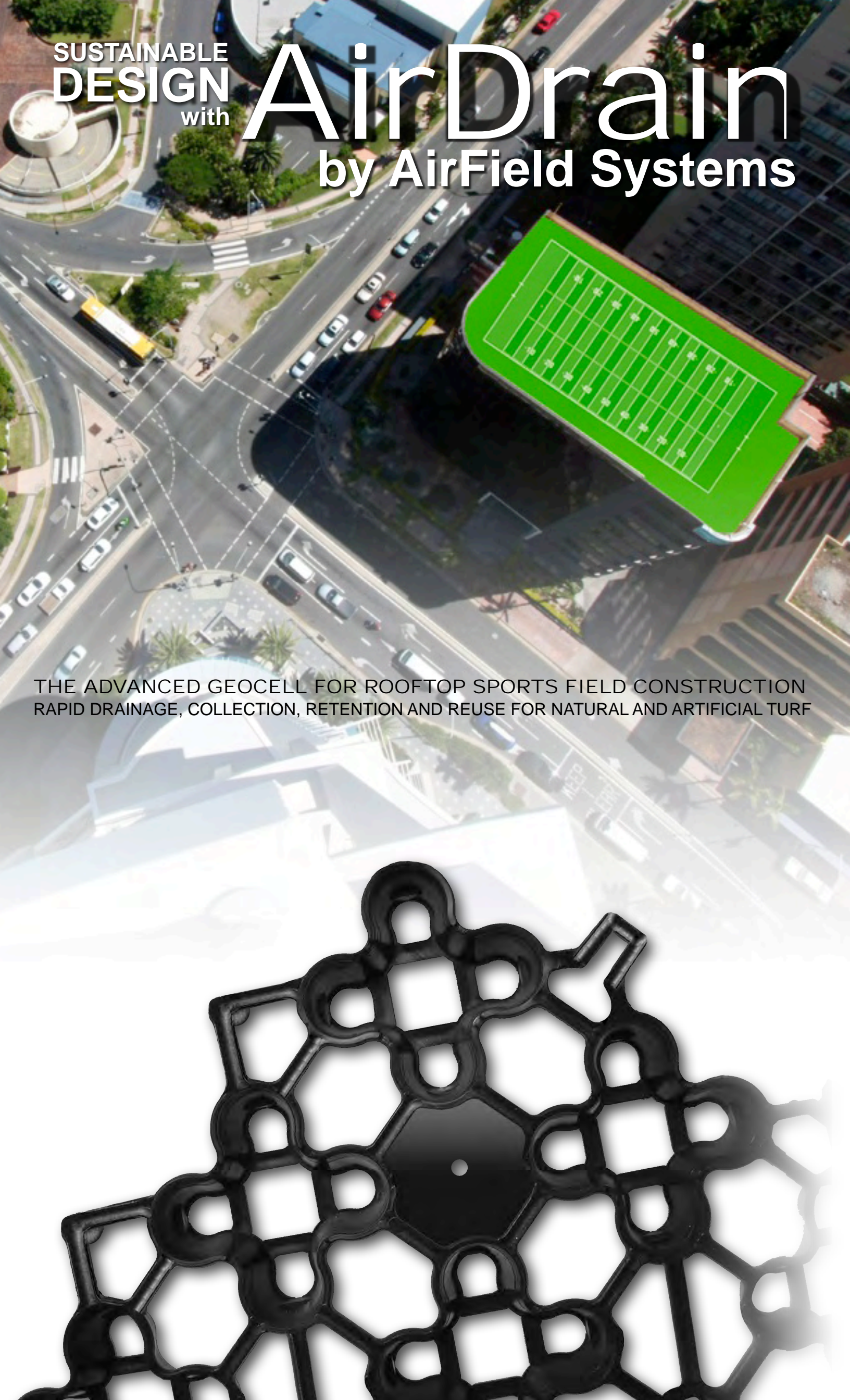


SUSTAINABLE
DESIGN
with

AirDrain

by AirField Systems

THE ADVANCED GEOCELL FOR ROOFTOP SPORTS FIELD CONSTRUCTION
RAPID DRAINAGE, COLLECTION, RETENTION AND REUSE FOR NATURAL AND ARTIFICIAL TURF



AirDrain

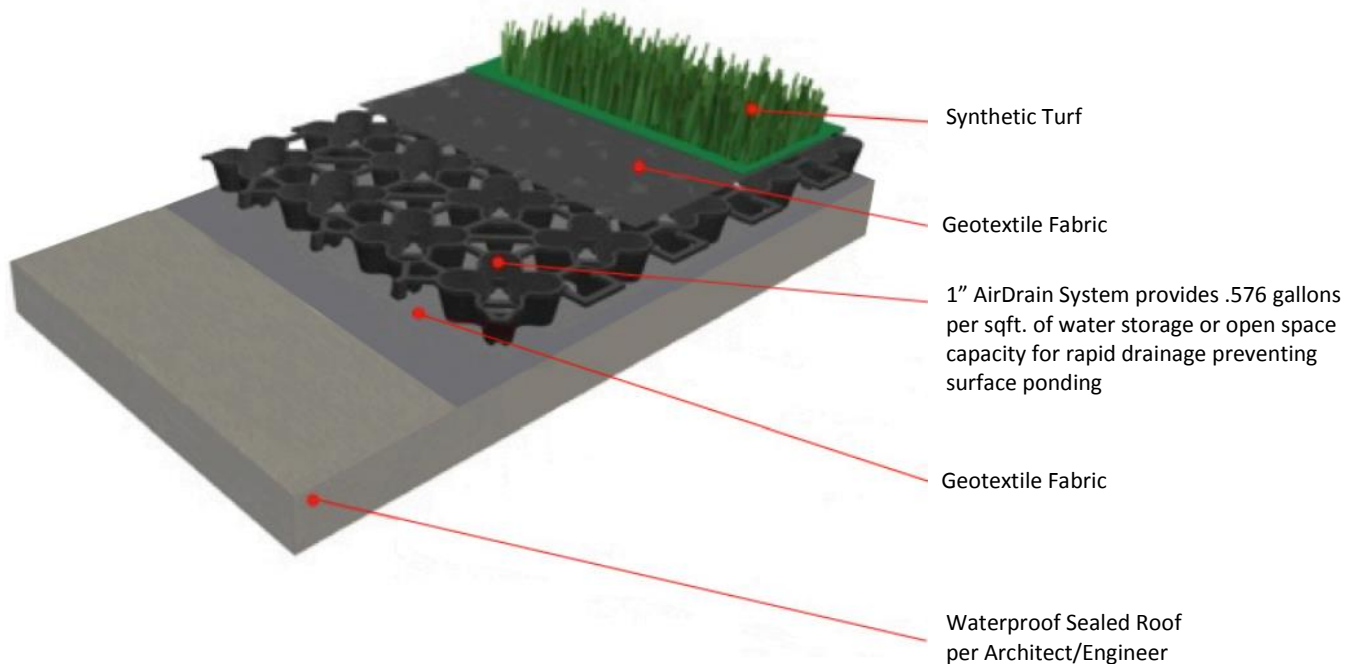
– What drains better than Air?

