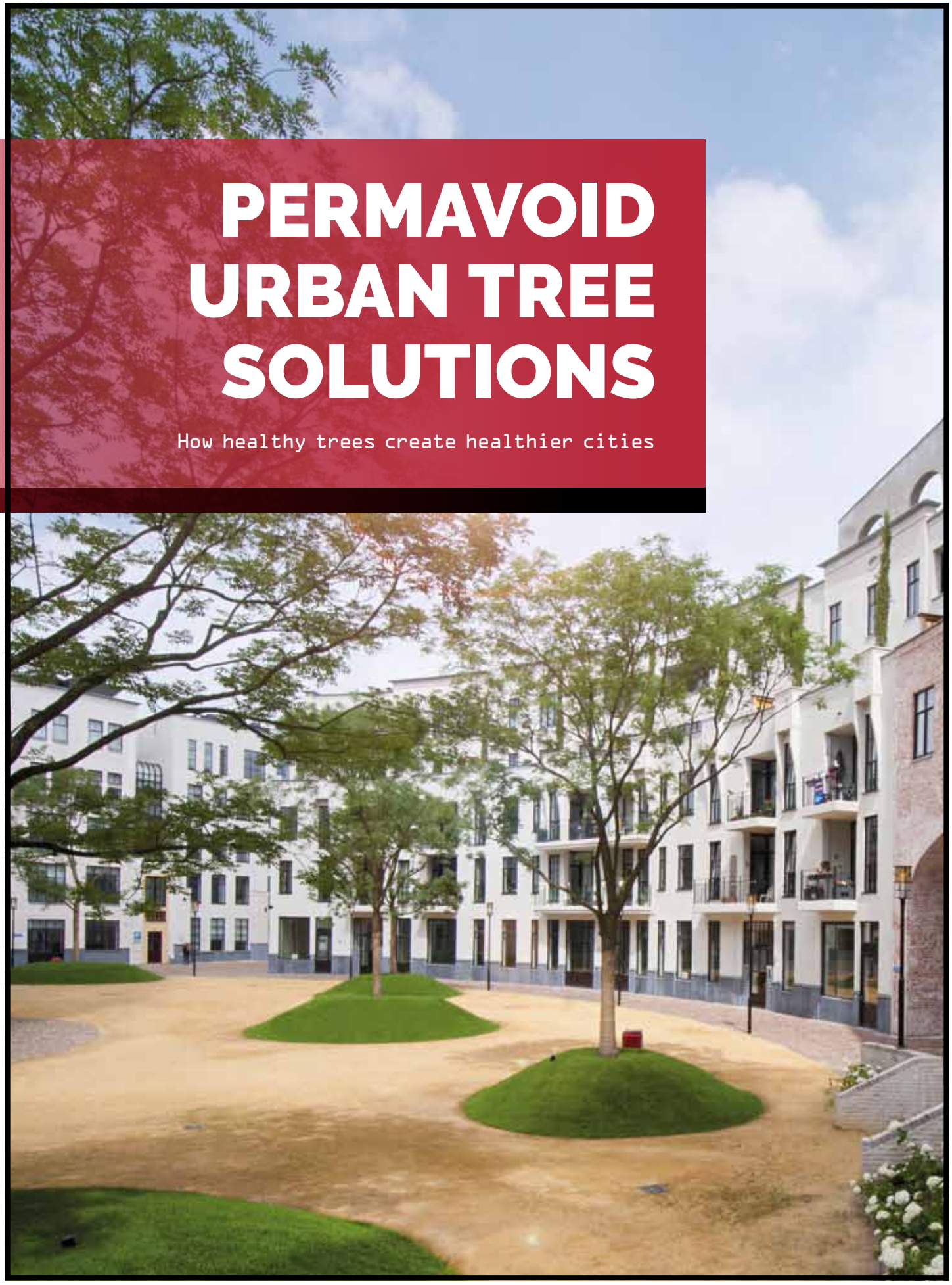
PERMAVOID URBAN TREE SOLUTIONS

How healthy trees create healthier cities



ABT, INC.

ABT, Inc. has been creating innovative water management systems in North America since 1983.

ABT, ADVANCED BUILDING TECHNOLOGIES

While our solutions and operations have grown tremendously over the years we still hold tightly to the core beliefs that made us successful: Create the most innovative, highest quality solutions, we stand behind our work and always put people first. Both with our own team and partners, it has been strong, lasting relationships that have driven our organization to success.

