Tree Conservation Notes

Athens-Clarke County Community Tree Program

Structural Soil Design and Implementation

Introduction

Root structure and function can be severely impaired when trees are planted in paved urban areas. Soils must be greatly compacted in order to provide a stable base for surrounding hardscape. When mineral soils are compacted, their structure is degraded with the elimination of macro and micro pores. These pores allow for gas and water exchange and provide space for roots to grow. When these pores are damaged, the available rooting area of a tree is restricted and trees are forced to exploit voids under hardscape to expand their root systems. This scenario can cause extensive hardscape damage which may pose a risk to area users.

Structural soil is a two-graded soil that is designed to meet engineering standards while providing a tree with adequate space for root expansion. Structural soils are made of crushed aggregate, mineral soils, and some type of a binding agent. The larger stone provides a stable base that has numerous voids that are filled with soil. There are several structural soils on the market; most structural soils are composed of ~80% aggregate, ~15% mineral soil, ~5% organic material and a hydrogel binding agent. Many structural soil recipes are patented; be sure to use a vendor that has paid the licensing fee to the patent holder.

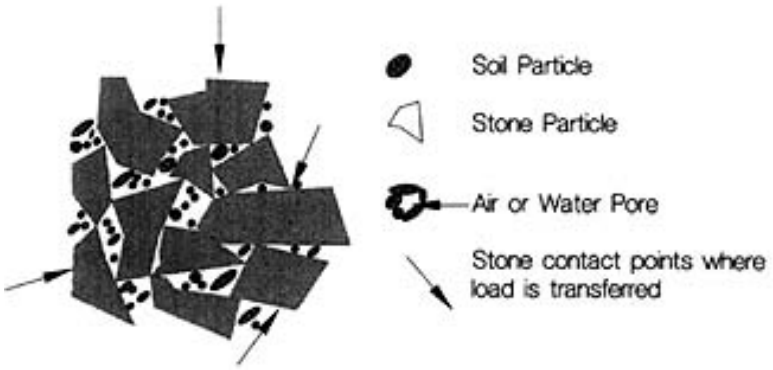

Figure 1. A two-graded soil allows for load bearing capacity and voids that permit root growth.

Installation

Structural soils need to be installed in continuous pits. Interconnected corridors allow for greater mineral soil availability to any one tree. Structural soil should have a minimum depth of 36”and a minimum of width of 5’. Since only 20% of the volume is mineral soil, greater widths are encouraged.

