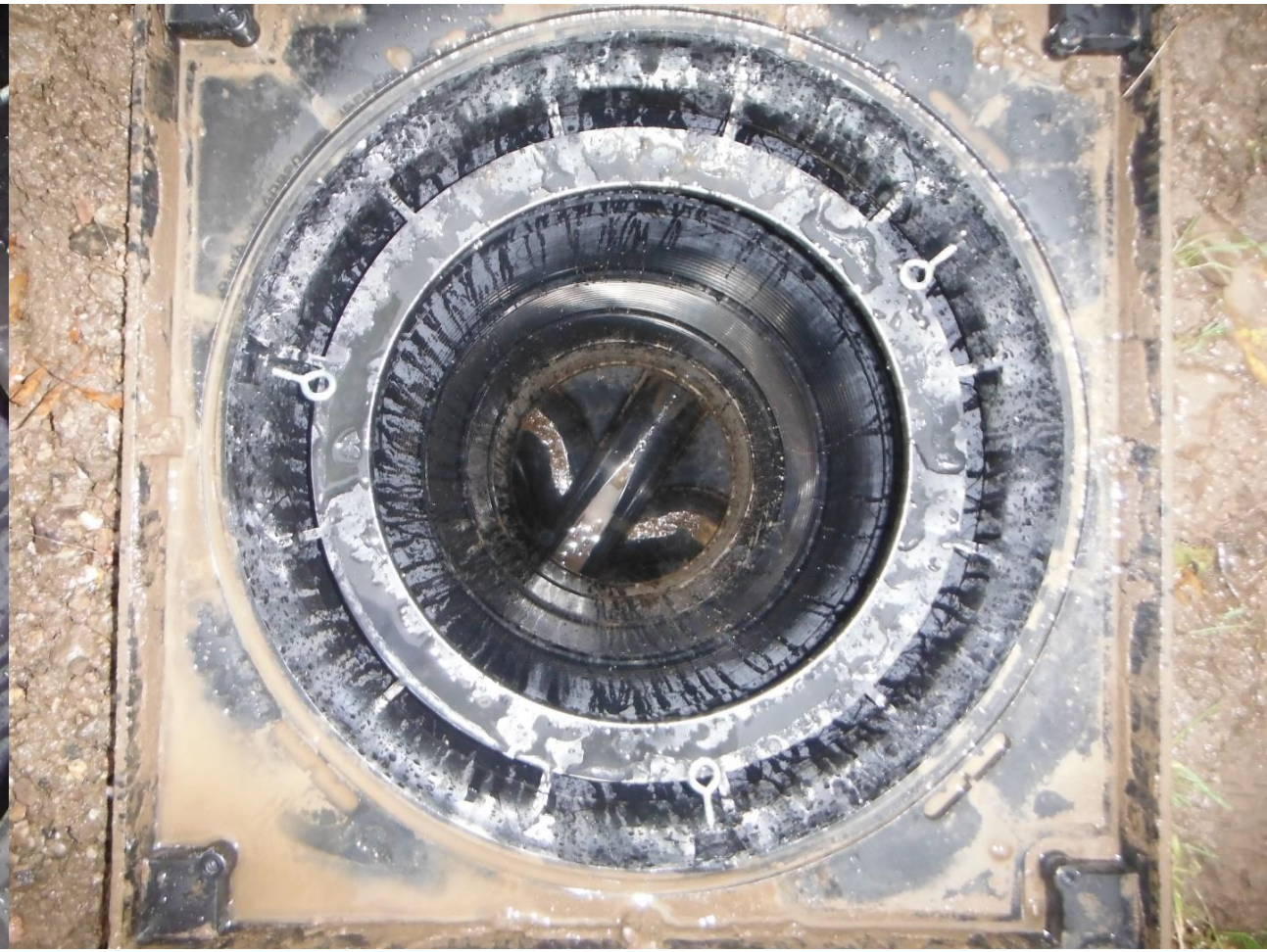
Kentucky Stormwater Association - 2017
Utilizing Urban Trees for Stormwater Management

DSCF0323 - Water flowing into the system from parking lot strip drain.



