

2021 TECHNICAL MEETING & TRADE SHOW

December 3-6, 2021 • Hyatt Regency Grand Cypress • Orlando, FL

Pad & Infill Systems/Alternative Infills/Sustainability

Presenters:

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Presentation Outline

- Learning Outcomes
- Turf Infills
- Pads
- System Selection
- Group Discussion



Creekside Park, Los Gatos, CA

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Learning Outcomes

Participants will gain an understanding of the infill and pad types available in the market; how they differ in terms of playability, impact attenuation, sustainability, and drainage performance; and methodologies for selecting an infill and pad system that works best for the site and the client.

King Park, San Mateo, CA

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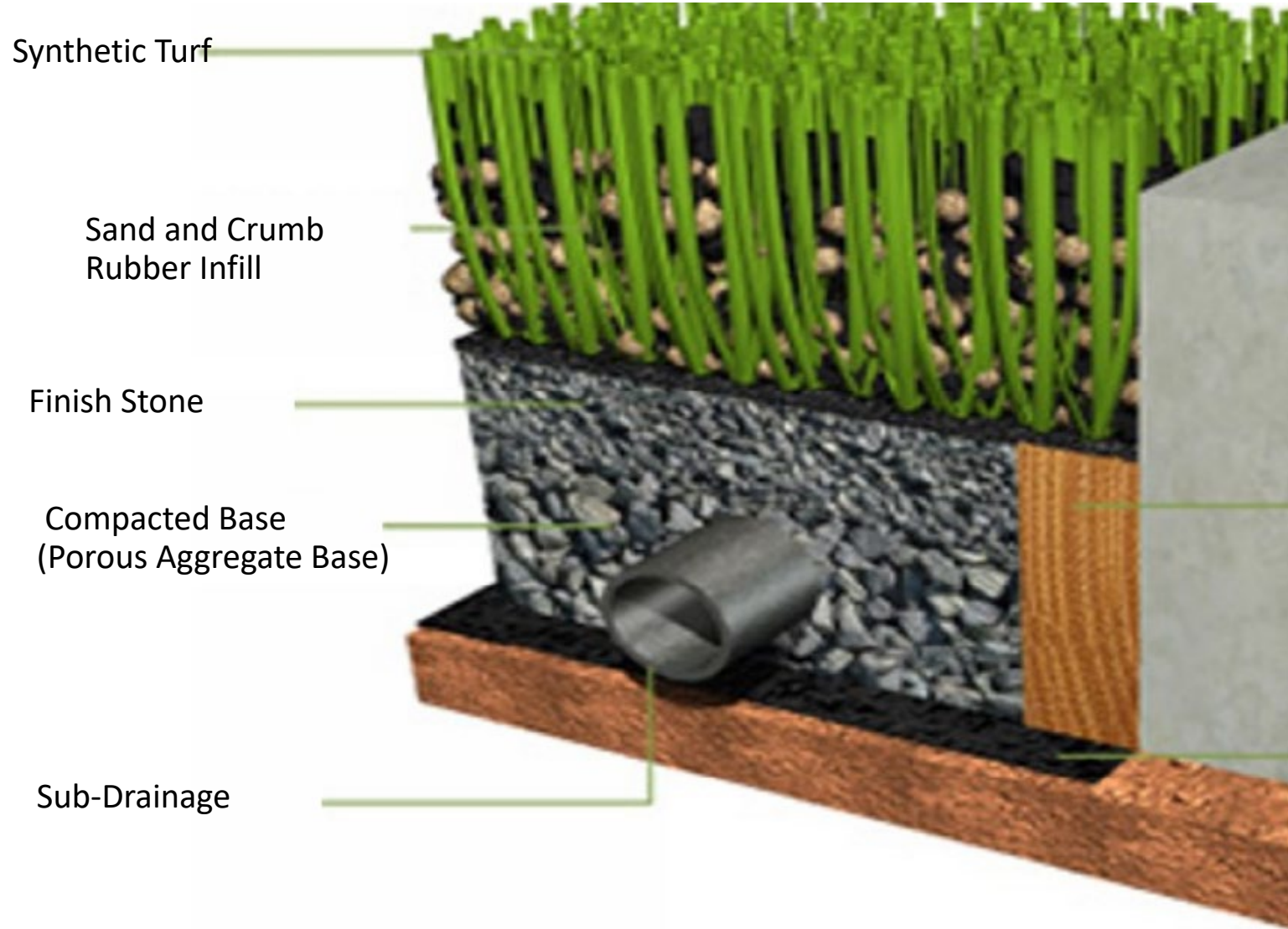
I. Turf Infills



