WHITEPAPER

PLAYGROUND SURFACES:

Why Playground Grass by ForeverLawn is the Superior Choice

PLAYGROUND GRASS™
by ForeverLawn®

INTRODUCTION

Today's playground designs continue to adapt in order to meet the needs of their communities' and end-users. At their inception in the United States over 130 years ago, there was very little concern for playground safety. In the 1970's and 1980's, injury related to playgrounds saw a dramatic rise. By the 1990's programs were formed focusing on "risk" of playground injuries from unsafe surfaces. Due to this focus and also an increase in injury-related lawsuits, many city planners looked to make playgrounds "risk-proof." However, new studies show that risk-aversion in parenting, educating and even playground development might not be best for children. Today, we've come full circle and realize that free and creative outdoor play is essential for children's health and development.

And, while safety is still paramount in today's playgrounds, designers understand that safety must be integrated seamlessly into their designs without limiting play or minimizing children's play activities or time spent outdoors. Safer and well-maintained play structures are a major contributor to today's playground designs, but safety surfaces underneath and surrounding play structures are just as or possibly even more important than the play structures themselves. In fact, many playground designers are evolving the way they approach design by using synthetic turf as a play element, itself, to create safer, cleaner and more comfortable play environments.

This white paper recaps the evolution of playground safety surfaces and why it was critical that they evolved and improved. We will describe the various safety surfaces along the evolutionary path and outline the pros and cons of each through technical performance data as well as target audience and end-user perceptions.

Through data and insights uncovered from secondary and primary qualitative research undertaken for this initiative, we will show why Synthetic Turf is the best surface overall for playground safety today and, further, why ForeverLawn® Synthetic Playground Grass™ is the superior choice in the category.

THE PLAYGROUND SAFETY SURFACE CATEGORY AND IT'S EVOLUTION

From Dirt and Paving Materials, to Sand and Pea Gravel, to Engineered Wood Fiber (EWF) and Rubber Chips

When playgrounds got their start in the U.S. during the early 1900's, early play structures were erected on hard ground such as soil and other hard surface materials. Due to the high amount of injuries, playground builders and designers quickly realized that different surface materials were needed to absorb the impact of landings and falls.

Sand was one of the first such safety surfaces used, due to its availability and cost effectiveness. But it was quickly discarded because sand was found to be just as unsuitable as a safety surface, because it becomes very hard when wet and does not minimize injuries from falls.

This spurred the next step in the evolution of playground safety surfaces of loose-fill materials, including engineered wood fiber (EWF), rubber chips and pea gravel. These loose-fill materials offered some degree of fall protection, but still created safety hazards like splinters from wood-based materials as well as choke hazards from children putting the loose chips and pea gravel in their noses, mouths and ears. And, with use, these loose-fill materials are often displaced from being directly under the play structures. Sharp objects can also get mixed in with loose-fill materials and pose unsuspected, hidden hazards. Further, the loose-fill materials are fairly dirty…. as the wood-based chips decompose and after rainy or snowy weather which allows mud and dirt to rise to the surface and coat the loose-fill materials. Mold and mildew growth is quite common on loose-fill materials and they are also ideal hiding places for insects, snakes and rodents.

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ENTER UNITARY RUBBER SURFACES

Rubber Tiles and Poured-in-Place (PIP) Surfaces

In 2000, the Architectural and Transportation Barriers Compliance Board issued accessibility guidelines for new construction and alterations of play areas as part of the Americans with Disabilities Act (ADA). These guidelines were adopted into law in 2010 and as of March 15, 2011, all play areas were mandated to be in compliance with these guidelines.

As playgrounds strove to be more inclusive to children and adults with mobility restrictions, playground surface options had to evolve yet again. The loose-fill materials such as pea gravel and wood-based materials or rubber mulch do not provide easy accessibility, so the next step in surface evolution required firmer materials that are more easily accessible by wheelchairs and other mobility equipment. The solution was unitary rubber surfaces such as rubber tiles, bonded rubber and poured-in-place (PIP) rubber surfaces.