DSCF0319 - shows outlet drain - no water flow outwards after 2 hours of rain fall, demonstrating attenuation in action. Some post installation debris visible. This is 80” (2m) down.

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Soil Cells

1 ½ YEARS

VS

INSTALLATION

Structural Soil


WE NEED TO
plan, provide & protect
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Applications

Streetscapes

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Applications

Parking Lots

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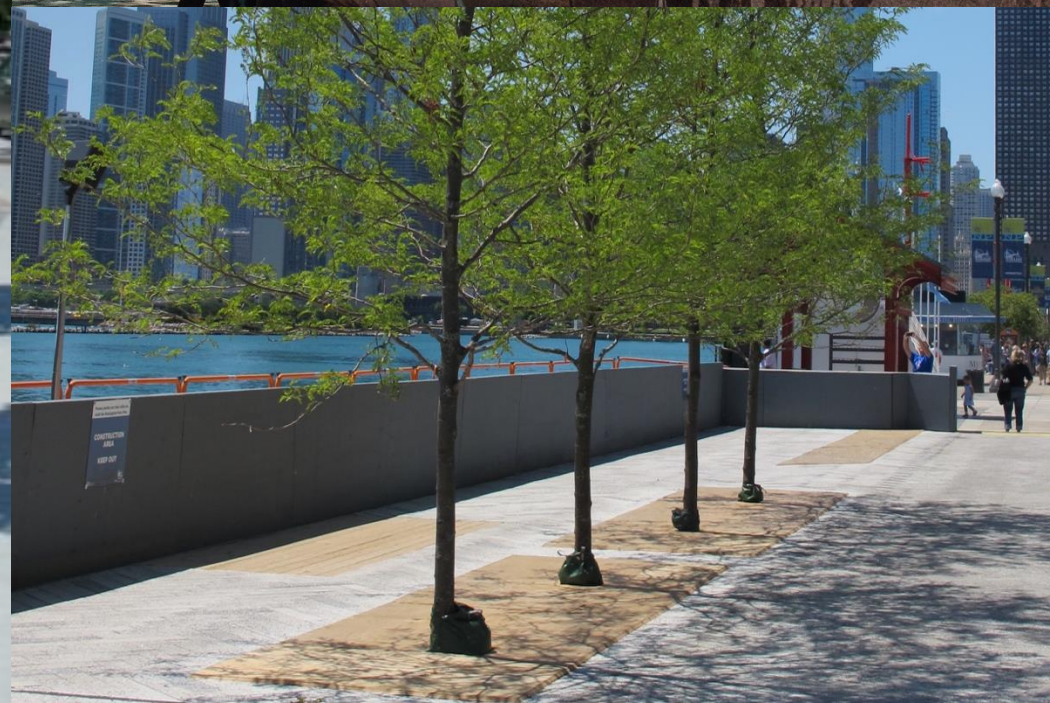
Applications

Road Medians



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Applications

Roof Tops & On-Structure

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Case Study

Before

Navy Pier, Chicago

GreenBlue URBAN

During

Navy Pier, Chicago

GreenBlue URBAN

After

Navy Pier, Chicago

GreenBlue URBAN

Case Study

2017

Navy Pier, Chicago

GreenBlue URBAN

Case Study

Before

Leslie Street, Toronto

GreenBlue URBAN

Case Study

During

Leslie Street, Toronto

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Case Study

After

Leslie Street, Toronto

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STORMWATER MANAGEMENT

RootRain Linear Drain

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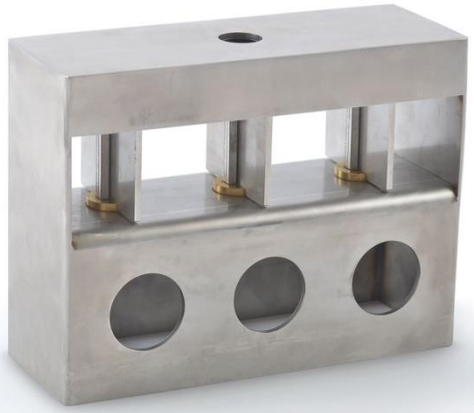
STORMWATER MANAGEMENT

CurbFlow



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Case Study

Pace University

New York City, NY

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Case Study

Hatcher Road

Phoenix, AZ

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Emmen Center Square

Emmen, Netherlands

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Portland Slip, Toronto ON

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What happens without correctly Designed Systems?