Green Roofing - Synthetic or Natural Turf

With limited space on campus, high schools and colleges are turning to rooftop sports surfaces to create multi-use green areas. Building a rooftop sports field with an AirField System provides drainage under 100% of the playing surface, prevents ponding, and moves water efficiently for reuse elsewhere on campus.

Over 1,000,000 square feet of AirDrain rooftop drainage system installed and counting.

Natural Turf- [Chesapeake Energy](#) 74,000 sqft. Synthetic Turf- [Escuela Campo Alegre](#) 76,000 sqft. and WPI "[Worcester Polytechnics Institute](#)" 174,000 sqft.



Benefits of AirField in a green roofing system include:

- AirDrain creates and helps maintain a more consistent Gmax for Synthetic Turf
- ASTM testing proves AirDrain's shock absorption properties reducing strain on joints and ligaments
- AirDrain can be reused when the Synthetic Turf must be replaced
- Can help qualify for **LEED™** and other green building credits
- A smaller carbon and development footprint with reduced site disturbance
- Water harvesting reclamation and reuse is easy
- AirDrain creates a one inch air barrier on the rooftop increasing the insulating properties.
- AirDrain is a 100% recycled copolymer with the impact modifier "metallocene" qualifying it as a "No Break" plastic. Making it able to withstand extreme heat and cold and still maintain performance.
- Resins can be made to the following specification "**Flammability UL 94, Flame Retardant, High Impact Polypropylene Copolymer Resins**"

*This drawing, specifications and the information contained herein is for general presentation purposes only. All final drawings and layouts should be determined by a licensed engineer(s). HIC & Gmax testing are measured in a lab setting and are not site specific.

ASTM Testing Proves the AirDrain Synthetic Turf Drainage Doubles as a Drainage Layer and Shock Pad

Whether installed on an aggregate base, concrete or asphalt the **AirDrain** drainage grid helps provide you with a consistent **GMAX** (as seen below) across the entire field. Some factors that might influence a change in **GMAX** would be an inconsistency of the infill or wear of the synthetic turf fibers. Unlike traditional shock pads / e-layer the **AirDrain** is 1" high, has a 92% air void. This unmatched vertical and lateral drainage all but eliminates standing water.

Some of the Benefits of an AirField Synthetic Turf Drainage System include:

- AirDrain creates and helps maintain a constant Gmax for artificial turf (See below)
- Shock absorption reduces the strain on joints and ligaments
- AirDrain is only limited by the drainage capacity of the profile above it and the exit drain
- AirDrain can be reused when the synthetic turf must be replaced
- Can help qualify for LEED and other green building credits
- A smaller carbon and development footprint with reduced site disturbance
- Water harvesting reclamation and reuse is possible
- AirDrain is a 100% recycled copolymer with the impact modifier metallocene qualifying it as a “No Break” plastic

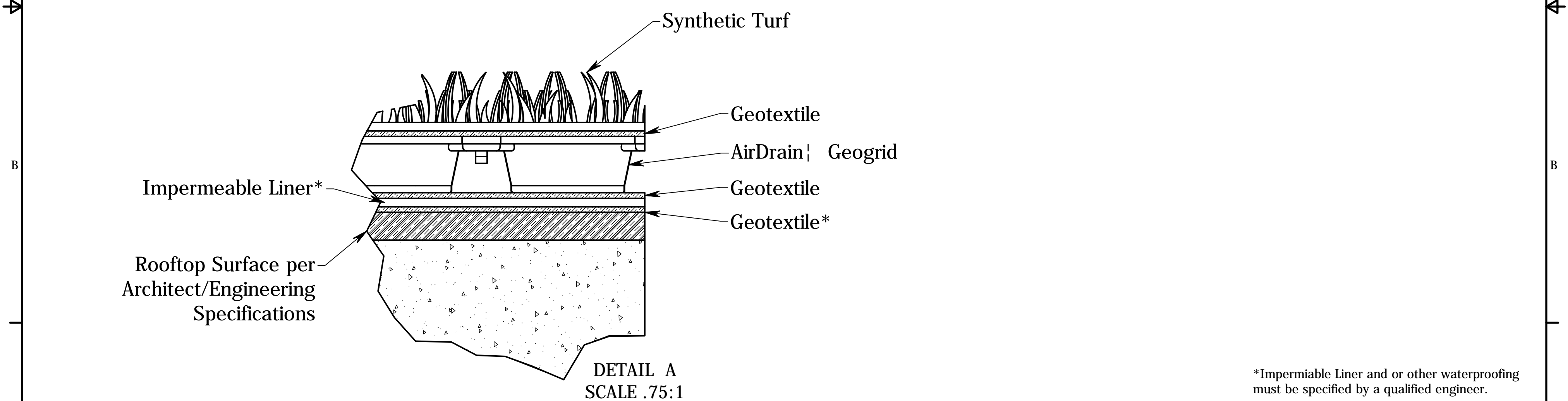
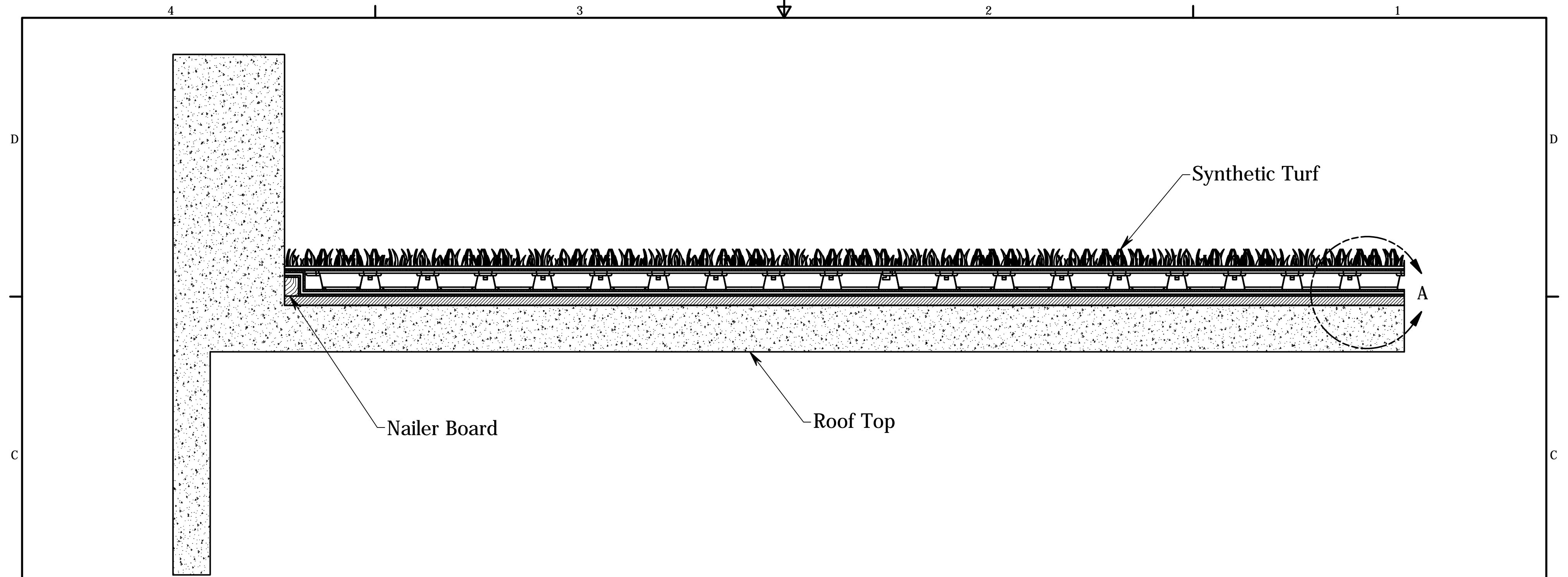
*** **AirDrain** can be made to the following specification “**Flammability UL 94, 30% Fiberglass Reinforced, High Impact, Flame Retardant Polypropylene Copolymer Resins**” for Rooftop applications. FLAMMABILITY @ 0.100 in V-0/5VA* UL94*

