

A special report for **architects** and **designers** of synthetic turf systems

## The CushionFall Sport advantage

*Key attributes and supporting evidence documenting  
benefits over other infill options*

**CushionFall Sport™**

A product offering of Colorbiotics

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# CushionFall Sport™

## Encapsulated crumb rubber infill

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### Overview

As the architect and/or designer of a synthetic turf system, you’re relied upon by stakeholders to offer credible recommendations based on educated, well-informed decisions. The process involves your experience and continuously gathering as much information as possible about the necessary components of a customized playing surface that best reflects individual client needs.

Among the most important of the many variables for consideration is the infill; a specification that previously was often taken for granted until the advent of technological innovations, environmental concerns and improvements to standard Styrene-Butadiene-Rubber (SBR) crumb rubber expanded the playing field of infill materials options. Now there are nearly a dozen choices being positioned in the market, and understanding the key differentiators, features and benefits can be difficult. This report has been prepared to provide you with an in-depth analysis of CushionFall Sport™ — a technologically advanced infill material that leverages the

performance characteristics and benefits of traditional SBR crumb rubber.



### Enhancing an already safe substance

Despite the U.S. Environmental Protection Agency (EPA) confirming the safety of standard SBR crumb rubber nearly two decades ago and more recent substantiation of its safety by scores of testing and independent research studies, we at Colorbotics, a leading provider of quality colorants, headquartered in Ames, Iowa, challenged our world-class team of scientists to develop an alternative.

CushionFall Sport is a vibrant, durable and safe encapsulated infill system that delivers outstanding aesthetics; is easy to maintain and, above all, is safe for athletes. In fact, it is patented as among the most environmentally safe, VOC- and heavy metal-reducing crumb rubber infill products in the United States and Europe. A brief overview of several key attributes and resulting benefits that set CushionFall Sport apart from SBR crumb rubber and alternative infill options follows.

### Volatile organic compounds (VOCs) and heavy metal leachate

Although all crumb rubber materials used for synthetic turf systems have long been approved and deemed safe by the EPA and a variety of state agencies, environmental concerns continue to be a topic raised by consumers and other members of the surrounding community when a synthetic turf field is discussed. For this reason, CushionFall Sport is designed to enhance the properties of SBR to make it even safer. As shown below, independent test results show the levels of VOCs present in CushionFall Sport are **reduced by 71.6 percent and heavy metal leachate lessened by 81 percent compared to that of standard SBR crumb rubber.**

### Quantification of percent of Volatile Organic Compounds CushionFall Sport vs. natural crumb rubber

<b>CushionFall Sport</b>		<b>CB-098</b>	<b>SML</b>	<b>7/6/2009</b>
Volatile organic compounds (VOCs) determination and quantification of percent of VOCs in natural black crumb rubber versus CushionFall Sport				
<b>Analyte</b>	<b>BP (F)</b>	<b>CushionFall Sport</b>		<b>Reduction Percent</b>
		<b>Raw rubber</b> Three sample average <b>ppm</b>	<b>Sport</b> Three sample average <b>ppm</b>	
MIBK	118	10.99	2.17	
Ethanol	173.3	0.87	0.47	
Acetone	134	0.66	0.50	
Carbon Disulfide	116	0.63	0.97	
Cyclohexanone	312	1.08	0.13	
tert-Butanol	180	0.00	0.00	
1-Butanol	243	0.00	0.20	
Methylcyclohexane	214	0.52	0.03	
Xylenes	279	0.34	0.10	
N,N-Dimethylacetamide	327	0.00	0.00	
Methyl Acetate		0.00	0.07	
Other C6-9 Hydrocarbons		1.23	0.00	
Total VOC ppm's released		16.32	4.63	71.61%
Average VOCs release over 12 compounds				<b>71.61%</b>

Volatile Organics Screen by SOP 5030, Rev 5  
 Gas Chromatography / Mass Spectrometry

Midwest Laboratories, Inc  
 Omaha, Nebraska

Table 1

**Quantification of metals leachate — CushionFall Sport vs. natural crumb rubber**

**CushionFall Sport**

CB-098

SML

7/6/2009

**Metals leaching determination and quantification of percent reduction of released metals in natural black crumb rubber versus CushionFall Sport**

