GreenBlue StrataVault™ Specification

StrataVault system is a highly engineered solution that must be correctly installed to meet relevant design criteria. While the StrataVault modules have very high strength capacity, the longevity of the pavement structure is contingent on all components being incorporated properly.
Table of Contents

1.0 Definitions ............................................................................................................. 3

2.0 Site Preliminaries ................................................................................................... 4
  2.01 Product Storage .................................................................................................................. 4
  2.02 Services ............................................................................................................................... 4
  2.03 Tree Pit Layout .................................................................................................................... 4
  2.04 Tree Pit Depths .................................................................................................................... 4
  2.05 Soil Analysis ......................................................................................................................... 4

3.0 Tree Pit Excavation and Drainage ............................................................................ 5
  3.01 Excavation ........................................................................................................................... 5
  3.02 Reinforcing Collar ................................................................................................................ 5
  3.03 Sub-grade Preparation ........................................................................................................ 5
  3.03(a) Structural Sub-base if required by Engineers ................................................................. 6
  3.04 Drainage ................................................................................................................................ 7

4.0 Matrix Installation and Soil Filling ........................................................................... 8
  4.01 Stratavault Assembly .......................................................................................................... 8
  4.02 Lateral Pipes ...................................................................................................................... 12
  4.03 Vertical Pipes ..................................................................................................................... 12
  4.04 Root/Moisture Barriers ..................................................................................................... 12
  4.05 Filtergrid Separation/Reinforcement ................................................................................. 13
  4.06 Granular Collar .................................................................................................................. 14
  4.07 Loading Matrix with Filler Soil ........................................................................................... 14
  4.07 Top Grate Placement ........................................................................................................ 15

5.0 Compaction and Pavement Layers ........................................................................ 16
  5.01 Tree Pit Opening ............................................................................................................... 16
  5.02 Granular Base Course ........................................................................................................ 17

6.0 Materials ..............................................................................................................  19
  6.01 Stratavault 30 Series ......................................................................................................... 19
  6.02 Stratavault 60 Series ......................................................................................................... 19
  6.03 Filter Grid 3030 ................................................................................................................ 20
  6.05 ReRoot Linear Root Barrier ............................................................................................... 21
  6.06 RootStop Linear Root/ Moisture Barrier ........................................................................... 22
  6.07 Aeration Pipes .................................................................................................................. 23
  6.08 Filler Soils ......................................................................................................................... 23
  6.09 Granular Base Course ...................................................................................................... 23
1.0 Definitions

A. StrataVault module: Patented, load-bearing engineered plastic module with vertical and lateral interlocks, for creating void space beneath pavements.


C. StrataVault Connector – Component for connecting StrataVault modules vertically.

D. StrataVault Foot Plate – Component for placement at base of matrix, connecting to feet, for point load dispersion.

E. StrataVault Top Grate – Component for placement at top of matrix for pavement support.

F. StrataVault Matrix: Assembled and interconnected volume of StrataVault modules

G. Lateral Pipe System: Perforated pipe system for circulation of air, and distribution of water and nutrients, connected to surface grating.

H. Vertical Pipe System: Large diameter plastic pipe system for inspection, circulation of air, and connection to surface grate.

I. RootStop Root/Moisture Barriers: Linear membranes to prevent root or moisture penetration.

J. ReRoot Barrier: Linear root barriers with vertical integral root training ribs.

K. Filler Soil: Correctly balanced soil mix to provide optimum growth conditions for tree root systems within StrataVault matrix.


M. Tree Pit Opening: The pavement opening within which the tree is planted.

N. Granular Base Course: Compacted granular material to approved regional standards for support of pavement to relevant Pavement Load design.

O. Tree Pit: Excavated space filled with quality soil media for tree planting.

P. Reinforcing Collar: A trench between StrataVault matrix and surrounding soil, lined with Filtergrid, filled with granular base course and compacted.
2.0 Site Preliminaries  
*Assessment of site conditions and planning of installation.*

2.01 Product Storage  
StrataVault modules shall be transported and stored on GreenBlue pallets, with pallet wrap intact until required for installation. Pallets shall be positioned on firm level base, so as not to impede traffic or work flow.

