Root Control Barriers

Tree Root Barriers

- Costly root damage to a sidewalk
Tree Root Barriers

Root barrier is a physical underground wall, placed so that structures and plants may cohabit happily together.

- Root damage to pavements
Tree Root Barriers

- Root damage to pavements

Invention of Root Control

- The 1974 patented invention of the 90-degree root deflecting rib molded to impervious, smooth walled (plastic) root barriers set into motion the new technology and science of tree root management.
- The excavation of the initial test trees provided dramatic evidence that a tree root tip could be successfully redirected downward along the barrier wall and rib into the prevailing soil environment beyond the bottom perimeter of the barrier.
Tree Root Barriers

- Roads, sidewalks and foundations can all suffer structural issues from tree roots.
- As plant roots spread in the search for nutrition, they will opportunistically enter irrigation or sewer with resulting line blockage.
- 5% of sewer line blockage is attributed to root invasion, though reports of line breakage due to the intrusion are rare.
- Clay and concrete pipes are more likely to be invaded than PVC pipe, with pipe joints being the typical mode of entry for roots.

Tree Root Barriers

- Root barrier products direct root growth from shrubs and trees downward, dramatically decreasing the roots' potential to clash with and penetrate nearby hardscapes, walls, or building foundations.
Development of Root Barriers

- Their construction and applications has progressed since 1992 when technology progressed from a concrete barrier which cracked and failed, to specific plastics with the capacity to handle major stresses and loads created by matric suction, soil and moisture movement.

What is Matric Suction?

- Matric suction is the pressure dry soil exerts on the surrounding soils to equalize the moisture content in the overall block of soil.
- Matric suction conditions in the soil profile were obtained through steady state unsaturated seepage analyses.
- The initial matric suction profile is the same as suction varied from 60 psi (409 kPa) at tree root to 7 psi (49 kPa) at lower boundary of the soil domain.
- The contours of changes in matric suction are presented below:

Contours of Final Matric Suction (kPa)

1 kPa = 6.89 psi
Development of Root Barriers

- Matric Suction (Cont’d)
  - The closer to the tree, the more change in suction is observed. The results of stress-deformation analysis are shown below as contours of vertical displacement.
  - A maximum foundation settlement of 3 inches (80 mm) and minimum settlement of 1 inch (25 mm) was observed.
  - A maximum settlement in the soil profile took place at tree location and decrease with horizontal distance and depth.

  [Diagram showing contours of vertical displacements (mm)]

  1 inch = 25.4 mm

- How do we minimize the shrinkage of reactive clay?
  - By placing a 5 to 6.5 feet (1.5 to 2 meters) root proof and waterproof wall around the structure that we wish to protect.
  - This will create an island effect and keep the change in moisture content to a minimum.
  - Root barrier will effectively disconnect the tree from the moisture under the slab.
  - Root barrier is a flexible waterproof cutoff wall which will achieve both goals of stabilizing the clay and keeping the tree roots away.

[Diagram showing root barrier and tree]
Development of Root Barriers

- Initial development of this product was based on stopping trees from affecting buildings, but as the research evolved, it was discovered that what was actually being done was stabilizing moisture in reactive clay.
- Learning from the above experience, a flexible waterproof cut off wall placed around a building will allow the building foundations to float on a block of stable clay and moisture, reducing the need for piers and other structure and proving to be very economical.

Tree Root Barriers

- Tree root barriers are mechanical guides that redirect tree roots down and away from hardscapes, preventing costly root damage while preserving the health and beauty of mature trees.
- Tree root barriers are used for linear, surround and root pruning applications on both new plantings and existing trees.
Tree Root Barriers

- **Linear application** - Provide maximum hardscape protection while utilizing all available rooting space for improved tree health by placing barriers in a straight line directly along the hardscape to be protected.

- **Surround application** - Protect hardscapes that surround a planting on all four sides. Plan to line the perimeter of the planting area with the panels – this provides the maximum available uncompacted soil volume for immediate root growth.

- **Root pruning application** - Root pruning can help prevent injury and preserve existing trees that are causing hardscape damage. Disruptive roots are cleanly cut and removed; linear Root Barrier is then installed.

Rigid Root Barrier Panels

- These root barrier panels are designed to redirect plant or tree root growth to prevent roots from growing into unwanted areas.