Analyte	Detection Limit in mg/L	Raw rubber	CushionFall Sport	Reduction Percent
		Three sample Average	Three sample Average	
Arsenic (TCLP)	0.1	n.d.	0.000	
Cadmium (TCLP)	0.005	n.d.	0.000	
Chromium (TCLP)	0.01	n.d.	0.000	
Lead (TCLP)	0.005	n.d.	0.000	
Mercury (TCLP)	0.001	n.d.	0.000	
Selenium (TCLP)	0.1	n.d.	0.000	
Zinc*(TCLP)	0.01	0.173	0.033	80.96%

**Average VOC reduction over 12 compounds**

**80.96%**

\*NOTE: Total Zinc was also run on sample sml5-255, uncoated raw rubber and is 18,758 ppm. Zinc is a raw material component in synthetic rubber for tires. The fact that the Zinc levels are low in the extract for the raw rubber indicated that the Zinc is well bound up in the rubber matrix. The Zinc levels in the extract of the coated rubber sample are even lower — an 81 percent reduction — an indication that the CushionFall Sport coating adds a protective, encapsulating layer to the rubber particles. .

EPA Metals Leachate Testing — Method 1312 — Synthetic Predipitation Leaching Procedure

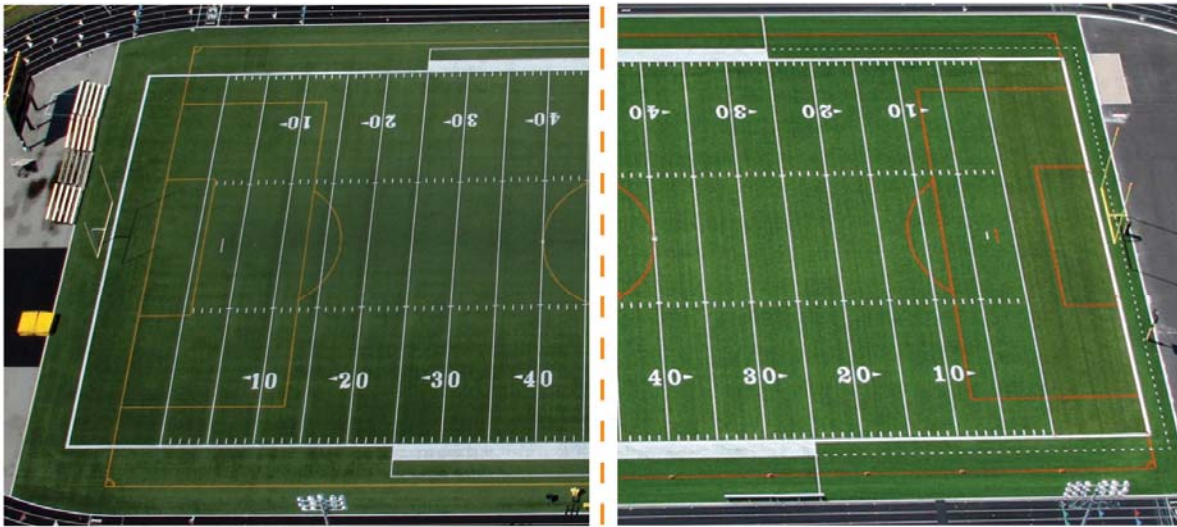
Midwest Laboratories, Inc.  
Omaha, Nebraska

**Table 2**

**Vibrancy**

The bright green encapsulation coating contributes to a more vibrant, realistic surface. CushionFall Sport is the ideal infill complement for synthetic turf systems where sporting events are often televised in high definition, eliminating the 5 o'clock shadow effect common with other black crumb rubber.