GMAX Results for: Turf - 2 1/2” Slit Film, in filled with 50% Green Rubber Infill and 50% Silica Sand.

The drainage/shock pad and turf underlying substrate consists of a concrete deck/rooftop, coated with a waterproof membrane and 2 separate layers of 5 ounce 100% recycled polyester geo-textile filter fabric.

Test #	Drop No.	Drainmatt Tested	Ft. / Sec.	H.I.C	Peak/Gmax	Avg./Loc.	Drainmatt Average
6	16	AIRFIELD Drop 1	11.7	222	89	105.5	
	17		11.7	289	105		
	18		11.7	292	106		
7	19	AIRFIELD Drop 2	11.7	215	87	103	
	20		11.7	275	101		
	21		11.7	294	105		
8	22	AIRFIELD Drop 3	11.7	249	97	113	Average of all Three 107.166
	23		11.7	308	109		
	24		11.7	333	117		

The Standard Test Method for Shock-Absorbing Properties of Playing Surface Systems and Materials (ASTM F1936-98 American Football Field) testing locations and procedure were preformed. The tests were performed using a Triax 2000 A-1 Missile, tripod mounted Gmax registration unit (www.triax2000.com). This report presents background information on the test procedures, existing conditions, test results and observations



*Impermeable Liner and or other waterproofing must be specified by a qualified engineer.

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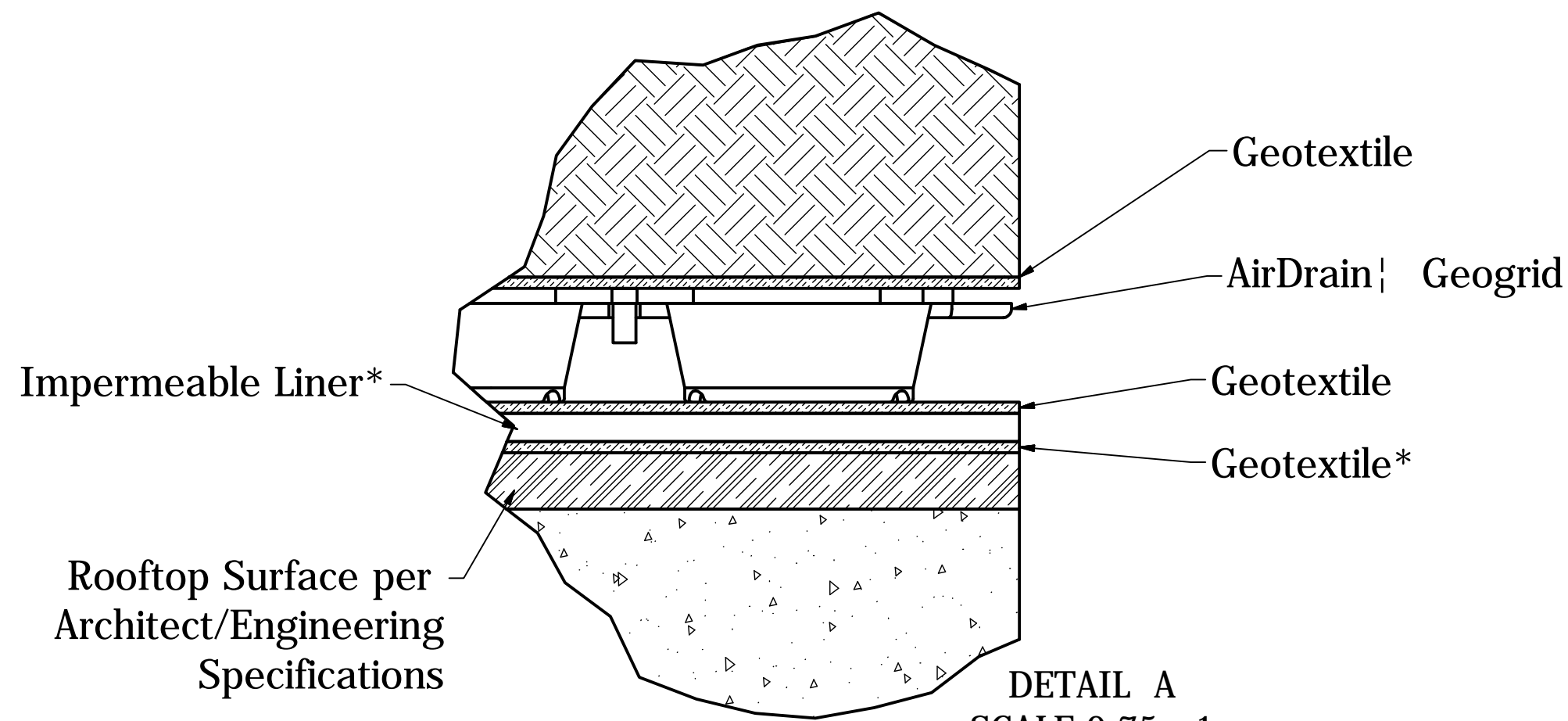
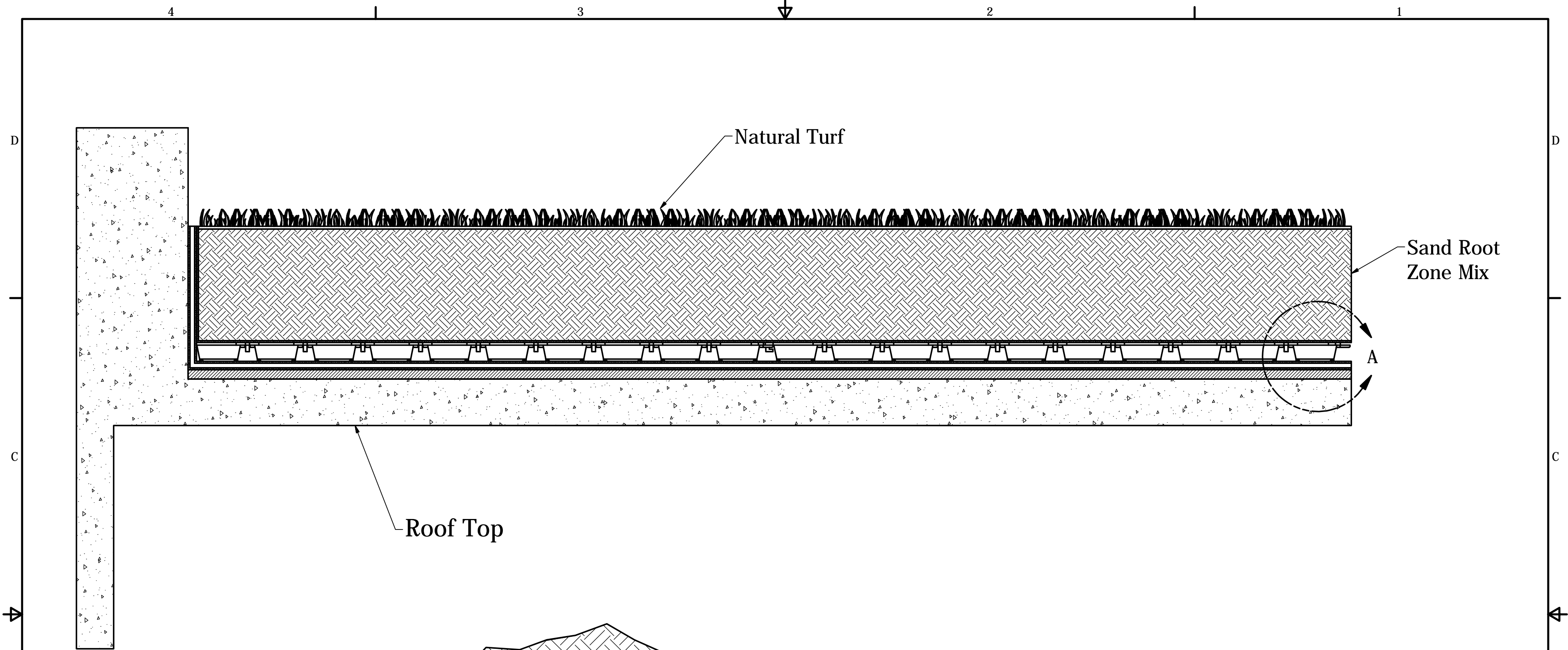
AirField Systems, LLC
 8025 N May Ave, Suite 201
 Oklahoma City, OK 73120
 www.airfieldsystems.com
 (405) 359-3375



