

**Release By:**

**Australia's  
Synthetic Turf Industry  
Leaders**

**The Real Facts About Synthetic Turf  
2010**

Report prepared by:



# Synthetic Turf

Since 1960, synthetic grass has offered a genuine alternative to natural grass in a growing number of applications. Stemming from this are the numerous debates regarding the benefits, the health implications and environmental impact of this product.

Market forces continue to drive industry leaders to research and develop products that satisfy increasingly stringent health, safety, environmental and performance requirements. These endeavors are not new and continue to be the impetus behind more advanced synthetic surfacing systems.

As a result, the synthetic turf manufactured today has some of the most technologically advanced raw materials in the marketplace. The ground breaking research and development that the industry leaders of these products have conducted, now assures all consumers that the products are not only safe to use but continue to offer all the benefits associated with artificial turf whilst also satisfying many of the desired outcomes provided by natural grass surfacing.

Key benefits of synthetic surfaces include:

- Water is not required
- Up to 70% of drainage can be harvested from these fields
- Significant higher use is possible on synthetic sports grounds
- High Quality turf: 20 – 25 hours per week Synthetic: 40 – 60 hours per week
- Studies have found injury rates between natural and crumb-rubber infilled synthetic turf fields to be similar
- The maintenance costs of synthetic turf are typically lower than the maintenance costs of natural turf

Contrary to out-of-date reports, the latest U.S. Environmental Protection Agency (EPA) as well as the New York State Health Department (NYSHD) findings show that synthetic turf is not only safe for athletes to play on but have almost no impact on the environment (see attached releases).

**The fact of the matter is that synthetic turf is the way of the future, as industry leaders we are committed to bring a product to the marketplace that meets all customer demands.**

## Limited EPA Study Finds Low Level of Concern in Samples of Recycled Tires from Ballfield and Playground Surfaces

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### FOR IMMEDIATE RELEASE

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**WASHINGTON** - The U.S. Environmental Protection Agency has released results of a limited field monitoring study of artificial-turf playing fields and playgrounds constructed with recycled tire material or tire crumb. The study was intended to gain experience conducting field monitoring of recreational surfaces that contain tire crumb. EPA will use the information to help determine possible next steps to address questions regarding the safety of tire crumb infill in recreational fields.

"The limited data EPA collected during this study, which do not point to a concern, represent an important addition to the information gathered by various government agencies," said Peter Grevatt, director of EPA's Office of Children's Health Protection. "The study will help set the stage for a meeting this spring, where EPA will bring together officials from states and federal agencies to evaluate the existing body of science on this topic and determine what additional steps should be taken to ensure the safety of kids who play on these surfaces."

Recycled tire material, or "tire crumb," is used in many applications, including as a component in synthetic turf fields and playground installations. In response to concerns raised by the public, EPA conducted a limited "scoping study" of tire crumb, which consisted of collecting air and wipe samples at three locations near EPA laboratories at Raleigh, N.C., Athens, Ga., and Cincinnati, Ohio. Sampling also was conducted in the Washington, D.C. area.

The limited study, conducted in August through October 2008, found that the concentrations of materials that made up tire crumb were below levels considered harmful. However, given the limited nature of the study (limited number of constituents monitored, sample sites, and samples taken at each site) and the wide diversity of tire crumb material, it is not possible, without additional data, to extend the results beyond the four study sites to reach more comprehensive conclusions.

The study confirmed that most of the methods tested were accurate, reproducible and appropriate for measuring concentrations of tire crumb constituents and therefore can be used in future studies.

## Study findings

- Particulate matter, metals and volatile organic compound concentrations were measured in the air samples and compared with areas away from the turf fields (background levels). The levels found in air samples from the artificial turf were similar to background levels.
- No tire-related fibers were observed in the air samples.
- All air concentrations of particulate matter and lead were well below levels of concern.
- More than 90 percent of the lead in the tire crumb material was tightly bound and unavailable for absorption by users of the turf fields.
- Zinc, which is a known additive in tires, was found in tire crumb samples. However, air and surface wipe monitoring levels of zinc were found to be below levels of concern.

EPA is aware that studies by other agencies were undertaken or completed while this survey was under way. EPA is planning a 2010 meeting with federal and state agencies to review all new study data and determine next steps.