**Black SBR rubber infill**

**CushionFall Sport**

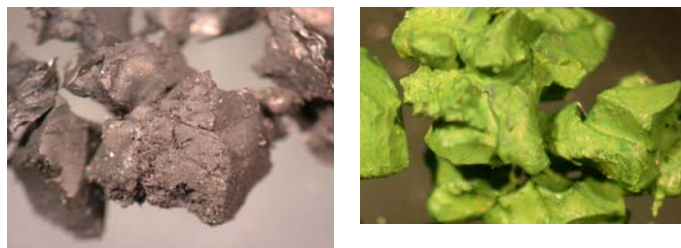
### Smoothing out rough edges

Standard SBR crumb rubber infill originates from discarded car and sometimes truck tires that are recycled into minute, coarsely ground particles. There are several processes that can be used to produce ground rubber crumb. Two of the most common are ambient grinding using various types of grinding mills, and cryogenic grinding of rubber by chilling with liquid nitrogen.

The ambient process often uses a conventional high powered rubber cracker mill set with a close nip. Vulcanized rubber is sheared and ground into a small particle. It is common to produce 10 to 30 mesh material using this relatively inexpensive method to produce relatively large crumb. The process produces a material with an irregular jagged particle shape and generates a significant amount of heat in the rubber while being processed. Excess heat can degrade the rubber.

Cryogenic grinding usually starts with chips or fine crumb that is cooled using a chiller. The rubber, while frozen, is put through a mill and produces fairly smooth fracture surfaces. Little or no heat is generated in the process, resulting in less degradation of the rubber. The most significant feature of the cryogenic process is that almost all fiber or steel is liberated from the rubber resulting in a high yield of usable product and little waste.

A closer look (see fig. 1) at ambient rubber reveals a substance with more jagged edges than that of the cryogenic rubber. While not apparent to the naked eye, one may assume this rough edge would have little if any impact on the overall functionality of the crumb particle. Yet the result is of relative significance. The effect created by the collective gathering of millions of individual crumb particles actually inhibits several beneficial attributes inherent to the chemical properties of raw SBR rubber including:



**Fig. 1**

**Water permeability** — Due to the encapsulation and coating of CushionFall Sport, individual crumb rubber particles repel water and moisture more readily. This allows a much more rapid evacuation of water allowing the field to drain more quickly and promoting a drier playing surface, which is important to maintain stable footing and traction.

- Permeability of CushionFall Sport exceeds more than 96.5 in. per hour at installation; among the most rapidly draining infill material surfaces available.
- More importantly, CushionFall Sport shows permeability will continue to exceed 45 inches per hour after 10 years of simulated wear and tear during a 20,000 cycle Lisport test.

## Water Permeability

Report#48510E CushionFall Sport

June 24, 2010

**Test Scope:** This test method determines rainfall drainage capacity (permeability) of submitted turf with installed infill system. Test data values represent drainage rates for the turf and infill system, and do not take into account the percolation properties of an underlying sub base.

**Test Method:** ASTM F1551-09: Standard Test Methods for Comprehensive Characterization of Synthetic Turf Playing Surfaces and Materials: Suffix-DIN 18-035, Part 6: Water Permeability of Synthetic Turf Systems and Permeable Bases

### Data / Results

Pass #	Water Flow Thru 6' Zone	Gallons/minute/yd <sup>2</sup>	Rainfall Capacity
1	63.82 Seconds	31.7	97.1 inches/hour
2	64.56 Seconds	31.3	96.0 inches/hour
3	64.25 Seconds	31.4	96.5 inches/hour

Average Rainfall Capacity
96.5 inches/hour

TSI TESTING SERVICES, INC.  
817 Showalter Ave  
Dalton, GA 30722

## Surface displacement

During heavy rainfall, ambient rubber has the propensity to float and scatter as air bubbles can accumulate in small crevices, facilitating simple infill migration (fig. 2).

When SBR rubber is coated with CushionFall Sport, the coating fills these very small voids making the particles much more similar to a cryogenic rubber surface. Additionally, the coating offers just a



slightly higher density than SBR rubber. This facilitates a consistent flow of water through the infill without raising and displacing any rubber (e.g. making it float). Hence, SBR rubber encapsulated with CushionFall Sport *maintains a settled composure in the turf supporting* a consistent, more stable playing surface and less infill displacement over time.