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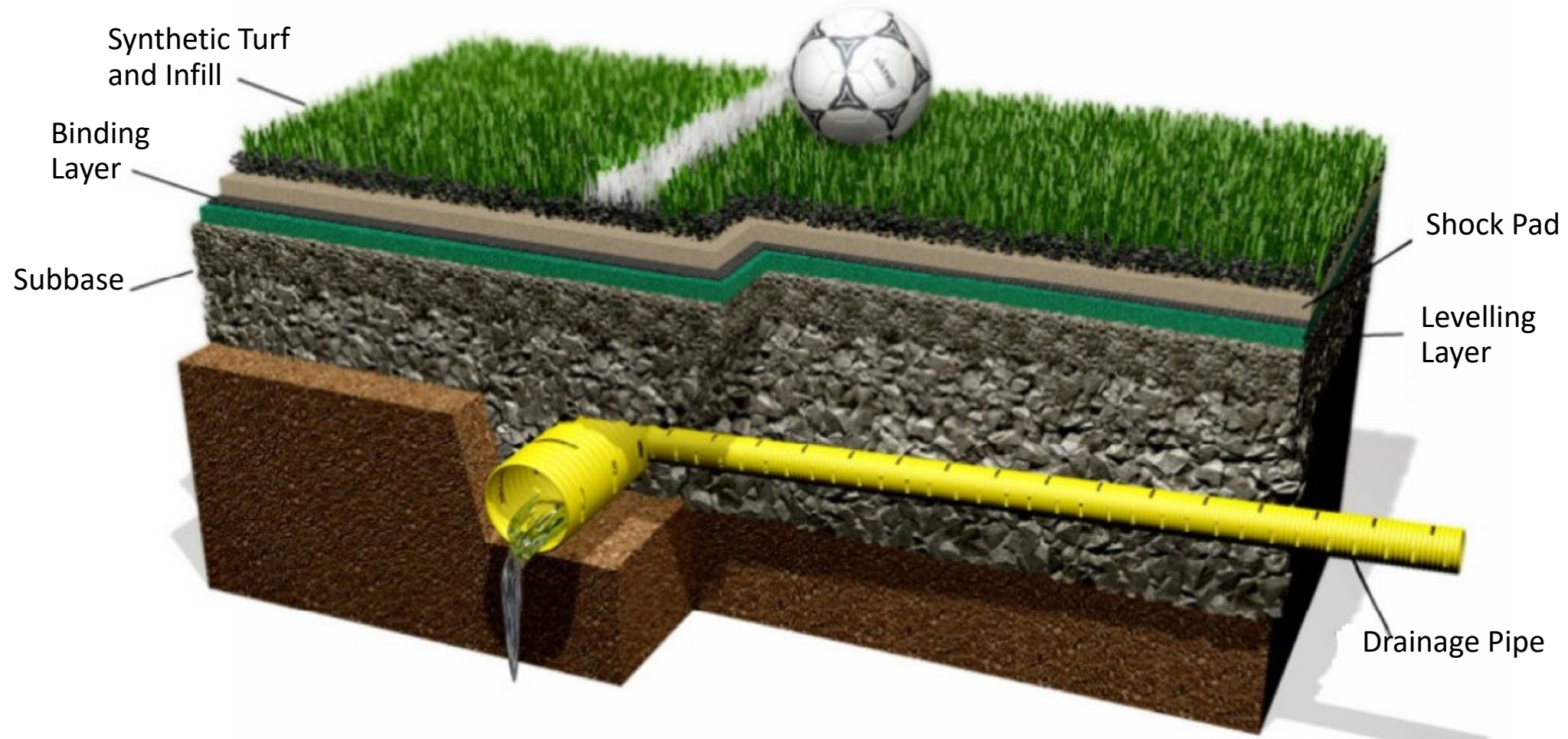
CROSS SECTION OF INSTALLATION



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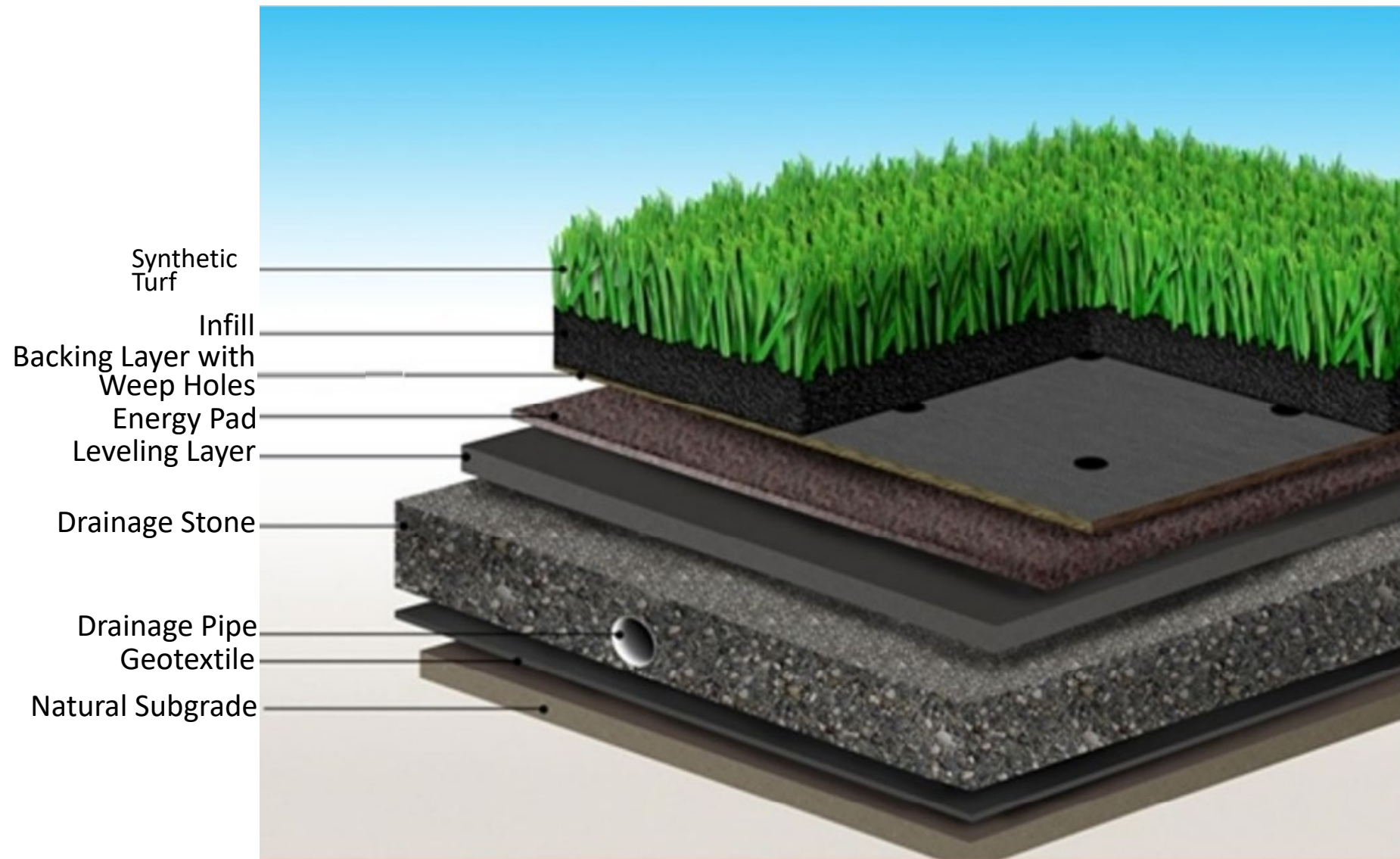
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CROSS SECTION OF INSTALLATION