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ROOTS IN SOILCELLS

An Evaluation of Root Growth Patterns

JOHN ATKINS | DIRECTOR, TREEOLOGY

GreenBlue URBAN

www.greenblue.com

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Establishing the future urban landscape

Construction Method (2011)

1. Excavation of site soil (clay based fill) to a depth of 1.3 m
2. Gravel layer 0f 100 mm depth below Stratacells
3. 3 layers of Stratacells backfilled with a sandy loam soil blend (see Figure 1)
4. RootRain piping was embedded within the Stratacells at a depth of approximately 500 mm below the final surface. (See Figure 1)
5. Root barrier and gravel placed between the concrete forecourt and the Stratacells vault system
6. Filter Grid geotextile layer above Stratacells and backfill media
7. RootRain and ArborVent system installed within the planting zone
8. Root Director placed about the planting position
9. Tree Grate incorporating the ArborVent system placed over the planted tree rootball and Stratacells vault system
10. 30 mm Gravel placed over the remainder of the tree vault.

Figure 9 shows the initial Stratacell layers being installed in 2011. Note the depth of concrete on one side, and RootRain piping incorporated into the Stratacells.

Figure 10 shows the backfilling of the Stratacells with sandy loam growing media and compaction. A root barrier has been placed between the Stratacells and the concrete forecourt with a strip of fine gravel approximately 250 mm wide placed against the concrete to minimize root invasion. The planting hole is prepared and ready for completion.

The initial trees selected were provided by the Trees Impact group of nurseries as 100 litre rootball size and produced to Natspec requirements. The root systems of the planted trees were a great start to the process.

Figure 5 is an image of a typical rootball grown to NATSPEC produced by Trees Impact (Ross Clarke 2015).

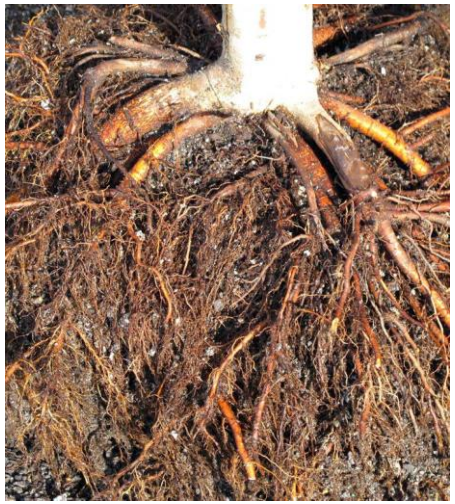

Figure 6 shows the initial distribution of roots through high water pressure removal of growing media. The NATSPEC criteria ensure trees develop a high degree of root division, rootball occupancy and no root girdling. (Jim 2015)

Figure 7 shows the view looking west at the commencement of excavation. The dense canopy of the Figs extended to ground level. Tree 1 had achieved 6m in height and 5 metres in width in a 4 year period.

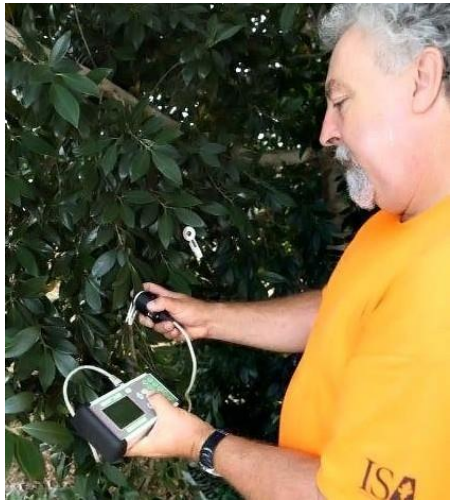

Figure 8 - Using the Handy PEA fluorimeter to measure chlorophyll fluorescence values.