**UV resistance**

CushionFall Sport is formulated to offer UV resistance, helping to minimize the degradation process that results after continuous exposure to bright sunlight. In short, by protecting the integrity of the infill particles through encapsulation, CushionFall Sport extends the overall life of the surface and the properties inherent to rubber.

**Product lifespan through simulated wear testing**

Over time, crumb rubber can lose some of its flexibility and elasticity characteristics after continuous contact, wear, compaction and normal aging. CushionFall Sport protects the properties of the rubber, helping playing surfaces retain their shock-absorption properties longer. CushionFall Sport has been tested by several independent laboratories for simulated wear using ASTM F355a-10: Standards Test Methods for Shock-Absorbing Properties of Playing Surface Systems and Materials (Procedure A).

- Expected normal wear will show some loss of color and coating over an eight- to ten-year period. This poses no threat to the integrity of the product and any loss of color or coating will easily evacuate the system with normal rainfall over time unnoticed. CushionFall Sport is warranted to offer a visually apparent green surface coating throughout the average life of a field.
- Impacts made after 20,000 cycles on LiSport simulated mechanical abrasion (simulated 10 years of wear) show CushionFall Sport performs very well with only a slight level of powdering.

Test data indicated only a slight breakdown in particle size. Density is relatively equal to that of SBR rubber, requiring no change in the installation process. G-Max / shock absorption properties remain at safe levels throughout the life of a field averaging approximately 135.

**Shock Absorbing Properties**    Report#48510B    CushionFall Sport    June 24, 2010

**Test Scope:** Data obtained from this test method are indicative of cushioning properties of the playing surface system and materials under the specific conditions selected. The playing system is impacted at a specified velocity with a missile of given mass and geometry to determine the maximum value of G encountered during impact

**Test Method:** ASTM F355a-10: Standard Test Methods for Shock-Absorbing Properties of Playing Surface Systems and Materials (Procedure A)

**Pre-Test:** Impacts Made After 20,000 Cycles on LiSport Simulated Mechanical Abrasion

G-Max Read Drop #2	G-Max Reading Drop #3	Average G-Max Reading
134	136	135

TSI TESTING SERVICES, INC.  
817 Showalter Ave., P.O. Box 2041  
Dalton, GA 30722

## Flammability

For indoor use, a synthetic turf system is required to pass similar flammability requirements to that of carpeting. CushionFall Sport has been independently tested using ASTM test method D 2859-06 and received an acceptable 8 of 8 PASS result. When testing Critical Radiant Flux, the flash point of CushionFall Sport was 71.6° higher than that of a synthetic turf system utilizing black SBR crumb rubber. This result means it will take longer for CushionFall Sport to ignite.

### Ignition Characteristics — ASTM D2859-06

CushionFall Sport December 22, 2009

#### Sample

**conditioning:** Sample preconditioned at 21°C / 65% relative humidity, then oven dried at 105°C ± 2°C during two hours, then cooled in a dessicator for one hour.

#### Number of

**tested specimen:** ASTM F355a-10: Standard Test Methods for Shock-Absorbing Properties of Playing Surface Systems and Materials (Procedure A)

Results	Individual Results			
Observation (pass / fail)	Pass	Pass	Pass	Pass
	Pass	Pass	Pass	Pass

Labosport Inc.  
5661, rue de Lanaudiere, Suite 200  
Montreal (Quebec) H2G 3A5 - Canada

## Static Electricity / Static Cling

A common problem after installation of synthetic turf is the presence of static electricity, the result of cold and low humidity that often creates isolated motionless charges of electricity. CushionFall Sport has been proven to reduce the static charge resulting from these external weather conditions.

## Summary

CushionFall Sport is a safe, durable and visually vibrant alternative to traditional crumb rubber infill for synthetic turf systems. Independent tests show the vibrant green coating significantly reduces VOCs and heavy metal content of the rubber, helps to maintain elasticity properties and creates a more realistic-appearing surface.

Additionally, when SBR rubber is coated with CushionFall Sport, it fills the voids and makes the particles smooth and more rounded. This facilitates a consistent flow of water through the infill without raising and displacing any rubber (i.e., without making it float).

