

**DESCRIPTION**

This work shall consist of furnishing and installing SYNTHETIC TURF-TUFTED NYLON WITH SEWN SEAMS in accordance with the contract documents and as directed by the Engineer.

**MATERIALS**

Base Aggregate: Shall consist solely of crushed ledge rock and shall be broken stone or gravel, free draining, well graded, uniformly mixed washed stone aggregate. The total thickness of the base stone aggregate shall be 150 mm (6”) minimum. Base aggregate may either be a coarse aggregate only or a combination of coarse aggregate with a fine top aggregate. The fine top aggregate (optional), where used, shall not exceed 50 mm (2”) thickness. Materials shall meet the gradations shown below.

**Base Coarse Aggregate-19mm(3/4 inch) material**

<u>Percent Passing by Weight</u>	<u>Sieve Size</u>
100	38 mm (1 1/2”)
80-90	19 mm (3/4”)
30-65	9.5 mm (3/8”)
10-40	#4
0-10	#16
0-5	#200

**Base Fine Top Aggregate-9.5mm(3/8 inch) material (optional)**

<u>Percent Passing by Weight</u>	<u>Sieve Size</u>
100	12.5 mm (1/2”)
85-100	9.5 (3/8”)
10-30	#4
0-10	#8
0-2	#200

The aggregate must contain three and one-half to four percent (3½ - 4%) moisture content to ensure that fine particles don’t migrate and to facilitate proper compaction. The Contractor shall provide certification from the source plant that aggregate meets all requirements. If deliveries of base aggregate show segregation of sizes, material shall be deposited in stockpiles and thoroughly mixed prior to installation. Bank run gravel, rounded sands and recycled concrete material shall be rejected for use as base aggregate.

Geo Textile: Shall be a non-woven, rot proof, heavy weight synthetic geo textile necessary to provide reinforcement, separation of the base aggregate and sub grade soils, and filtration of water from the base aggregate to the sub grade soils. Geo textile used shall conform to the following properties:

<u>Property</u>	<u>ASTM Test</u>	
Elongation	D4595	≥50%
Grab Strength (min)	D4632	665 N (150 lbs)
Tear Strength (min)	D4533	270 N (60 lbs)
Puncture Strength (min)	D4833	370 N (85 lbs)
Permittivity (min)	D4491	1.4/sec
Apparent Opening Size (max)	D4751	0.18 mm (0.0070 in) Std. No. 80 sieve

Non-woven Geo Textile:

Shall be:

Mirafia 160N	ADS 5000	AEF 880
As manufactured by	As manufactured by	Manufactured by
Ten Cate	Advanced Drainage Systems, Inc.	BOOM Environmental Products
365 S. Holland Dr.	4640 Trueman Boulevard	P.O. Box 600619
Pendergrass, GA	Hilliard, OH 43026	Newtonville, MA 02460
Phone: 706.693.2226	Phone: 800.821.6710	Phone: 800.770.2666

or approved equal as determined by the engineer.

Slotted Polyethylene Pipe: Pipe shall be either full circular cross-section or a panel line drainage system, whichever is shown on the drawings. A panel drainage system is a flexible, prefabricated drainage system, with either a series of small interconnected corrugated round pipes or a flat pipe with full horizontal cross-section, wrapped in a non-woven, drainage geo textile. The Contractor shall not have the option of substituting the panel drainage system where round pipe is shown (or vice versa). The drawings shall strictly be followed. Pipe and fittings of both types shall be made from high density, virgin PE compounds that conform with the requirements of cell Class 324420C, as defined and described in ASTM D3350.

Panel Drainage System: Shall comply with the requirements for test methods, dimensions, and markings found in AASHTO Designations M288. Panel drainage pipe and fittings shall be Multi-Flow Drainage Systems as approved by the Engineer. The panel drainage system shall be 450mm (18") in width with an outer corrugated perforated pipe wall.

300mm ( 12") Circular Drainage Pipe: Shall comply with the requirements for test methods, dimensions, and markings found in AASHTO Designations M252 and M294. Pipe shall have an outer corrugated perforated wall and an essentially smooth inner wall (waterway). Corrugations for these sizes may be either annular or spiral. Size shall conform to the AASHTO classification "Type SP" (which describes pipes with a smooth waterway and Class 2 perforations). Pipe and fitting shall be approved as per the submittals. The minimum parallel plate stiffness values when tested in accordance with ASTM D2412 shall be as follows:

<u>Diameter</u>	<u>Pipe Stiffness</u>
100mm (4")	340 kPa (50 psi)
150mm (6")	340 kPa (50 psi)
200mm (8")	340 kPa (50 psi)
300 mm (12")	340 kPa (50 psi)
375 mm (15")	290 kPa (42 psi)
450 mm (18")	275 kPa (40 psi)
600 mm (24")	235 kPa (34 psi)

Filter Fabric Wrap for Perforated Pipe: Both circular and panel profile perforated pipe shall have a machine knitted polyester envelope to prevent infiltration of fine soil particles while allowing water to flow freely. It shall be factory applied and ready for installation.