2.02 Services  
Installer must obtain accurate service locations from all providers, and discuss potential conflicts with tree pit location prior to commencement. Any amendments to tree pit numbers, dimensions or location to be approved by the principal Landscape Architect in writing.

Statutory clearance and cover measurements for service pipes and conduits to be observed by Installer.

2.03 Tree Pit Layout  
Tree pit locations and dimensions shall be accurately surveyed, and marked using string lines, survey pegs and marking paint. Landscape Architect to inspect and approve the tree pit layout, relative to project details, including granular collar detail.

2.04 Tree Pit Depths  
Installer to confirm excavation depths from finished pavement elevations, including provision for drainage and base course layers.

2.05 Soil Analysis  
Site soil analysis to be conducted by soil analyst and submitted to Landscape Architect to ensure adequate drainage of surplus water from base of tree pit. Where drainage is inadequate, provision shall be made using land drains connected to main storm-water pipe, or grade to soakage pits. Design of soakage pits to be approved by Landscape Architect, prior to commencement of works.
3.0  Tree Pit Excavation and Drainage

*Excavating the pit, providing adequate drainage, and meeting required load capacity at floor of tree pit.*

3.01  Excavation

Tree pit to be excavated accurately to dimensions of detail plans, allowing 200mm (8”) additional clearance in length and width. Side walls of excavated pit to be clean, straight, and within 15° of vertical. Measure tree pit length, width and diagonals at base of pit to ensure that correct dimensions are being obtained (measurements shown on tree pit detail plus 200mm). Confirm that correct depth has been provided, measuring from finished pavement level, including any drainage layers. Base of tree pit should be flat, with a positive grade for drainage.

3.02  Reinforcing Collar

The top perimeter of the tree pit shall be further excavated to a depth of 300mm (12”), and to a width of 200mm (10”), or of sufficient width to permit a narrow foot compacting plate to be utilized. Sides and base of this excavation to be clean and straight.

3.03  Sub-grade Preparation

Base of tree pit must be free of debris and level. Check CBR of the subgrade below the proposed granular pavement layers to ensure it meets the documented pavement design criteria. If the subgrade is fill confirm the subgrade surface below the Stratavault matrix is compacted to a minimum of 95% of maximum dry density at optimum moisture content in accordance with ASTM D 698 Standard Proctor Method. A minimum bearing strength of 100kpa is required.

Proof compact the subgrade in natural ground with a minimum of three passes of a suitable vibrating compacting machine or apply other compaction forces as needed to achieve the required subgrade compaction rate.

Apply additional compaction forces at optimum water levels.
3.03(a) Structural Sub-base if required by Engineers
Install structural sub-base to the depths indicated in the drawings, under the first layer of StrataVault modules.

Compact aggregate sub-base layer to a minimum of 95% of maximum dry density at optimum moisture content in accordance with ASTM D 698 Standard Proctor Method. Compact the subgrade with a minimum of three passes of a suitable vibrating machine or apply other compaction forces as needed to achieve the required subgrade compaction rate.
3.04 Drainage
Positive drainage to main storm-water service from base of tree pit is mandatory if the design incorporates water harvesting, and strongly recommended if the site soil is not well drained. The base of tree pit must be graded at 5% to the perforated collection pipe in trench. Collection pipe to be wrapped in filter sock, and connected to storm-water system. A 100mm (4”) layer of clean aggregate to be placed in base of tree pit, and leveled.

If an aggregate drainage layer is specified, cover with a proprietary non-woven filter fabric to engineer specifications.
4.0 Matrix Installation and Soil Filling

Assembling the matrix and associated components, filling with soil.

4.01 StrataVault Assembly

Check and confirm all tree pit dimensions, and mark location of tree with surveyor pegs before commencing assembly of StrataVault matrix. Rectify any discrepancies or errors.

Ensure base of pit is level and free of debris. Place first StrataVault Foot Plate in left corner of tree pit.
Place StrataVault Modules in the pit connected to Foot Plates.

