This HydroTurf® Specification document has been prepared to provide the Owner, Design Engineer, Construction Quality Assurance Professional of Record, and the Contractor / Installer with a general guidance specification. All information, recommendations and suggestions appearing in this specification concerning the use of our products are based upon experience, tests and data believed to be reliable; however, this information should not be used or relied upon for any specific application without independent professional examination and verification of its accuracy, suitability and applicability. The independent professional shall edit this document to suit the site specific project design criteria. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by Watershed Geosynthetics LLC as to the effects of such use or the results to be obtained, nor does Watershed Geosynthetics LLC assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. HydroTurf® product (US Patent Nos. 7,682,105, 8,585,322, and 9,163,375; Canadian Patent No. 2,663,170; and other Patents Pending) and trademark are the property of Watershed Geosynthetics LLC. Nothing herein is to be construed as permission to grant license or as a recommendation to infringe any patent.

Note to Author: This Specification should be edited in all places where it may be in conflict with other contract requirements. Specific areas of concern are highlighted throughout this document where site specific contract requirements may change. The highlighted text is not exhaustive to all changes that may be required to utilize this document for any specific project. The engineer of record is responsible for ensuring this document conforms to all professional, contract and regulatory requirements. Please make any site specific changes, and then delete highlighted notes in the final issued specification.

SECTION __________

HYDROTURF® Z ENGINEERED TURF SPECIFICATION

PART 1: GENERAL

1.01 SUMMARY

A. Section Includes:


1.02 RELATED SECTIONS

Section 31 23 13 - Subgrade Preparation
Section 01 42 00 - HydroTurf Z References and Definitions
Section 03 49 01 - HydroBinder® Infill Specification
Section 03 05 59 - Penetrating Catalyzed Colloidal Silicate Concrete Treatment for HydroTurf

Section xx xx xx - 1
1.03 REFERENCES

A. See Section 01 42 00 - References and Definitions

1.04 SUBMITTALS

Include the appropriate project submittal requirements and MQC Testing. Examples of potential submittal requirements are included in the following.

A. Pre-Production and Pre-Shipment – Submit to the Owner’s Representative

1. Certificate of Compliance: Certificate of Compliance shall indicate that the engineered turf meets or exceeds the property values in Table 1. Also, the turf fiber color / blend shall be indicated.

2. Provide representative manufacturer Product Data Sheet.

3. Provide one (1) representative product sample.

4. Provide manufacturer’s quality control program for the engineered synthetic turf component, including test procedures and frequency for this project.

5. Provide Material Safety Data Sheets (MSDS) for the engineered synthetic turf and for the HydroBinder infill.


B. Prior to mobilization of the Installer to the site, Contractor shall submit the following information from Geosynthetic Installer:

1. Installation schedule.

2. Installation capabilities, including:
   a. Information on equipment proposed for this project;
   b. Average daily production anticipated for this project; and
   c. Quality control procedures.

3. Resume of the superintendent to be assigned to this project, including dates and duration of employment.
4. Resumes of all personnel who will perform seaming/welding operations on this project, including dates and duration of employment.

5. GEOSYNTHETICS INSTALLER PERSONNEL shall attend HydroTurf Z orientation prior to beginning the installation.

C. During the installation, the Installer shall be responsible for the timely submission to the Owner’s Representative of subgrade acceptance certificates, signed by the Installer, for each area to be covered with HydroTurf.

PART 2: MATERIALS

2.01 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver materials to the site only after the Owner’s Representative and the Owner approve required submittals.

2. CQA Personnel shall observe and document that all rolls of delivered to the site have been properly identified with the following for Engineered Synthetic Turf:
   a. Manufacturer’s name
   b. Product identification
   c. Lot number
   d. Roll number
   e. Roll dimensions

3. CQA Personnel shall observe and document the following with regard to Engineered Synthetic Turf:
   i. The synthetic turf is wrapped in rolls with protective covering.
   ii. The rolls are not damaged during unloading.
   iii. Protect the synthetic turf from mud, soil, dirt, dust, debris, cutting, or impact forces.
   iv. Each roll must be marked or tagged with proper identification.
4. Separate damaged materials from undamaged materials and store at locations designated by the Owner until proper disposition of material is determined by the Owner and the Owner’s Representative.