Collectively, the many attributes of the bright green encapsulation process further enhance the properties of standard SBR crumb rubber, making CushionFall Sport the ideal infill choice for sport synthetic turf surfaces.

CushionFall Sport is a trademark of Becker Underwood in the U.S. and / or other countries. For more information about CushionFall Sport visit [www.cushionfallsport.com](http://www.cushionfallsport.com).

## CushionFall Sport™ Manufacturer's Limited Warranty

CUSHIONFALL SPORT ENDEAVORS TO USE THE HIGHEST QUALITY MATERIALS AND THE LATEST MANUFACTURING TECHNIQUES IN THE PRODUCTION OF OUR CUSHIONFALL SPORT RUBBER PRODUCTS (THE "PRODUCTS"). THESE HIGHMATERIAL QUALITIES PERMIT CUSHIONFALL SPORT TO OFFER A GUARANTEE AGAINST DEFECTS IN WORKMANSHIP WITH RESPECT TO THE PRODUCTS FOR A PERIOD OF EIGHT (8) YEARS FROM THE DATE THE PRODUCTS ARE MANUFACTURED OR PRODUCED, SUBJECT TO THE LIMITATIONS SET FORTH BELOW. THE OBLIGATION OF CUSHIONFALL SPORT UNDER THIS MANUFACTURER'S LIMITED WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT (WITH THE VALUE PRO-RATED OVER THE EIGHT (8) YEAR LIMITED WARRANTY PERIOD) OF THE PRODUCTS IN NO EVENT SHALL THE OBLIGATIONS OF CUSHIONFALL SPORT UNDER THIS MANUFACTURER'S LIMITED WARRANTY EXCEED THE PURCHASE PRICE OF THE PARTICULAR PRODUCTS SOLD BY CUSHIONFALL SPORT. THE REMEDY OF REPAIR OR REPLACEMENT SET FORTH HEREIN SHALL BE THE SOLE AND EXCLUSIVE REMEDY OF THE HOLDER OF THIS MANUFACTURER'S LIMITED WARRANTY AND CUSHIONFALL SPORT SHALL HAVE NO OTHER OBLIGATION OR LIABILITY IN CONNECTION WITH ANY MATTER OR THING, INCLUDING, WITHOUT LIMITATION, THE CONDITION OR QUALITY OF THE SYNTHETIC TURF IN WHICH THE PRODUCTS ARE USED.

THE TERM CUSHIONFALL SPORT™, AS USED HEREIN WITH RESPECT TO THE PRODUCTS, SHALL INCLUDE ONLY THE RUBBER INFILL SUPPLIED BY CUSHIONFALL SPORT. NOTWITHSTANDING ANYTHING TO THE CONTRARY CONTAINED IN THIS MANUFACTURER'S LIMITED WARRANTY, THIS MANUFACTURER'S LIMITED WARRANTY SHALL NOT COVER ANY DEFECTS, FAILURE IN OR DAMAGE TO THE PRODUCTS DUE OR ATTRIBUTABLE TO ANY OF THE FOLLOWING:

- (A) ABUSE, MISUSE, NEGLIGENCE;
- (B) PRODUCTS INSTALLED, REPAIRED, ALTERED OR REPLACED BY ANY PERSON OTHER THAN AN TURF AUTHORIZED INSTALLER, REPAIR PERSON OR FIRM APPROVED BY CUSHIONFALL SPORT;
- (C) PRODUCTS DAMAGED, DIRECTLY OR INDIRECTLY, IN ANY MANNER OR RESPECT, BY ANY PARTY OTHER THAN CUSHIONFALL SPORTS;
- (D) PRODUCTS EXPOSED TO LIGHT OTHER THAN NATURAL LIGHT OR ARTIFICIAL LIGHT APPROVED IN WRITING BY CUSHIONFALL SPORT;
- (E) PRODUCTS NOT MAINTAINED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE SUPPLIER OF THE TURF, INCLUDING, WITHOUT LIMITATION, THE CARE AND MAINTENANCE OF THE INFILL SYSTEM AND CLEANING METHODS;
- (F) ORDINARY WEAR & TEAR; OR
- (G) USE FOR ANY PURPOSE OTHER THAN SYNTHETIC TURF NEEDS TO APPROVED IN WRITING BY CUSHIONFALL SPORT.