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Infill Material Options

- 10 Things to Consider When Specifying Infill
 - Athlete Safety
 - Heat Absorption
 - Moisture Retention
 - Migration Resistance
 - Environmental Impact
 - Shock Attenuation
 - Energy Restitution
 - Abrasion Mitigation
 - Foot Traction
 - Ball Reaction



Crumb Rubber

- Crumb rubber is derived from scrap tires that are ground up and recycled. Two types of crumb rubber infill are ambient and cryogenic. Crumb rubber infill is substantially metal free, and, according to the STC Guidelines for Crumb Rubber Infill, should not contain liberated fiber in an amount that exceeds .01% of the total weight of crumb rubber.



Cryogenic Rubber

- Cryogenic (SBR) rubber is the cleanest, highest grade of rubber granule. Ground-up recycled tires are cryogenically frozen then shattered into small, smooth-edged particles. This smooth shape facilitates a consistent flow of water through the infill without raising and displacing any rubber while allowing rubber and sand to remain in suspension in a layered system - the optimal mix for a safe and consistent playing surface.



Ambient Rubber

- Ambient (SBR) Rubber is an environmental, cost-efficient, and durable solution that has withstood the test of time. Processed through a rubber cracker mill at ambient temperature, the result is a more jagged rubber granule than its cryogenic cousin, creating a looser infill with air pockets which can lead to infill migration.



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EPDM Infill

- EPDM (Ethylene Propylene Diene Monomer) is a polymer elastomer with strong resistance to wear and tear. It will not change solid form under high temperatures. Typical EPDM colors are green and tan. EPDM has proven durability in a variety of climates. Its elasticity properties and resistance to atmospheric and chemical agents provide a stable, successful performance.



Sand (Silica) Infill

- Pure silica sand is one of the original synthetic turf infill components. This product is natural, non-toxic, chemically stable, and fracture resistant. Silica sand infills are typically tan, off-tan or white in color, and round or sub-round in shape. As a natural product there's no possibility of heavy metals, and the dust/turbidity rating is less than 100. It may be used in combination with other infills to provide a safe, more natural playing surface. It is important that silica sand have a high purity round shape (greater than 90%) to resist crushing and absorption of bacteria and other field contaminants. Silica sand may be coated and used as an individual infill product or may be combined with other infills.



Coated Silica Sand Infill

- This high-purity silica sand with a soft or rigid coating specifically engineered for synthetic turf. These coatings are either elastomeric or acrylic (non-toxic) and create a bond with the sand grain sealing it from bacteria and providing greater performance and durability. Coated sand is available in various sizes and may be used with or without a pad and are available in various colors. The consistency of coated sand infill provides ballast and shock absorbing qualities.



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TPE Infill

- Thermo plastic elastomer (TPE) infill is non-toxic and heavy metal free, and available in a variety of colors. TPE is durable, resists fading, and 100% recyclable and reusable as infill when the turf is replaced. TPE offers consistent performance and exceptional g-max ratings over a broad temperature range



Organic Infill

- Made from natural materials that are odor free and non-toxic, organic infill has become a popular choice. The fibers boast a natural resistance to mold, mildew, and decay and allow for clean water runoff. As an absorptive organic material, this infill locks in water that is then released when sunlight warms the turf to create a cooler playing surface. Superior foot stability and pressure distribution is safer and less abrasive for athletes. And, with 100% recyclable materials, organic infill can be repurposed in an environmentally friendly way.



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Ground Coconut Husk & Cork Organic Infill

- Made from natural materials that are odor free and non-toxic, organic infill has become a popular choice. The mix with Coconut Husk and Cork is a 100% organic mix, consisting 90% coconut husk fibers and 10% cork.



Coated Rubber Infill

- Rubber can be coated with colorants, sealers, or anti-microbial substances if desired. Coated rubber provides additional aesthetic appeal, reduction of dust by-products during the manufacturing process, and complete encapsulation of the rubber particle.



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Alternative Rubber Infill

- EcoGrind or ShoeGrind and other sources are available. They are a multi-colored rubber made from 100 percent recycled athletic shoes or other post-industrial recycled products. Made of contaminant-free recycled materials, a “slice-and-grind” technique is used, as each shoe is cut into three slices — rubber out-sole, foam mid-sole and fiber upper. These slices are then fed through grinders and refined for use.



Alternative Infill Systems Organics

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Organic Infill Options

- Cork
 - PureFill (Proprietary)
- Fibrous Coconut, Shells and Others
 - GreenPlay (Proprietary)
 - GeoFill (Proprietary)
 - Infill Pro Geo (Proprietary)
 - PureGeo (Proprietary)
 - Safeshell (Open Market)
 - Olive Cores



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Organic Infill Pros & Cons Versus Crumb Rubber

- Pros
 - Organic
 - Proven heat reduction
 - Natural look
 - “FIFA 2 star” playability
- Tradeoffs
 - Additional maintenance
 - Low specific gravity (floats)
 - “Fibrous” material needs watering and replenishment
 - “Fibrous” material can break down



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Composite Options

- Heat Reducing Composite
 - Recycled Extruded Composites (by multiple manufacturers)



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Composite Options- Extruded Composites



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Composite Infill Pros & Cons Versus Crumb Rubber

- Pros
 - Closest performance to crumb rubber
 - Proven temperature reduction
 - Affordability versus other alternatives
 - References (NCDAA D-1)
- Tradeoffs
 - System still uses crumb rubber (middle layer)