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## **FACT SHEET**

### **Crumb-Rubber Infilled Synthetic Turf Athletic Fields**

*August 2008*

#### **PURPOSE**

There are several kinds of synthetic turf surfaces (*e.g.*, surfaces that use a fill material (“infill”) between the blades of artificial grass and those that do not), and synthetic turf may be installed for different uses (*e.g.*, single or multiple sport athletic fields, landscaping, golf applications). The focus of this fact sheet is athletic fields with crumb rubber infilled synthetic turf. This fact sheet was developed to assist people in making decisions about installing or using this kind of synthetic turf athletic field. Considerations related to other kinds of synthetic turf fields are not addressed in this fact sheet.

#### **BACKGROUND**

The first well-publicized use of AstroTurf, a synthetic turf for athletic fields, was at the Houston Astrodome in 1966. This first generation of synthetic turf was essentially a short pile carpet with a foam backing. Since then, design changes have resulted in a greater variety of synthetic turf athletic fields. One type of synthetic turf is fabricated using synthetic fibers, manufactured to resemble natural grass, and a base material that stabilizes and cushions the playing surface. The fibers are typically made from nylon, polypropylene or polyethylene and are connected to a backing material. The base material, also called infill, consists of one or more granular materials that are worked in between the fibers during the installation process. Commonly used base materials are granulated crumb rubber (usually from used tires), flexible plastic pellets, sand, and rubber-coated sand. A combination of sand and crumb rubber is often used.

Crumb rubber is produced by grinding used tires. Steel and fiber tire components are removed during the process and the rubber pellets are sorted by size. Pellet sizes ranging from about one-sixteenth to one-quarter inch in diameter are used on synthetic turf. Crumb rubber is typically applied at a rate of two to three pounds per square foot of field surface.

#### **HEALTH AND SAFETY CONSIDERATIONS**

Some potential health and safety considerations related to synthetic turf have generated public concern.

These include:

- Heat stress
- Injury
- Infection
- Latex allergy
- Chemical exposure

## **Heat Stress**

Synthetic turf fields absorb heat, resulting in surface temperatures that are much higher than the temperatures of the surrounding air. In June 2002 at Brigham Young University (BYU) in Utah, the average surface temperature on a synthetic turf field was reported to be 117°F while the average surface temperatures on natural turf and asphalt were 78°F and 110°F, respectively. A maximum surface temperature of 200°F on the BYU synthetic turf field was reported. A turfgrass specialist at the University of Missouri reported measuring an air temperature of 138°F at “head-level” height on the university’s synthetic turf field on a sunny 98°F day. The surface temperature of the field was reported to be 178°F. A study conducted at Penn State University measured surface temperatures on experimental plots of nine different types of infilled turf. Temperature measurements were made on three occasions. The average air temperatures reported were 79°, 78°, and 85°F. The corresponding average surface temperatures reported for the synthetic turf plots are 120°, 130° and 146°F.

Water can be applied to synthetic turf to reduce the surface temperatures on warm days. A study at BYU found that watering synthetic turf lowered the surface temperature from 174°F to 85°F, but the temperature rose to 120°F in five minutes and to 164°F in twenty minutes. A study conducted by Penn State University on experimental synthetic turf plots examined the effect of watering synthetic turf on surface temperature. Measurements were made on three occasions. For one monitoring period, surface temperatures ranging from about 130° to 160°F were lowered initially to about 75°F, but increased within 30 minutes to temperatures ranging from about 90° to 120°F, where they remained fairly stable for the three-hour monitoring period.

The surface temperatures reported on synthetic turf fields can get high enough to reach levels of discomfort and may contribute to heat stress among users of the fields. While watering synthetic turf may reduce surface temperatures, other factors are likely to influence its effectiveness. At the present time, NYSDOH is unaware of any studies that have examined the role of synthetic turf in contributing to heat stress or that have compared the occurrence of heat stress among athletes playing on natural turf and synthetic turf.

Because of the potential for high temperatures on infilled synthetic turf fields, it is important that people who play or work on the fields be provided with adequate warnings regarding the potential for heat stress. People should also be advised to remain hydrated and to seek relief from the heat in shaded areas. The potential for and frequency of high surface temperatures warrant consideration when making decisions about installing and using a synthetic turf field.

## **Injury**

There is a common perception that there are more sports injuries on synthetic than on natural turf athletic fields. Many factors influence the rate of sports injuries, including the type of playing surface. The many kinds of synthetic turf surfaces and changes in the turf products over the years complicate the assessment of how the playing surface affects injury rates. Other risk factors have been implicated in injury rates among athletes, in addition to the type of playing surface. These risk factors include level of competition, skill level, age, shoe type, previous injury and rehabilitation, and a number of individual physical characteristics. We identified five studies that compared injury (*e.g.*, sprains, lacerations, fractures) rates among athletes when playing on infilled synthetic turf and natural turf fields. Although the ability of the studies to detect differences in the injury rates was limited by the small number of injuries reported, the

studies concluded that there were no major differences in overall injury rates between natural and infilled synthetic turf. Although each study found some differences in specific injury types, there was no consistent pattern across the studies.