DRAWN	Gary	9/22/2012
CHECKED		
QA		
MFG		
APPROVED		

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Airfield Systems			
TITLE AirDrain! Synthetic Turf Rooftop Drainage			
SIZE		DWG NO	REV
C		Rooftop_Assembly_SYN_RT_001	2
SCALE		SHEET 1 OF 1	



DETAIL A
SCALE 0.75 : 1

*Impermeable Liner and or other waterproofing must be specified by a qualified engineer.

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DRAWN	Gary	4/2/2012
CHECKED		
QA		
MFG		
APPROVED		
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Airfield Systems			
TITLE AirDrain Natural Turf Rooftop Drainage			
SIZE	C	DWG NO	Rooftop Assembly RT_004
SCALE		REV	6
		SHEET 1 OF 1	

AirField Systems Illustrated Manual for Green Roof System Sub-Surface Drainage

1. The roofing membrane underlying the proposed green roof area is to be verified as in compliance with all project specifications before work commencement on the AirField Sub-Surface Drainage System. Any discrepancies noted upon preliminary roofing inspection are to be satisfactorily repaired according to related specification sections and repairs verified before proceeding with work.
2. Once the roofing membrane system has been inspected and accepted, begin installation of the AirDrain™ GeoCell material over the approved roofing membrane system. The AirDrain™ GeoCell panels are to be installed with the larger diameter clover openings facing upwards. Place the first GeoCell panel to the roof area's upper left hand corner. It is of primary importance to orient the GeoCell materials with the integral indicator tab to the panels bottom left hand corner (refer to Figures 17). Proper sequencing and orientation of panels will result in a rapid installation.

The GeoCell panels are to be installed across the roofing membrane system in a rowed pattern. Staggering of rows will allow for multiple row completion by a multi-manned crew. Secure the first panel (1-1) and commence with panels 1-2, 1-3 and so on with one directional pull to secure (see Figures 16, 18 and 19). Once the first row has progressed across the field, start with the second row. By maintaining proper GeoCell panel orientation, the top edge panel connectors will drop into the previously installed panel receptors after the one directional pull secures the panel (see Figures 18). The GeoCell panels can be shaped to individual field areas as needed with an appropriate cutting device.

3. Install geo-textile filter fabric layer over the AirDrain™ GeoCell material. Firmly attach one end of the geo-textile filter fabric roll to the GeoCell panel edge with approved adhesive. Roll the geo-textile filter fabric across the entire width of the roof area until it reaches the GeoCell panel on the opposite side of the roof. Firmly attach the geo-textile filter fabric to the GeoCell panel edge on this side of the roof. Apply 2 to 4 inches of approved adhesive with a paint roller on top surface of fabric edge.

Firmly attach the next geo-textile filter fabric roll to the GeoCell panel edge. Overlap the first piece of filter fabric by approximately 6 inches to cover the 2 to 4 inches of approved adhesive and roll out the next filter fabric section across the roof. When the opposite side of the roof is reached, firmly attach the filter fabric to the GeoCell panel outside edge. Repeat this process until all the AirDrain™

GeoCell is completely covered with geo-textile filter fabric. Once the geo-textile filter fabric installation is complete there should be no visible gaps, puckering, folds, wrinkles or excessive loose material overhangs. Installed geo-textile filter fabric is to be smoothly laid across all the AirDrain™ GeoCell material.