Alternative Infill Systems TPE/EPDM

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Thermoplastic Options

- TPE
 - Forgrin (Open Market)
 - EcoMax (Proprietary)
 - Powerfill (Open Market)
- EPDM
 - Numerous (Open Market)



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Thermoplastic Pros & Cons Versus Crumb Rubber

- Pros
 - References
 - System performance
 - Minor heat reduction
- Tradeoffs
 - Some history of product failure
 - Varied sources and grades, mainly from Europe
 - Virgin material
 - Cost



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Alternative Infill Systems Alternative Rubber



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Alternative Rubber Options

- Post Industrial Material
 - Nike Grind - ShoeGrind
 - Sole Revolution (Open Market)
- Coated Rubber
 - CushionFall (Open Market)



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Alternative Rubber Pros & Cons Versus Crumb Rubber

- Pros
 - Not SBR, but rubber material
 - No pad needed
 - Post-industrial recycled material
 - Proven system durability
- Tradeoffs
 - Still considered a “rubber”
 - Aesthetics (multi-colored)
 - Limited supply



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Alternative Rubber Pros & Cons Versus Crumb Rubber

- Pros
 - Less “perception” of health risk
 - No pad needed
 - Similar play to sand/rubber
 - Green color
- Tradeoffs
 - Still SBR
 - Coating can chip off over time



Alternative Infill Systems Coated Sand

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Coated Sand Options

- Coated Sand
 - Envirofill (Open Market)
 - EnviroSand (Proprietary)



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Coated Sand Pros & Cons Versus Crumb Rubber

- Pros
 - No rubber
 - Color options
- Tradeoffs
 - Compaction
 - Limited performance
 - High cost
 - Limited history
 - Coating can come off over time

Alternative Infill Systems Summary

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	Material *1	Color	Shape	UV Stability	Availability *4	Resilient Shock Pad Recommended
Crumb Rubber	Styrene butadien Rubber (SBR) Recycled tire rubber shredded	Black	Angular shaped granules	Stable	Readily Available	No
Silica Sand	Rounded Silica Sand	Tan/Brown	Rounded Particles	Stable	Readily Available	Required (see comments)
Organic	Cork or Coconut Husk or rice hulls (Pure fill or Geofill)	Natural appearance (tan/brown)	Angular shaped granules	Low Stability	Limited availability	Yes (see comments)
Coated Crumb Rubber	SBR (Styrene butadien Rubber) Recycled tires shredded and coated with acrylic or EPDM	Custom colors available	Angular shaped granules	Medium Stability	Readily Available	No
(Ethylene Propylene Diene Monomer) Rubber	Virgin rubber produced for infill of athletic fields only	Custom colors available	Angular shaped granules	Medium Stability	Limited availability	No (see comments)
TPE (Thermoplastic Elastomer)	Extruded plastic pellets (Ecomax or Ecogreen similar)	Custom colors available	Typically Uniform pellets Shape depends on manufacturer	Stable	Limited availability	Recommended
Coated Sand	Polymer Coated Silica Sand	Green	Fairly Round Particles	Stable	Limited availability	Required (see comments)
Shoe Grind	Recycled NIKE's Environmentally Preferred Rubber (Meet or exceeds restricted substance standards set for wearable consumer goods) <i>Proprietary Products avail.</i>	Multiple Colors	Angular shaped granules	Stable	Very Limited Availability	No
Polymer & Mineral Mix	Extruded composite (coolplay example)	Green	Fairly Rounded	Stable	Readily Available	No



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Type of Alternative Infill	Material	Pros	Cons
Crumb Rubber	Styrene butadien Rubber (SBR) Recycled tire rubber shredded	Low cost Highly analyzed and Tested for safety and health Good drainage Does not float Low maintenance, high UV stability - maintains resiliency Manufacturers Warranties Warm Fields in freezing climates Readily available	Poor reputation Perception as hazardous to human health 'Heat' of play, hot fields/concern in warm climates Static cling - gets in uniforms and equipment
Silica Sand	Rounded Silica Sand	Low cost Highly analyzed as infill Low maintenance Good drainage Common mineral Manufacturers warranties Adds weight/stability to infill systems	Relative 'hardness' Abrasive Cost (requires resilient pad if used alone)
Organic	Cork or Coconut Husk or Rice Hulls	Natural material/renewable Perception as natural material Reported to reduce heat concerns as infill Natural color & appearance Good resiliency Reported common use in Europe	High Cost - high materials cost Cost - resilient pad recommended Cost - Husk products must be kept moist - requires irrigation system Cost - slightly higher maintenance costs/shorter life cycle Freezes-hard fields in freezing climates Potential for weed and mold growth Limited availability Floats-should not be used in flood prone areas



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<p>Coated Crumb Rubber</p>	<p>SBR (Styrene butadien Rubber) Recycled tires shredded and coated with acrylic or EPDM</p>	<p>Low maintenance Good drainage High UV stability - maintains resiliency Coating reported to encapsulate SBR rubber outgassing & improve heat concerns Manufacturers warranties Does not float Variety of colors-reported to reduce heat concerns Does not require resilient pad or irrigation</p>	<p>High cost - high materials cost Same chemical makeup & potentials as SBR rubber Relatively little analysis as turf infill Limited availability</p>
<p>EPDM (Ethylene Propylene Diene Monomer) Rubber</p>	<p>Virgin rubber produced for infill of athletic fields only</p>	<p>Low maintenance Good drainage High UV stability - maintains resiliency Coating reported to encapsulate SBR rubber outgassing & improve heat concerns Manufacturers warranties Does not float Variety of colors-reported to reduce heat concerns Does not require resilient pad or irrigation</p>	<p>High cost - high materials cost Very similar makeup & potentials as SBR rubber Relatively little analysis as turf infill Generic material - must use proven - proprietary formulations for quality Limited availability in quantities needed for fields Limited analysis for use as infill Unproven - limited use as infill</p>
<p>TPE (Thermoplastic Elastomer)</p>	<p>Extruded plastic pellets</p>	<p>Low maintenance Very good drainage Manufacturers warranties Variety of colors-reported to reduce heat concerns Does not require irrigation Common plastic used widely in medical, food and toy manufacturing Some older U.S installations</p>	<p>High cost-high materials costs Cost-use of resilient pad recommended Relative hardness-needs resilient pad Generic material-must use proven-proprietary formulations for quality Limited availability in quantities needed for fields Limited analysis for use as infill</p>