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Fittings: The fittings shall not reduce or impair the overall integrity or function of the pipeline. Fittings may be either molded or fabricated. Common corrugated fittings include in-line joint fittings, such as couplers and reducers, and branch or complimentary assembly fittings such as tees, wyes, and end caps. These fittings may be installed by various methods, such as snap-on, screw-on, bell and spigot, and wrap around. Couplings shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints. Only fittings approved by the Engineer and compatible with the circular pipes and panel drains shall be used. Where designated on the plans, a neoprene or rubber gasket shall be supplied.

Synthetic Turf: Shall be of tufted nylon construction, using 100% nylon 6.6 textured pile fiber ribbon and polyester high-tenacity filament backing yarns, such as the following:

Smart Turf	Four Seasons Nylon	Pure Grass HPG Anti-Microbial
As manufactured by	As manufactured by	Nylon Surfacing
Forever Green Athletic Fields	PlaySafe Turf & Track	As manufactured by
1961 Hartel Street	135 Freeman Street	AstroTurf
Levittown, PA 19057	Brooklyn, NY 11222	2680 Lakeland Road
Phone: 215.547.1000	Phone: 718.383.0568	SE Dalton, GA
		Phone: 800.723.8873

or approved equal as determined by the Engineer.

Synthetic turf shall be 100% glued to the separately installed shock pad. Factory bonding is not acceptable.

Pile weight shall be between 1580 grams (56 ounces) and 1700 grams (60 ounces) per square meter: The fiber shall be treated with an ultraviolet (UV) inhibitor resistant to UV degradation and fading. The G-Max rating of the synthetic turf system shall not exceed a reading of 145 at installation and 180 thereafter, as per ASTM F 355, Test Method A. If readings do exceed 180, the contractor shall be responsible for whatever measures are required to achieve G-Max ratings below 180, at no cost to the State.

Tuft height shall be minimum one and three-quarter 45 mm (1 3/4") inch long fibers. Turf shall be delivered in minimum 3.65m (12') width rolls of sufficient length to run from sideline to sideline. Turf color shall be Verde, simulating natural grass. Synthetic Turf shall be of national reputation with previous acceptance at all levels of competition, and shall be resistant to insect infestation, rot, fungus, mildew, ultra-violet light and heat degradation. It shall have flow-through drainage (both turf and pad) allowing free movement of surface run-off through turf and pad.

Adhesive: Shall be a solvent based, one-part, high green strength urethane. Synthetic turf shall be firmly adhered to the shock pad 100% with an adhesive made especially for the adhesion of synthetic turf as approved by the Engineer. (see submittals)

Polyurethane Backing: The backing shall consist of a perforated primary and secondary backing with a minimum drainage rate of 300mm (12") per hour. Primary backing shall be woven polypropylene. Secondary backing shall include a non-woven membrane system with polyester additive featuring dimensional stability characteristics.

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Shock Pad: A system without a shock pad is not acceptable and will be rejected. The system must meet all field test requirements Pad shall be constructed from one of the following materials:

Selected SBR rubber  
particle pad minimum  
ten (10mm) millimeters thick

Brock Foam SL 1000  
Porous closed cell  
composite pad minimum  
(10 mm) millimeters thick

Porous Cross Link Polyethylene  
pad minimum ten (10 mm)  
millimeters thick

As manufactured by  
Dodge-Regupol Inc  
715 Fountain Avenue  
Lancaster, PA 17601  
Phone: 800.322.1923

As manufactured by  
Brock USA  
2840 Wilderness Place  
Boulder, CO 80301  
Phone: 303.544.5800

As manufactured by  
Engineered Sportfield Solutions  
4223 Rock Run Road  
Havre de Grace, MD 21078  
Phone: 410.878.6341

RTH Rubber  
As manufactured by  
Ultimate Systems Ltd.  
P.O. Box 465  
1430 N. Main Street  
Delphos, Ohio 45833

or approved equal as determined by the Engineer.

Shock pad must be free draining.

Perimeter edge details required for the system shall be as shown on the drawings and as approved by the Engineer.

