

TURF CELL[®] Porous Paving System

DESCRIPTION:

Turf Cell[®] is a structure which provides incredible load bearing strength while protecting vegetation root systems from deadly compaction. High void spaces within the entire cross-section enable excellent root development, and storage capacity for rainfall from storm events. Stormwater is slowed in movement through and across Turf Cell[®] surfaces, which deposits suspended sediment and increases time to discharge. Suspended pollutants and moderate amounts of engine oils are consumed by active soil bacteria, which are aided by the system's excellent oxygen exchange capacity.

BENEFITS:

- Pervious Load Bearing Surface
- Stormwater Pollution Filtration and Treatment
- Airborne Dust Capture and Retention
- Heat Energy Reflection Reduction, "Cool" Surface
- Tree Growth within Parking Areas

APPLICATIONS INCLUDE:

- Infiltration Basins
- Fire Access
- Parking
- Driveways
- Event Parking
- Pedestrian Access
- Handicap Parking
- Emergency Access

SIZE:

Manufactured in 52mm x 260mm x 480mm Piece (Unique easy to use interlocking system, with a rigid clipping system)

ATLANTIS TURF CELL INSTALLATION SPECIFICATION

PART ONE: DESIGN SPECIFICATIONS

1. TENDER PROCESS

- a. The tender should detail, in writing the, approximate time of installation, current specified product legal status, engineering specifications, product test reports by independent, certified institution, manufacturers quality assurance documents, relevant insurance requirements, manufacturers product specification and supervision advice.
- b. The tenderee cannot change the specifications before or after the tender has been awarded.
- c. The project designer is responsible for making change of specifications.
- d. If the tenderee omits any part of the tender, he will be automatically excluded from the tender process.
- e. If the product specified is patented within country, no alternative products will be accepted as the product is protected by the law of intellectual property right.
- f. Products which infringe patents are not eligible for this project.
- g. On case of litigation due to patent infringement, the sub contractor will immediately remove installed products and replace with the legally recognized product.

2. PATENTS

- a. Atlantis Matrix Tanks are protected by a patent under Commonwealth of Australia Patents Act 1990

Modular Drainage Channels

Astral Property Pty Limited

Patent Number 785 313

Term of Letters Patent - Twenty years from 18 October 2000

3. CHANGE OF THE SPECIFICATION

- a. The contractor is not a qualified designer and is not allowed to change or omit any part of the tender specification.
- b. After the tender has been awarded, the designer can propose changes to some products subject to design engineer, architect or landscape architect approval following investigation of the proposed change. The designer is responsible for proving that the proposed products so not infringe the law.

4. CHAIN OF RESPONSIBILITY

- a. There is a chain of responsibility in project design such as entrepreneurial ideas, concept design, construction design, installation requirements and products.
- b. If an installer makes changes across project boundaries, he will assume the legal responsibility for the changes.

PART TWO: TECHNICAL SPECIFICATIONS

1. Description of Work
 - a. Work Included:
 1. It is the manufacturer's recommendation to install Atlantis Drainage Cell 30mm (1.09") as a medium to eliminate excess water from the soil profile. At the same time using the cup system of the 30mm drainage cell for passive irrigation of the turf during prolonged dry periods.
 2. Provide and install sandy gravel road base as per Geotechnical Engineer's recommendations and/or as shown on drawings, to provide adequate support for project design loads.
 3. Provide Turf Cell[®] Paving System products including Turf Cell[®] units, and installation as per the manufacturer's instructions furnished under this section.
 4. Provide and install clean sharp sand to fill the Turf Cell[®] units, when needed.
 5. Provide and install grass by using sod or hydro seeding.
 - b. Related Work:
 1. Subgrade preparation
 2. Subsurface drainage materials
 3. Irrigation installation
2. Quality Assurance
 - a. Follow ISO 90002 requirements.
 - b. Installation: Performed only by skilled/semi skilled workpeople with satisfactory record of performance on landscaping or paving projects of comparable size and quality.
3. Submittals
 - a. Submit manufacturer's product data and installation instructions.
 - b. Submit material certificates for base course and sand fill materials.
4. Delivery, Storage, and Handling
 - a. Protect Turf Cell[®] units from damage during delivery and store under tarp to protect from sunlight, when time from delivery to installation exceeds one week.
5. Project Conditions
 - a. Review installation procedures of Drainage Cell and coordinate Turf Cell[®] work with other work affected. Generally, Drainage Cell and Turf Cell[®] are installed at the same time as project grass installation, nearly the last site construction activity.
 - b. All hard surface paving adjacent to Turf Cell[®] areas, including concrete walks and asphalt paving must be completed prior to installation of Turf Cell[®].