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ADDITIONAL REASONS FOR PLAYGROUND SURFACE EVOLUTION

A. Safety Standards for Public or School Playgrounds and Parks

Along with many other safety playground standards, the Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment, ASTM F1292 was first published in 1991. While testing methods and evaluations are very complex, below is a simplified definition of the ASTM F1292 Standard:

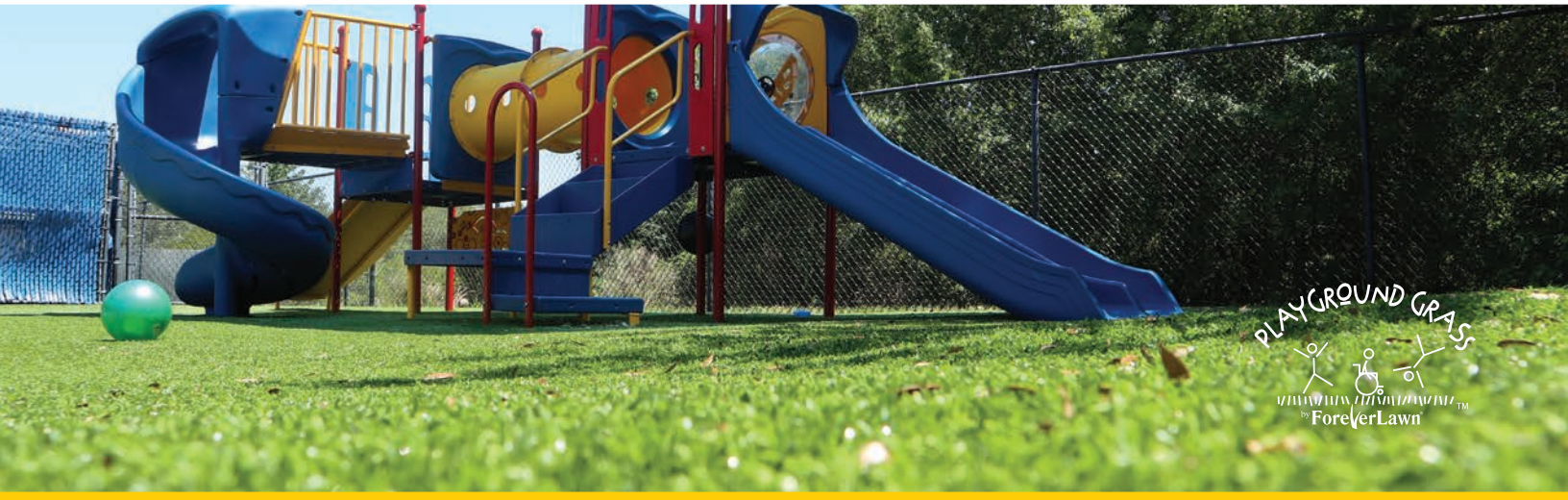
- G-max and Head Injury Criterion (HIC) are the criteria of injury risk with attenuation material on the ground for children aged 3 to 14 years old.
    - G-max is defined as the maximum acceleration of a missile during an impact, expressed in G units.
- HIC defined: A specific integral of the acceleration-time history of an impact, and determines the relative risk of head injury.

The fatal limit of G-max is defined to be 200 G and that of the HIC is 1,000. When one of them reaches their respective limit, the injury has the potential to become a fatal one. Although it has been said that F1292 should be improved, this specification has been conventionally applied as the standard evaluation method for loose-fill and playground surfacing materials since its inception and was renewed in 2013.

It should be kept in mind that the ASTM F1292 Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment are the minimum standards recommended and that these standards are recommended not to keep children from being hurt, but to keep children from incurring fatal injuries from falls.

B. Continued Improvement of Playground Designs and Age Appropriate Play Areas

In addition to safety concerns/regulations and required accessibility guidelines, today's playground trends of more natural looking and feeling surface options, creating better play experiences for children and increasing outdoor play time were additional drivers of safety surface evolution beyond unitary rubber surfaces and PIP options.



THE RISE OF SYNTHETIC TURF AND SAFETY PADDING OPTIONS FOR PLAYGROUND SAFETY SURFACING

More Active, Creative and Stimulating

In the search for more ideal safety surfaces to exceed vs. just meeting ASTM Attenuation and Fall Height Requirements, as well as the desire to increase outdoor play among children AND meet the needs of today's playground design trends, synthetic turf has become the safety surface of choice among city planners, playground decision makers, designers and end users. Because synthetic turf has performed so well on athletic fields, more and more designers are specifying it for playgrounds.

Synthetic turf, with additional padding options included between the base layer and the turf surface around play structures, is by far the safest playground surface option available today. And, along with their improved drainage systems, synthetic turf surfaces allow children to play outside immediately after bad weather passes and also extends the season for outdoor play.