Recycled Plastic Lumber Edge: Synthetic turf shall be attached to a recycled plastic lumber placed around the perimeter of the field and the edges of any cutout areas, as designated on the Layout drawing. For the plastic lumber, either the 75mm x 150mm (3" x 6") or 75mm x 200mm inch (3" x 8") size is acceptable. Recycled plastic lumber shall be fabricated from a combination of High Density Polyethylene (HDPE) and Low Density Polyethylene (LDPE) recycled polyethylene, including UV-inhibiting pigment. The Plastic lumber composition and mechanical properties shall be as follows.

Minimum High Density Polyethylene:	70%
Tensile Strength (ASTM D638):	20,685 kPa (3000 psi)
Compressive Strength (ASTM D6108):	20,685 kPa (3000 psi)
Flexural Modulus of Elasticity (ASTM 6109):	1,378,950 kPa (200,000 psi)

The Bulk Density and Specific Gravity of the recycled plastic lumber shall conform to the acceptable standards determined by the standard test method in ASTM D6111. Recycled plastic lumber shall not absorb moisture, corrode, rot, warp, splinter, or crack and the surface shall not be slippery when wet. The recycled plastic lumber shall not contain any material that will be irritating when in contact with skin. Cross sections shall not show wide deep gaps or holes. Plastic lumber shall remain unpainted.

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Hardware for attaching synthetic turf to recycled plastic lumber shall be stainless steel or galvanized. Use hardware supplied by the chosen Synthetic turf manufacturer/installer.

Steel Bar Reinforcement: The steel reinforcement shall conform to the requirements in Subsection 709-14. Sizes as indicated on the drawings.

Goal or Perimeter Playing Lines and Logos: Shall be as shown on the drawings and shall be permanent factory tufted lines incorporated into the synthetic turf; unless line marking paint is specifically shown on the drawings. For primary playing lines, the turf color shall be white. Secondary lines shall be yellow (unless otherwise shown on the drawings).

Line Marking Paint: Will be as shown on drawings or as requested by New York City Parks and Recreation (NYCDPR). Line paint application temperature shall be between 50F to 90F. Drying time shall be 24 to 48 hours. Coverage (undiluted) shall be 275 linear feet of 10mm (4") wide line per gallon. Color of turf to be as shown on the drawings or requested by NYCDPR. Line paint shall be approved by Engineer. (see submittals)

**SUBMITTALS:** All submittals shall be made to the Engineer for review and approval.

Certificate of Sub Base Acceptance: Prior to the beginning of installation, the manufacturer/installer of the synthetic turf and pad shall inspect the sub base and supply a Sub Base Acceptance Certificate that shall be on synthetic turf manufacturer's representative letterhead.

Shop Drawings: Shop drawings shall be prepared at the scale of the construction documents, or larger, and shall contain all pertinent information regarding installation, including seaming plan, edge detail, permanent field lines, logos and drainage pipe layout. These drawings shall be submitted to the Landscape Architect for approval prior to the manufacturing and shipping of materials.

Installer Qualifications: The resilient synthetic turf Sub/Contractor must demonstrate experience on at least five (5) installations of the proposed material. The synthetic turf manufacturer must certify the designated supervisory personnel on the project as competent. The Contractor shall submit for approval, the name and qualifications of the proposed sub/Contractor. The Contractor shall submit the following:

1. A letter on turf manufacturer's letterhead affirming the Sub/Contractor as competent in the installation of the material, including seams and proper installation of their product.
2. Proof of five (5) installations of the proposed material by the proposed Sub/Contractor.
3. Name, address, and phone numbers for a minimum of three (3) professional references associated with synthetic turf work performed by proposed Sub/Contractor.

Synthetic Turf Sample and Test Results: The Contractor shall submit two (2) 450mm x 600mm (18" x 24") minimum samples of green turf carpet material showing backing with perforations and attached shock pad. Manufacturers literature for samples shall also be submitted with the samples. Samples of additional turf colors, where shown, shall also be submitted. Certified copies of independent (third Party) laboratory reports shall be submitted certifying the following properties at a minimum:

- Pile Weight and Total Product Weight: ASTM D5848
- Primary and Secondary Backing Weights: ASTM D5848
- Tuft Height: ASTM D5823

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- Tuft bind: ASTM D1335
- Grab/Tear Strength: ASTM D5034

Pipes and Fittings: Product literature shall be submitted prior to installation that clearly indicates the exact model and type of pipes to be used for drainage of the field, as well as fittings to connect them together.

Adhesive: Product literature shall be submitted prior to installation.

Line Paint for Synthetic Turf: Product literature shall be submitted prior to installation.

Maintenance Manuals: Prior to final acceptance, the Contractor shall submit to the engineer three (3) copies of Maintenance Manuals, which shall include all necessary instructions for the proper care and preventative maintenance of the synthetic turf system, including any painting or markings.