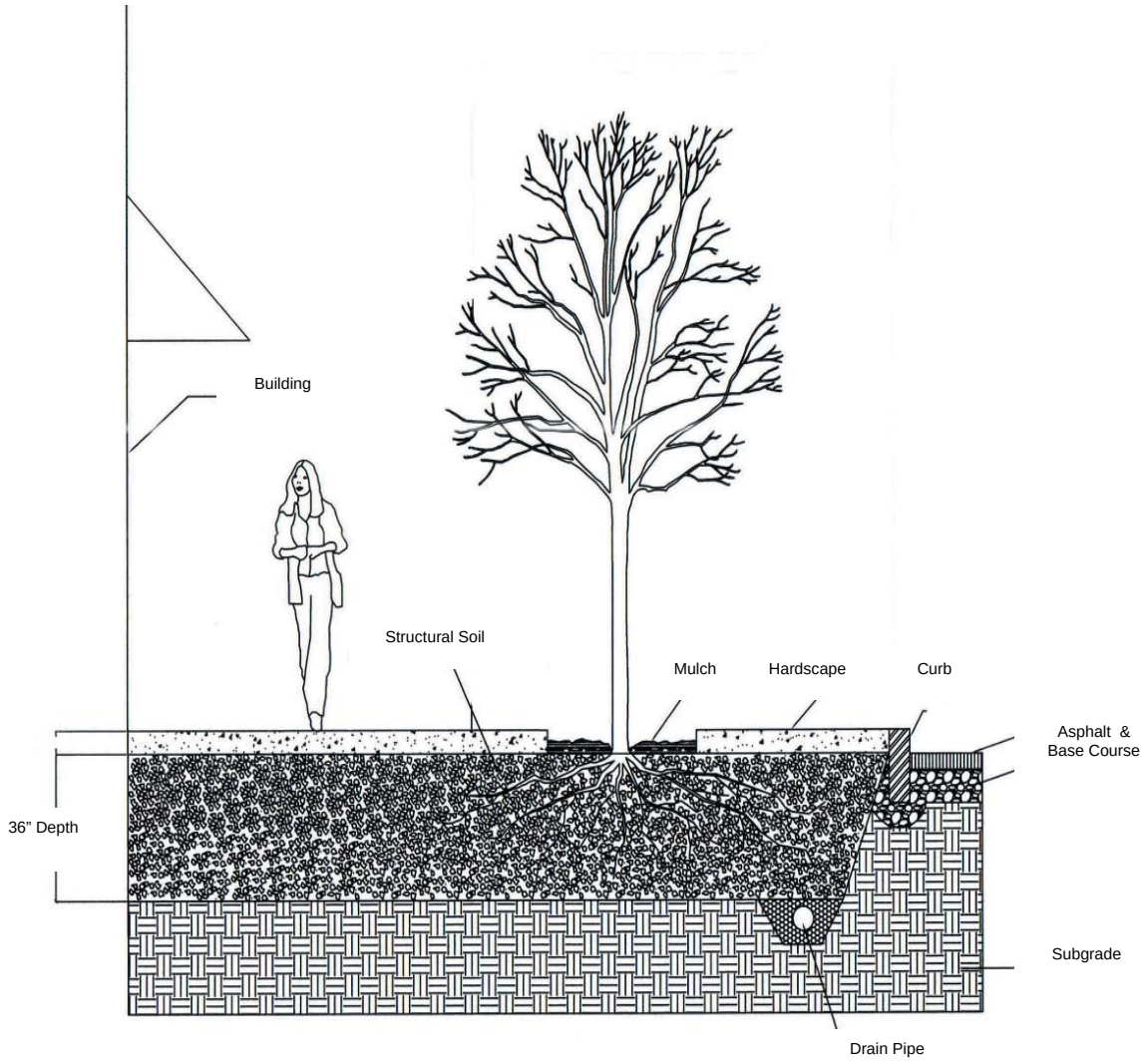

Figure 2. A profile of a structural soil pit.

If nonporous pavement is used, provisions for irrigation should be made. Since structural soil varies greatly from the surround urban soils, contractors need to install a drainage system. Provisions need to be made to allow for trunk expansion while still allowing pedestrian use. Tree grates with removable sections are ideal; pavers can also be used. **Be sure to compact the structural soil in 6” lifts during installation. Failure to compact structural soils can result in settling that will damage surround hardscape.**

Figure 3. Collapsing pavers from improperly compacted structural soil.

Figure 4. Installation showing individually compacted “lifts”.

Alternatives to Structural Soil

Several vaulting systems have recently come onto the market. These systems use modular frames to support the hardscape around the trees. Early research indicates that these systems are better for trees because they provide more mineral soil for rooting within a given area. Vaulting can be especially useful in situations where hardscape needs to be bridged to allow access to open soils nearby. Vaulting systems should be able to meet the AASHTO H-20 loading requirements. The most common vaulting system is the Silva Cell manufactured by Deeproot.

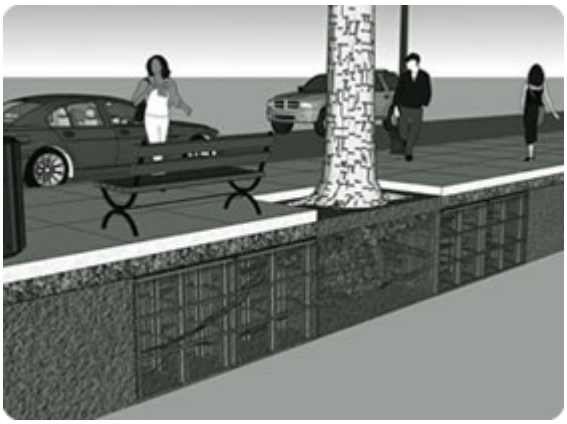

Figure 5. Profile view of a vaulting system.

Figure 6. The Silva Cell modular system.

Suppliers

Cornell Structural Soil
ERTH Products LLC.
P.O. Box 3750
Peachtree City, GA 30269
770-487-6677
www.erthproducts.com

Stalite Structural Soil
ITSAUL NATURAL LLC.
124 Freight Lane
Dahlonega, GA 30533
706-864-7664
www.itsaulnatural.com

Silva Cell System
DeepRoot Partners L.P.
7 Village Walk Drive
Decatur, GA 30030
404-378-9390
www.deeproot.com

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Smiley, T.E., *et al.* 2006. *Comparison of Structural and Noncompacted Soils for Trees Surrounded by Pavement.* Arboriculture and Urban Forestry 32(4), 164-169.

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