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<p>Coated Sand</p>	<p>Rounded Silica Sand</p>	<p>Low maintenance Very good drainage Manufacturers warranties Variety of colors-reported to reduce hear concerns Does not require irrigation Does not float Can add weight/stability to infill systems</p>	<p>High cost-high materials costs Cost-use of resilient pad recommended Relative hardness-needs resilient pad Generic material-must use proven-proprietary formulations for quality Limited availability in quantities needed for fields Limited analysis for use as infill Unproven-limited use as infill</p>
<p>Shoe Grind</p>	<p>Company Environmentally Preferred Rubber (ground speakers) (Meets or exceeds restricted substance standards set for wearable consumer</p>	<p>Low maintenance Very good drainage Good resiliency and life cycle Recycled material Does not require irrigation or resilient pad Has been used for years with SBR as stand alone infill additive</p>	<p>High cost-high materials costs Very limited availability No color choices-poor aesthetics-can look 'trashy' Very similar chemical makeup & potentials as SBR rubber Static charge-sticks to equipment and clothing</p>
<p>Polymer and Mineral Mix</p>	<p>Extruded composite</p>	<p>Low maintenance Very good drainage Good resiliency and life cycle Recycled material Does not require irrigation or resilient pad Proven heat reduction Least expensive option</p>	<p>Crumb rubber still used in the system</p>



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II. Pads



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Pads

- Nomenclature: shock pads, composite underlayment, e-layers
- Serve multiple purposes
 - Impact attenuation
 - Consistent playability
 - Drainage
- More prevalent use in recent years
 - Alternative infills
 - Greater emphasis on player safety
 - Playability
- Often required beneath alternative infills



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Pad Categories

- Panels
- Rolls
- Tiles
- E-Layer
- Others??

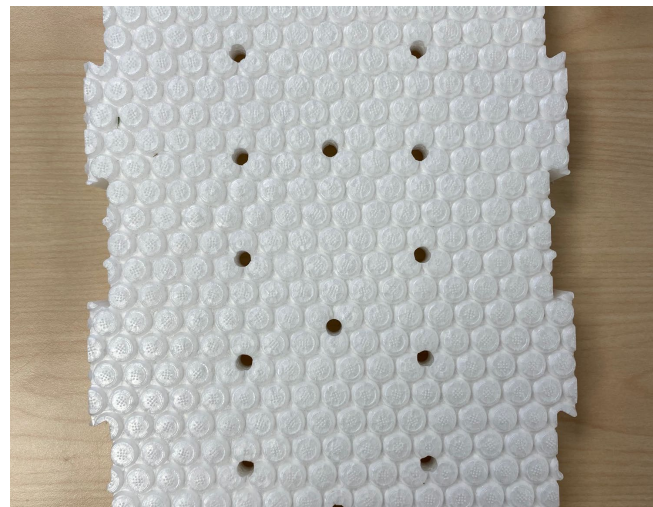


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Panels

- Interlocking
- Vary in thickness
- Drainage
- Recycled & virgin materials



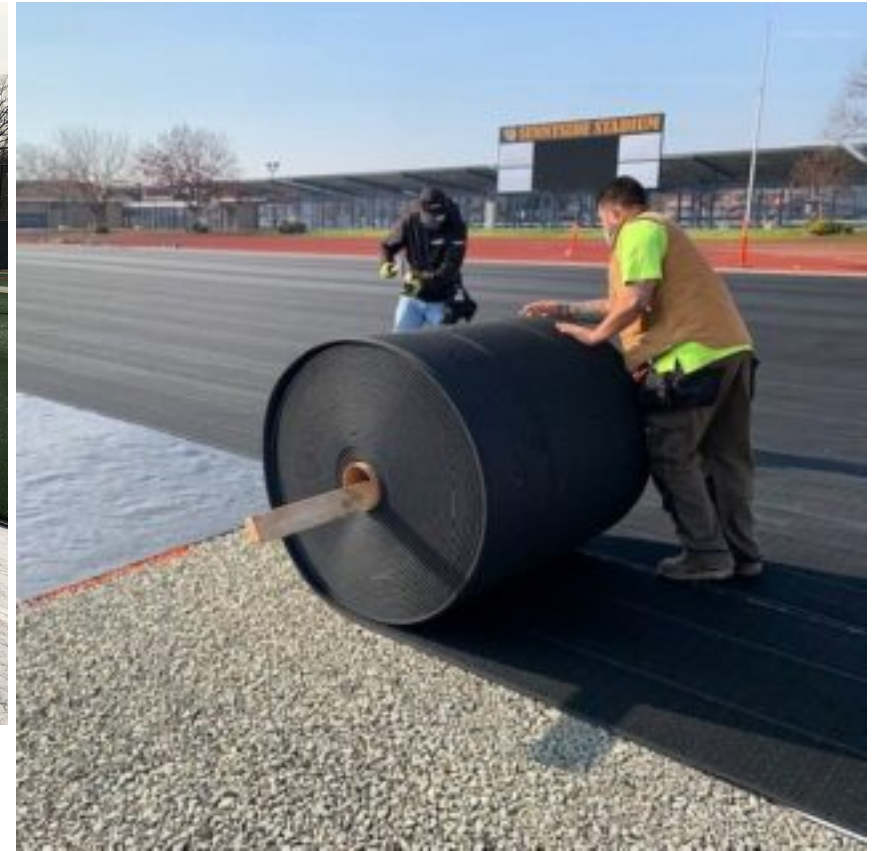
King Park, San Mateo, CA

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Rolls

- Rolls laid side by side
- Vary in thickness
- Drainage
- Recycled & virgin materials

