

WE BUILD RESILIENT CITIES

CUPOLEX[®]
SOLUTIONS



CUPOLEX SOIL CELLS

The most effective and economical solution for:

- planting trees in urban areas and ensuring their growth on uncompacted, oxygenated soil;
- securing existing urban pavements with exposed tree roots.

PATENTED PRODUCT

PONTAROLO[®]
ENGINEERING



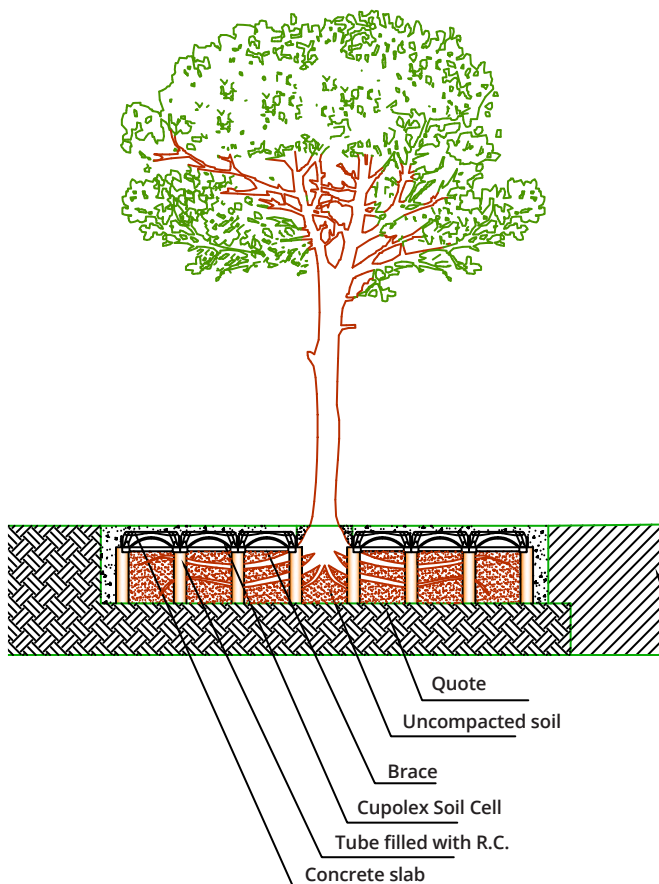
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PLANTING TREES

The innovative **Cupolex Soil Cell** pavement system by Pontarolo Engineering is an effective and economical green infrastructure designed for the growth of trees in paved areas. The Soil Cell cast in place concrete pavement structure prevents the lifting and the damaging of urban pavements by the tree roots. Cupolex soil cell is a structure perfect for sidewalks, bike paths, or urban areas in general.

Trees, whose presence is essential for combating smog and pollution, are free to grow in uncompacted soil that is properly oxygenated and, if necessary, irrigated.

Cupolex Soil Cell can be designed to support any vehicular traffic loading, ensures long-lasting durability of the project, and provides simple management of urban greenery.



How it works

The Cupolex Soil Cell system enables the creation of vegetative islands where tree roots can thrive and expand freely. Trees in urban areas face numerous challenges due to lack of water and air, as well as difficulty developing their root systems in the dense and compacted soil beneath pavement. **Cupolex Soil Cell** addresses these challenges by providing a nurturing environment for young plants, with soft soil, air exchange, and water supply, while also maintaining load-bearing capacity of the structure for heavy loads such as vehicular traffic. By providing a more suitable environment for growth, trees are able to thrive, absorb CO₂ and pollutants, and live longer.

Cupolex Soil Cell Pavements are constructed by assembling the Cupolex Soil Cell formwork. The resulting product is an engineered concrete pavement structure capable of providing carrying capacities equivalent to conventional road pavements. The elevated Cupolex Soil Cell pavement is supported by the matrix of concrete columns formed by the **Cupolex Soil Cell** concrete forming system that are poured monolithically with the pavement. The paving loads are transferred vertically downward to the subbase below the planting soil layer, allowing the pavement to support high load-bearing capacities.

Features

- Designed to support any vehicular traffic loading;
- Finished pavement is supported by concrete, not plastic;
- Durability minimum 50 years;
- Trees do not compromise or damage the structural integrity of the paved surfaces;
- Urban trees can grow and thrive in their urban setting;
- Improves tree stability and reduce the risk of it falling;
- Improved oxygen exchange thanks to the aerated void under the pavement ;
- Flexible for any dimension on plan or depth and can be easily installed around new or existing trees, underground utilities, and pavement penetrations;
- Cupolex Soil Cell pavements can be designed with varying depths and slopes and are available up to 2.0m (7ft);
- Resulting concrete pavement can be easily cut or modified for any temporary emergency or permanent repairs without impacting excavation procedures and the structural integrity of the soil cell pavement structure;
- Ease of installation of irrigation and water distribution systems;
- Can be combined with Cupolex water management system;
- Cupolex Soil Cell pavements are concrete pavement structures and do not require any gravel or fill cover;
- Stamped engineered design drawings, construction training, inspections, and monitoring provided by CUPOLEX®;
- Provides savings in time and materials compared to other tree and stormwater management systems;
- Two unskilled labourers can assemble up to 40 m2 (400 sq.ft.) of soil cell area, ready for concrete placement, in one hour;
- Produced according to ISO 9000:2015 quality standards.

