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CENTER FOR SPORTS SURFACE RESEARCH

From the Field: Getting to Know Today's Synthetic Turf

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Welcome to From the Field - A Guide to Athletic Field Safety and Care.

Throughout this series, we will focus on a sometimes overlooked but critical component affecting the safety and performance for athletes of all ages – the playing surface.

Our goal is to provide you with simple, helpful tips about playing conditions that maximize both safety and performance.

Once primarily reserved for professional stadiums, synthetic turf fields are now found in communities across the country. Whether considering a switch from natural turf or replacing a current synthetic turf field, it is important to know the terminology and understand the characteristics of today's synthetic turf systems.

This month's From the Field column explains many of the important details related to synthetic turf products on the market.

Fiber/Yarn/Pile

The fibers of synthetic turf serve as the "grass blades" of the synthetic turf system. Fibers are typically made of polyethylene and are classified as either slit-film or monofilament.

Slit-Film Fibers – Slit-film fibers are manufactured in sheets, cut into thin strips, then slit with razors to create multiple strands. Before installation, the fibers appear rather wide, however, after the installation process and field use, the fibers "bloom" or separate, as they are designed to do.

Monofilament Fibers – Unlike slit-film fibers, monofilament fibers are single strands of yarn made to more closely resemble the appearance of grass blades and are not designed to split. Monofilament fibers come in a variety of shapes and configurations. Shapes, polymer blends, and the manufacturing process vary among manufacturers. Each of these characteristics influence the wearability (fiber breakdown) of the fibers as the field is used.

Combinations of Slit-Film and Monofilament Fibers – Synthetic turf manufacturers have recently started to produce products that contain a blend of both fiber types. These dual-fiber products are marketed, but currently unproven by research, to combine the positive attributes of slit-film and monofilament fibers.

There are several other terms and characteristics of synthetic turf that involve the fiber component of synthetic turf.

Pile Height – Pile height is the height of turf fibers (in inches or millimeters).

Denier – Denier is a yarn size unit that is the weight in grams of 9000 meters of yarn. The higher the denier, the larger or heavier the fibers.

Faceweight – Faceweight is a measure of the total amount of yarn (fibers) in ounces per square yard (not including the backing).

Gauge – Gauge is the distance between two adjacent rows of fibers (in inches)

Stitch Rate – Stich rate is the number of stitches in a 3 inch by 3 inch piece of turf

Tuft Bind **–** Tuft bind is the force required to pull a tuft of fibers from the backing (measured in pounds)

Lisport Test – A Lisport test is a standardized test used to simulate field use and determine mechanical breakdown of fibers. Lisport testing results comparing the wearability of various monofilament turf fibers can be found here.

Infill

One of the main differences between the synthetic turf used today and older versions is the use of infill material. Infill material provides cushioning and support for the fibers and also serves as the "soil" of the field, allowing for cleat penetration.

For the vast majority of fields, the infill material that is used is either a combination of sand and crumb rubber (Styrene-Butadiene Rubber – SBR) or crumb rubber alone.

There are two types of crumb rubber that are used as infill for synthetic turf fields.

Cryogenic crumb rubber – Cryogenic crumb rubber is produced by first freezing recycled tires with liquid nitrogen and then shattering the tires into small, round pieces of rubber.

Ambient crumb rubber – Ambient crumb rubber is produced by grinding recycled tires at room temperature to produce smaller particles for use as infill.

Regardless of the type of process used to produce the crumb rubber, all steel belts and other metal parts in the tires are removed during the manufacturing process.

Silica sand is often mixed with crumb rubber to produce a surface that feels firmer under foot than crumb rubber alone.

Seams

Synthetic turf rolls are typically 15 feet wide. The seams are joined either by gluing or sewing (or both).

Each seam is a weak point within the field. Seams can separate over time if not joined correctly and can create tripping hazards. Routine field inspections should include making sure seams have not separated.

Backing

The backing holds the fibers in place and provides dimensional stability. Characteristics of the backing also determine drainage rate. To facilitate drainage, backings are either naturally porous or perforated holes can be burnt into the backing to allow for water movement.

Potential problems with backings include poor anchoring of turf fibers resulting in fibers being pulled from the backing or poor water infiltration resulting in slow field drainage. Selecting a product with a proven track record of rapid drainage and that will not clog over time is important to the long-term functionality of the field.

Shockpad

Shockpads come in several different forms. Traditional-style pads come in pre-manufactured rolls. These types of pads are often made of a combination of crumb rubber, expanded foam, and urethane.

Another type of shock pad is an elastic layer, or "e-layer". E-layers contain crumb rubber and a polyurethane binder and are installed using a paving machine.

It is important to note that shockpads are not required with many synthetic turf systems. Proper and routine field maintenance often results in surface hardness (Gmax) values well within an acceptable range without the need for a shockpad.

Base

After the sub-base (native soil) is graded and prepared, the base is installed. In most cases, the base consists of crushed stone and provides a foundation for the field as well as a drainage media. Additionally, a series of drainage pipes is installed in the gravel bed and connected to a main drain along the edge of the field.

Entire field installations can fail as a result of poor base construction and/or the use of improperly graded gravel. As a result, it is important that the contractor installing the base has experience installing synthetic turf bases and that base materials are tested prior to installation.

In certain situations, a concrete of porous asphalt base is installed instead of gravel. These types of bases are typically reserved for venues that constantly host concerts or other events that put greater weight loads on the field.

Quick Tips

When considering purchasing a synthetic turf field, do your homework. Contact field owners in your surrounding area and ask them about their turf and if they would recommend the particular system they have. Visiting local fields to see the turf for yourself is also a good idea.

Seek out independent research to see how the products you are considering perform. Penn State's Center for Sports Surface website contains many studies on synthetic turf.

Be sure to get a good installer. The contractor(s) installing the field should have experience installing synthetic turf fields. This includes all aspects including sub-base, base, and turf installation. Ask for references. Mistakes made during install can affect the field for its entire lifespan.