



THE DEFINITIVE GUIDE:

- HOW TO BUY THE PERFECT FIELD HOCKEY STICK -

Mantis Hockey Ltd.

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THE MANTIS GUIDE TO BUYING THE PERFECT HOCKEY STICK

In this guide we will attempt to clearly define the various aspects of hockey sticks and then explain in the following six sections how each of the different aspects may affect your choice of hockey stick.

Based on years of experience, we have compiled this guide in order to provide both seasoned players, and newcomers to the sport of field hockey with an in-depth guide to field hockey sticks, as well as the knowledge required to make an informed choice when looking for the best hockey stick to suit their specific needs.

Over the last 20 years a combination of technological advances, adaptation of the game to artificial surfaces and consumer demand, has led to field hockey stick manufacturers producing a wide range of products to suit all skill sets, playing styles, preferences and budgets.

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INTRODUCTION

Please see the section overviews below for a brief summary of the aspects covered. If you are new to the sport we strongly recommend you read the section on Specifications first in order to familiarise yourself with the basic elements and technical terminology associated with hockey sticks.

SPECIFICATIONS: A basic introduction into the different parts of a hockey stick, terminology, as well as the technical restrictions on hockey sticks as set out by Hockey's governing body the FIH (International Hockey Federation).

MATERIALS: A description of the various materials used to build hockey sticks, their pros and cons and how to choose the right material for you.

LENGTH: Discussion of the important factors that may help you choose the correct hockey stick length.

WEIGHT: Discussion of hockey stick weights and the factors that may help you choose the correct weight.

BOW: A detailed introduction into the bow of hockey sticks shafts, the latest technical restrictions and how it might affect your game.



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SPECIFICATIONS

In this section we set out to provide a brief induction into the terminology associated with hockey sticks and outline the official FIH's (International Hockey Federation) specifications for hockey sticks.

Ever since the beginnings of the sport, hockey sticks have maintained a traditional shape. Over the years the shape has been continuously refined but essentially consists of three identifiable elements, the handle, shaft and head, a curved protrusion at one end. Please see diagram below.



The Handle: All senior sticks will have a handle of a similar diameter, this is approximately 25-30mm before a grip is applied. The diameter will be proportionally reduced for junior hockey sticks.

The Shaft: The variations seen in hockey stick's shafts are somewhat limited. Some ranges from individual manufacturers do offer features which attempt to increase stiffness or aid control but in the vast majority of sticks on the market the cross section tends to be fairly consistent. The only exception to this being the amount of curvature or bow. Several manufacturers do offer models or ranges with differing amounts of bow, to read more on this please see our section on hockey stick bows.

The Head: A number of different options are available with regard to the head of a hockey stick including the amount of curvature as well as some newer innovations which see special rubberised inserts and indented concave faces for improved feel and control. For more information on this topic please see our Head Shape section.



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STICK MATERIALS

Traditionally hockey sticks have been made from wood, more specifically Mulberry. As the game has developed, technology improved and the movement towards playing on both sand and water based artificial surfaces has firmly taken hold, a number of additional materials have been introduced into the manufacture of hockey sticks.

The 1990s saw the introduction of several aluminum shafted sticks which clearly increased hitting power, but after a number of injuries resulting from the failure or partial failure of the metallic parts of these sticks, the FIH quickly took a firm stance to prevent further potential injuries by banning the use of metallic components in hockey sticks.

As 'space-age' materials such as fibreglass, carbon fibre and Kevlar became more widely available and cheaper to produce, several manufacturers stepped into the fray with hockey sticks developed using composite materials. Although limited in initial appeal, consistent refinements have resulted in composite sticks being widely used and accepted. The use of composite materials has also been combined with the traditional wood to create lighter, stiffer hockey sticks which maintain the traditional wooden feel.

Wooden Hockey Sticks

One-piece head construction: For many years hockey sticks were hand crafted from individual blocks of Mulberry. Mulberry being the wood of choice due to its combination of strength and flexibility. However the limitations in this style of manufacture were quickly realised as the changes in playing style demanded increased curvature in a hockey sticks head. Attempting to recreate a modern Maxi or Hook headed stick (see Head Shape section for more info) from a single piece of wood in many cases would prove impossible due to the increased stresses on the wood.

Laminate head construction: In order to get around this problem stick manufacturers moved towards a 2 part stick construction, combining a traditional one piece handle bonded to a laminated head. The lamination process which essentially involves the bonding together of several layers of wood provided the much needed combination of strength and pliability required to create the new head styles. This said, early examples were prone to de-laminating or layers separating from each other, (especially when kept in wet environments) causing splitting along the layer boundaries. Over time this problem has been dramatically reduced through improved bonding techniques and better stick care, to leave laminate construction as the method of choice for most modern wooden hockey sticks.