THE EXPRESS WARRANTIES SET FORTH IN THIS MANUFACTURER'S LIMITED WARRANTY ARE IN LIEU OF AND EXCLUDE ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE, AND OF ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF CUSHIONFALL SPORT, INCLUDING, WITHOUT LIMITATION, NEGLIGENCE. CUSHIONFALL SPORT NEITHER ASSUMES NOR AUTHORIZES ANY PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OR INSTALLATION OF PRODUCTS SUBJECT TO, WITHOUT LIMITATION OF, THE FOREGOING, IN NO EVENT SHALL CUSHIONFALL SPORT BE LIABLE TO THE HOLDER OF THIS MANUFACTURER'S LIMITED WARRANTY, OR ANY OTHER PARTY, FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE USE OF PRODUCTS, OR PRODUCED IN SPEC, INCLUDING, WITHOUT LIMITATION, CLAIMS FOR DAMAGES RELATING TO PERSONAL INJURY, LOST TIME OR CONVENIENCE, LOSS OF USE OF THE PRODUCTS, LOST PROFITS OR REVENUES, DOWNTIME COSTS, THE LOSS OF PERSONAL OR COMMERCIAL PROPERTY, THE COSTS OF TELEPHONE, TRAVEL OR LODGING, OR ANY OTHER DAMAGES. CUSHIONFALL SPORT ENDEAVORS TO HANDLE ALL WARRANTY CLAIMS PROMPTLY AND PROFESSIONALLY. THE OBLIGATIONS OF CUSHIONFALL SPORT UNDER THIS MANUFACTURER'S LIMITED WARRANTY ARE CONDITIONED ON CUSHIONFALL SPORT HAVING BEEN PAID IN FULL AT THE TIME OF THE CLAIM WITH RESPECT TO THE ORDER TO WHICH THIS MANUFACTURER'S LIMITED WARRANTY RELATES, INCLUDING ALL CHANGE ORDERS.

ALL CLAIMS MADE UNDER THIS MANUFACTURER'S LIMITED WARRANTY SHALL BE INVALID AND NULL AND VOID UNLESS (I) MADE IN WRITING TO CUSHIONFALL SPORT WITHIN EIGHT (8) YEARS FROM THE DATE OF SUBSTANTIAL COMPLETION, AND (II) MADE WITHIN THIRTY (30) DAYS OF THE DATE ON WHICH THE HOLDER OF THIS MANUFACTURER'S LIMITED WARRANTY KNEW, OR SHOULD HAVE KNOWN, OF THE DEFECT GIVING RISE TO ITS CLAIM. IN THE EVENT SUCH HOLDER OF THIS MANUFACTURER'S LIMITED WARRANTY EITHER FAILS TO SUBMIT ITS CLAIM IN WRITING WITHIN SAID EIGHT (8) YEAR PERIOD OR FAILS TO SUBMIT ITS CLAIM WITHIN THE THIRTY (30) DAY PERIOD AFTER THE DATE SUCH HOLDER OF THIS MANUFACTURER'S LIMITED WARRANTY KNEW, OR SHOULD HAVE KNOWN, OF SAID DEFECT, THEN SUCH HOLDER OF THIS MANUFACTURER'S LIMITED WARRANTY SHALL BE DEEMED TO HAVE WAIVED ITS CLAIM IN ITS ENTIRETY. ANY AND ALL CLAIMS OR OTHER CAUSES OF ACTION ARISING OUT OF THIS MANUFACTURER'S LIMITED WARRANTY SHALL BE BROUGHT ONLY IN THE FEDERAL OR STATE COURTS OF THE STATE OF IOWA AND SHALL BE GOVERNED BY, AND CONSTRUED IN ACCORDANCE WITH, THE LAWS OF THE STATE OF IOWA. THIS LIMITED WARRANTY IS NOT TRANSFERABLE IN ANY MANNER OR RESPECT.

INSTALLATION LOCATION: \_\_\_\_\_  
Installation Date: \_\_\_\_\_