We take this belief outward as we evaluate our role in the global community and in turn strive to be stewards of a healthy planet. This is seen in many ways, like our actions: the fleet of hybrid cars we drive, the EPS recycling program we conduct, the solar powered manufacturing plants we operate. We demonstrate this in our products: Nanosteel that outperforms galvanizing without leeching zinc into the groundwater, Polydrain's chemical

resistance that captures caustic industrial chemicals and prevents contamination, FirstFlush which removes hydrocarbons and other pollutants from stormwater and Permavoid which captures, retains, utilizes and conserves our rainfall locally as the precious resource it truly is.

INTRODUCING PERMAVOID SOLUTIONS

With the ABT Permavoid range of products we are capable of creating circular, nature based solutions for sustainable water management in metropolitan areas. Solutions that combine rainwater management and green infrastructure, enabling reliable multifunctional use of space in the urban environment. Our solutions are usable in Blue-Green vegetated roof systems, podium decks, gardens, for urban trees, sports pitches and Sustainable Urban Drainage Systems (SUDS) when aiming at water-sensitive design. We make sure no water goes to waste by embracing the Permavoid philosophy: "catch, store and reuse water where it falls". We enable cities to treat water like a valuable resource, instead of a nuisance. For more than fifteen years Permavoid has specialized in a wide range of innovative solutions for urban areas worldwide, which will be explained in more detail.

CURRENT CITIES & URBAN TREES

Metropolitan areas face many challenges. Worldwide, people are relocating to urban centers, while simultaneously weather patterns are shifting.

As populations increase, so follows development and building of impermeable surfaces, all to the detriment of our green spaces. This exacerbates the Urban Heat Island Effect, distorts the water cycle, intensifies flood risks and diminishes quality of life.

Healthy tree growth starts at the roots. Unfortunately, in most urban environments, trees face heavily compacted dirt to meet traffic loading rather than healthy aerated soil to root within. Furthermore, they are forced to grow beneath paved surfaces that runoff rainwater and constrict soil gas exchange. This leads to unhealthy trees that can no longer function as the community so desperately needs. Functions like evaporative cooling, air purification and carbon sequestration are lost. Instead we are left with trees that struggle to survive, cause damage to sidewalks and streets, detract from neighborhood aesthetics and generate increasing maintenance costs.

PERMAVOID URBAN TREE SOLUTIONS

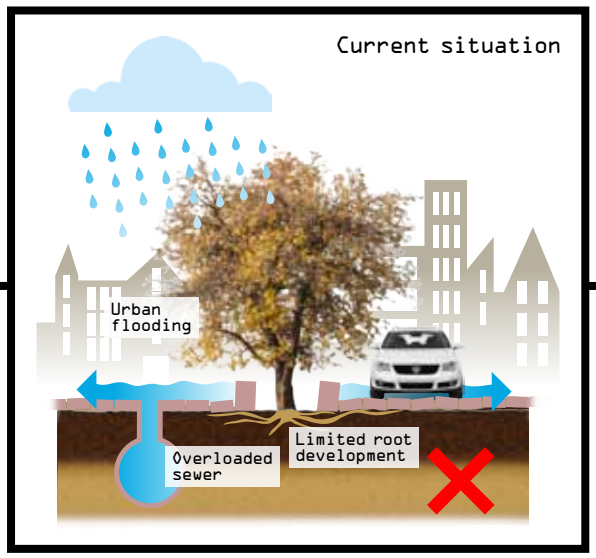
Ecosystems offer valuable inspiration for cyclical water management. In a forest, for example, rainwater is retained extensively within the soil, organic matter and plants precisely where it lands.

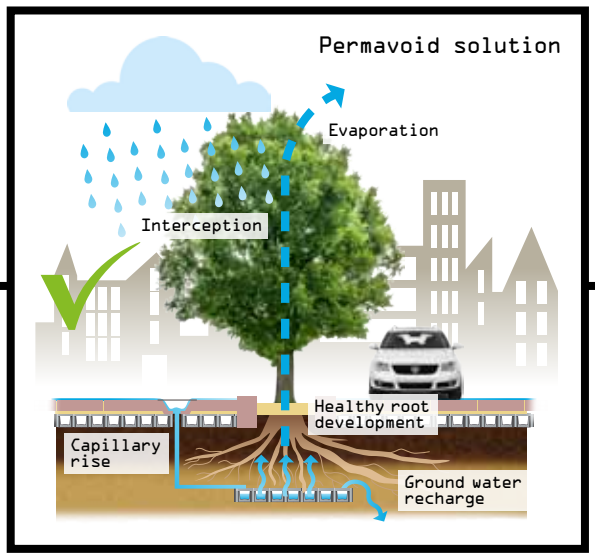
Only once these reservoirs are full does excess water slowly move onward to streams, rivers, lakes and other ecosystems. This precious resource is the lifeblood of vegetation, and plants are adept survivors so they harness every possible drop. We can take our cues from these natural solutions and aim to mimic their behavior within our water sensitive urban areas. When done, we create city environments, teeming with green infrastructure, that promote improved livability, value and social wellbeing.