5. Separate rolls without proper documentation and store until the Owner’s Representative approval is received.

B. On-Site Storage:

1. Store in space allocated by the Owner.

2. Protect from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat or other damage.

3. Store the engineered turf on level prepared surface (not on wooden pallets). The prepared surface for the engineered turf should be graded to drain away from HydroTurf components.

4. Stack the engineered turf no more than three rolls high.

C. On-Site Handling:

1. Use appropriate handling equipment to load, move or deploy engineered turf. Appropriate handling equipment includes cloth chokers / straps, and spreader bar for loading, spreader and roll bars for deployment. Dragging rolls and / or panels on the ground surface shall not be permitted.

2. Do not fold engineered turf material. Folded material shall be rejected.

3. The installer is responsible for storage, and transporting material from storage area to installation area.

D. Damaged Engineered Synthetic Turf:

1. Damaged engineered synthetic turf will be documented by the Owner’s Representative.

2. Damaged engineered synthetic turf shall be repaired, if approved by the owner’s representative, in accordance with these specifications or shall be replaced at no additional cost to the Owner.

2.02 ENGINEERED SYNTHETIC TURF – HYDROTURF Z

A. Manufacturer: Shaw Industries, Inc.
1. The engineered turf component shall meet or exceed property values listed in Table 1 as an individual component and as the performance property as the HydroTurf Z system.

2. Engineered synthetic turf shall be supplied by Watershed Geosynthetics as a component of the HydroTurf Z Revetment System.

B. Substitutions

1. None

C. The engineered synthetic turf shall be comprised of the following components:

   1. Polyethylene monofilament yarn fibers
   2. Two polypropylene backing geotextiles
   3. Polyethylene coating extruded to the geotextile backing

D. The polyethylene yarn shall conform to the color selected by the Owner per color coding provided under Section 1.04(A)(1).
Table 1 – Property Values for Engineered Synthetic Turf Component of HydroTurf Z

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Required Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yarn</td>
<td>ASTM D1577</td>
<td>Polyethylene Monofilament</td>
</tr>
<tr>
<td>Tufted Pile Height</td>
<td>ASTM D5823</td>
<td>2.25 ± 0.25 inches</td>
</tr>
<tr>
<td>Pile Weight</td>
<td>ASTM D5848</td>
<td>34 ± 2.0 oz/yd²</td>
</tr>
<tr>
<td>Weight of Extruded Polyethylene Coating</td>
<td>ASTM D5848</td>
<td>16 ± 2.0 oz/yd²</td>
</tr>
<tr>
<td>Total Weight</td>
<td>ASTM D5848</td>
<td>56.5 ± 4.0 oz/yd²</td>
</tr>
<tr>
<td>Yarn Tensile</td>
<td>ASTM D2256</td>
<td>25 lbs (min)</td>
</tr>
<tr>
<td>CBR Puncture</td>
<td>ASTM D6241</td>
<td>800 lbs (min)</td>
</tr>
<tr>
<td>Wide Width Tensile (MD / XMD)</td>
<td>ASTM D4595</td>
<td>1000 lb/ft. (min)</td>
</tr>
<tr>
<td>Aerodynamic Evaluation</td>
<td>GTRI Wind Tunnel</td>
<td>120 mph</td>
</tr>
<tr>
<td>UV Resistance and Stability of Engineered Synthetic Turf</td>
<td>ASTM G147 / ASTM G7</td>
<td>&gt;60% Retained Tensile Strength at 100-year exposure (projected)</td>
</tr>
<tr>
<td>Steady State Hydraulic Overtopping</td>
<td>ASTM D7277 / ASTM D7276</td>
<td>25 ft/sec velocity</td>
</tr>
<tr>
<td>Manning’s N Value</td>
<td>ASTM D7277 / ASTM D7276</td>
<td>0.018 – 0.025</td>
</tr>
<tr>
<td>Interface Friction (Low Confining Stress Against Concrete Sand)</td>
<td>ASTM C5321</td>
<td>28° min. (peak)</td>
</tr>
<tr>
<td>Standard Roll Dimensions</td>
<td>12-ft (3.66-m) Wide x 300-ft (91.4-m) Long</td>
<td></td>
</tr>
<tr>
<td>Roll Area (approximate)</td>
<td>3600 ft² (334.5-m²)</td>
<td></td>
</tr>
</tbody>
</table>

* Georgia Tech Research Institute

**PART 3: EXECUTION**

**3.01 EXAMINATION**

A. Verify in writing that the surface on which the engineered synthetic turf will be installed is acceptable. In so doing the Installer shall assume full liability for the accepted surface.