Attach the Bridge Connectors between the Modules and press into place until a firm ‘click’ is felt.
Continue laying out Foot Plates, placing modules on Foot Plates, and connecting with Bridge Connectors, until the first layer of the matrix is complete.

If additional layers are specified, place Vertical Connectors in the top of the module columns.
Then lay out the Modules, connecting the feet firmly to the Vertical Connectors. Use Bridge Connectors as previous to connect modules laterally.

Note - do not place the Top Grates in top layer until soil has been loaded to specified levels after step 4.06.
4.02 Lateral Pipes
Perforated aeration pipes must be installed within the top layer of modules, as per tree pit design details. The pipe must be laid in a complete connected circuit, within 600mm (24”) of outer edge of matrix. Junctions and risers to be fitted at spacings of no more than 3.6 metres (12’). Riser pipes to be trimmed to 150mm (6”) above finished pavement level, and supported in vertical position by temporary staking. Open ends of pipe to be sealed with caps or weather-proof tape.

4.03 Vertical Pipes
Where vertical aeration or inspection pipes are specified, they should be placed within the large central opening of the StrataVault modules, in correct locations. Pipes should be trimmed to length 150mm (6”) above finished pavement level. Open ends of pipes to be sealed with caps or weather-proof tape.

4.04 Root/Moisture Barriers
Where detailed on the tree pit plans, a linear RootStop Barrier shall be installed. Typically this will be placed between the StrataVault matrix, and the side wall of the pit. Ensure the barrier is inserted to the relevant depth of the pit, and is not in contact with any sharp debris or stones what may cause a puncture in the barrier. Any joins shall be overlapped by 150mm (6”) and taped both sides using RootStop tape over clean dry surfaces. The top edge of the RootStop barrier shall be trimmed with a sharp knife to level with the top of the StrataVault matrix.
**4.05 CombiGrid Separation/Reinforcement**

The outer trench for provision of granular collar shall be cleaned, and all filler soil and debris removed. Place the CombiGrid layer to top of matrix, and cut to length, ensuring that the material covers the top and sides of the matrix. Fold back top to allow for soil filling (step 4.07), then replace. Any material joins must be straight, free of debris, and over-lapped 150mm (6”). Pipe penetrations to be provided by means of two intersecting slits cut with a sharp knife to form a cross.
4.06  Granular Collar
Load the granular base course material into the base of the collar trench, ensuring the CombiGrid layer is not displaced from the base of the trench. Ensure the CombiGrid is compacted against the side of the matrix prior to loading the granular collar. Compact the granular material in 150mm (6”) lifts until the collar is level with the top of the matrix.

4.07  Loading Matrix with Filler Soil
Ensure that all required filler soil testing and certification is complete to satisfaction of Landscape Architect prior to loading into tree pit.

When matrix is fully assembled, with all specified piping and barriers in place, the filler soil can be loaded into the matrix.

Soil should be placed using an excavator bucket, and spread with rakes or shovels until the void spaces are filled. Use tamping to shake soil into all voids.

Continue loading dry soil, and raking out and tamping/vibrating, until matrix is filled.

Note: In some instances an air layer is detailed in the top of the matrix. In this case, soil is loaded, spread and tamped/vibrated in smaller amounts, to ensure an even distribution of soil beneath the air layer.
4.07  Top Grate Placement

Once soil has been loaded to specified levels, place the Top Grates in top layer. Press firmly into all apertures in the top of the matrix.
5.0 Compaction and Pavement Layers

Enclosing the tree pit, and placing pavement layers, to comply with design loads.

5.01 Tree Pit Opening

Confirm the exact required position of the tree pit opening from project details and with reference to survey markers. Cut Filter grid layer and fold back to expose the tree pit opening. Position form-work to provide for poured concrete system, or other method as specified on project details.