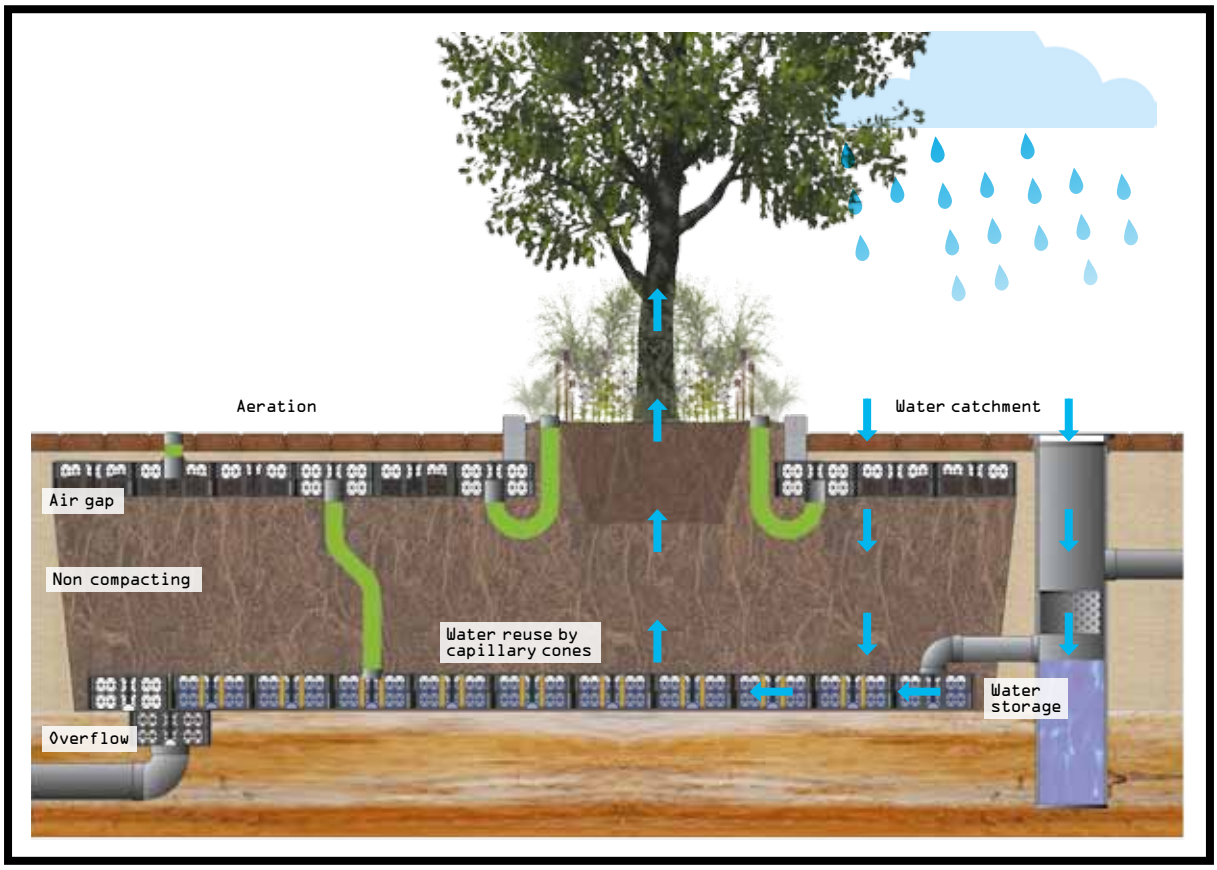
The Permavoid tree solution consists of layered build-up, enabling a completely paved growing site for the tree, usable as a bike path, walkway or car park. These paved areas still provide the tree with soil gas exchange rates just like in nature and soil compaction rates in which tree roots properly develop. In addition, stormwater can be converted into capillary irrigation available year round.

With the Permavoid geocellular units a 6-inch rigid and high strength raft is created just 2 inches under the pavement, creating a second ground level over the tree root space. This open space enables unhampered soil gas exchange and prevents tree roots from destroying or lifting the paved surface above. The raft spreads weight loads over a larger area, preventing soil compaction of the tree root zone.