Synthetic Turf is also ideally suited to meet the needs and design trends in today's playgrounds:

- Improving playability and creativity (designing exercise into play).
- Creating age appropriate areas, graduated challenges (challenges are highly valued by kids) and flow between these areas.
- More use of color, mounds and hillsides as play areas.
- Cleaner play environments that are free from germs and allergens.
- More natural looking and feeling play areas.

As further proof of synthetic turf benefits, playground decision maker respondents to the "Investigating the State of Play" research ranked Critical Must Haves in their playgrounds. When looking at the top ranked factor of Cleanliness, synthetic turf is the best safety surface choice compared to loose-fill and poured-in-place rubber solutions. Further, synthetic turf is the best surface solution for other "safety" ranked items: Strict Safety Factors / Such as Fall Height Compliance and being Allergen-free. Synthetic turf also rises above alternative surfacing options as it relates to other must haves: Overall Appearance and Appeal, Overall Fun Factor and Reduced Maintenance – Easy to Maintain.

Item	Ranking	Item	Ranking
Cleanliness	9.2	Passive Spaces	7.7
Overall Appearance & Appeal	8.7	Safety and Age Appropriate Signage	7.7
Overall Fun Factor	8.7	Active Spaces	7.5
Socialization Spaces	8.2	Natural Play Elements	6.7
Regular Maintenance	8.0	Strict Safety Factors / Such as Fall Height Compliance	6.3
Safe Play Elements that Look Risky	7.8	Allergen-Free	6.2
Design / Elements for All Ages	7.7		

THE LATEST EVOLUTIONARY STEP:

ForeverLawn Synthetic Grass – Created Solely for Playgrounds

The latest step of the evolution of playground surfaces today, comes from ForeverLawn, who pioneered synthetic playground turf solely for playground use. This is unique to ForeverLawn….other synthetic turf providers use their products universally across all turf applications….almost as if playgrounds are an afterthought. Additional benefits of ForeverLawn Synthetic Playground Grass include:

- It's the Safest Synthetic Turf Available.
    - ForeverLawn Playground Grass voluntarily exceeds Head Injury Criterion (HIC) recommendations and offers the best fall safety ratings in the industry when used with SafetyFoam Pro padding.
    - ForeverLawn Playground Grass meets and exceeds the ASTM fall height requirements for up to 15 feet.
    - SafetyFoam Pro is exclusive to ForeverLawn and was designed to be part of their Playground Grass safety system.
    - SafetyFoam is made of 100% expanded polypropylene with a unique interlocking design, creating a consistent, safe surface.
    - AlphaSan® antimicrobial technology is manufactured into the blades of select Playground Grass products for playgrounds that desire the highest level of safety available.
    - Meets or exceeds established testing standards with regard to heavy metals in turf, according to CPSC, ASTM and the State of California standards.
    - Resists mold, mildew and decay.
    - Environmentally friendly: Recyclable and non-toxic.

- Unparalleled Accessibility:
    - Proprietary XStatic™ Antistatic Technology which reduces static build up on the playground. This is important for playground users who rely on electronic devices such as cochlear implants for minimal interference, so they can enjoy a safer, more rewarding play experience.
    - ForeverLawn Playground Grass Ultra, which incorporates their XStatic™ Antistatic Technology, is the only patented anti-static turf available that meets ANSI/ESD STM97.2 - ESD Test Method.
    - Meets ASTM 1951 ADA certification requirements.

- Superior Construction: Premium Durability & Playability.
    - Unique blade and yarn construction that resists wear up to four times that of other synthetic grasses.
    - Revolutionary seaming system that keeps seams secure and locked in place.
- Flexible Design Features.
    - Customizable designs.
    - Standardized designs also available (Funscapes) which include play paths, play spaces and play fields.
        1. Allows playground turf enhancements even when budget constraints exist.
    - Allows designers to include playground grass as part of the play experience, it's a play element on its own.
- Best Aesthetic Appeal – Nicest Looking.
    - Quotes from Playground Decision Makers about their ForeverLawn Synthetic Playground Grass:

"Love their products / unique (mounds)"

"Great, QUALITY products."

"Aesthetics are extremely important – they nail it! It's so natural and soft feeling."