4. Once the geo-textile fabric has been installed atop the AirDrain™ GeoCell material, the Sub-Surface Drainage System is complete and ready for inspection and acceptance by the Green Roof System Contractor. Satisfactorily repair all deficiencies noted and obtain approval and acceptance before proceeding with green roof system installation. Minimize any required vehicular traffic on completed sub-surface drainage system. Where vehicular traffic is required, limit equipment to flotation tire type and minimize vehicle speed and turning on drainage system to the greatest extent possible. Any sub-surface drainage system damaged by green roof system installation is to be satisfactorily repaired and accepted before the green roof system is installed. Refer to AirDrain™ Rooftop Drainage for Synthetic Turf or Natural Turf drawings for typical completed green roof system cross section.

DISCLAIMER: The following drawings and/or general installation instructions are provided only to show a concept design for installation and are not instructions for any particular installation. These drawings and general instructions are not complete and are provided only to assist a licensed Geo-Technical Engineer, a Landscape Architect and/or Civil Engineer in preparing actual construction and installation plans. These drawings and instructions must be reviewed by a licensed Geo-Technical Engineer, a Landscape Architect and/or Civil Engineer and adapted to the condition of a particular installation site and to comply with all state and local requirements for each installation site. THESE DRAWINGS AND/OR GENERAL INSTRUCTIONS DO NOT MODIFY OR SUPPLEMENT ANY EXPRESS OR IMPLIED WARRANTIES INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IF APPLICABLE RELATING TO THE PRODUCT.

