First Commercial Installation of Silva Cells in Kelowna, BC

Recent research indicates that trees produce few environmental benefits until they become large. Ideally, we should all be managing streets lined with mature, healthy specimens. Yet, city trees are too often placed into "tree coffins," square cutouts in the sidewalk where trees grow poorly, live fast, and die young. Those trees that do survive tend to lift up adjacent sidewalks and may be removed or subjected to harsh root pruning just as soon they start to produce some benefits to city dwellers.

Engineered or "structural" soils are one potential solution but the volume of soil available for root growth is generally around 20% of the total volume of structural soil placed in the ground. Other techniques have also been tried, but one of the biggest challenges is providing a large volume of uncompacted soil for tree growth while also providing the structural support for a sidewalk or asphalt.

A new product, "Silva Cells," developed by James Urban and DeepRoot, takes a very different approach. Utilizing a modular framework of interlocking "cells," an underground planter is constructed which can be backfilled with a large volume of high quality, uncompacted soil. The cells meet required load-bearing standards and can also help to manage storm water on-site. The cells can be placed in many different configurations to match the geometry of the site, providing the required soil volume by going deeper or wider around the tree planting hole.

The first commercial installation of this product was recently completed along Richter Street in downtown Kelowna, British Columbia. A previous test installation was conducted in Redwood City, California. The Kelowna installation was set up as a long-term comparative experiment. Trees along one block of Richter street were planted in Silva Cells, while another adjacent block was planted in engineered soils, and a third block was planted in conventional tree pits (four foot square cutouts with root barriers). All three treatments had underground irrigation installed. Tree growth and long-term survival will be compared in each treatment over time.

Table 1 summarizes the actual labor and material costs for the three different treatments, as bid upon by our landscaping contractor. The Silva Cell treatment cost was more than twice as much as the standard tree pit, whereas the engineered soils were intermediate in cost (Table 1). As this was the first installation there was a learning process required on the part of our contractor, therefore additional cost savings may be seen in the future as the contractor gains more experience with the installation techniques.

Silva Cells being moved to the trenches.

However, the cost per unit of soil volume was more favorable on this project for the Silva Cells, if one considers the volume of good quality soil available for tree growth. On a cost per unit soil volume, the Silva Cells were less than half the cost of the other two treatments (Table 2). This calculation assumes 0.9 cubic meters for standard tree pits, and takes into account that the engineered soil used contained about 22% actual soil and the Silva Cells 92% soil. Keep in mind that these comparative costs were specific to the design of this project; soil volumes and costs are likely to vary in other circumstances where a different volume or type of engineered soils is used, or a different number of Silva Cells are installed.

Table 1. Comparative costs ($ CDN) per tree, for standard tree pit, engineered soil trench and Silva Cell treatments, includes all labor and materials.

Item:	Cost per Tree (materials and labor):		
	Standard Tree Pit	Engineered Soil Trench	Silva Cell Trench
Tree	$ 547.00	$ 547.00	$ 547.00
Concrete curb for grate	$ 167.00	$ 167.00	$ 167.00
Custom tree grate	$ 1,280.00	$ 1,280.00	$ 1,280.00
Irrigation	$ 1,041.00	$ 1,041.00	$ 1,041.00
Engineered Soil	$ -	$ 1,269.00	$ -
Silva Cells	$ -	$ -	$ 3,503.00
Cost per tree	**$ 3,035.00**	**$ 4,304.00**	**$ 6,538.00**

Table 2. Comparative cost ($ CDN) per unit of soil volume (cubic meters), for standard tree pits, engineered soil trenches and Silva Cells. This was the actual soil volume of good quality soil provided for each tree on this project, based on 92% soil volume in the Silva Cell and 22% soil in the engineered soil trench.

	Standard Tree Pit	Engineered Soil Trench	Silva Cell Trench
Approx soil volume per tree	0.9 m^3	1.27 m^3	5.22 m^3
Cost per cubic metre	**$ 3,372.22**	**$ 3,388.98**	**$ 1,252.49**

Excavated trench, ready for installation of soil cells.

Assembly of soil cells and irrigation pipes.

Discussion

While the initial capital costs of the Silva Cells were twice as expensive as the conventional tree pits, the extra cost would be recouped if the Silva Cell trees live at least twice as long. Since the average life span of a downtown tree is often less than 10 years (USDA Forest Service, 2007), it should not be difficult to achieve this increased longevity.

In the long run, we hope the investment will also pay off in terms of reduced infrastructure repair costs, and additional environmental benefits gained through larger, healthy trees.

While the product does require specific training for proper installation, DeepRoot is planning to offer this training to contractors in the future.

One of the concerns raised by an engineer working on the project was the possibility that the Silva Cells may have to be excavated at some point in the future. If the site did have to be excavated he felt there might be additional difficulties related to the presence of the Silva Cells and also related to disposal of the soils since it would be contaminated with the Silva Cells. However, old or damaged cells should be fairly easy to remove from the excavated soil. We are hoping that excavation will not be necessary and deliberately avoided placement of Silva Cells near the underground utilities for this reason. The Silva Cells also contain a metal bar that could assist in locating cells in the future, prior to digging. The presence of these cells should be marked on city and utility plans, and the manufacturer has stated that they can provide instructions on how to excavate and reassemble the system if excavation is necessary.

Final view with trees installed.

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References

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