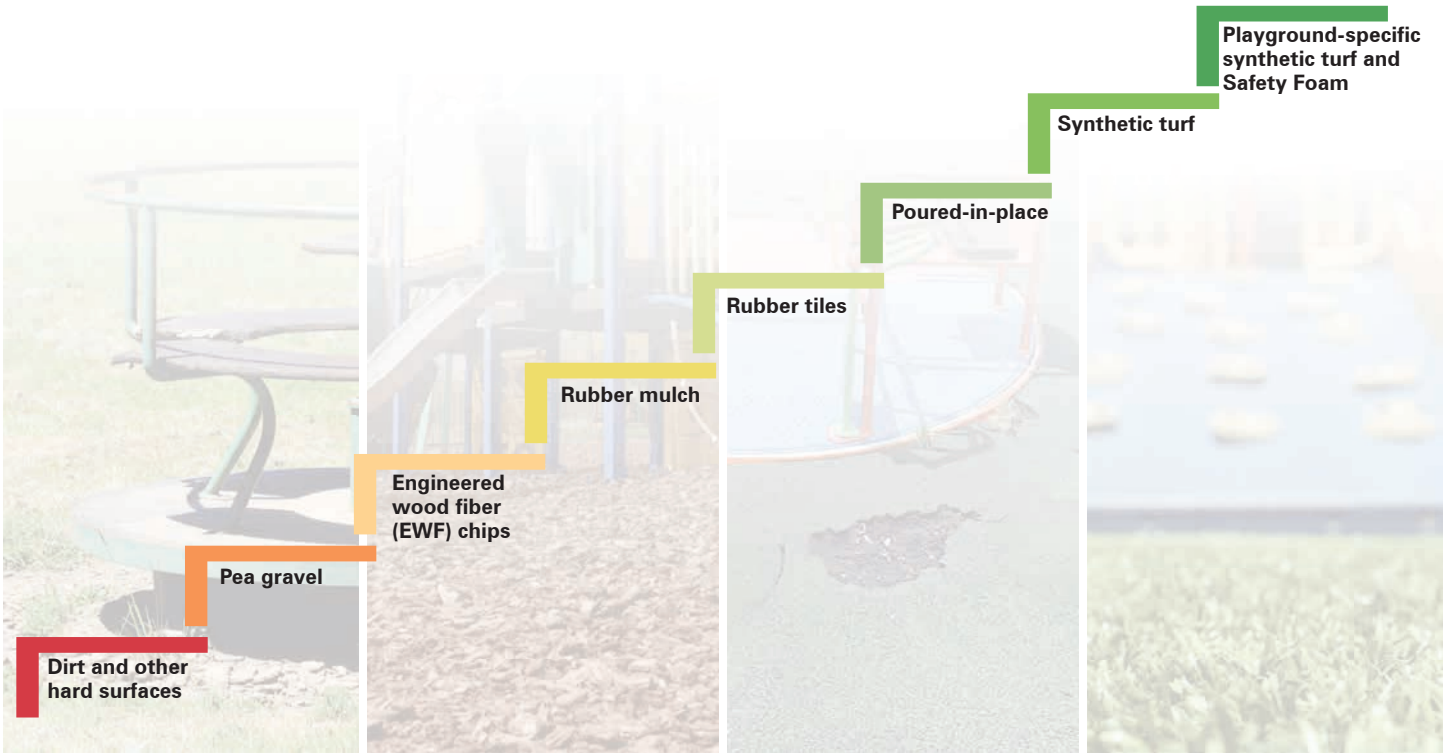
- Unparalleled Customer Service.
    - Faster and proper installation: Network of experienced, certified installers.
    - Local, Ready to Serve each Community, as evidenced by the following customer quotes:

"Their sales folks were amazing, very consistent and really followed up."

"We were able to get specs, documents, samples, etc. very quickly."

"They were very professional, neat and clean. That's important when they are working in our public spaces."

"I would definitely use them again and recommend them to anyone.It is more than exceeding my expectations."



Basic safety surfaces for lower-budget or tapped-out projects

Higher-end, larger-budget projects or premium surfaces designed for specific applications.

HOW PLAYGROUND DECISION MAKERS VIEW THE VARIOUS PLAYGROUND SAFETY SURFACES

Decision Maker's Perceptions of Safety Surfaces

In a recent qualitative study "Investigating the State of Play" among Park Officials and Education Administrators conducted by ForeverLawn Synthetic Turf, respondents categorized the various safety surface options along a continuum of quality as shown in the chart above. Respondents appear to be quite in tune with the category, viewing the quality of materials very similarly to the evolutionary path shown previously.

From left to right, respondents viewed pea gravel as strictly a price play, mainly considered only when dealing with strict budget constraints. They indicated that wood-based materials and rubber mulch were one step up from pea gravel in quality for a safety surface but still less than ideal because of the tendency for it to be displaced, the "dirty" factor and choke hazards. Next came rubber tiles, synthetic turf and poured-in-place. The ultimate in quality and performance in respondents minds is synthetic turf specifically designed for playgrounds with a safety foam or pad underneath the turf to cushion falls.