The potential for head injuries from contact with the surfaces has been assessed by determining the ability of the surfaces to absorb impacts. Tests have shown that the force of impact on asphalt surfaces is much higher than the level generally accepted to be associated with serious head injury. The force of impact on many types of natural turf and all types of synthetic turf tested are below this level. The force of impact on frozen natural turf is typically above the acceptable level. No data are available for the force of impact on frozen synthetic turf.

The abrasiveness of synthetic turf fibers may contribute to the injury risk among athletes, particularly for abrasions or “turf burns.” The degree of abrasiveness appears to be dependent on the composition and shape of the turf fibers. A study conducted at Penn State University suggests that synthetic turf with nylon fibers is more abrasive than synthetic turf with other types of fibers.

### **Infection Risk**

Some people have expressed concern that infections, including methicillin-resistant *Staphylococcus aureus* (MRSA), may be more common among users of synthetic turf fields than users of natural turf fields. This possibility has not been studied systematically, and no definitive statements can be made about differences in risk between the two surfaces.

At least two questions are important in evaluating the risk of infection. Does skin damage occur more frequently on synthetic turf than natural turf, thus providing a place where infections are more likely to occur? Are there more germs on synthetic turf than natural turf?

While injury studies have not consistently identified differences in abrasion and laceration risks between natural and infilled synthetic turf, some types of synthetic turf may result in more skin abrasions.

Although very few tests have been performed, the available data do not suggest the widespread presence of infectious agents, such as MRSA, on synthetic turf fields. Also, the available information indicates that outdoor or indoor synthetic turf surfaces are no more likely to harbor infectious agents than other surfaces in those same environments. Disease outbreak investigations conducted in response to illnesses caused by a variety of germs (*e.g.*, MRSA, *Campylobacter*, meningococcus, echovirus, herpes simplex virus, hepatitis virus, coxsackie virus) have not identified playing fields, either natural or synthetic, as likely to increase the risk of transmitting infections.

Skin cuts and abrasions that may result from contact with athletic fields, including both natural and synthetic fields, are susceptible to infection. Athletes and others developing skin abrasions should clean the wounds and seek prompt medical attention. Athletes should avoid sharing towels (on and off the field), equipment, razors, soap and other objects with others, because sharing these items can spread germs.

### **Latex Allergy**

Latex, a substance found in natural rubber, contains substances called “latex allergens,” which can cause an allergic response in some people. About 6 percent of the general population is allergic to the substances in latex. Tire rubber contains the latex allergen, although at much lower levels than in latex

gloves and other consumer products. People playing on synthetic turf may be exposed to latex allergens through direct contact with the skin (dermal exposure) and inhalation of small rubber particles suspended in the air.

A study conducted for the California Environmental Protection Agency tested samples of tire rubber on the skin of guinea pigs. None of the animals developed any rashes or allergic reactions from contact with the rubber.

Whether crumb rubber can cause an allergic response in people is not known. NYSDOH is unaware of any occurrences of latex allergy associated with contact with crumb rubber or synthetic turf fields.

### **Chemical Exposure**

Exposure to a chemical requires contact with it. Contact with a chemical occurs in three ways: swallowing it (ingestion exposure), breathing it (inhalation exposure), and having it come in contact with the skin (dermal exposure) or eyes (ocular exposure). The potential for harmful effects from exposure to a chemical depends on the amount of the chemical a person contacts, how the chemical enters the body (ingestion, inhalation, dermal, or ocular), how often contact occurs, and the toxic properties of the chemical. The ability of a chemical to be released from a substance (*e.g.*, crumb rubber) is an important factor in determining how much exposure actually occurs. Other factors that can influence a person's risk for adverse health effects from environmental chemicals include age, gender, general health, genetic differences, exposure to other chemicals and lifestyle choices.

Tires are manufactured from natural and synthetic rubbers along with numerous chemical additives, including zinc, sulfur, carbon black, and oils that contain polyaromatic hydrocarbons (PAHs) and volatile organic chemicals. Because crumb rubber is manufactured from used tires, it probably contains the same chemicals as tire rubber.

