CU-STRUCTURAL SOIL: AN UPDATE AFTER MORE THAN A DECADE OF USE IN THE URBAN ENVIRONMENT

SUELO ESTRUCTURAL-CU: UNA ACTUALIZACIÓN SOBRE SU USO EN EL AMBIENTE URBANO

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In 1995, I published the first scientific paper on what would become to be known as structural soil – later CU-Structural Soil. The development of this soil medium came about as we recognized that the single most important factor limiting the healthy growth of trees in urban areas was a lack of an adequate volume of soil. There appeared to be plenty of soil under sidewalk pavement and gravel for tree roots to grow into, however most of that soil was so highly compacted as to make it inaccessible to tree roots. The soil was too dense. So tree roots were contained within the hole into which they were planted, or managed to grow out of the hole into the gravelly base course directly under the paved surface- often heaving sidewalks in the process. Neither outcome was acceptable. Trees in sidewalk 'containers' grew poorly and never attained the envisioned size for which they were planted and tree roots that 'broke out' under the sidewalk often caused a tripping hazard as the pavement was raised.

Soil under pavements of any kind – concrete, asphalt, block pavers, etc.-was required to be compacted to bear the weight of the pavement surface. Engineering specifications for pavement installation call for a high degree of compaction, often specified as 95% Proctor or peak density, to ensure that pavements would not subside, crack or fail.

This background set up the problem for us. Trees require a large volume of soil in order to grow and provide the benefits for which we plant them, yet pavement installation specifications require that the soil below the pavement be highly compacted, limiting root growth. Could we develop a soil that would meet engineers' requirements for soil compaction while allowing tree root growth? The outgrowth was CU-Structural Soil.

Simply put, CU-Structural Soil is a mixture of crushed gravel and soil with a small amount of hydrogel to prevent the soil and stone from separating during the mixing and installation process. Many years of research went into finding the right blend of these three elements so that the requirements of pavement installation and the growth of the tree could be satisfied. The keys to success were the following: the gravel should be single –sized (approximately 1inch in diameter with no finer particles) and crushed to provide the greatest porosity. The soil needed for structural soil was loam to clay loam that contained at least 20% clay to maximize water and nutrient holding capacity. The proportion of soil to stone was approximately 80% stone to 20% soil by dry weight, with a small amount of hydrogel aiding in the uniform blending of the two materials. This proportion ensured that each stone touched another stone creating a rigid lattice or skeleton, while the soil almost filled the large pore spaces that was created. This way when compacted, the load would be born from stone to stone and the soil in between the stones would remain uncompacted.

After testing this soil in controlled experimental sites at Cornell, we were ready to begin using it in installations. We also decided that we needed to patent the material to ensure its quality control. As we were developing CU-Structural Soil, we often spoke about it at conferences so that several people decided to try it for themselves. Often during these attempts the user would change the proportions of soil to stone by adding more soil that we specified. In doing this, stone did not touch another stone, it being pushed apart by too much soil. When that mixture was compacted, the stone lattice would not occur and the end result was compacted stony soil. These mixes were also called 'structural soil' yet had nothing to do with the carefully researched proportions we had developed. Therefore we decided to patent our structural soil as CU-Structural Soil® in 1998 (U.S. Patent # 5,849,069). Cornell University owns the patent and Amereq, Inc (www.amereq.com) is the licensee who sublicenses it all over the country and Canada. There are other structural soils, however, only CU-Structural Soil has over a decade of research and hundreds of installations.

There are now 71 licensed producers of CU-Structural Soil in the US and Canada and over 500 installations from Quebec to Puerto Rico to California. CU-Structural Soil has been used in many different climates and is compatible with irrigation when that is necessary. As with any new technology, we are learning more about it as we continue to do research on its uses.

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HOW DO YOU SELECT THE RIGHT TREE OR SHRUB FOR YOUR LANDSCAPE?*

¿COMO SELECCIONAR EL ARBOL O ARBUSTO ADECUADO A SU PAISAJE?

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There are four questions that come to mind when thinking about plant selection:
What is the plant's function on the site?
How well the plant adapted to the site?
What are the management issues related to the use of a particular plant?
What are the plant's aesthetic attributes?

What functions do plants play in the urban environment?
People who regard the use of plants in the urban environment as an aesthetic nicety are not seeing the whole picture. It will be increasingly incumbent on professionals to recognize and quantify the many functions that plants play in order to justify the need for continued funding of the green urban environment in times of restricted budgets.

Where summer temperatures are very high, plants, especially trees provide shade and reduced air temperatures. Tree planting to reduce wind speeds has long been practiced around the world. Research shows that semi porous windscreens that may include trees and shrubs can have a profound wind reducing effect. A barrier of approximately 35% transparent material can create a long calm zone that can improve human comfort levels.

A few plants alone do a poor job of reducing noise. However, dense planting especially combined with solid barriers or landforms can reduce noise significantly.