Supplementary irrigation was present and was used initially to establish trees during hot summer months.

Soil Profile

Figure 3 shows the first trench excavated, exposing the edge of the tree vault system. The trench edge was 1.6 metres from the trunk on this side. Note the presence of roots (15 – 25 mm diameter) found at the edge of the vault.

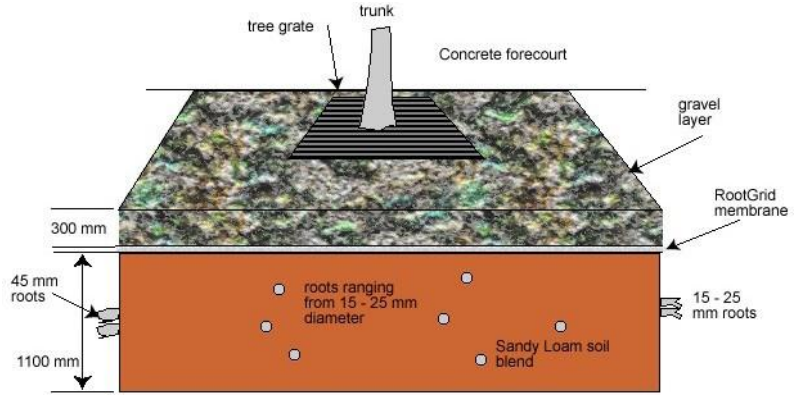

Figure 4 shows a diagram of the basic soil profile within the tree vault and initial root presence.

Excavation Method (2015)

1. Trenching about tree vault zone to permit access to depth of 1.5 m

Figure 11 shows the view looking at the trenches excavated about Tree 1 with some of the exposed Stratacells and Root Grid.

2. Removal of canopy of Tree 1

Figure 12 - removing the canopy to permit access for further work.

3. Removal of tree grate and Root Director about root crown.

Figure 13 - the canopy has been removed and the excavator dismantles the tree grate system. The RootRain piping is partially exposed.

4. Excavation of gravel layer down to Root Grid and exposure of the Root Director.

Figure 14 - using the excavator to remove the uppermost layer of gravel and expose the Ribbed linear root barrier.

5. Air excavation of soil about root crown zone and first layer of Stratacells.

Figure 15 - with the Root Grid membrane and ReRoot linear barrier removed, air excavation commenced to start to unveil root growth.

Figure 16 -the high pressure air easily exposes the first layer of Stratacells and the initial root crown.

8. Final removal of root system and air cleaning

Figure 19 - excavation by air and machine expose roots that have descended to a depth of 700 mm then spread through the Stratacell voids in a linear fashion.

7. Air excavation of remaining roots and Stratacells for next two layers

Figure 20 - this image shows how the roots grew in several directions. The majority of root development was parallel to the edge of the concrete. Large roots were present just above the RootRain pipes. Other roots grew at 90 degrees to the root barriers and concrete edge. Most lateral spreading roots were present at a depth of 600 – 700 mm or lower.

6. Mechanical removal of Stratacells.

Figure 17 - the first insight into the patterns of root growth in the Stratacells is revealed once the first layer is mechanically removed. In some cases, Stratacells had to be cut away as roots had penetrated the cells.

7. Air excavation of remaining roots and Stratacells for next two layers

Figure 18 clearly shows the downward initial root growth caused by ReRoot linear barrier. The Root-Rain Piping and security straps did their job. The diameter and number of roots present was observed as well as the deep penetration of roots.

Figure 21 - after considerable mechanical excavation occurred, the final root system was removed, complete with root barrier, sections of RootRain and Stratacells where roots had grown well through the layers.

Figure 22 - the complete root system excavated minus a few lateral roots that broke off. The roots were found to a depth exceeding 1.8 metres and had a spread exceeding 4 metres in all directions.

IS THIS

sustainable infrastructure?

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Sustainable Infrastructure Starts in Design!!

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THE
first tree

PLANTED IN
soil cells

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“ Sustainable infrastructure
is development that meets the needs of present society without compromising the ability of future generations to meet their own. ”
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Establishing the future urban landscape
THANK YOU