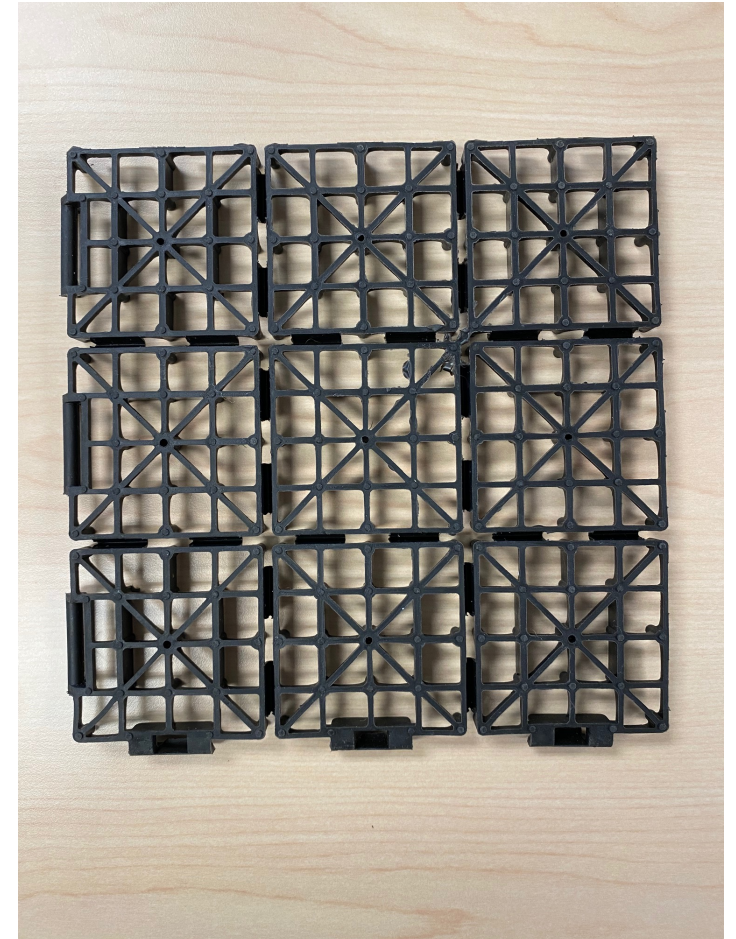


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Tiles

- Similar to panel-type system
- Drainage
- Recycled & virgin materials



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E-Layer

- Poured-in-place
- Drainage
- Virgin materials
- Certain markets use e-layers more than others

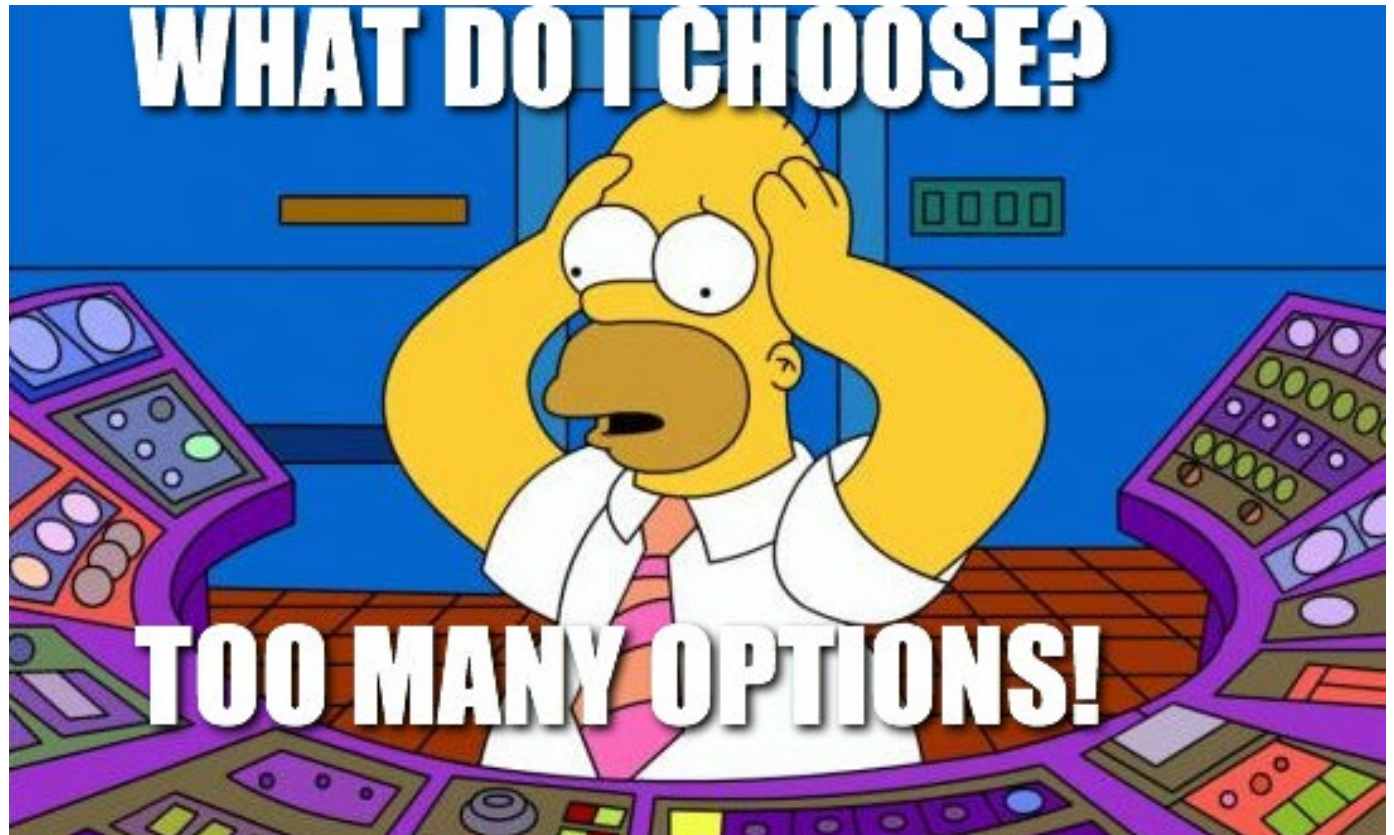


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Considerations

- Track Record/Product Support
- Budget
- Safety
- Compatibility
- Performance
- Drainage
- Warranty/Service Life
- Ease of Installation
- Sustainability (Knowing your constituency)
- Procurement
- Every project is different! There is no magic formula.