- These can be used to wrap around the roots of a tree or to simply line the side of the tree on which you do not want root growth.
Rigid Root Barrier Panels
Surround application

Features:
- Versatile barrier for linear or surround applications
- Raised 90-degree root deflecting ribs
- 90-degree ¾” raised rib, side interlocking panel to panel joining system allows for adjustable lengths.
- Material:
  - Polyethylene with ultraviolet inhibitors.
  - Thickness: 0.08 inch (2 mm)

Rigid Root Barrier Panels
Linear application

- Panels feature 90 degree root deflecting ribs, self interlocking panel to panel connection, eliminating joiner strips and gluing.
- As well as being a root impervious barrier, the panels direct roots downward to prevent costly damage to surrounding hardscapes and landscapes.
- These panels will reduce maintenance costs and liabilities for government agencies, cities, and private industry.
Design and Installation Guidelines – Roads (Option A)

- Normally placed between the tree and whatever is to be protected.
- The tree should not be surrounded.
- The preferred method is placing the root barrier along beside the path, building, pipe, etc. so that the tree root can not gain access to the structure.
- To stabilize moisture in reactive clays under the structure, a deeper barrier is required.
- Dig a trench to the required depth, insert root barrier. Ensure 2-inch of root barrier is left above finished ground.
- In the base of the trench, place a layer of pure sodium bentonite 2 to 4-inches deep then backfill.

Design and Installation Guidelines – Roads (Option B)

- Typical root barrier installed at the back of curb, for use only if road base is sound without cracks and a good seal can be achieved between root barrier and road base.
- Dig a trench to the required depth, insert root barrier. Ensure 2-inch of root barrier is left above finished ground height.
- If the barrier is to be placed back of curb into road base, excavate a 4-inch slot into compacted road base (not right through the base).
- In the base of the trench, place a layer of pure sodium bentonite 4-inches deep then backfill.
Design and Installation Guidelines – Trees

- Dig a 4-inch wide trench to the required depth, insert root barrier. Ensure 2-inch of root barrier is left above finished ground height (this is to allow for settlement and may be trimmed off later).
- Trim exposed tree roots to leave a clean cut, treat them with fungicide if required.
- Backfill the base of the trench placing a layer of bentonite, then backfill using spoil from the trench.
- Root barrier should be trimmed to just below the lawn mower height but above ground.

Design and Installation Guidelines – Foundations

- Dig a narrow trench to the required depth, insert root barrier. Ensure 2-inches of root barrier is left above finished ground height (to be trimmed later).
- Trim exposed tree roots to leave a clean cut, treat with fungicide if required.
- Backfill the base of the trench placing a layer of bentonite, then backfill with flowable fill to get compaction.
- Bring root barrier up inside foundation formwork prior to placing slab.
- Root barrier should be trimmed to just below damp course height but above ground.
Root Barriers Today and Code Appearance

- In California root barriers are an integral component of many city codes or engineering specifications, initiated to control directional root growth patterns of urban trees.
- However, in some regions of the U.S., root barriers are still viewed with curiosity and skepticism.
- Root barriers have been around for nearly two decades and today there is a strong movement eastward from their birthplace in the west.

Root Barriers Today and Code Appearance

- Currently root barrier products are marketing in the U.S., Canada, Europe, Hong Kong and Australia.
- Field testing of root barriers has been done by various groups such as the U.S. Department of Forestry, Forest Service, U.S. Department of Agriculture, the University of California system as well as regular use and specifications by hundreds of cities and landscape architects.
Root Barriers Today and Code Appearance

- The City of Pasadena has specified root barriers for 18 years to help maintain pedestrian safe environments.
- The City of Los Angeles has planted thousands of trees in root barriers over the past 14 years, per code. The L.A. code was re-written in May, 1982, just one year after the city conducted their own excavation of test plantings.
- The city of Santa Barbara has been a pioneer in root pruning and retrofit root barrier installations over the past 15 years.
- A conservative estimate of over 1.5 million trees are growing in root barrier planting systems with as many as 20% of those in linear or retrofit applications.

Root Barriers in CSI (Section 02934)

Specifier Notes: This product guide specification is written according to the Construction Specifications Institute (CSI) 3-Part Format, including MasterFormat, SectionFormat, and PageFormat, contained in the CSI Manual of Practice.

The section must be carefully reviewed and edited by the Architect to meet the requirements of the project and local building code. Coordinate this section with other specification sections and the Drawings.

Delete all “Specifier Notes” when editing this section.

SECTION 02934
ROOT BARRIER SHEET MATERIAL

Specifier Notes: This section covers NDS “Shawtown™ SM Series” root barrier sheet material. Consult NDS for assistance in editing this section for the specific application.
Tree root damage to a parking pavement

Tree root damage to a parking pavement
Tree root damage to a parking pavement

Concrete Deterioration

- Case Studies
Signs of scaling and exposed aggregates

Signs of D-Cracking and Scaling
Scaling

Signs of D-Cracking
D-Cracking and Scaling

Spalling of Concrete
Spalling of Concrete

No sign of deterioration under the covered areas
No sign of deterioration under the covered areas

Drying shrinkage cracks in the covered areas
Tree Root Barriers

Repaired Concrete Slab by Asphalt Patching

Warehouse with Concrete Slab
Warehouse with Concrete Slab

- Random Shrinkage Crack
- Rebar under the S.O.G.