In nature, tree roots often gain access to groundwater through the natural capillary action of soils. This water source is mimicked by the Permavoid system through a secondary raft placed just below the root zone. In this way, water from nearby rooftops and streets is stored and made available via capillary fiber technology. Water is available on demand for transpiration without the use of pumps, hoses, valves or energy.


Current situation
Urban flooding
Overloaded sewer
Limited root development


Permavoid solution
Evaporation
Interception
Capillary rise
Healthy root development
Ground water recharge


Aeration
Water catchment
Air gap
Non compacting
Water reuse by capillary cones
Water storage
Overflow

CASE STUDIES

Different examples of succesful projects. Installation and end result pictures are shown.


Installation


End result


Installation


End result

Installation

End result

Installation

End result

KEYS TO SUCCESS

PERMAVOID STRUCTURAL INTEGRITY

The interlocked Permavoid units spread weight loads over a larger area preventing compaction of the root zone. The strength of the geocellular Permavoid construction and the free air space acting like a root 'barrier' also prevents root growth damage to the pavement above.

URBAN FUNCTIONALITY COMBINED WITH HEALTHY TREE GROWTH

The structural raft created by Permavoid allows for walkways, bike paths and car parking places to be created in urban areas while maximizing tree health, even on poor, low bearing capacity soils. The system allows larger rootable soil volumes, enhancing the tree's life span and ecosystem services, without losing valuable urban space at the surface.

SOIL-GAS EXCHANGE

The hollow Permavoid units, through simple pipe connections to the surface, allows for extensive aeration of the root zone. This mimics the natural atmosphere to ensure proper gas exchange, promote root development away from the surface and enhance tree vitality within dense urban areas.

OPTIONAL LONG LASTING NUTRIENT SUPPLY

Specially designed mulch, with a very high organic matter, housed within the upper Permavoid structural layer, allows percolating storm-water to pick up and deliver vital nutrients directly to the root zone of mature and developing trees, each time it rains.

SOIL

The Permavoid system creates rootable volume with a structural sand based soil mix. This soil is capable of carrying traffic loads while still providing support for root growth and sufficient oxygen, water and nutrients; without excessive compaction.

NATURAL ON DEMAND CAPILLARY IRRIGATION

The optional second and deeper layer of Permavoid forms a sub surface 'tank' and can be filled with water harvested from trees or adjacent streetscapes. When excess storm water is retained within Permavoid, it is delivered to trees and plants through natural capillary irrigation over extended time lines without the use of pumps, hoses or energy. This means green spaces can span longer periods of drought wit-

hout reverting to our drinking water to maintain plant health and thus preserve our most precious resource.

By capturing, storing and utilizing water at the source, large volumes of run-off are kept out of our sewer systems which mitigates flood risks, property damage and illicit sanitary overflows.

SOIL BIOLOGY

With an ample supply of oxygen and water, essential micro-organisms such as fungi and bacteria can develop along with the tree in the growing site. This creates a natural environment for the tree to live in and prevents harmful anaerobic situations and swamp gas formation in the soil.

REDUCING THE URBAN HEAT ISLAND EFFECT

By increasing water storage throughout our cities we increase the thermal mass of our environment. This greatly assists in moderating temperature extremes. Furthermore, natural transpiration by trees can evaporate large volumes of water which increases adiabatic cooling and tree canopy density (shadow), further reducing sensible heat and mitigating the Heat Island Effect caused by urban development.

BIODIVERSITY

Trees are great supporters of biodiversity in the urban environment. They need water and an opportunity to mature. That is what the ABT Permavoid system provides: cost effective, long lasting and sustainable nature based growing sites for urban trees and landscaped spaces within our cities.

VALUE, HEALTH AND WELLBEING

Proximity to high quality green infrastructure has proven many times over to improve people's state of mind. Real estate increases in value when close to green infrastructure. Investing in urban green space, especially urban trees, has proven to generate a significant return on investment. Consider the main functions trees provide for liveable cities, not just for the future, but for today.

With the ABT Permavoid range of products we are capable of creating circular, nature based solutions for sustainable water management in metropolitan areas. Solutions usable for urban trees, Blue-Green roofs, podium decks, gardens, sports pitches and SUDS when aiming at water-sensitive design. We make sure no water goes to waste by the catchment, storage and reuse of water where it falls. For more information about our solutions please contact us or visit www.abtdrains.com

OTHER SOLUTIONS BY

permavoid

Sports and recreation

Blue Green roofs

Structural subbase

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