B. The beginning of installation means acceptance of existing conditions. The Installer shall be responsible for maintenance of the covered subgrade once installation of engineered synthetic turf begins.
3.02 SURFACE PREPARATION

A. Maintain the surface suitability and integrity until the HydroTurf installation is completed and accepted.

B. Repair rough areas and any damage to the subgrade caused by installation.

C. To avoid sharp bends in the engineered synthetic turf, bevel the leading edges of the anchor trenches and grade breaks.

D. Subgrade shall be smooth, uniform, firm and unyielding, and free from rocks or other debris. No rocks or protrusions greater than 1/4-inch in diameter shall be exposed at the subgrade surface.

3.03 ENGINEERED SYNTHETIC TURF DEPLOYMENT AND INSTALLATION

A. Engineered synthetic turf shall not be deployed:

1. During precipitation;
2. In the presence of excessive moisture;
3. In areas of ponded water;
4. In the presence of excessive winds; or
5. In excessive heat or cold.

B. The engineered synthetic turf shall be deployed without damage by equipment, handling, trafficking, leakage of hydrocarbons, or by other means. The engineered synthetic turf shall not be dragged.

C. The synthetic turf is anchored to prevent movement by the wind (the Contractor is responsible for any damage resulting to or from windblown synthetic turf).

D. The synthetic turf shall be deployed smooth and free of tension (but not loose), stress, folds, ripples / wrinkles, creases, and free of contaminants such as soil, grease, fuel, etc. The turf shall be in intimate contact with the underlying subgrade.

E. The synthetic turf shall be deployed with the synthetic grass blades pointing towards the top of the slope on slopes greater than 12%.

F. The panels shall be deployed in a manner to ensure that the turf filaments are pointing upslope and in the same direction as the adjacent panel. The engineered synthetic turf has colored marker fibers (yellow) on one side of the roll. These colored fibers shall be lined up on the same side of every
panel. This will ensure that the turf filaments (grass blades) are pointing in the same direction.

G. The engineered synthetic turf shall be secured with sand bag anchoring.

H. Synthetic turf seaming shall be performed as follows:

1. The seam overlaps shall be 4-inch (min) and shall be shingled with the flow of water. The panel on the up-flow / upstream side shall have the overlap placed on top of the down-flow / downstream panel.

2. Seaming of the engineered turf component may be performed by heat-bond welding. This is described as follows:

   a. The DemTech 4-inch, single-wedge welder (Model No. VM-20/4/A Pro-Wedge Welder 120V, VM20 Outfitted with 100-KIT/4S/VC/A.2 Welding Kit, 4-in, 220V, S.S.) shall be used to heat-bond the seams.

   b. Since the temperature and speed controls of the DemTech VM-20 wedge welder are variable and can be increased / decreased depending on weather and environment conditions, the temperature and speed shall be confirmed with a trial seam. This trial seam shall be field tested. Trial seams shall be performed at the beginning of each day and during the day when the weather (i.e., temperature, humidity, etc.) conditions change.

   c. Field testing of this trial seam consists of the following:

      i. Observe the weld and confirm that the geotextile backings are not melting. If they are melting, then the machine is too hot.

      ii. Observe and feel the welded seam in order to confirm that there is a stiff, inner core which is continuous along the weld.

      iii. Observe and confirm that the welds may not be pulled or peeled apart by hand. If it can, there was not enough heat during the welding process. During production welding, the pulled or peeled seams shall be re-seamed or patched with a cap.

      iv. All seams shall be verified by the installer that they are continuous by running their fingers along the seam. If there is any penetration of their fingers
into the seam, the installer will need to use a hand-held Leister at the location of the penetration in the seam in order to weld it continuously. The seam will need to be re-inspected by the installer.

d. Production field seaming shall be performed and verified in the same manner as trial seams. The field seams shall be inspected every hour at a minimum. This inspection of the field seams shall be the same as the inspection for the trial seams.

e. Burnouts shall be patched.

f. All seams not passing the visual inspection shall be repaired.

g. After seaming operations, the edges of the synthetic turf panels shall be sufficiently anchored with sandbags in the top of slope perimeter anchor trenches unless otherwise noted on the construction drawings.