Reinforcement: The increased wear and demand for more stiffness lead by hockey players forced manufacturers on a search to find materials and methods to improve these elements of their hockey sticks. The increasing use of previously space age materials and reduced costs led the manufacturers to incorporate a number of new materials in order to take advantage of their specific properties. Initial designs used these materials to a very limited extent such as strips bonded to the playing side of the shaft to provide greater strength or stiffness. The current innovation in top of the range hockey sticks sees the use of woven sleeves incorporating one or more materials to completely encase the shaft of the stick as well as additional strips in key areas of the stick to increase stiffness and strength as well reduce wear and tear.



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Composite Materials

Modern hockey sticks, both wood and fully composite take advantage of a number of different materials and their properties in order to maximise the power and feel. In this section we shall briefly explain the different materials, their properties and their potential uses.



FIBREGLASS
WEAVE



KEVLAR /
ARAMID
WEAVE



CARBON
FIBRE
WEAVE

Hockey Stick Materials - Fibreglass, Kevlar, Carbon

Fibreglass: Cheap and easy to control, fibreglass is made from fine strands of glass and is often woven together and combined with a resin to increase strength and stiffness but more often applied to wooden sticks to limit wear to areas such as the head.

Kevlar/Aramid: This fibrous material often used in built proof vests and body armour is very strong yet flexible. Kevlar or Aramid as it is generically called, is used to increase the strength of the stick to a level above that of fibreglass.

Carbon Fibre: Thin, expensive and very light strands of carbon are often woven into sheets or strips. Very stiff and strong, Carbon Fibre is used in a variety of hi-tech industries such as Formula 1 racing where the combination of strength and light-weight makes carbon fibre the obvious choice. Carbon Fibre is the material used to create the stiffness in hockey sticks which in turn lead to the greatest amount of power being transferred from the stick to the ball. In brief, the more Carbon Fibre in a stick, the stiffer it is. The weakness of carbon fibre is its low resistance to impact or brittleness, which causes it break. As a result Carbon Fibre is often combined with Kevlar/Aramid in order to take advantage of its strength yet prevent breakage.

Resin: A range of glue-like substances that dry to form a very strong, hard, wear-resistant material. Resins are used for a variety of purposes. On their own they provide great protection from the wear of sand and water based surfaces and as a result are often applied to the head of both wooden and composite sticks as a protective layer as both part of the manufacturing process and as an aftermarket accessory i.e. TK Stick Magic. In conjunction with other composite materials such as fibreglass, Kevlar/Aramid and Carbon Fibre they can be used as both a bonding agent to securely bind fibrous strips and sleeves to wooden sticks or in the case of purely composite hockey sticks the major constituent of the stick, holding together the under-lying strengthening and stiffening fibres.

Composite Hockey Sticks

Composite hockey sticks have experienced a very rapid evolution from rather heavy and bulky beginnings to profiles and weights almost identical to traditional wooded hockey sticks.



TWIN-CHANNEL CONSTRUCTION

Composite Hockey Stick: Twin Channel Construction Composite hockey sticks are as the name suggests manufactured from a number of woven fibres which are pre-soaked in resin and then baked in a mould to combine the different elements and take on the desired shape, profile and strength characteristics.

Once cooled the sticks are painted and lacquered to provide the customised hard-wearing outer finish.



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The standard twin-channel construction technique was developed to provide the ideal strength to weight ratio required for modern hockey sticks. The different fibres used in the construction provide the hockey stick with its particular characteristics, i.e. more Carbon Fibre the stiffer and more expensive to produce, the more fibreglass the more flexible and cheaper the stick.

Wood Vs. Composite Hockey Sticks

The argument of wooden versus composite hockey sticks has raged throughout the hockey community for many years now. In this section we will try to outline the various Pros and Cons associated with each of the construction techniques and leave you to make your own decision.

Common misconceptions: The restrictions set by the FIH (hockey's governing body) prevent top of the range composite hockey sticks from creating more hitting power than an equivalent wooden stick.

Arguments For Wood:

- Wood as a material is cheaper than composite materials and therefore results in reduced retail prices.
- The natural characteristics of wood result in a softer feel for the ball which many players, including internationals favour.

Arguments Against Wood:

- Due to the hand made nature of the stick it is very difficult to get any two sticks that are exactly the same.
- Wooden sticks are only as good as the wood they are made from and therefore inconsistencies in the quality, moisture content and density of the wood may result in two sticks of exactly the same specification performing completely differently.
- Without additional protection wood is more susceptible to wear on sand based surfaces.
- Wood has a tendency over time to draw in moisture which leads to loss of power and likelihood of breakage.
- Wooden sticks have a smaller sweet spot for creating maximum hitting power.