Independent Field Test Results: After completion of synthetic turf, the Contractor shall engage the services of an independent laboratory capable of performing field tests utilizing ASTM F355 Test Method A. Tests shall be conducted on two (2) separate visits. The first test shall be conducted after installation, but prior to the final acceptance of the work. The second test shall be conducted at final acceptance of the work. Both tests shall be performed with no visible frost on the ground.

**CONSTRUCTION DETAILS**

It shall be the responsibility of the contractor to ensure that the base is ready for the installation of the turf system, and when satisfied with its condition the contractor shall notify the Engineer in writing.

The area to receive the resilient artificial turf shall be excavated to the correct depth, including peripheral drainage trenches, where shown in drawings for slotted polyethylene pipe. The sub grade shall be laser graded and pitched to ensure positive drainage (an average one-half percent (1/2%) from the center to the peripheral slotted pipe drainage lines), as indicated on the drawings, and all finished sub grade elevations verified with laser leveling instruments. The Contractor shall be careful to avoid over excavation. Geo textile separation shall be rolled directly over the prepared sub grade and the peripheral drainage trench, overlapping all seams a minimum of 150mm (6") in all directions.

All slotted polyethylene pipe shall be laid in reasonably close conformity to line and grade and shall have a full, firm, and even bearing at each joint and along the entire length of pipe and surrounded with the base aggregate drainage material, in accordance with the plans, specifications, and directions of the Engineer. Joint misalignment shall not result in offsets, in the interior smooth liner, greater than 6mm (1/4"). Pipe laying shall begin at the downstream end.

Recycled Plastic Lumber Edging shall be installed around the perimeter of the field area and the clay cutout areas (if any) on a prepared level surface and drilled to receive the steel reinforcing rods, the rods hammered in place to 6mm (1/4") below the lumber surface and the void filled with approved sealant.

The base aggregate shall be installed in three (3) 50mm (2") lifts over the geo textile and compacted to a ninety percent (90%) Proctor Density, maintaining a consistent slope of one-half percent (1/2 %) from the centerline of the field to the sideline. The base aggregate must be free draining, consistent with the vertical draining requirements of the synthetic turf manufacturer, and the surface of the field

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shall be perfectly level. The Contractor shall employ laser leveling devices to determine the correct sub grade and finished grade elevations of both first and second lift of base aggregate. The synthetic turf manufacturer's representative and the Engineer must approve the permeable base aggregate installation prior to installation of the synthetic turf.

The shock pad shall be loose laid directly over the properly prepared base aggregate. The Contractor shall take extreme care to prevent disturbance of the base aggregate in regard to compaction and planarity. Any disturbed areas shall be rolled with a 3.6-5.4 metric ton (8,000~12,000 lbs) roller, to the satisfaction of the Engineer.

The full width rolls of turf shall be laid out across the field and the edges attached to the recycled plastic lumber perimeter attachment with a nail gun, or as per manufacturer's directions, at maximum 300mm (1') intervals. The major seams shall be sewn as per manufacturer's directions and head seams, other than at sidelines, shall not be acceptable.

Synthetic turf shall be adhered to the pad over the base with no wrinkles, ripples or bubbles. Slits in the fabric to relieve such defects are not permitted.

Turf shall be of sufficient length to permit full cross playing field installation. The full width rolls of turf shall be laid out across the field and the edges attached to the asphalt in accordance in the drawing or as per manufacturer's directions, at maximum 300mm (1') intervals.

Adhesive installations shall be glued down with minimum 300mm (12") wide textured seam tape. Adhesive shall be spread not in excess of 9.1m (30 linear feet) of seam tape per 3.8 liters (1 gallon) of adhesive. Adhesive shall be a solvent based, one-part, high green strength urethane. Hot melt glue and two-part epoxy systems are NOT acceptable. Sewing installation shall have stitches every 13mm (½") or less. All seams shall be transverse to the field direction; i.e., run perpendicularly across the field. Seams shall be flat, tight, and permanent with no separation or fraying. Permanent playing lines shall be laid out and incorporated in the turf as shown on the drawings. Drains shall be marked on the surface with an inlaid white dot two inches in diameter.

Weather Restrictions: Where gluing of seams is indicated, the temperature must be 9 degrees Celsius (48 degrees F) and rising, unless heating of glue is utilized. Do not deliver or install surfacing material if either ambient air temperature or material temperature is below 0 degrees Celsius (32 degrees F).

**METHOD OF MEASUREMENT**

This work will be measured as the number of square meters of SYNTHETIC TURF-TUFTED NYLON WITH SEWN SEAMS satisfactorily furnished and installed.

**BASIS OF PAYMENT**

The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.