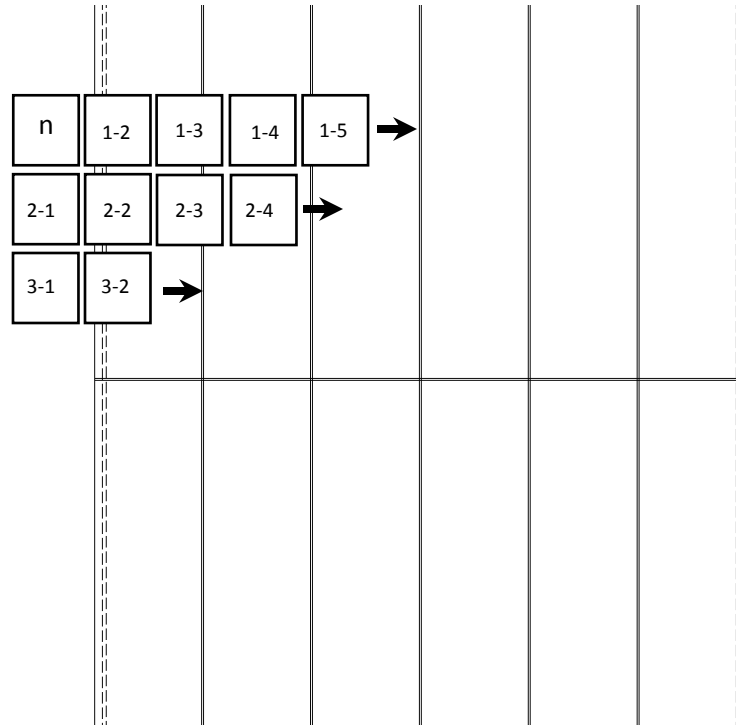


Figure 16



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www.airfieldsystems.com

Airdrain® Geocell

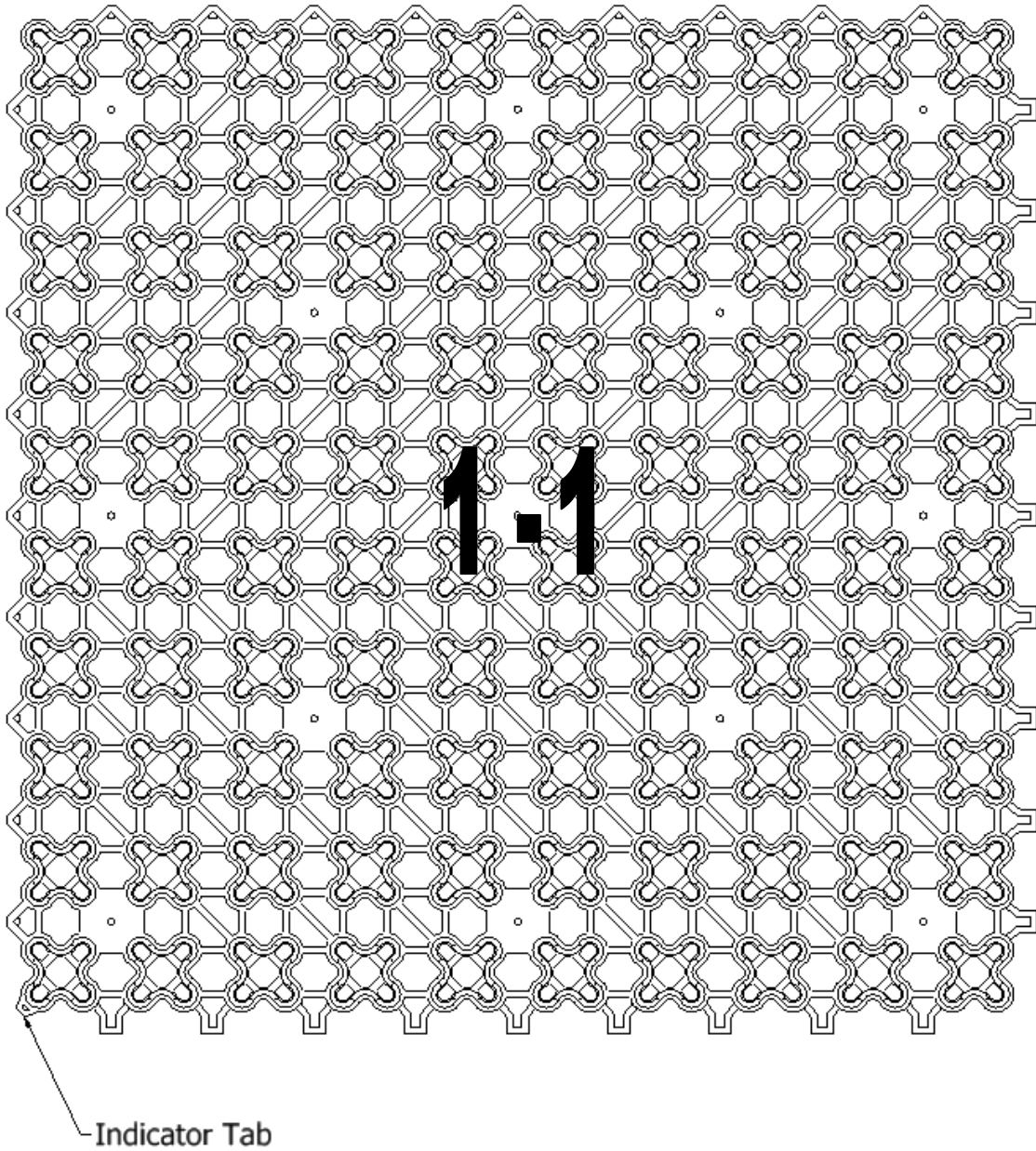


Figure 17



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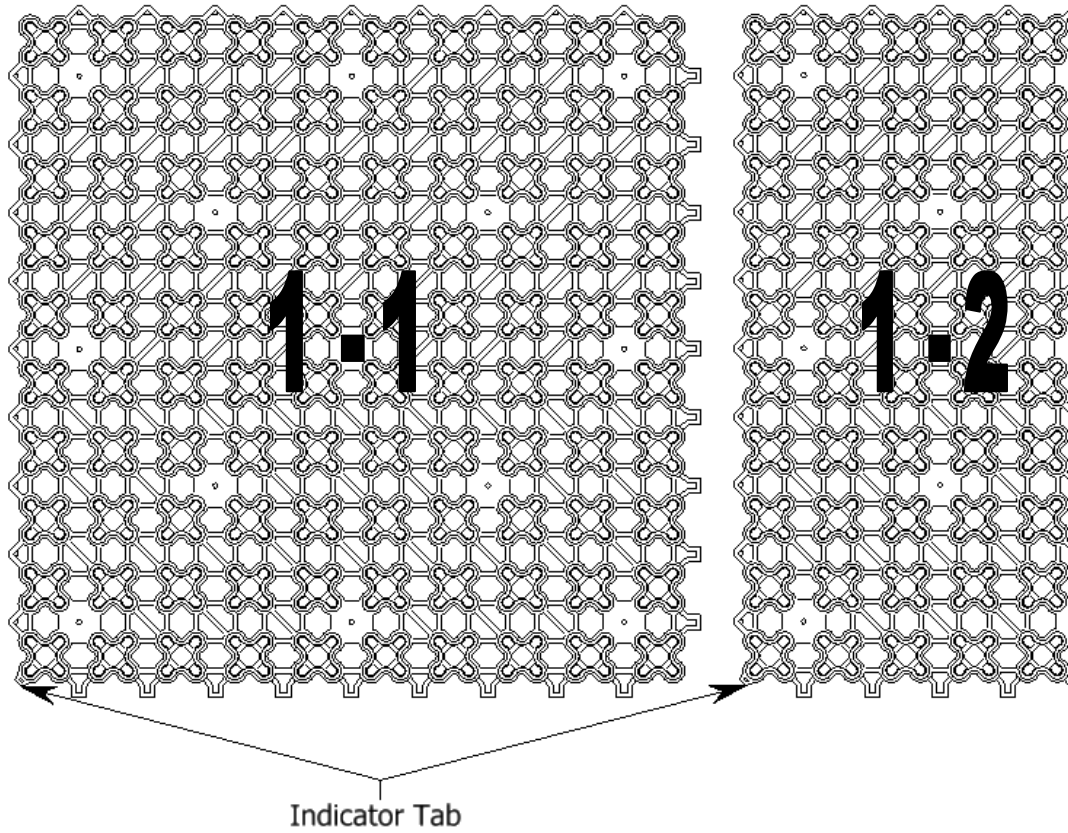


Figure 18

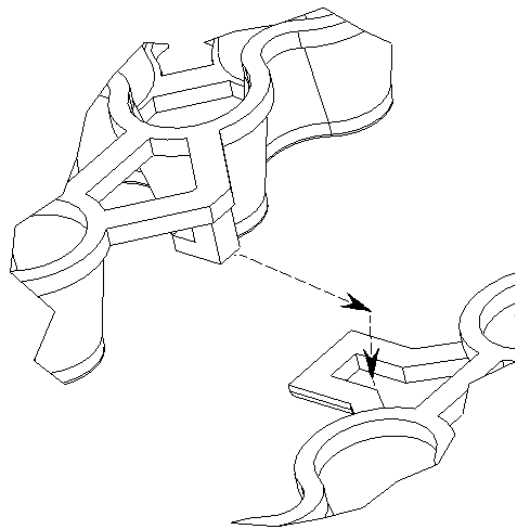


Figure 18A



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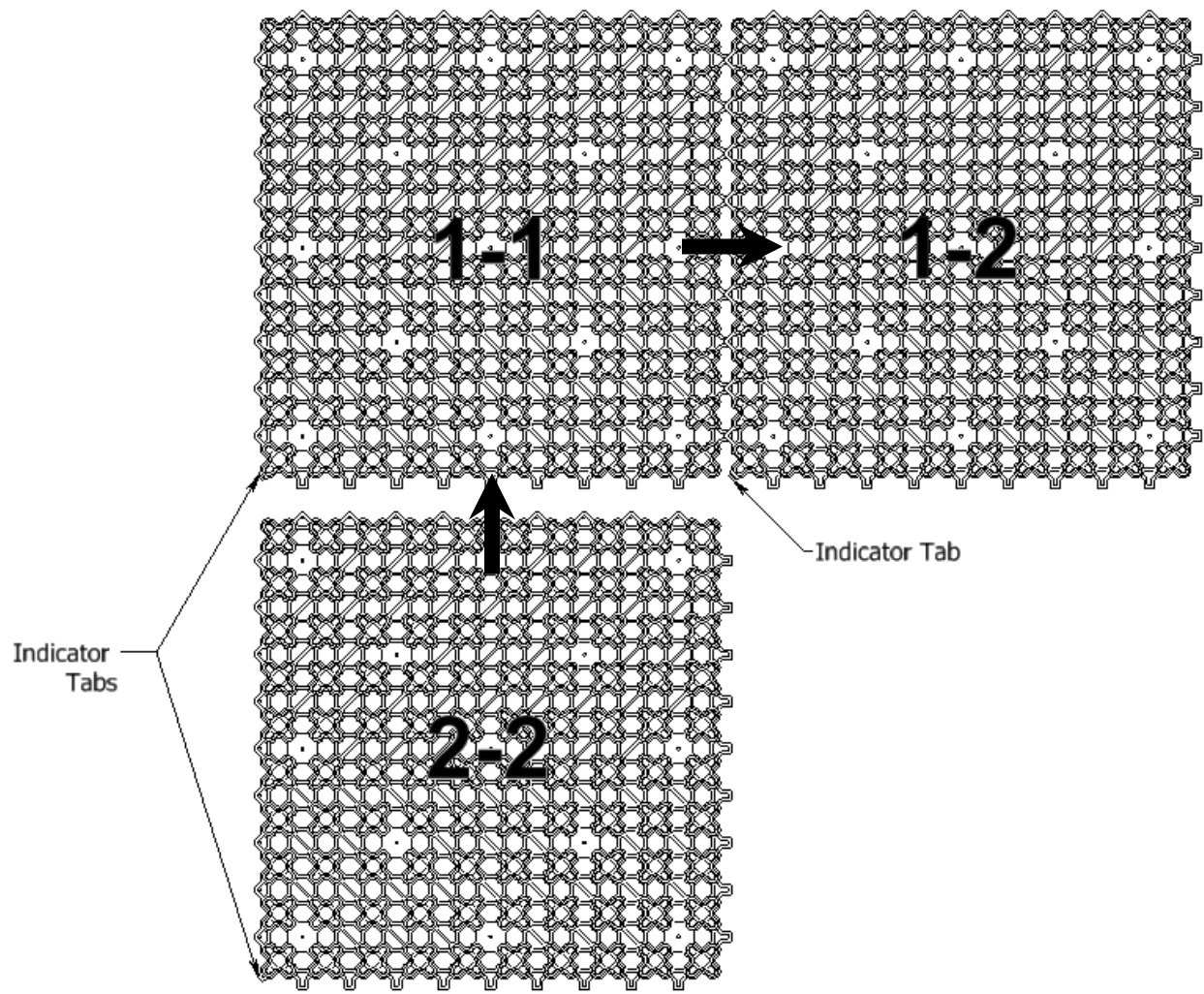


