

7 Types of Pitch Surface

- 7.1 There are essentially two main groups of pitch surface: natural grass and synthetic turf. Within each, there are several different types. As these guidelines are aimed predominantly at synthetic turf pitches, only a brief statement regarding natural grass is included here.

Natural Grass Pitches

- 7.2 There are many types of grass, and expert advice should be sought to help in the choice of grass that is most suitable for a particular climate and soil conditions. Similarly, advice on whether to seed the pitch or to lay sods should be sought. The latter is far more expensive, but has the advantage that it can be played on much sooner than a seeded area, which could require at least a year of careful maintenance to become sufficiently established to permit safe play without causing serious damage to the surface.

Choosing the Playing Surface

- 7.3 Having decided to install synthetic turf, the type of surface can be resolved. However, given the choice, players who have had experience of the different types of surface will generally prefer an unfilled or water-based pitch. This is simply because, although most filled (usually sand-filled) pitches are a significant improvement on natural grass in terms of speed, predictable ball movement and resistance to wear under all weather and wear conditions, the unfilled pitch offers all of these advantages, apart from the price, but avoids the filled surface which can be abrasive to skin, sticks and balls.
- 7.4 The decision as to the type of playing surface to be installed has direct implications for the design of the drainage system, the need for irrigation, the nature of the base and sub-base and, in some cases, for the marking of lines.

Synthetic (or Artificial) Turf Pitches

- 7.5 There are a number of different types of synthetic surface available. These fall generally under one of the following headings:
- **Filled surface:** a surface (or carpet) comprising a synthetic yarn filled with sand (or similar material) to the full height of the pile to help maintain its verticality. The pile height is greatest in this type of surface.

The sand is an important element. A high quality material with well-rounded particles that allows adequate drainage at all times and prevents compaction of the fill while under use is usually specified by the pitch supplier.

A filled pitch rarely justifies the installation of a watering system. In moderate climates, the sand within the turf carpet can remain slightly damp for much of the time. However, in warmer climates, the pitch will dry out and some degree of watering will greatly improve its playing characteristics. Hence, provision of some form of irrigation (even hand-held hoses) should be seriously contemplated.

- **Dressed surface or water-based filled surface:** a surface (or carpet) comprising a synthetic yarn filled with sand (or similar material) to between 65% and 80% of the pile height to help maintain its verticality. The pile is a little denser in this surface but the pile height is less.

For optimum performance, it is recommended that this type of surface be watered, although this is not absolutely necessary. The quantity of water should be much less than on an unfilled water-based surface – see below.

- **Unfilled surface (un-watered):** a surface (or carpet) comprising a synthetic yarn only. The pile height is less than for a dressed surface, but the pile itself is denser to provide stability to the turf surface. This type of pitch is rarely used for competitive hockey as its playing characteristics are inferior to other types.
- **Water-based unfilled surface:** a surface (or carpet) comprising a very dense synthetic pile of short length. It is essential from the safety, comfort and playability points of view that this type of surface is maintained wet during play. It also ensures that wear on the turf carpet is minimised and the full expected life of the turf realised.
- **Long-pile surface (also known as a “third generation” or “rubber crumb” pitch):** a surface comprising a synthetic yarn, the pile of which is much longer than any of the previously mentioned types; it is also the least dense. The turf carpet is partially filled with small rubber granules to about 50% to 75% of the pile height although an initial bottom layer of sand is sometimes used. In general, this type of surface does not meet the performance requirements for hockey. However, certain particular turfs of this type have been assessed by FIH and found to meet requirements. They are referred to explicitly in the list of approved turfs on the FIH website.

Pitch Irrigation or Watering

7.6 Although pitch irrigation is described in more detail in the *Pitch Irrigation* section of this Guide, it is worth mentioning here the relative merits of watering the various types of pitch surface and the related recommendations. Clearly, it is always advisable to consult the pitch turf manufacturers and seek their opinion. The material used in the turf yarn is a contributory factor in the need or otherwise of watering as discussed later in this section.

7.7 **Sand-filled pitch:** in most instances, such a pitch does not justify the expense of installing a watering system. However, it is widely known that the pitch plays better when the sand is slightly damp. Consideration should be given, therefore, to the installation of a water source to enable hand-held hose watering to be carried out.

- 7.8 This is more important in hotter, drier parts of the world as the sand will certainly dry out and tend to become “dust”. Watering will also improve the playing characteristics. In more moderate climates, the sand remains damp for longer periods, so the need for such watering will be significantly less.
- 7.9 **Sand-dressed pitch:** in most cases, the installation and use of a watering system would improve the playability of the pitch. This is particularly the case in hot climates where, because the carpet pile completely hides the sand or granular fill, pitch surface temperatures can rise to uncomfortable levels.
- 7.10 The choice of a sand-dressed pitch is likely to be based on budgetary constraints and these would likely exclude the installation of a watering system. Consideration should, nevertheless, be given, at the time of installing the pitch, to making provision for a future watering system to be provided when funds become available. As a minimum, provide hand-held hoses.
- 7.11 **Water-based unfilled pitch:** it is considered essential that this type of pitch is watered for every match. In fact, the FIH strongly discourages playing on an inadequately watered unfilled pitch. There are four main reasons for this:
- greater risk of injury to players;
 - the playability of the pitch is affected: the ball does not travel truly and is more likely to bounce dangerously;
 - greater wear is caused to the pitch surface, considerably shortening the life of the turf, and could affect the manufacturer’s warranty;
 - pitch surface temperatures, particularly in hot climates, can rise to unhealthy levels.