Studies have been conducted by the California Environmental Protection Agency Office of Environmental Health Hazard Assessment and the Norwegian Institute of Public Health to assess the potential for ingestion exposure to the chemicals in crumb rubber by children playing on synthetic turf. Both studies concluded that health risks to children resulting from the ingestion of crumb rubber are low.

The Norwegian Institute of Public Health also collected data to assess potential health risks resulting from dermal and inhalation exposures to chemicals contained in synthetic turf fields. Health assessments were conducted for adults and children. The researchers concluded that adverse health effects resulting from dermal exposures to crumb rubber or from inhalation exposures to organic chemicals released from the fields are unlikely. No health assessment of the concentrations of rubber particles in the air was made.

A French study measured the concentrations of organic chemicals emitted as gases (known as volatile organic compounds or VOCs) from crumb rubber under laboratory conditions. The data were used by the French National Institute for Industrial Environment and Risks to evaluate possible health effects from inhaling VOCs released from synthetic turf. The study authors concluded that the concentrations of organic compounds emitted did not pose a health concern for athletes, officials or spectators.

Some types of synthetic turf fibers contain elevated levels of lead (*e.g.*, in the range of about 2,000 to 9,000 parts per million). Degradation of these fibers can form a dust that presents a potential source of

lead exposure to users of the fields. The Centers for Disease Control and Prevention and the Agency for Toxic Substances and Disease Registry addressed the potential for lead exposures from synthetic turf fibers in a June 2008 Health Advisory (<http://www.cdc.gov/nceh/lead/artificialturf.htm>). For new or replacement installations, select synthetic turf products that do not have elevated lead levels.

Our review of the available information on crumb rubber and crumb rubber infilled turf fields indicates that ingestion, dermal or inhalation exposures to chemicals in or released from crumb rubber do not pose a significant public health concern.

## **OTHER CONSIDERATIONS**

A number of other factors may need to be considered when installing and using synthetic turf.

**Use:** Synthetic turf is more durable than natural turf and can be used without the rest periods that natural turf requires to keep the turf healthy. The New York City Department of Parks and Recreation (NYCDPR) estimates that on an annual basis, permitted use (hours per year) for synthetic turf athletic fields is 28 percent higher than for natural grass fields.

**Installation:** Installation costs of synthetic turf vary depending on the amount of site preparation required and the specific field design. The installation costs of synthetic turf are generally much higher than the installation costs of natural turf.

**Maintenance:** The maintenance costs of synthetic turf will vary depending on the field's use and design, but are typically estimated to be lower than the maintenance costs of natural turf. Natural turf requires regular mowing, fertilizer application, pest control and possibly watering. Synthetic turf requires replacing infill materials, repairing seams and removing weeds and moss. Specialized equipment, which may or may not be included in the field's purchase price, is required for these activities.

**Lifetime:** NYCDPR estimates that the lifetime of a natural turf field is on the order of five years. The synthetic turf industry estimates that the lifetime of an infilled synthetic turf athletic field is eight to ten years, depending on care during installation and use. NYCDPR and other New York entities have seen similar lifetimes.

## SUMMARY OF INFORMATION FOR CRUMB-RUBBER INFILLED SYNTHETIC TURF ATHLETIC FIELDS

Heat stress	Surface temperatures on crumb-rubber infilled synthetic turf fields can reach levels of discomfort and may contribute to heat stress. This warrants consideration when making decisions about installing and using a synthetic turf field. While watering synthetic turf may briefly reduce surface temperatures, a number of factors may influence its effectiveness. People using these fields should be advised to remain hydrated and to seek relief from the heat in shaded areas.
Injury	Overall, studies have found no consistent differences in injury rates between natural and crumb-rubber infilled synthetic turf.
Infection	Skin cuts and abrasions that may result from contact with athletic fields (natural and synthetic turf) are susceptible to infection. Athletes and others developing skin abrasions should clean the wounds and seek prompt medical attention. Athletes should avoid sharing equipment, razors, towels, soap and other objects with others, because these items can spread germs.
Latex allergy	At the present time, NYSDOH is unaware of any occurrences of latex allergy resulting from contact with crumb rubber or synthetic turf fields.
Chemical exposures	Based on the available information, chemical exposures from crumb rubber in synthetic turf do not pose a public health hazard.

## **WHERE CAN I GET MORE INFORMATION?**

If you have any questions about the information in this fact sheet or would like to know more about in-filled synthetic turf athletic fields, please call the NYSDOH at 1-800-458-1158 or write to the following address:

New York State Department of Health  
Bureau of Toxic Substance Assessment  
Flanigan Square, 547 River St.  
Troy, NY 12180-2216

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