3. Repairs, caps and tie-ins of engineered turf shall be performed as follows:

a. Repairs to engineered turf shall be completed by using 4-inch (min) overlapped a heat-bonded seam.

b. Tie-in seams along flatter slope (i.e. 15% or less) with length greater than 25 feet shall use the DemTech VM-20 single-wedge welder [Section 3.05 (H)(1)(c)].

c. A hand-held Leister with a pressure wheel should be used in shorter or smaller concentrated areas (i.e., butt seams, caps or patches). The hand leister shall be immediately followed by a press wheel providing a constant pressure.

d. Hand leistering shall be field tested with a trial seam to confirm proper seaming.

e. The quality of these trial and field welds shall be confirmed by the following visual observations:

i. Observe the weld and confirm that the geotextile backings are not melting. If they are melting, then the machine is too hot.
ii. Observe and feel the welded seam in order to confirm that there is a stiff, inner core which is continuous along the weld.

iii. Observe and confirm that the welds may not be pulled or peeled apart. If they can, there was not enough heat during the welding process. Pulled or peeled seams shall be re-seamed or patched with a cap.

iv. All hand Leistered seams shall be continuous. These seams shall be verified by the installer that they are continuous by running their fingers along the seam. If there is any penetration of their fingers into the seam, the installer will need to use a hand-held Leister at the location of the penetration in order to weld the seam continuously. The seam will need to be re-inspected by the installer.

4. All seams as noted by the Owner’s Representative as not passing the visual inspection shall be repaired.

I. The top of slope anchor trenches shall be left open until seaming is completed of the engineered synthetic turf. Expansion and contraction of the engineered synthetic turf should be accounted for during installation. Prior to backfilling the top of slope anchor trench, the depth of penetration of the engineered synthetic turf into the anchor trench shall be verified by the Owner’s Representative at a minimum of 100 foot spacing along the anchor trench. The anchor trench should be filled in the morning when temperatures are coolest to reduce bridging of the engineered synthetic turf.

J. Installer shall backfill top of slope anchor trenches prior to placement of infill into the engineered synthetic turf component. This will minimize the creation of wrinkles while placing the infill. Bottom and side-slope anchor trenches shall not be backfilled until after infill placement. This will allow corrections in the field during the deployment of the engineered synthetic turf. Note that wrinkles will travel down the slopes and cannot be redistributed up slopes, so it is important that bottom and side-slope anchor trenches remain open so that pulling adjustments can be made.

3.04 EQUIPMENT ON THE ENGINEERED SYNTHETIC TURF

A. Construction equipment on the deployed synthetic turf shall be minimized to reduce the potential for synthetic turf material puncture. Small equipment such as generators shall be placed on scrap synthetic turf / geosynthetic material (rub sheets) above engineered synthetic turf.
B. On flat slopes, ATV type vehicles and/or rubber tracked skid steer machines may be allowed prior to infill placement if their ground tire pressure is less than 5 psi, and if the subgrade is well-compacted, firm and unyielding.

C. The HydroBinder infill may be placed over the synthetic turf with an equipment ground pressure less than 5 psi. The placement of the HydroBinder shall be in front of the equipment so that the tires or tracks drive on the placed infill.

D. Light rubber tired or rubber tracked vehicles (with an equipment ground pressure less than 15 psi) may be allowed to operate on slopes shallower than or equal to 3H:1V after the HydroBinder is placed prior to hydration. Equipment operation on slopes steeper than 3H:1V is not permitted until after the HydroBinder Infill has been placed, hydrated, and fully cured.

E. Equipment operators shall inspect equipment rubber tires or tracks for sharp protrusions from foreign matter or tire/track damage, embedded rocks, or other foreign materials protruding from tires/track prior to driving on the synthetic turf. Equipment travel paths driven on synthetic turf shall be as straight as possible with no sharp turns, sudden stops or quick starts.

F. Damage caused by having equipment on the engineered synthetic turf (i.e., tears, rips, punctures, wrinkles, ripples, movement, etc.) shall be the responsibility of the installer to repair.

G. Post installation and after 28 days of curing of the HydroBinder, vehicle (ground) tire pressures should be limited on the HydroTurf system to less than 35 psi. Driving should be limited to areas where the subgrade under the HydroTurf is well-compacted, firm and unyielding.

END OF SECTION