HOW DECISION MAKERS AND END USERS REACT TO THE DIFFERENT PLAYGROUND SAFETY SURFACES:

The experiences of those utilizing the different playground surfaces are critically important as well. Following are direct quotes from park superintendents, school administrators and camp directors who shared their first-hand experience and observations of the different safety surfaces they've used within their systems:

Appearance, Appeal and Draw, Safety and Cleanliness

"With mulch we had constant splinters and with other unitary rubber surfaces, we had constant burns and scrapes. Since we put in synthetic turf, we just don't have that anymore."
– Park District Superintendent

"Our synthetic playground grass is cleaner and more inviting."
– Park District Superintendent

"They (kids) are more willing to take the leap (on our new playground synthetic turf) because they know they won't get hurt." – Daycare Director

"Since we've installed our playground turf, infants and children feel safer, so they are free to explore more." – Daycare Director

"There is nothing to trip on (even surface), choke on or get scratches and scrapes from."

"There are less injuries, scratches and scrapes."

"We've had kids fall off, land on the playground turf and be great. The safety of our new playground turf has had the most prominent impact." – School System Superintendent

"Parents would never send their kids to school in their nice clothes or shoes, because the pea gravel, mud and mulch would destroy them!" – Daycare Director

Playability & Inclusiveness

- Playground Synthetic Turf Safety Surface specific comments:

"If we didn't have the playground turf safety surface, they wouldn't be outside as much. That helps them focus themselves for everything else – it has a great impact on the kids as well as the parents." – Elementary School Principal

"It allows kids to get back to nature, looks real, allows them to disconnect from the world, which fosters creativity." – Camp Director

"Provides sensory benefits – look, touch and feel." – Daycare Director

"Kids are less fearful, more confident." – Daycare Director

"They know they won't get hurt or come away dirty, so they are more active and imaginative. They sit on it and play, roll around more, jump and play on the surface and the mounds, dive onto the turf, they run around a lot more." – Daycare Director

"The mounds are fantastic and allow for imaginative play, the kids love them." – Daycare Director

Additional Benefits to End Users

Decision makers' experiences and observations also included many community and economic benefits:

- Community:

  "All ages, from adults to seniors and different aged children, are playing together and getting to know each other." – Park District Superintendent

  "Community use of our parks and playgrounds is exploding." – Park District Superintendent

  "Because our playgrounds are more inviting, safer and cleaner, they are more of a destination." – Park District Superintendent

  "We've seen profound effects on how the community uses our playgrounds outside of the school day." – School System Superintendent

  "The parents and teachers love it!" – Daycare Director

  "Our parents' previous worries are gone, they can relax while their kids are on our playgrounds."– Park District Superintendent

  "The teachers are confident that the kids are safe." – School System Superintendent

- Economic:

  "Everyone sees the evidence that their tax dollars are being spent to benefit the entire community." – Park District Superintendent

  "Parents are enamored with it, it helps us sell our daycare program." – Daycare Director

  "Our community park and school playgrounds have such ascetic appeal…. it's even driving new and existing home sales." – Park District Superintendent

PLAYGROUND SAFETY SURFACE STUDIES: WHAT THE NUMBERS SAY

While qualitative research and industry-recognized pros and cons of the different safety surfaces tell a compelling story, the numbers from playground safety surface studies also support the case for synthetic turf over loose-fill options and unitary rubber surfaces.

London Playground Study

A 2015 study compared London Playgrounds to those in New York, Los Angeles and San Francisco . They compared grass, sand, rubber matting, and bark surfaces used in the London Playgrounds to Rubber Tile and Poured-in-Place Rubber Surfaces mainly used in the U.S. Playgrounds. The study concluded that "The U.S. seems to have reached 'peak safety' and has created a nation of overly expensive, homogeneously safe, and insidiously boring play spaces. The study also found that the comparative London vs. U.S. injury rates demonstrate that the "safer" U.S. spaces have unintended consequences. In pursuit of fun, children are using play structures in unintended ways often hurting themselves by falling on these surfaces that are too expensive to maintain."

Key insights from the London Playground study:

- Playgrounds are for Play: Everything on a playground should be playable, including surfaces. Fun should be prioritized over maintenance and being "seemingly" safe.
- Risk is a Good Thing: The best playgrounds look dangerous but are completely safe, offering ways to play based on skill level, strength, and bravery.

