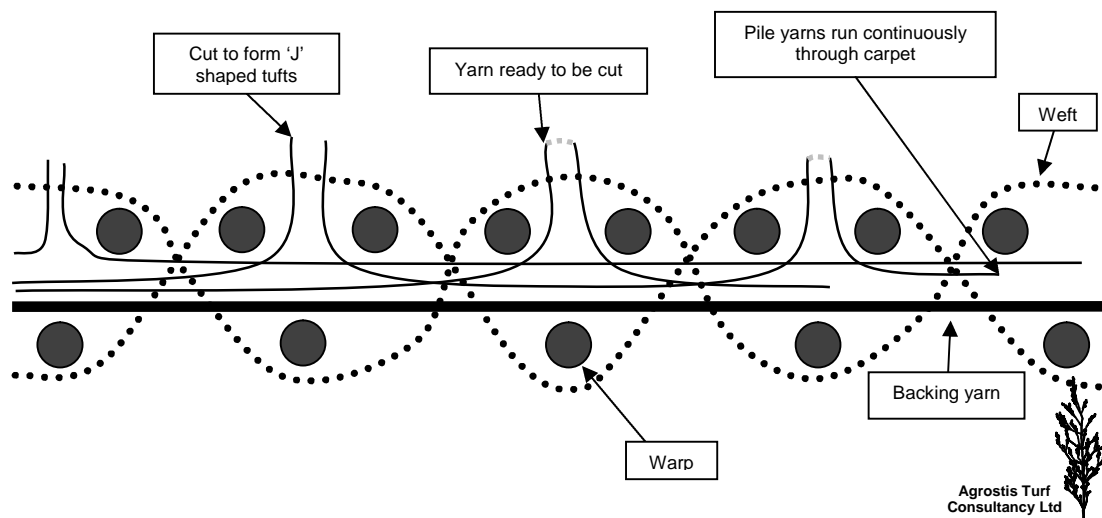
The first method creates a 'U' shaped tuft by threading yarn through a woven mesh and is known as the Axminster method. In an Axminster gripper weave, cut tufts of yarn are inserted at the point of weaving by means of grippers. For each tuft to be inserted along the width of the carpet there is a corresponding metal gripper which rises from the bed of the loom to grip the

appropriate coloured end of yarn from the vertical yarn carrier. A knife blade slices the tuft to the correct length, the gripper then returns to the bed of the loom and places the tuft in the appropriate position. The weft shots of the backing yarns then bind it into place. A beater bar pushes each row of tufts and weft shots tightly against one another to form the carpet.

The second weaving method is similar to the Axminster method but uses complete yarns to form each tuft which also further increase the carpets' resistance to de-lamination and tuft loss. This method is known as the Wilton method and produces 'J' shaped tufts.

A Wilton weave carpet is one in which the pile yarns run continuously into the carpet and are raised above the surface of the integral backing by means of wires or hooks. Wilton carpets are often cut or loop products and different yarn types can be used to produce different surface textures. Wilton weaving is not as versatile as Axminster due to continuous yarns that create waste on the back of the carpet. The carpets do not suffer from the delamination and stability weakness often associated with tufted carpets however.

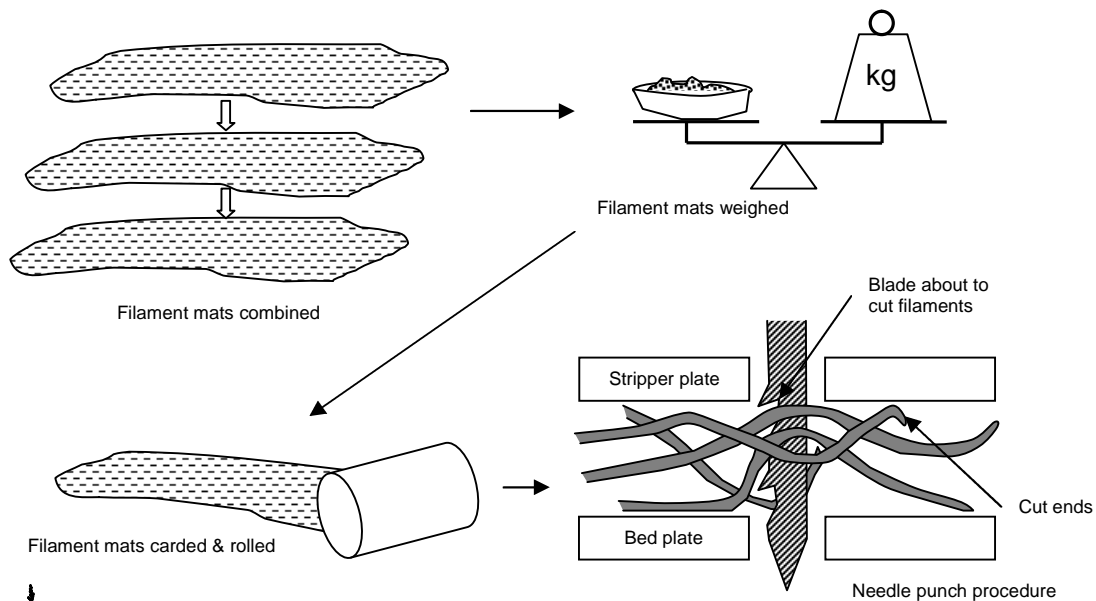
As with the tufting method of carpet manufacture it is possible to incorporate a number of different types and colours into a woven carpet yarn.



Wilton weaving method

Needle-punch

This type of carpet manufacture is quite different from the tufting and weaving methods. It is more akin to the production of felt and the process is long and convoluted. It involves the mixing and weighing of an exact amount of fibres, which are then carded and rolled before each fibre mat is needle punched. The final yarn is a composition of at least two yarns, each have undergone this process. The combined yarn is needle punched through the backing material, impregnated with various treatments and finally cured.



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This process is repeated for each yarn that is to be included. Yarns are then combined and the filament mats are needle punched through the backing material.

Needle punch method

This manufacturing process produces a durable hardwearing carpet suitable for a wide range of indoor and outdoor applications. The carpets' quality is highly dependent on the quality and size of needles used in the needle punch process. The nature of manufacture creates a low pile carpet as the majority of the fibres are lying flat, which allows the carpet to mimic quite accurately, for example, a natural clay tennis court. Due to the significant amount of pile lying horizontally this surface provides a reasonable amount of cushioning and grip.

4th Generation carpets

These are just becoming available and their overall performance remains to be tested by the market. The generational change refers to the formation of two carpet structures in the same carpet. So for example, a 65 mm monofilament tuft arrangement at a certain tuft density might be combined with a 20 mm fibrillated arrangement at another tuft density. The carpet has to be put through the tufting machine twice to achieve this. Many aspects of the performance of the carpet are affected by and there are many potential advantages. For example, it may be possible to reduce or dispense with altogether the need for fill materials.