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Track Record

- Has the manufacturer successfully installed pads for similar projects in your area?
- Positive experiences/testimonials
- Local representation
- Will they be there in the event a product issue comes up (construction or post-construction)

Pinewood School Upper Campus, Los Altos Hills, CA



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Budget

- Easily 15% to 20% of the overall field cost could be attributed to a pad.
- Value (performance per \$ spent)



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Safety

- Who's using the field?
- GMAX: Peak deceleration experienced in an impact event (ASTM F355-A cylindrical missile)
- HIC: Measure of the likelihood of head injury arising from an impact. (ASTMF355-E Head form missile)
- Critical Fall Height
- Get the test data and understand the implications and relevance specific to your facility



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Compatibility

- Turf, infill and pad as a total system
- Infill type
- Pile height
- Sport type(s)



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Performance

- Common measures of performance:
 - Vertical deformation
 - Shock absorption
 - Force reduction



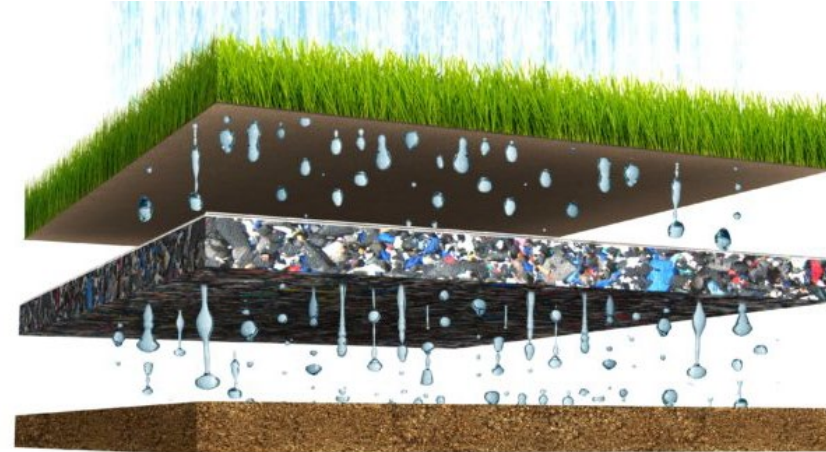
Artificial Athlete: www.sportstestequipment.com,
accessed September 30, 2021

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Drainage

- Vertical drainage
- Vertical and horizontal drainage



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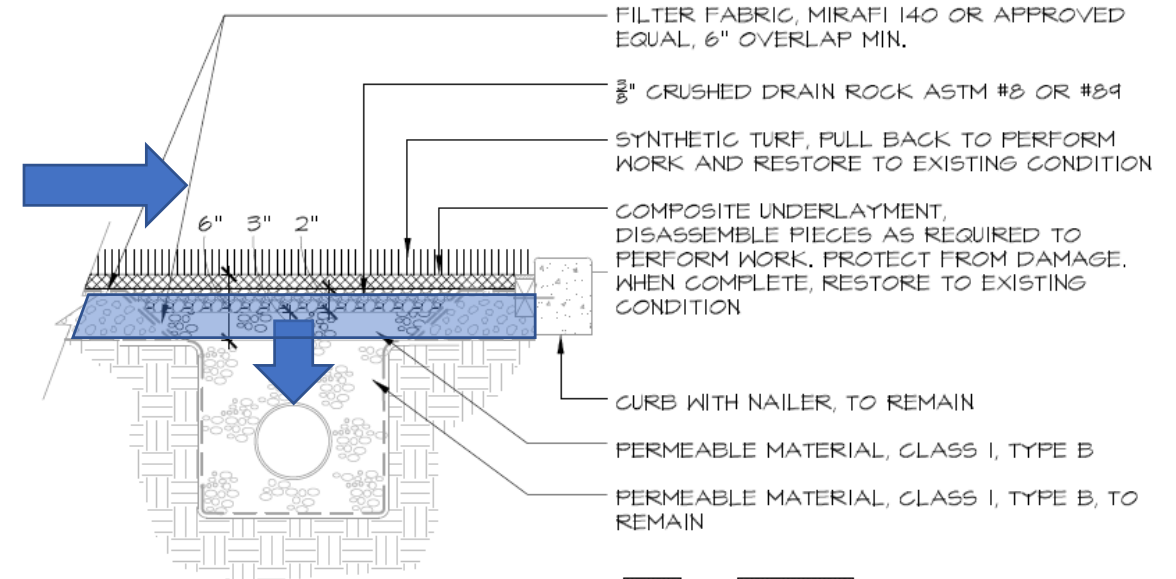
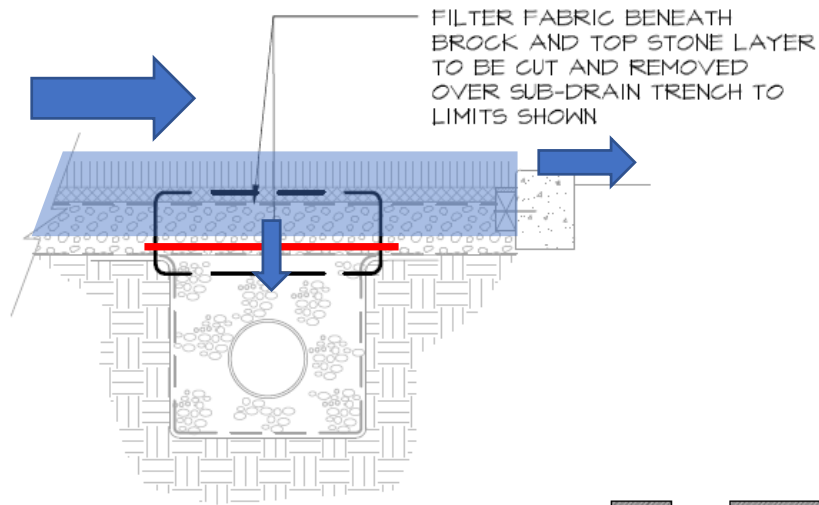
Franklin Elementary School, Burlingame, CA