The National Study of Playground Equipment and Surfacing

The National Study of Playground Equipment and Surfacing conducted by The National Program for Playground Safety, and published in March, 2019, sheds more light on the safety of playground surfaces. The study conducted safety testing on various playground surfacing materials to study injury rates at different fall heights. It found, not surprisingly, that an increase in head injuries occurred as fall heights increase. Further study findings follow:

- At higher fall heights, the playground surfacing is more likely to be found non-compliant with the current ASTM F1292 standard.
- Loose-fill surfaces evaluated by NPPS in the field demonstrate compliance at fall heights below 9 feet, with a marked decrease in compliance above 9 foot fall heights.
- Rubber unitary surfaces tested (poured-in-place and rubber tile products) demonstrated a decrease in compliance with ASTM playground surfacing impact attenuation standards at fall heights above 6 feet.

Recommendations from the study include:

- Limitations on playground equipment height, and stricter standards for loose-fill surfaces (sand, pea gravel, crumb rubber, wood-based materials) above 9 feet.
- Limitations on playground equipment height for rubber unitary surfaces tested (rubber tile, poured-in-place) above 6 feet.
- Playground surfacing material must be adequately maintained and its performance periodically verified.
- 74% of loose-fill playground surfacing material had been displaced at the time of testing and 40% of loose-fill material had deteriorated surrounding each play structure.
- Of the 415 play structures assessed, 13% did not meet ASTM-F1292 criteria and close to 7% were found to have inappropriate surface materials under and around the play structure.

The study summarized that, "It is critical for owner/operators and consumers to be aware of playground safety, maintenance and the importance of having an appropriate surfacing material under and around all play structures."

RECAP OF SAFETY SURFACE OPTIONS PROS AND CONS

Surface Type	Pros	Cons
Loose-Fill Materials		
Sand & Pea Gravel	• Most affordable • Can meet some ASTM Standards • Easily sourced	• Sand becomes hard when wet • Displaced easily, requires diligent maintenance • Pea gravel is a potential choke hazard as children often place in mouth, nose, and ears. • Not ADA compliant • Dirty • Not recommended by IPEMA • Not recommended for over a 5' fall height. • Not allowed in many cities and states due to local laws • Very limited application as safety surfacing • Not mold or mildew resistant • Attracts insects, snakes, rodents and other animals • Can hide sharp or undesirable objects • All loose-fill surfaces meet ASTM standards, however in specific testing: • Only 85% of sand tested under play structures are meeting attenuation standards, while 82% had a HIC score below 1000. • Pea Gravel Requires a minimum of 12" of loose-fill at all times. Even less than sand, only 80% of pea gravel tested are meeting impact attenuation standards, while only 65% had a HIC score below 1000.
Engineered Wood Fiber [EWF] & Rubber Mulch	• Relatively inexpensive • Meets ASTM Standards • Meets IPEMA Requirements • ADA Compliant (if maintained daily) • Both have the ability to reach a wide range of critical fall height requirements depending on depth of product and proper maintenance.	• Dirty and potentially toxic: Rubber mulch from tires should be coated with non-toxic material. • Not mold or mildew resistant • Design limiting • EWF can become waterlogged and can freeze in cold weather • Displaced easily, requires diligent maintenance and regular top-offs • Attracts insects, snakes, rodents and other animals • Can hide sharp or undesirable objects • All loose-fill surfaces meet ASTM standards: ◦ However, in random testing, 74% of ALL loose-fill playground surfacing material had been displaced and 40% had deteriorated around play structures.