Place ReRoot linear ribbed root barrier within the tree pit opening as specified (where relevant), with vertical ribs facing inwards. Ensure bottom edge of ReRoot barrier is placed on the StrataVault matrix, and upper edge is at finished pavement level. Trim to suit with sharp knife. Ensure any joins are overlapped a minimum of 150mm (6”), are clean and dry, and taped both sides with RootStop tape.
5.02 Granular Base Course
Load and spread granular base course material onto the CombiGrid layer, in an even depth of 100mm (4"). Compact this layer with a vibrating plate compactor with a mass of 1200kg – 1400kg/m² of base plate, to specified compaction levels. Continue building compacted granular layers to required levels, including the reinforcing collar.
6.0 Materials

6.01 StrataVault 30 Series
- Engineered plastic modular system designed to assemble together to create a matrix beneath pavements. The interconnected skeletal matrix provides in excess of 90% void space for filling with soil media, or storing/detaining storm water. Due to the high structural integrity of the modules, these matrixes can be incorporated close to trafficked pavement surfaces- subject to engineers’ certification.
- 100% recycled Polypropylene (PP)
- No steel components- corrosive free.
- Ultimate Load Strength 300 kpa
- Module size 60cm (24 inch) x 60 cm (24 inch) x 40cm (16 inches) in height. System includes Bridge connectors, Vertical connectors, Foot plates, Top Grates.

6.02 StrataVault 60 Series
- Engineered plastic module designed to assemble together to create a matrix beneath pavements. The interconnected skeletal matrix provides in excess of 94% void space for filling with soil media, or storing/detaining storm water. Due to the high structural integrity of the modules, these matrixes can be incorporated close to trafficked pavement surfaces- subject to engineers’ certification.
- 100% recycled Polypropylene (PP) reinforced with Fibre glass
- No steel components- corrosive free.
- Ultimate Load Strength 600 kpa
- Module size 60cm (24 inch) x 60 cm (24 inch) x 40cm (16 inches) in height. System includes Bridge connectors, Vertical connectors, Foot plates, Top Grates.
6.03 CombiGrid
Composite of a laid geogrid made of stretched, monolithic polypropylene (PP) flat bars with welded junctions and a mechanical bonded filter geotextile welded within the geogrid structure, used for the reinforcement in many fields of civil engineering including road construction, landfill and hydraulic engineering.

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method*</th>
<th>Unit</th>
<th>30/30 Q1 151 GRK 3</th>
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<tbody>
<tr>
<td><strong>Geogrid</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Raw material</td>
<td>-</td>
<td>-</td>
<td>Polypropylene (PP), white</td>
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<td>Mass per unit area</td>
<td>EN ISO 9864</td>
<td>g/m²</td>
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<td>EN ISO 10319</td>
<td>kN/m</td>
<td>≥ 30 / ≥ 30</td>
</tr>
<tr>
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<td>%</td>
<td>≤8 / ≤8</td>
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<tr>
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<td>kN/m</td>
<td>12 / 12</td>
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<tr>
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<td>kN/m</td>
<td>24 / 24</td>
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<tr>
<td>Aperture size, md x cmd**</td>
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<tr>
<td>Production specific elongation</td>
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<td>%</td>
<td>O</td>
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<tr>
<td><strong>Geotextile</strong></td>
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<tr>
<td>Raw material</td>
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<td>-</td>
<td>Polypropylene (PP), white</td>
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<td>Mass per unit area</td>
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<td>%</td>
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<td>Puncture force</td>
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<td>Displacement at static puncture strength</td>
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<td>30</td>
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<tr>
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<td>-</td>
<td>Yes</td>
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<tr>
<td>Roll dimensions, width x length</td>
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<td>m x m</td>
<td>4.75 x 100</td>
</tr>
</tbody>
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* based on, ** md = machine direction, cmd = cross machine direction
6.05  ReRoot Linear Root Barrier

- Linear root deflecting barriers to be used in proximity to tree root ball, to protect all pavement layers.
- Vertical, integral ribs guide tree roots down into StrataVault matrix beneath pavement.
- Continuous rolls to minimize joins and possible penetration.
- Widths to suit application and pavement depth
- 100um thickness
- 100% High density Polyethylene. This resin meets FDA regulation 177.1520 for food packaging.