Pitch Carpet Materials (Yarns)

- 7.12 Historically, turf yarns have been made from nylon, polypropylene or polyethylene, or a combination of those. There are some differences in performance characteristics between them and these are discussed below. The FIH does not specify any one type of yarn; its technical requirements are purely performance based.
- 7.13 **Nylon:** originally, all synthetic turfs were made of nylon and some manufacturers have continued with this yarn. It has the capacity to absorb water up to 5% of its own weight, and so it is softer and has a lower drag resistance when thoroughly wet, which many players welcome. As it dries out, however, it becomes harder and adopts a higher drag coefficient so that playing conditions can change noticeably during the course of a single match, particularly on hot, drying days. The higher drag can lead to an increase in lower limb injuries.
- 7.14 **Polypropylene:** all three yarn materials are treated during their manufacture to have resistance to ultra-violet (UV) light, which tends to make the fibres become brittle in time. None is completely UV-resistant, but polypropylene is probably the best of the three, followed by polyethylene. So for hot, sunny climates, this may be a consideration. Polypropylene fibres

remain hard at all times, because they are impervious to water. Particularly when fibrillated, polypropylene has the capacity to hold water between the pile fibres (as does nylon) but as the water drains or evaporates, the drag coefficient remains fairly constant. For both nylon and polypropylene surfaces, the amount and frequency of water application affects the playing characteristics of the pitch. The design of irrigation and drainage systems is therefore critical.

- 7.15 **Polyethylene:** the majority of FIH approved manufacturers appears to be moving from polypropylene to polyethylene yarns because the latter have an improved slide factor, which in turn should require the application of less water. Early reports from players and officials with experience of this new material (frequently referred to as LSR – low slide reaction) indicate that substantial savings in water quantity for irrigation can be realised without any consequential adverse affects on pitch playability or player comfort and safety.
- 7.16 The FIH has stated that it is actively seeking a turf that requires no irrigation, yet exhibits the same qualities and characteristics as a water-based pitch as far as performance, playability and player comfort and safety are concerned. In this context, the initial reports on polyethylene surfaces are very encouraging. When this improved type of turf becomes available and accepted, this Guide will be updated.

Carpet Manufacture

- 7.17 Turf carpet manufacturers each have their preferred materials and methods of manufacture. They will use terms that may not be encountered elsewhere. Do not be put off by the technical language. Talk to clubs and associations with recent experience and learn from that experience.
- 7.18 The FIH makes no recommendation with regard to the various treatments to the yarn or the processes to form the turf carpet. For example, the yarn may be twisted, curled, fibrillated, multiplied or have other treatments before it is looped or knitted into a pre-formed backing fabric and then cut to the desired length. The backing fabric is then sealed.
- 7.19 Manufacture is by weaving, tufting or knitting to the density required for the particular type of surface.

Shock-pads

- 7.20 Early synthetic turfs were laid without a shock-pad or elastic layer (e-layer) as it is called in some countries. It is now recommended that all synthetic pitches be laid with one of the many forms of shock-pad as it will help to absorb the impact (dynamic forces) of players running on the surface and reduce the incidence of lower limb injuries. In fact, the FIH now makes a shock-pad mandatory for any pitch to become classified under its listing. The various forms of shock-pad include the following.

- **Integral pad:** the manufacturer bonds the shock-pad to the back of the turf carpet at the factory. A disadvantage of this system is that the resulting carpet roll is very heavy and unwieldy to handle. Also the shock-pad should last much longer than the playing surface (carpet), yet, when the turf carpet has to be replaced, the shock-pad is lost and has to be replaced as well.
- **Roll-out pad:** this pad is manufactured separately and supplied in rolls. It is then fixed in place by gluing and/or stitching.
- **Modular pad:** this pad is manufactured separately, but supplied in rectangular modules for fixing using an adhesive.
- **Dimple pad:** this is a roll-out pad, but one that has been formed into large dimples to allow a degree of air-cushioning.
- **In-situ pad:** as the name suggests, this is manufactured on site using a hot mix of rubber shred or crumbs, bound with polyurethane. It is laid using a highway paving machine. The advantage of this system is that the pad can be of variable thickness to even out any imperfections in the level of the underlying base, and can produce a smooth finish on which to lay the turf carpet.

Pitch Construction

- 7.21 The FIH *Handbook of Performance Requirements for Synthetic Hockey Pitches – Outdoor* describes the necessary construction for a pitch and the various tests that need to be performed and passed for a pitch to be certified as complying with the requirements.
- 7.22 It is recommended that the pitch surface and shock-pad be laid on a properly designed and engineered base and, where necessary, a sub-base. The base should comprise a layer of graded stone (which includes the drainage system) overlain by a layer (preferably two layers) of a bituminous material. Carried out properly, the base will outlast by several times the life of the shock-pad and surface carpet.

Approved Turfs

- 7.23 A list of turfs meeting the requirements in the FIH handbook mentioned above is published on the FIH website (www.worldhockey.org).

Summary of Key Points

- There are various types of synthetic turfs including filled, dressed and water-based surfaces.
- FIH “standard” category turf is usually sand-filled or sand-dressed; the “global” category is water-based un-filled.
- Synthetic turf yarns are usually made of nylon, polypropylene or polyethylene.
- The turf carpet can be made in various ways but must meet the FIH requirements.
- The requirements include a shock-pad under the turf carpet; the shock-pad can be constructed in various ways, but an in-situ pad is generally preferred.
- The FIH *Handbook of Performance Requirements for Synthetic Hockey Pitches – Outdoor* sets out the specifications for approved synthetic turfs and certified fields.