Installation Process

- Excavate the area to the required depth.
- Create a laying plan for the installation of the **Cupolex Soil Cell** elements.
- Lay **Cupolex Soil Cell** Base Grid while preparing the tree planting hole
- Position the tubes.
- Fix the tubes in place with the appropriate plastic braces.
- Close the tube holes with caps to prevent soil from entering.
- Fill the space between the tubes with topsoil, compacting it lightly.
- Remove the plugs.
- Position the Cupolex domes.
- Install Cupolex Flat Stop around the perimeter to prevent concrete from filling the air chamber beneath the domes.
- Reinforce the slab with electro-welded mesh as per the design.
- Pour the concrete slab as per the design.
- Plant the tree.



SPECIFICATION

Installation of trees in structural Soil Cell pavement

Installation of trees through the creation of a structural Soil Cell pavement capable of supporting project loads and properly oxygenating uncompacted soil as a useful space for the rooting of trees. This includes excavation up to the project level (excluding the removal of pavement, which is computed separately), compaction of the excavation bottom, and supply and installation of high-tensile geotextile (> 30 KN/m in both directions). Fill with gravel to a minimum thickness of 20 cm, including supply and installation of any drainage pipes as specified in the project. Minimum grade of compaction of 95%. Subsequent supply and installation of high-tensile geotextile (> 30 KN/m in both directions) on the bottom and walls of the excavation section. Supply and installation of the system of recycled plastic formwork for structural soil cell pavement such as Cupolex Soil Cell or similar. Installation of bases, tubes, braces any half-braces and caps to stabilize the structure during the placement of soil provided as per agronomic project specifications. Removal of caps and installation of domes and/or half-domes as specified in the project. Including a ventilation pipe for natural oxygenation with section as specified in the project. Including any structural calculation, technical report, and executive drawings, structural and agronomic supervision on site. Excludes supply and installation of reinforcing steel, which is computed separately. Including supply and installation of concrete with specifications as per project for filling tubes, domes, half-domes, and reinforced concrete slab with a thickness of ...cm. Including installation and removal of containment formwork, use of mechanical vibrator, and use of pump. Excludes cutting, removal, and disposal of existing pavement, supply of irrigation system, pavement finishing, any welded sheets for soil containment, disposal of excavation material, and any draining concrete supplied and installed over the structural soil cell pavement.

SECURING URBAN SURFACES BY ELIMINATING EXPOSED ROOTS

The innovative Cupolex Soil Cell system by Pontarolo Engineering provides an effective and affordable solution for securing existing pavement on sidewalks, squares, bike paths, etc. in case of exposed roots that compromise the old pavement.

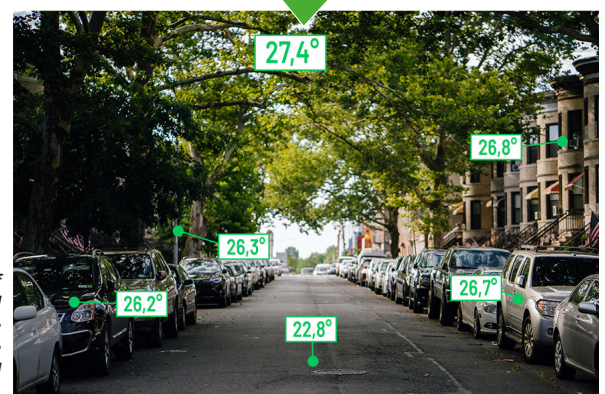
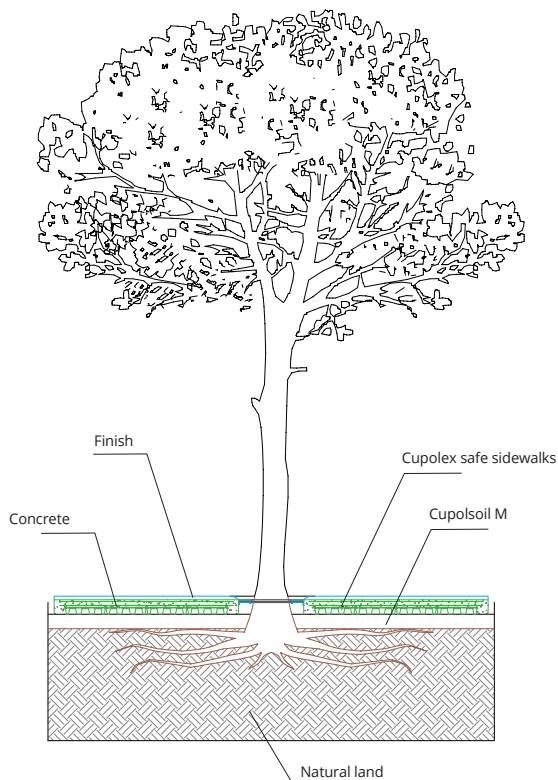
This system allows for the creation of a highly resistant urban surface without suffocating trees, combining high load-bearing capacity and proper soil oxygenation. By using Cupolex Soil Cell, a new supply of fertile substrate is provided along with the simultaneous creation of a load-bearing and oxygenating layer.