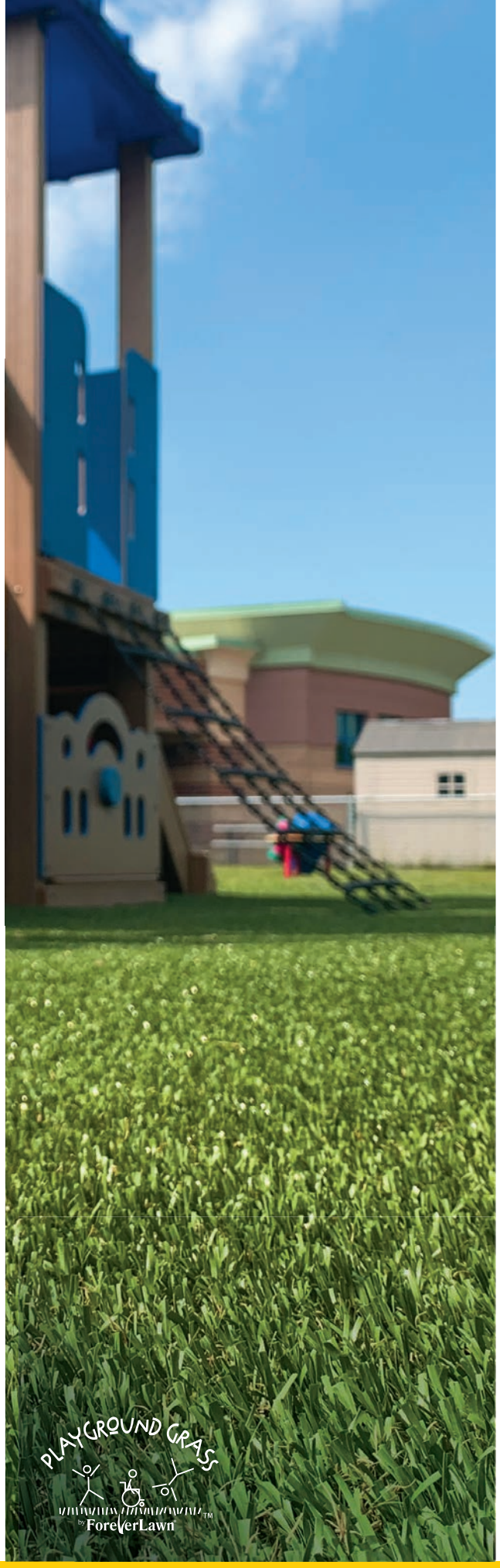
Recap of safety surface options pros and cons (Contd.)

Unitary Surfaces		

Rubber Tiles & Poured in Place [PIP] Rubber	• Smooth, cushioned surface
	• ADA Compliant
	• Slip resistant
	• Minimal maintenance
	• Meets ASTM Standards
	• Meets IPEMA Requirements
	• Variety of colors
	• Customizable
		• High initial outlay
		• PIP:
		  ◦ Costly to install and maintain, must be resealed regularly
		  ◦ Installation is weather dependent as it has to cure on sight
		  ◦ Expensive and difficult to repair, discrepancies will show
		• When not maintained properly, crumb rubber can delaminate
		• Unnatural look & feel
		• Shrinks & fades over time
		• Gets hot in the summer and hard in the winter
		• Surface can feel somewhat abrasive, cause scratches and scrapes
		• Kids don't interact with the surface, they play on it like it is concrete
		• Warranty not as long as other surfacing options (typically 5 years for PIP and 10 years for Rubber Tiles).
		• Can become stiff over time, requiring testing to ensure safety standards are upheld
		• Only 85% of unitary products tested (rubber tiles & PIP) met impact attenuation standards and 87% had a HIC score below 1000.
		• NOT recommended for fall heights over 9 feet

Generic Synthetic Turf	• Moderate maintenance • ADA compliant • Will not shrink or fade • Aesthetically pleasing, natural look & feel • Improved drainage, dries quickly • Increases outdoor playtime & season • Maintains good impact attenuation at different temperatures. • Long lifespan, low lifetime costs • Meets ASTM Standards, up to 12' fall height • Meets IPEMA requirements • Anti-microbial, no allergens • Users interact with it like it is natural grass (roll, play, sit and jump on it)	• High initial outlay • Infill needed (Approx. 10 lbs. per square foot) to maintain integrity and requires regular maintenance. • Material can get hot in direct sunlight over extended periods of time • Static electricity build-up on surface • Taller pile heights can get matted down with heavy use which can minimize fall height ratings.
PLAYGROUND GRASS by ForeverLawn™	Includes Pros of Synthetic Turf Above, Plus: • Exceptional drainage - further extends outdoor play. • Minimal infill recommended • Requires minimal maintenance after installation • Antimicrobial and antistatic technology manufactured into the blade. • Variety of product and colors available • Only manufacturer that has their own safety system. • Exclusive "Play Mound" product line • Exceeds the ASTM fall height requirements for up to 15'. • Easily groomed • 15-year warranty • Only premium backed turf made specifically for playgrounds. • Inclusive ADA compliant surface	• High initial outlay • Material can get hot in direct sunlight over extended periods of time

Sources: The National Study of Playground Equipment and Surfacing as well as multiple industry sources including websites and white papers of playground equipment manufacturers, playground surfacing manufacturers and suppliers.