Arguments For Composite:

- Composite sticks have a greater power to weight ratio i.e. strength and stiffness can be maintained by a lighter weight composite stick.
- The heads of composite hockey sticks are designed to create a larger and more forgiving sweet spot for maximum hitting power.
- The manufacturing process leads to composite sticks being much more consistent in their weight, stiffness and power, so if you've used one stick you can be fairly confident another hockey stick of the same specification will feel and perform to the same level.
- The nature of a composite hockey stick (i.e. a high resin composition) means that aftercare resins naturally bond better to like materials, resulting in increased playing life and consistent feel.

Arguments Against Composite:

- Harsher, less refined feel for the ball, although with ongoing development this is becoming less pronounced.
- Cost of materials and production result in more expensive sticks than a wooden stick of a comparable specification.



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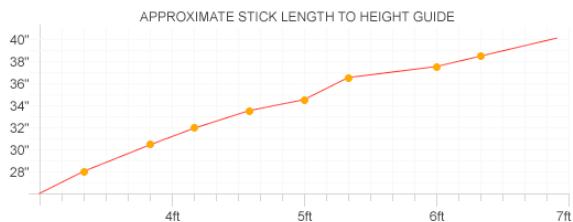
STICK LENGTH

Traditionally senior hockey sticks have been 36 inches or 1 yard long, but over the last 15 years the standard length has increased to 36.5 inches. At this point in time there is no set restriction governing the maximum length of a hockey stick but manufacturers tend not to produce many sticks of more than 38.5 inches. However some manufacturers can take special orders for lengths up to 42 inches.

Choosing the correct stick length

In many respects the overriding factor that should influence the length of stick you choose is your height, although by no means is this the only consideration. In junior players choosing a stick of a suitable length is paramount in the development of skills and control. Please see the graph below for a rough guide to the appropriate stick lengths based on a player's height.

Rough guide to hockey stick length based on height:



Note: The rough guide above fails to take into account strength. There is a strong argument that you should choose the longest stick you can comfortably control. A stronger and more skilful player may well want to take advantage of the longer reach or increased vision (due to more upright posture) that a longer stick might offer.

With junior sticks choosing the correct length of stick has slightly different implications (due to the fact that junior sticks are carefully designed to maintain a good balance between shaft and head weight.) The correct stick length should therefore also result in a suitable weighting.

Key Questions to Ask Yourself:

- Does the stick feel comfortable?
- Is my body interfering with my control of the stick i.e. it is touching your stomach and therefore too long?
- Do I have to bend too low to hold the stick reducing my vision and possibly causing long term damage to my back i.e. the stick is too short?
- Can my hands control the stick's head throughout the swing when attempting to hit a ball or does the stick control my hands (YES - Good, NO - The stick is probably too long and therefore too heavy)?



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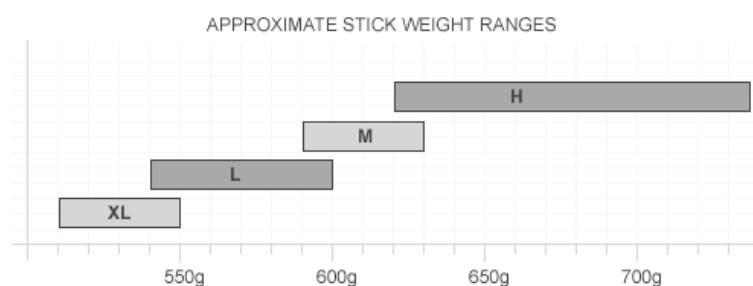


STICK WEIGHT

Traditionally hockey stick manufacturers have labelled their products with weight guides, these being Light (L), Medium (M) and Heavy (H), each representing a range of 30 - 40g. Only very recently was it that the FIH specified a maximum weight for a hockey stick of 737 grams, although the common preference is significantly lower than this.

Ongoing development of composite hockey sticks which are capable of maintaining their strength and stiffness in sticks of lower weights, has resulted in many manufacturers introducing a new weight band of XL (Extra Light). Although the exact weight ranges used by manufacturer do vary somewhat, the graph below gives you a useful indication of what each of the labelled weights actually represents.

Hockey Stick Weight Range Graph



Currently due to the demands of the modern game very few manufacturers offer sticks in the heavy weight range. Manufacturers offer Extra Light sticks in either high specification sticks due to costs involved in creating a stick that maintains its strength at this weight or a low specification where stiffness and power are not a primary concern.

