

In 1998 Senior Public Works Inspector of Santa Monica, CA, Richard Valeriano, had a dream in which sidewalks were flexible, not rigid. This led to trials using small rubber pavers instead of concrete near large ficus trees with roots causing repetitive concrete damage.

This experiment led to the development of Rubbersidewalks™ in 2001 when Lindsay Smith saw rubber pavers as an alternative to cutting down urban trees in her neighborhood. At that time—and even today—healthy urban trees are removed solely because of damage to concrete sidewalks.

At the beginning of the trials, Mr. Valeriano supposed that tree roots would bulge up below the pavers, as they do with concrete.

This is not what happened.

The following slides—known as the 21st Street Study—document the behavior of tree roots beneath a modular, lightweight system (such as Rubbersidewalks™) over a five year period. They show that trees can be preserved and maintained, and that their roots need not be dangerously cut off.



Pre-Study 1988-2000



- The previously existing concrete sidewalk next to mature ficus tree was repaired twice over a 12 year period. Each time concrete was severely damaged by tree roots.

Installation – April 2000

Fairview Library



- 120 square feet rubber pavers installed next to ficus tree
- Pavers are 1'x2.5'x2" rectangles and have no connection feature
- Above grade roots directionally trimmed
- Two Sections to be studied, A and B
- Both Sections remain untouched for 27 months

Section A - First Maintenance July 2002



- Two years after installation pavers are slightly faded and harder
- Pavers remain on grade and have 'settled'
- No disruption or dislodgement has occurred

Section A - First Maintenance & Discovery



Pavers are removed and roots exposed

Tree has produced thin, fine offshoots or “scout roots”

Scout roots start in fan-like pattern then grow along seams of paver joints.



Root growth under rubber pavers

What if the roots were 'maintained' every 2-3 years? What would such a strategy mean in terms of maintenance costs and also in terms of the urban forest?

Arborists speculated as to the causes of the observations:
Was it because of the difference in temperature, moisture content, or reduced mass of rubber pavers vs. concrete which explained the change?



Root growth under concrete

Section A - First Maintenance Action, July 2002



- Scout roots are trimmed with hand tools (no big equipment need)
- Minimal trauma to tree
- Sub-base re-graded and pavers are reinstalled
- 2 workers take 2 hours
- Cost approx. \$1.50 per square foot

March 21, 2005

Second Maintenance of Section A

First Maintenance of Section B



- Section B
First Maintenance in
5 years
- Section A
Second Maintenance after
2.75 years

Section B First Maintenance (Pavers not touched in 5 yrs)



March 2005

- Paver displacement and undulation slightly greater than in 2002
- Discoloration and increased hardness
- Surface wear same as Section A (indicates change in base but not much in product)

Section B First Maintenance



- Two seams are pushed open by underlying roots
- One root measures 1.75" in diameter

March 2005

Section B First Maintenance Discovery, March 2005



- Pavers are removed
- Find same number of roots and same growth pattern as Section A, but these roots are larger
- All roots grow along seams
- Roots grow so straight along seams that they resemble pipes; indicates roots grow where they find air, water and space

Section B First Maintenance, March 2005



- Roots are trimmed by hand tools
- Causes minimal trauma to tree
- Cost to city is minimal

March 2005

Section B First Maintenance, March 2005



- Sub-base is re-graded
- Pavers reinstalled
- No impact on traffic or noise to neighborhood
- 2 workers take 2 hours costing \$1.50 per sq. ft.

Section A - Second Maintenance, March 2005



- Pavers show further discoloration and brittleness comparable to Section B
- No roots visible in any seams
- One area of displacement, and uplift of 1/2"

Section A - Second Maintenance, March, 2005



- Pavers are removed with 2 workers in 7 minutes
- Fewer offshoots are found than in 2002
- Smaller volume of roots
- Roots still follow the seams of the pavers

Section A - The Exceptional Root



March 2005

- One large root stood out, undoubtedly one missed in the first maintenance
- By studying this root and comparing it to other root growth, discoveries are made:

The Exceptional Root: Discoveries



- 1) If a root can be traced back to the last “nub” and directionally trimmed at that spot, the future direction of new offshoot growth can be controlled and even predicted.

The Exceptional Root: Discoveries



- 2) It was demonstrated that if offshoots can be traced back to its source and trimmed, the root can be directed to produce fewer offshoots in the future.

The 21st Street Study: Discoveries



- 3) It is speculated that the first trimming of the scout roots may have modified their behavior and conditioned them to grow elsewhere than under the pavers.

City of Santa Monica, 2005



- The city has installed over 4,000 sq. ft of Rubbersidewalks at more than 40 locations.

Conclusions: Five years post install



1) Comparing observations of Section B after 5 years, to Section A after 2.25 years and again after 5 years, leads one to believe that periodically exposing roots—an opportunity afforded by a modular system like Rubbersidewalks™ promotes tree well-being, and savings.

Conclusions: Five years post install



2) New root growth (offshoots, scout roots, absorbing roots) are produced in great volume initially. If pruned in these early stages: first two-five years of production, the tree will continue to produce new offshoots but less of them.

Conclusions: Five years post install



3) Taking advantage of this opportunity to expose and prune roots in the first 5 years will have long term results and effectively control root growth by diverting the surface root growth to a deeper level or alternate path of root growth.

Conclusions: Five years post install



4) Maintaining the health of tree, reducing size and volume of root growth, and diverting root growth, is served by 'midcourse adjustment' (maintenance) after two to five years.

March 2005

Conclusions: Five years post install



5) Concrete would not have presented such opportunities and most likely would have been cracked or displaced no later than third year.