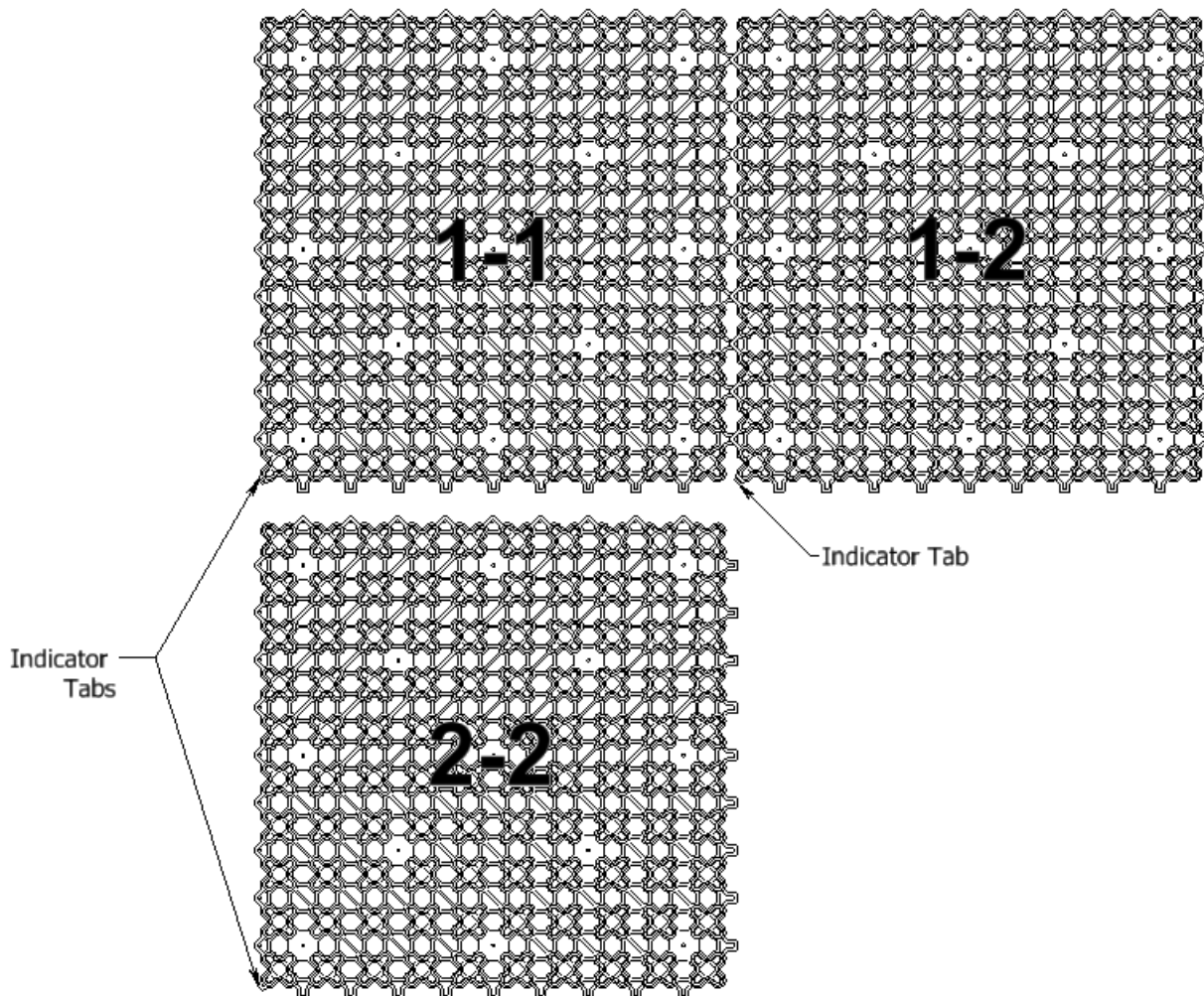
Figure 19

Proper Sequencing and Orientation of AirDrain GeoCell Panels for Rapid Installation

Pallet Staging: AirDrain pallets cover approximately 798sqft. per pallet and should be staged accordingly within the installation area so that you minimize the amount of time to stage the AirDrain grid along the install lines across the project. Typically placing the AirDrain every 65 feet across and 15-20 feet back from each other. (Call AirField with questions that you might have about proper staging and installation.)

All Installations must start in the Top Left Corner of the Field and work Left to Right to be installed properly.

1. Orientate the AirDrain GeoCell materials with the integral indicator tab to the panel's bottom left corner (painted yellow). **Install the AirDrain units by placing units with the connectors and platforms up creating a flat surface for the profile above. If the male connectors do not fall or drop into the female connectors then the orientation is incorrect, please call AirField Systems Immediately at 405-359-3775.**



2. Install the AirDrain panels across the field in a rowed pattern. Staggering of rows will allow for multiple row completion by a multi-manned crew.
3. Once the first row has progressed across the project, start with a second row. Have a person staging the panels in three's snapped together along the row. The crew can then install the left side of the panel while elevating slightly the top portion (so the male and female connectors don't sync) once the left side has been snapped with a pull along the row direction, the top portion should fall into place and with a bottom vertical pull holding the inside of parts 1 & 3 snap all three parts in place.



4. AirDrain panels can be shaped to individual field areas as needed with appropriate cutting device. If a typical field is installed correctly there should only be two sides that would need to be trimmed.
 - A. If only a few parts need to be trimmed, use tin snips.
 - B. If many parts require trimming, set up a table and use a circular saw with a no melt, plastic cutting saw blade.