Choosing the Correct Weight

There are three key factors when considering the appropriate weight stick, strength, position and style, but essentially the final decision comes down to the individual's comfort and feel. The first question that you should always ask yourself when picking up a hockey stick and swinging it for the first time is: Can I control the head throughout the swing?

- **Strength:** The stronger you are the easier you will find it to control a heavier stick. If your stick is too heavy it might have a detrimental affect on your game. This is probably why more and more players are choosing Light and XL hockey sticks.

- **Playing position:** Individual positions on the pitch require slightly different skills and this may well influence your choice of stick weight. Defenders often need to make longer more powerful passes or clearances as well as stronger tackles therefore may consider a heavier stick to create more power in their strikes and prevent their stick being brushed aside in a tackle. Forwards often favour a lighter stick to allow closer ball control and maneuvering in the D. Midfielders vary often depending on their specific role or playing style.

- **Style:** Each individual develops a style to suit their own skills. For example a defender who relies heavily on close control and jab tackling may consider a lighter stick and a forward who relies heavily on a powerful shot may well choose a heavier stick.

If in doubt we would always recommend that if you choose the lighter option!



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STICK BOW

The bow, or rake as it is also known is the amount of curvature along the playing surface of the stick from the top of the handle to the base of the head of a hockey stick. The amount of bow is measured by placing the hockey stick face down on a flat surface and measuring the maximum distance between the surface and the playing surface of the stick.

Over the past decade player's preference of increasingly more bow led initially to an imposed limit of 50mm. Now however, following a rules amendment from the FIH (Hockey's Governing Body) the rules are set to be changed in a two stage process. For internationals and top class domestic hockey the new ruling setting the maximum level of bow to 25mm came into force as of the 1st of January 2006. For all other levels of domestic hockey the new ruling will apply as of the 1st of July 2006.

This change to the rules was deemed necessary in response to the development of the drag flick technique for short corner routines, Internationals were regularly producing ball speeds of up to 90 mph and this in turn led to a number of well publicised injuries resulting in the FIH's decision to take action to limit the dangers involved.

In a pre-emptive response to the forthcoming rule change all hockey stick manufacturers limited the hockey sticks in their ranges to a maximum bow of 25mm for the 2005-2006 season, therefore removing many of the products with more extreme bows.

Advantages of Increased Bow

With the new limitations in place, some of the benefits of increased bow have now been reduced but do still offer performance advantages to many players.

Slingshot effect: As the ball is propelled along the shaft of the stick it builds up speed so that when it leaves the end of the stick it is travelling faster than the speed of the head of the stick (if the technique is executed properly). This technique can be used on both a horizontal plane with the stick parallel to the ground (for passing or drag flicking) or a vertical plane with the stick at right angles to the ground (for aerial passes). Without going into a full explanation of the drag flick technique it is difficult to explain the benefits of increased bow. In general terms it enables the individual to build up initial speed over an increased distance without the ball slipping off the head, provides more energy into the ball in the desired direction of travel and due to the fact that so much of the ball speed is generated at end of the motion a greater level of control (and disguise) is/can be created.

Dampening: The exact opposite effect of a slingshot motion, when receiving the ball with the stick in a horizontal position, parallel to the ground, the bow will work against that natural tendency of the ball to roll up the stick thus providing greater control.

Disadvantages of Increased Bow

With the reduced advantages of the new bow limitations comes reduced disadvantages.

Hitting & Passing: Due to the curvature of a hockey stick with an increased bow, the stick will come into contact with the ball sooner and at a different angle than with a straight or less bowed stick. Depending on the angle of the stick when attempting to strike or pass the ball two different effects are likely to occur. Striking the ball with the stick in a vertical position (i.e. at right angles to the ground) the ball will lift off the ground to a varying extent, depending on the power imparted to the ball. Striking the ball with the stick in a horizontal position (i.e. with the stick parallel to the ground) will cause the ball to move in a direction left of the intended target. Striking the ball with the stick in any position in between is likely to cause the ball to lift and and move in a direction left of the intended target, depending on the sticks angle and the power imparted to the ball.



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Receiving on the Reverse Side: When receiving a ball on your reverse stick side, the tendency is to lean the leading edge of the stick towards the ball in order to trap it and instantly gain more control. With a hockey stick with an increased bow when you lean the leading edge of the stick towards the ball the bowed element of the shaft raises further off the ground sometimes leading to the ball slipping underneath the shaft of the stick.

Having listed the disadvantages of a hockey stick with an increased bow, we must point out that all of the disadvantages can be overcome with the development of a slightly altered technique. For many, the change in technique will come very naturally in 2 or 3 training sessions as you get used to the stick and more aware of its differences.



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