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COMPACTION NOTES:

1. $\frac{3}{8}$ " CRUSHED DRAIN ROCK - CONSOLIDATE WITH VIBRATORY PLATE WITH AT LEAST 1 PASS. DISTRICT REP SHALL BE ON-SITE TO VERIFY CONSOLIDATION IS ACCEPTABLE.
2. CLASS I TYPE B PERMEABLE ROCK - CONSOLIDATE WITH HEAVY VIBRATORY TURTLE WITH AT LEAST 3 PASSES. DISTRICT REP SHALL BE ON-SITE TO VERIFY CONSOLIDATION IS ACCEPTABLE. ADDITIONAL PASSES MAY BE REQUIRED TO CONFIRM CONSOLIDATION. IF MATERIAL BREAKDOWN IS OBSERVED, USE A SMALLER COMPACTOR.



2
L1.0 **COLLECTION TRENCH, EXISTING**
SECTION
17019PerforatedSubdrainLine_Existing.dwg

3
L1.0 **COLLECTION TRENCH, PROPOSED**
SECTION
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Other Keys to Success

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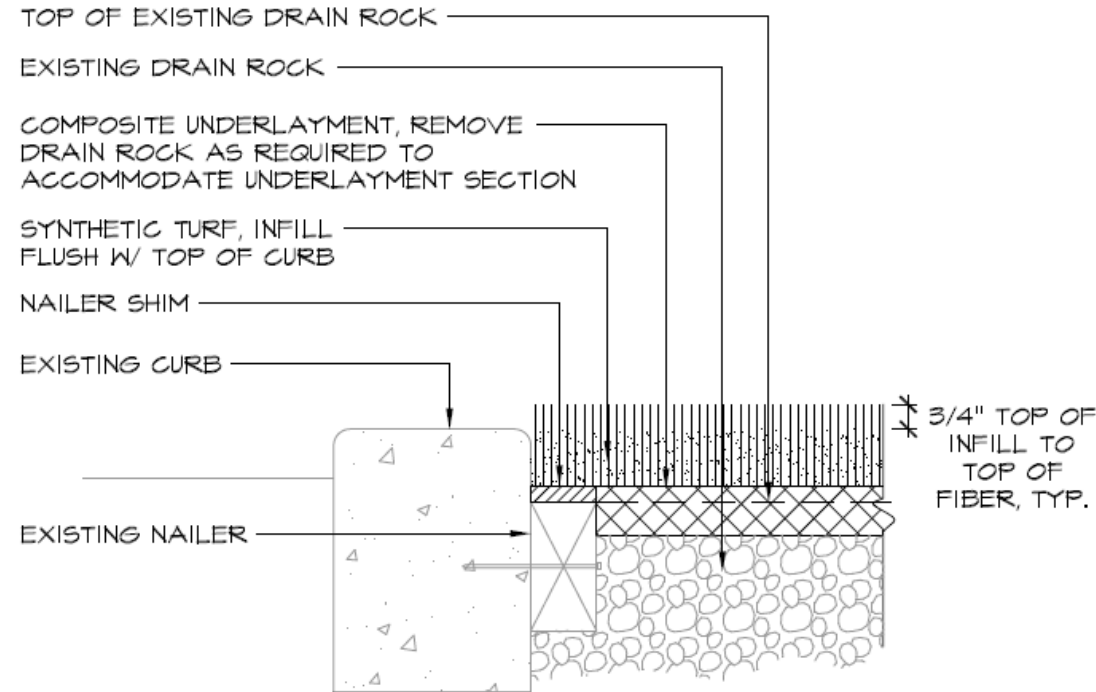
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Installation

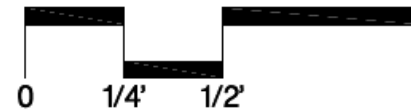
- Schedule
- Weather factors
- Ease of installation
- Type of installation

LIMIT OF CLASS 2 PERMEABLE MATERIAL REMOVAL, REMOVE CLASS 2 PERMEABLE MATERIAL TO ACCOMMODATE COMPOSITE UNDERLAYMENT, DEPTH VARIES BETWEEN 0" AND 1/2". ACHIEVE GRADE CONFORM WITHIN 15'-0" OF EDGE NAILER, TYP., UNLESS SHOWN OTHERWISE.



5
L5.0

SYNTHETIC TURF EDGE SECTION



17019Turfedge_4.dwg



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Sustainability

- Material composition
- End of life recyclability



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Procurement

- Performance specification
- Sole source
- Direct purchase



Oliver Sports Park, Hayward, CA

Selecting a System

- Questions to be answered early on:
 - What sport(s) will be played on the field?
 - What ages are the athletes?
 - What are the community's expectations with regard to turf and infill type?
 - How will the field deal with stormwater?
 - How well is the field going to be maintained? Be realistic.
 - What is the available budget?
 - How will the materials be procured? Design-bid-build, direct purchase, etc?
 - Manufacturer track record and product support