Visit [AirField Systems Flickr page](#) to watch a video of a 74,000 sq ft project for Chesapeake Energy illustrating a 3 man crew installation.

DISCLAIMER: The preceding and following drawings and/or general installation guidelines are provided only to show a concept design for installation and are not instructions for any particular installation. These drawings and general instructions are not complete and are provided only to assist a licensed Geo-Technical Engineer, a Landscape Architect and/or Civil Engineer in preparing actual construction and installation plans. These drawings and instructions must be reviewed by a licensed Geo-Technical Engineer, a Landscape Architect and/or Civil Engineer and adapted to the condition of a particular installation site and to comply with all state and local requirements for each installation site. THESE DRAWINGS AND/OR GENERAL INSTRUCTIONS DO NOT MODIFY OR SUPPLEMENT ANY EXPRESS OR IMPLIED WARRANTIES INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IF APPLICABLE RELATING TO THE PRODUCT.

General Information			
General			
Construction	Injection Molded Copolymer		
Composition	Copolymer Polypropylene Using Impact Modifier		
Dimensions	31.784" x 31.880" x 1.000" (7.03 sq ft.)		
Unit Weight	3.100 lbs.		
Forms	Pellets		
Shipping			
Parts Per Pallet	114		
Pallet Dimensions	33" x 33" x 48"		
Pallet Weight	390 lbs.		
Area Per Pallet	798 sq. ft.		
Pallets Per Trailer	114 (3 wide x 2 tall x 19 deep)		
Area Per Trailer	90,972 sq. ft.		
ASTM and ISO Properties ¹			
Physical	Nominal Value	Test Method	
Specific Gravity	0.940	ASTM D792	
Melt Mass-Flow Rate (230°C/2.16 kg)	20 g/10 min	ASTM D1238	
Mechanical	Nominal Value	Test Method	
Density	57.490 lb/ft ³	ASTM D1505	
Tensile Strength (Yield, 73°F)	2,145 psi	ASTM D638	
Tensile Elongation (Yield, 73°F)	16%	ASTM D638	
Flexural Modulus (73°F)	100,175 psi	ASTM D790	
Compression Strength (73°F)	233 psi	ASTM D6254	
Impact	Nominal Value	Test Method	
Notched Izod Impact (73°F, 0.125 in)		ASTM D256	
Thermal	Nominal Value	Test Method	
Deflection Temperature Under Load 264 psi, Unannealed	160°F	ASTM D648	
Expansion/Contraction Index ¹			
Temperature	Humidity	Length	Width
100°F	98%	31.881"	31.817"
-5°F	0%	31.765"	31.713"
Change		.116"	.104"
Joint Expansion/Contraction Capacity		.420"	.572"
Safety Factor		362%	550%
Examples of Usage			
Application	Required Strength	Safety Factor	
Auto	40 psi	x 168	
Truck	110 psi	x 61	
DC10	250 psi	x 27	
Space Shuttle	340 psi	x 19	

¹ Independent laboratory testing conducted by TRI/Environmental, Inc., TSI/Testing Services, Inc. and Wassenaar.



PRODUCT DATA SHEET – 14N5006NC

Flame Retardant, High Impact Polypropylene Copolymer, Black

PROPERTY	TYPICAL VALUE	TEST METHOD
MELT FLOW RATE (230°C/2.16kg), g/10min	12	ASTM D1238
SPECIFIC GRAVITY	0.99	ASTM D792
NOTCHED IZOD IMPACT, ft·lb/in	No Break	ASTM D256
GARDNER DART IMPACT, in·lb	160	ASTM D5420
TENSILE STRENGTH, psi	2800	ASTM D638
FLEXURAL MODULUS (tangent), psi	135,000	ASTM D790
HDT @ 66 psi, °F	175	ASTM D648
SHORE D HARDNESS	63	ASTM D2240
FLAMMABILITY, 0.062” minimum thickness	V-0*	UL94*
RTI RATING, °F, 0.062” minimum thickness	230*	UL746*
LINEAR MOLD SHRINKAGE, in/in	0.016-0.022	Matrixx Method

* UL recognized, File E158835

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TEST REPORT



1325 North 108th E. Ave.
Tulsa, OK 74116
918.437.8333 ph. | 918.437.8487 fx.

CLIENT: Airfield Systems
8028 N. May Ave, Ste 201
Oklahoma City, OK 73120

Attn: Michael Bean

Test Report No:	TJ0963	Date:	November 21, 2012
------------------------	---------------	--------------	--------------------------

REFERENCE: QAI Laboratories Proposal Number FB110812-1

SUBJECT: Evaluation of the sample per ASTM C 518-10 Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

SAMPLE ID: One sample identified by client as: Airdrain™ Sythetic Turf Rooftop Drainage, was received from client on 11/14/12 in good condition.

TEST REQUESTED: The material was tested and evaluated for Thermal Conductivity in accordance with the procedures outlined in ASTM C 518-10.

TEST DATE: 11/20/12

RESULTS: See test data on the following pages.

CERTIFICATION: The tests reported here were conducted under the continuous direct supervision of QAI Laboratories Inc., Tulsa, OK.

**SIGNED FOR AND ON BEHALF OF
QAI LABORATORIES, INC.**

Linda Lewis
Materials Department Technician

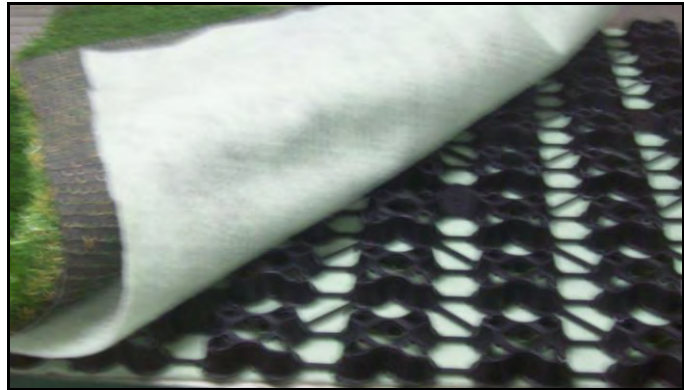
Randall P. Baker, PE
Tulsa Plumbing and Materials Manager

Test Procedure and Results

Sample ID: Airdrain™ Synthetic Turf Rooftop Drainage

Thermal Conductivity/Thermal Resistance
ASTM C 518-10

T_H = Hot Plate Temp (°F)	102.26
T_C = Cold Plate Temp (°F)	51.33
Q = Heat Flow (mV)	4.903
$\Delta\chi$ = Sample Thickness (in.)	1.743
ΔT = Hot Plate - Cold Plate (°F)	50.93
k = Thermal Conductivity, (BTU in) / (hr·ft ² ·°F)	0.6326
R = Thermal Resistance, (hr·ft ² ·°F) / BTU	2.7553



End of Report