How it works

The Cupolex Soil Cell system offers a solution to repair pavement damage caused by tree roots without the need to uproot the trees. First, the damaged surface is removed, and then an air excavation technique is used to dig into the soil without harming the roots. Next, Cupolosoil, a mineral substrate that provides both support and nutrients, is applied to the excavated area.

The Cupolex system is first put in place, followed by the installation of an electro-welded mesh. Concrete is then poured over the mesh, and lastly, the finishing layer is applied.



Comparison of temperatures recorded with and without the presence of trees, at the same temperature and relative humidity.

Features

- Improves tree stability and reduce the risk of it falling.
- Improved oxygen exchange thanks to the aerated void under the pavement
- Possibility to save tall trees with protruding roots from being cut down.
- The use of air excavation ensures that the root system is not damaged.
- Prevents soil and pavement uplift as the roots do not need to protrude.
- Ensures a greater supply of rainwater to the plants through infiltration.
- Cupolsoil, the mineral substrate, is supportive, nutritious and symbiotic, enabling the development of the tree root system.
- Produced according to ISO 9000:2015 quality standards.
- Highly flexible system, adaptable to any project design.
- Reduces urban maintenance costs.

Installation Process

- Remove the existing surface;
- Remove soil with air excavation to preserve the root system up to the design level;
- Lay a mineral substrate, Cupolsoil, with bearing and nutrient functions and related geotextiles;
- Proceed with the installation of Cupolex;
- The Cupolex must be installed from left to right and from top to bottom relative to the arrow and the installation must follow the laying layout;
- The elements can be easily cut to fit the project dimensions;
- Lay reinforcing mesh over Cupolex with an adequate concrete cover.
- Pour the concrete;
- Follow with the laying of the finishing layer.



SPECIFICATION

Requalification of sidewalk or bike lanes damaged by protruding roots through a structural soil cell pavement.

Requalification of sidewalk or bike lanes damaged by protruding roots. Removal and disposal of existing pavement. Soil decompaction with air spades compressors and its removal up to the project level.

Supply and installation of lower geotextile with a strength of 11kN/m. Supply and installation of technical substrate such as Cupolsoil, with bearing, nutrient, draining, and water accumulation functions. Supply and installation of high-strength geotextile (> 30 kN/m in both directions).

Creation of a suitably ventilated cavity under the reinforced concrete structure made by supplying and installing Cupolex Soil Cell, made of recycled plastic domes, with a plan measurement of 56 x 56 cm and a minimum area of 1185 cm²/m² on 28 supports per m² to stabilize the elements during installation on the technical substrate Cupolsoil, including structural design. Supply and installation of reinforcing steel and concrete, with slopes and drainage systems as per the design are also included. Agronomical assistance on site and final pavement excluded.

12 GOOD REASONS TO HAVE TREES IN CITIES

1. **Trees produce oxygen**, which is crucial for our survival. In just one season, a single tree can provide enough oxygen for ten people.
2. **Trees absorb CO₂**, which helps to reduce the greenhouse effect.
3. **Trees filter out fine dust**, a dangerous form of pollution that comes from engines, home heating, and industry.
4. **Trees stabilize the soil**, reducing the risk of hydrogeological disasters.
5. **Trees provide habitat for animals**.
6. **Trees have a calming effect on our psyche**, reducing stress and anxiety.
7. **Trees help to reduce noise pollution** by dampening sound with their leaves.
8. **Trees enhance the creativity** of children.
9. **Trees cool both the outdoor air and buildings**, reducing the need for air conditioning.
10. **Trees purify rainwater** by removing harmful pollutants and heavy metals.
11. **Trees increase the value of real estate** by making the surrounding area more attractive.
12. **Trees represent a living historical memory**, becoming an integral part of the landscape and living for hundreds of years.