- c. Gradients for grass porous paving surfaces can vary from flat to 20%, depending upon vehicle types to use the surface. Please note that fire access, or other emergency vehicles, will generally require a gradient that is less than 6%. If there are any questions regarding existing gradients on this project, please contact the Project Designer, or Atlantis Water Management or your Local Distributor.
- d. Cold weather:
 - 1. Do not use frozen materials or materials mixed or coated with ice or frost. Be careful in handling Drainage Cell and Turf Cell[®] in temperatures below 0°C
 - 2. Do not build on frozen work or wet, saturated or muddy subgrade.
- e. Protect partially completed paving against damage from other construction traffic when work is in progress, and until grass root system has matured (about 3 to 4 weeks). Any barricades constructed must still be accessible by emergency and fire equipment during and after installation.
- f. Protect adjacent work from damage during Drainage Cell and Turf Cell[®] installation.

PRODUCTS

- 1. Availability
 - a. The permeable paving system must:
 - i. Be modular in nature
 - ii. Fit into the footprint of the specified system
 - iii. Have a minimum of 3 years of use in the country of installation
 - iv. Be manufactured in a factory with ISO9001:2000 certification
 - v. Be manufactured from a minimum 85% post-consumer recycled polypropylene
 - vi. Meet the following requirements:

Test	Value	Unit
Net Void Area	80	%
Service Temperature	-4 to 65	Degrees Celsius
Unit Weight	> 5.5	Kilograms per square metre
Size per opening	< 35	square centimetres
Rib Orientation	Linear & Parallel	Vertical & horizontal
Unconfined Crush Strength (0.8m x 0.8m plate)	130	Tonnes per square metre

- b. Approved Products include Atlantis Turf Cell permeable pavers
Atlantis Corporation Pty Ltd
Unit 3, 19-21 Gibbes Street

2. Materials

- a. Base Course: Sandy gravel material from local sources commonly used for road base construction, passing the following sieve analysis.
 - i. Sources of the material can include either "pit run" or "crusher run." Crusher run material will generally require sharp sand to be added to mixture (33% by volume) to ensure long-term porosity. If there is difficulty in finding local sources to meet this sieve analysis, an alternative mixture can be created by mixing 2/3 crushed drainage rock (0.75" dia) with 1/3 gravel or river sand.

Percent passing through	US Sieve Designation	Nominal Sieve Opening	
		mm	inches
100	3/4"	19.0000	0.7500
85	3/8"	9.5100	0.3750
60	#4	4.7600	0.1870
30	#40	0.4200	0.0165
<3	#200	0.0740	0.0029

- ii. Selected materials should be nearly neutral in pH (range from 6.5 to 7.2) to provide adequate root zone development for turf.
 - iii. Alternative materials such as crushed shell, lime rock, and/or crushed lava may be considered for base course use, provided they are mixed with sharp sand (33%), and brought to proper compaction. (Crushed shell and lime rock alone can set up like concrete without sand added).
- b. Atlantis Turf Cell[®] Units
 - i. Lightweight injection-moulded plastic units 0.052x0.480x0.0260m (2.05" x 18.9" x10.24") with hollow rings and square pattern allowing maximum grass root penetration and development. The clipping system must be solid to create a grid like uniform structure for proper long-term structural performance; peg like clipping is not acceptable for long term structural integrity. The plastic shall be 100% post-consumer recycled plastic resins, predominately PP, with minimum 3% carbon black concentrate added for UV protection. Loading capability is equal to 148.58t/Sqm (166.0psi) when filled with sand, over an appropriate depth of road base. Standard colour is black. Unit weight = 652 grams/pcs, volume = 5% solid.
 - c. Sand:
 - i. Obtain clean sharp sand (washed concrete sand) to fill the 52 mm high rings and square spaces within the cell structure when seeding or using 13 mm (half inch) thick sod (soil thickness).
 - d. Grass:
 - i. Use species resistant to wear by traffic generally a Blue/Rye/Fescue mix used for athletic fields in northern climates, and Zoysia, Fescue, or Bermuda types in southern climates (or as specified by Designer)

- ii. Check with local sod and seed suppliers for preferred mixtures.
- iii. Dedicated fire access can use same grass species used on surrounding turf.
- iv. Parking applications require greatest wear-resistant species possible, generally available only by seed or sprigging. (Choose one of the following paragraphs to suit project requirements.)
 - 1. Sod: Use 13 mm (0.5") thick (soil thickness) rolled sod from a reputable local grower. Species should be wear resistant, free from disease, and in excellent condition. Sod shall be grown in sand or sandy loam soils only. Sod grown in soils of clay, silt, or high organic materials such as peat, will not be accepted.
 - 2. Seed: Use seed materials, of the preferred species for local environmental and projected traffic conditions, from certified sources. Seed shall be provided in containers clearly labelled to show seed name, lot number, net weight, % weed seed content, and guaranteed % of purity and germination. Pure Live Seed types and amount shall be as shown on plans.
- e. Mulch: (Needed only for seeding.) Shall be of wood or paper cellulose types of commercial mulch materials often used in conjunction with hydro seeding operations. Mulches of straw, pine needles, etc. will not be acceptable because of their low moisture holding capacity.
- f. Fertilizer: A commercial "starter" fertilizer, with Guaranteed Analysis, or as recommended by local grass supplier, for rapid germination and root development.
- g. "Atlantis Turf Cell[®]" sign to identify the presence of Turf Cell[®] paving, stating that special maintenance is required, with the Manufacturer's phone number, and made of durable materials for outdoor exposure shall be provided and installed.
- h. Fire Access Signage & Delineation: Fire access must be identified regarding their entrance and physical location with the placement of signs, gates, curbs, bollards, etc. Specific signage wording and other details must be coordinated with and approved by local fire authorities.