CONCLUSION 1: SYNTHETIC TURF IS THE OBVIOUS CHOICE FOR PLAYGROUND SAFETY SURFACING

Of the many factors that impact the safety and playability of America's play spaces, it is obvious that synthetic turf is by far today's best playground surfacing option, increasing safety and enhancing children's state of play. As presented previously, there are numerous pros and very few opposing cons regarding synthetic turf's use in playground surfacing applications. It's no surprise that synthetic turf's sales are projected to double by 2025.

Additional evidence supporting synthetic turf as the playground safety surface of choice:

- Playground Decision Makers positive experiences with installation and use of their synthetic playground surfaces.
- Observations and research among parents, teachers, end users and communities at large:
    - Increased engagement with and enjoyment of their new playgrounds.
    - Improved safety and relaxation factors.
    - The fact that synthetic turf is always ready for play, it's proven to increase outdoor and free play….aiding in children's social, physical and cognitive development.
        1. Let's kids be outdoors more after inclement weather and extends the outdoor play season.
        2. Allows kids the freedom to be kids, building confidence because they are free from fear of injury.
        3. Over the last decade synthetic turf has become the preferred surface for play as well as for soccer and football.

CONCLUSION 2: FOREVERLAWN SYNTHETIC PLAYGROUND GRASS IS THE SUPERIOR CHOICE IN THE CATEGORY

Within the synthetic turf playground safety surface category, ForeverLawn Synthetic Playground Grass is clearly the superior choice. A short recap of previously presented data follows:

- ForeverLawn Pioneered Synthetic Grass Designed and Formulated Exclusively for Playgrounds.
    - Superior drainage systems and durability – maximizes the outdoor play season and play time.
- It's the Safest Synthetic Turf Available.
    - Features natural shock absorption and proprietary padding options that offer the safest fall specification.
    - Proprietary backing and seaming systems so there are no holes, gaps or uneven surfaces thereby creating play areas that are free from trip hazards.
- Offers Unparalleled Accessibility over Other Synthetic Turf Options.
    - Built-in antimicrobial and antistatic technology.
    - Smooth surfaces that are universally accessible and inclusive.
- Superior Construction: Premium Durability & Playability.
    - Propriety blade system that outlasts wear and tear of up to 4 times that of other synthetic turf offerings.
- Minimal Maintenance: Minimal Infill Recommended.
- Best Aesthetic Appeal – Nicest, Most Natural Looking.
- Unparalleled, Local Customer Service.
- The Most Flexible Design Options.
    - Customizable and Standardized Designs.
    - Full line of colors available.
- 15-Year Warranty.

REFERENCES

- *"The Evolution of North American Playgrounds From 1900 to the Present and Beyond."* How architects, landscape architects, child development experts, and equipment designers have revolutionized outdoor play Sponsored by Little Tikes Commercial, By Kathy Price-Robinson
- *"National Study of Playground Equipment and Surfacing."* Source: The National Program for Playground Safety (March, 2019)
- *"Investigating the State of Play"* Secondary and Primary Qualitative Research Among End Users: Nautilus Strategy and Research for ForeverLawn Synthetic Turf (March-August, 2020)
- *A Study on Changes to the Form of Children's Playgrounds in Japan by Analyzing the JILA Selected Works of Landscape Architecture*: Source: Department of Forest Science, The University of Tokyo, Tokyo Japan. iamqinqing@gmail.com; Published April 10, 2019
- *"London Study of Playgrounds: The Influence of Design on Play Behavior in London vs. New York, San Francisco and Los Angeles."* Published 2015.
- *"Children's Perspectives on Playground Use as Basis for Children's Participation in Local Play Space Management."* Source: Marit Jannsson, Swedish University of Agricultural Sciences (February, 2015)
- *"A History of Children's Play and Play Environments: Toward a Contemporary Child-Saving Movement"*, Dr. Joe L. Frost, Centennial Professor Emeritus at the University of Texas at Austin, (Routledge, 2010)
- *ForeverLawnPlaygroundGrass.com*
- *"Simplification and Transformation of ASTM F1292 Measurement Procedure for Fall Accident Injury Criteria"* Source: National Institute of Occupational Health & Safety (Published Online, Aug., 2014)
- *"Public Playground Safety Handbook"* Source: U.S. Consumer Product Safety Commission (December, 2015)
- *"Synthetic Turf, the World's Fastest-Growing Play Surface"*, Source: Kevin Kinsley, ForeverLawn Synthetic Turf (May, 2020)
- *"A Historical Look at Playgrounds & Playground Safety"*, NoFault.com website