Nominal physical properties:

<table>
<thead>
<tr>
<th>PROPERTY*</th>
<th>ASTM D</th>
<th>UNIT</th>
<th>VALUE</th>
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<tbody>
<tr>
<td>Density</td>
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<td>g/cm³</td>
<td>0.952</td>
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<tr>
<td>Melt Index</td>
<td>1238</td>
<td>g/10 min</td>
<td>0.35</td>
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<tr>
<td>ESCR,F₀₅ ° Condition B</td>
<td>1693</td>
<td>h</td>
<td>50</td>
</tr>
<tr>
<td>Tensile Yield Strength</td>
<td>638 @ 50mm/min</td>
<td>MPa</td>
<td>27</td>
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<tr>
<td>Elongation at Break</td>
<td>638 @ 50mm/min</td>
<td>%</td>
<td>&gt;600</td>
</tr>
<tr>
<td>Brittleness Temperature</td>
<td>746</td>
<td>°C</td>
<td>&lt;90</td>
</tr>
<tr>
<td>Flexural Modulus</td>
<td>790</td>
<td>MPa</td>
<td>1310</td>
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<tr>
<td>Shore Hardness D</td>
<td>2240</td>
<td>-</td>
<td>66</td>
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<tr>
<td>Thermoforming**</td>
<td>cm</td>
<td>18-23</td>
<td></td>
</tr>
</tbody>
</table>

* Physical properties reported herein were determined on compression molded specimens prepared in accordance with Procedure C of ASTM D 1928.

** 0.61 x 1.22 x 3.2mm blank heated to forming temperature.

*** Test conditions: 296ml, 23g bottle, 10% fill, Orvus K Detergent.
6.06 RootStop Linear Root/ Moisture Barrier

- Linear root/ moisture barriers for use within or lining the main tree pit, where moisture or roots must be prevented from entering an external zone. Commonly used to protect critical services, or road based courses.
- Continuous rolls to minimize joins and possible penetration.
- Widths to suit application and pavement depth
- 100% High density Polyethylene. This resin meets FDA regulation 177.1520 for food packaging.

Nominal physical properties:

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<td>50</td>
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<td>%</td>
<td>&gt;600</td>
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<tr>
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<td>746</td>
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<td>MPa</td>
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<tr>
<td>Shore Hardness D</td>
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<td>Thermoforming**</td>
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<tr>
<td>Sheet sag</td>
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<td>&gt;700</td>
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</table>

* Physical properties reported herein were determined on compression molded specimens prepared in accordance with Procedure C of ASTM D 1928.
** 0.61 x 1.22 x 3.2mm thick blank heated to forming temperature.
*** Test conditions: 296ml, 23g bottle, 10% fill, Orvus K Detergent.
6.07 Irrigation & Aeration Pipes

- Flexible, perforated pipe system for optimizing oxygen exchange within the tree pit soil. This lateral pipe system is connected to the surface by means of T-pieces and riser pipes, and also forms the means of distribution for harvested storm water, and supplementary irrigation or nutrient dosing.
- 100% High density Polyethylene pipe
- Moulded T-Pieces and junctions
- Cast aluminum ventilation grilles with tamper-resistant grating.

6.08 Filler Soils
Refer addendum: Filler Soil Specification for Stratavault Tree Pit.docx

6.09 Granular Base Course
Granular material meeting the standard below, or equivalent (approved by specifying Landscape Architect in consultation with qualified Civil or Geotechnical Engineer):


  a. Type I mixtures shall consist of stone, gravel, or slag with natural or crushed sand and fine mineral particles passing a No. 200 sieve.

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Percent Passing</th>
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<tbody>
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<td>37.5mm (1.5&quot;)</td>
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<tr>
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<tr>
<td>9.5mm (3/8&quot;)</td>
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<tr>
<td>4.75mm (No 4)</td>
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<td>2.0mm (No 10)</td>
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<tr>
<td>75μm (No 200)</td>
<td>5-15</td>
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</table>

This is a generic and non-specific specification to assist designers/engineers in appropriate design. The supplier/manufacturer takes no responsibility with regards to its application for any project. It is suggested that a professional engineer be engaged to prepare designs and specifications for any project utilising the Stratavault system.