EXECUTION

1. Inspection: It is recommended that Fire Department inspectors be scheduled to inspect installation of Turf Cell[®] during preparation of the sub base, installation of the base course, and installation of Turf Cell[®] units in Fire Access applications only. Verify with Fire Department if certificates of inspection if required.
 - a. Examine subgrade and base course installed conditions. Do not start Turf Cell[®] installation until unsatisfactory conditions are corrected. Check for improperly compacted trenches, debris, and improper gradients.
 - b. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found unsatisfactory, contact Project Manager for resolution.
2. Preparation: Ensure that sub base materials are structurally adequate to receive designed base course, wearing course, and designed loads. Generally, excavation into undisturbed normal strength soils will

require no additional modification. Fill soils and otherwise structurally weak soils may require modifications, such as geotextiles, geogrids, and/or compaction (not to exceed 90%). Ensure that grading and soil porosity of the subbase will provide adequate subsurface drainage.

- a. Lay specified Geo-Textile and lay Atlantis 30mm Drainage Cell over the Geotextile without affecting the created falls lay Specified Geotextile blanket on the top of Atlantis Drainage Cell and place base coarse material over prepared sub base to grades shown on plans, in lifts not to exceed 150 mm, compacting each lift separately to 95% Modified Proctor Leave minimum 10 mm to 15 mm for Turf Cell[®] unit and sand/sod fill to Final Grade.
 - b. Spread all Soils as specified and as supplied from local Soil Supplier, evenly over the surface of the base course with a hand-held, or wheeled, rotary spreader. The soils should be placed immediately before installing the Turf Cell[®] units to assure that the polymer does not become wet and expanded when installing the units.
3. Installation of Turf Cell[®] Units
- a. Install the Turf Cell[®] units by placing units in a way in which they clip up as a continuous Blanket. Units can be easily cut with an Electric Saw to the corners and edges. Units placed on curves and slopes shall be clipped thoroughly. Tops of units shall be between 5 mm to 10 mm, below the surface of adjacent hard-surface pavements.
 - b. Fill up the Turf Cell[®] with sand and potting mix in the ratio of (40%-60%) as they are laid in sections by "back dumping" directly from a dump truck, or from buckets mounted on tractors, which then exit the site by driving over the turf cells which are already filled. The fill is then spread laterally from the pile using flat bottomed shovels and/or wide "asphalt rakes" to fill the Turf Cell[®]. A stiff bristled broom should be used for final "finishing" of the fill. The fill must be "compacted" by using water from hose, irrigation heads, or rainfall, with the finish grade no less than the top of Turf Cell[®] and no more than 6 mm above top of the Turf Cell[®].

4. Installation of Grass

(Choose one paragraph below to meet grass installation method desired.)

- a. Install grass seed and mulch over sand-filled rings with commercial hydro seeding equipment, at rates shown on plans and per manufacturer's recommendations. Coverage must be uniform and complete. Following germination of the seed, areas lacking germination larger than 20 cm x 20 cm must be reseeded immediately. Seeded areas must be fertilized and kept moist during development of the turf plants.
- b. Install thin sod directly over sand filled rings, filled no higher than the top of the rings. Sod strips should be placed with very tight joints. Following initial watering, roll the sod to push turf into Turf Cell[®] eliminating any air pockets and ensuring good soil contact. Sodded areas must be fertilized and kept moist during root establishment (minimum of 3 weeks).

5. Protection

(Choose one paragraph below to match grass installation method.)

- a. Seeded areas must be protected from any traffic, other than emergency vehicles, for a period of 4 to 6 weeks, or until the grass is mature to handle traffic.
 - b. Sodded areas must be protected from any traffic, other than emergency vehicles, for a period of 3 to 4 weeks, or until the root system has penetrated below the Turf Cell[®] units.
6. Cleaning: Perform cleaning during the installation of work and upon completion of the work. Remove all excess materials, debris, and equipment from site. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

END OF SECTION:

If you have any questions regarding this specification, please contact
Atlantis Water Management: Unit 3/19-21 Gibbes St, Chatswood NSW 2067