CITY OF TORONTO
TREE PLANTING SOLUTIONS IN HARD BOULEVARD SURFACES
Best Practices Manual
Consulting Team
dtah / Arup / Urban Trees + Soils / Urban Forest Innovations Inc

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Missed opportunities?

Bay and Lakeshore

Previous standard
Tree Requirements

1. Sufficient soil volume
2. Zone of rapid root taper
3. Water in
4. Water out
5. Room for canopy growth
6. Quality nursery stock
Best Practices Manual:
Overall Strategies

1. Grow a decent tree.

1. The public realm is acceptable and affordable on day one.

1. Appropriate for the utility access requirements.
2.1 Principle 1: More Soil Yields Larger, Healthier Trees

Key Recommendations

- Individually-planted trees each need a minimum of 30m³ of soil (in contrast to the current City standard of 9m³ of soil per tree).

- A grouping of ≥ 2 trees in a soil bed need a minimum of 20m³ of soil per tree.

- Adequate soil depth is 1m; greater depth if available is better; minimum soil depth is the depth of the tree’s root ball.

- Where existing soil resources are available, they should be used.

- An approach that prioritizes total tree canopy size over quantity of trees, should be used.

It is a fact that more lateral soil volume will yield larger, healthier trees.

Each cubic metre of soil volume will support approximately 2.2m² of tree canopy area (canopy area is defined as the area on the ground directly under the canopy). Accommodations must be made laterally, as trees roots run laterally rather than vertically down.

A single, mature tree with a canopy diameter of 4m requires 30m³ of soil volume. Street trees that share soil resources in a continuous trench or planting bed require 20m³ of soil volume per tree to achieve a healthy, mature size. In places where especially large, long-lived trees are essential to the streetscape, such as important boulevards and promenades, shared soil volumes of 40m³ per tree should be provided, if space and budget allow.

Native soil resources may be available in the urban condition. This can offset the volume of new growing medium brought to site to reach the recommended soil volume. Urban trees find soil resources in many places besides the planting soil provided. These can include

- Comparison of the tree height attainable from the soil volume of the current City standard tree detail (covered trench T3-A) to the tree height attainable with recommended target of 30-40 m³ soil volume.

- Single, large trees have a significant streetscape impact.
Fewer large trees are better than many small trees!
Wider space equals more soil per tree!

Goal – **30 m³** per tree or **20 m³** per tree if grouped

**EXISTING SPACING**
6-8m

**PROPOSED SPACING**
10m Or Greater

same 80m³ of soil...
Tree / Utility Conflict Management

Horizontal zoning will seldom yield acceptable soil volumes.
Pavement repair after utility repair

**Two stage repair - standard:**
Utility contractor repairs utility. Leaves the site filled with non shrink fill and asphalt. City paving contractor later makes final repair to match paving.

**Single stage repair:**
Repair to paving made at the same time as the utility repair.
Three different approaches are proposed to increase root zone volume.

- **Cast in place concrete**
- **Pre cast concrete with pavers**
- **Poured in place reinforced concrete paving slab**

**SUSPENDED PAVEMENT**

- ‘BRIDGE’ OVER ROOT ZONE TRENCH

- **Pavers**
- **Concrete**

**SUSPENDED PAVEMENT OVER SOIL CELLS**

- **Planted**

**OPEN PLANTER**
PAVEMENT BRIDGE

Cast in place concrete
Too hard to restore the structural integrity of the paving after a repair.

Cast in place concrete
Utility repair
Two stage not possible
PAVEMENT BRIDGE

Pre-cast concrete
PAVEMENT BRIDGE

Roncesvalles

Pre-cast concrete
PAVEMENT BRIDGE

Pre-cast concrete
Utility Repair
Two stage repair possible
Soil Cells
Soil Cells

Utility Repair
Two stage repair possible?
Open Planters
Hybrid systems

Planter

Soil Cells

Precast trench
Kit of Parts: *Tree Opening Size*

1500mm (60")
Preferred minimum

1200mm (48")
Minimum
**Kit of Parts:** Align tree opening to paving joints
Adjustable metal rim to reduce odd shaped cut pavers
Kit of Parts: Tree Opening Materials

LOOSE GRAVEL

MULCH

PLANTING

SAVE MONEY – NO TREE GRATES
Kit of Parts: *Trunk Protection*

Plastic mesh temporary trunk protector

SAVE MONEY
NO TREE GUARDS
Please No Tree Grates

1. Do not protect the tree.
2. Hide root and trunk flare problems.
3. Still a tripping hazard.
4. Eventually girdle or damage the tree.
5. Very expensive, spend money on soil.
BETTER DESIGN BUT…

+/- $3K IN
+/- $ 1K OUT

EVENTUAL TRIPPING HAZARD AS TREE BECOMES SUCCESSFUL
Kit of Parts: Root Zone ID – Ontario ONE CALL

ID MARKERS AT EACH TREE OPENING ALLOW UTILITY COMPANIES TO KNOW WHAT IS BELOW THE SURFACE WITHIN PLANTED TREES.
We are too focused on tree shape. The problems are below the soil line!
Kit of Parts:

Water Harvesting

Sidewalk water into channels

Pervious pavers

Gutter water into inlets
Kit of Parts: **Water Harvesting**

Sidewalk water into channels

Lessons from Bloor Street:
Riglets and inlets determined to be too small
Kit of Parts: Water Harvesting

Trench drain at back side of curb

Continuous trench drain is preferred
Best Practices Manual:
Pilot Projects: Bloor Street

Two utility stakeholders explorations: Enbridge (gas) and Toronto Water.
Soil cell trench filled with soil

Manual removal of two decks, unscrewed and set aside for future re-installation.

Excavation below bottom of soil cells to daylight water pipe.

Soil cell decking system.

Backfill installation on top of deck.
Kit of Parts: Standard details
Kit of Parts: Specifications

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PART 1 - GENERAL

1.1 WORK INCLUDES

1.2 RELATED WORK

1.3 MATERIALS AND WORKMANSHIP

1.4 SUBMITALS

1.5 MOCK-UP OF SYSTEM

1.6 AS-BUILT DRAWINGS

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2.2 Plants - Balled and Burlapped Trees

All Trees shall be field grown and dug balled and
the following modifications to standard nursery prac-
tices shall be used:

Prior to digging each tree check the
soil from the base of the trunk to inspect
for any signs of soil that will
be of the appropriate
level of quality.

A minimum of three radial roots shall be
avoided and pruned to the appropriate
level. Adundant and circling roots
shall be rejected.

Apply a 25 mm diameter, out of point of
all trees 300 mm above the natural ground
level.

Prior to digging any tree, using hand
hoe, the tree shall be dug and the
root ball in the natural ground
shall be damage the bark of the root ball and the
roots shall be burlapped or tied.

Plants shall be burlapped or tied.

3.1 Plants to be burlapped or tied.

Apply 3mm thick, woven, corrugated
plastic or burlap material to the root ball of the tree to
reduce tree movement and wind penetration.

4.1 Plants to be burlapped or tied.

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2.4 Growing Medium

A mixture of Topsoil, Course Sand and Pine Bark Compost mixed to the following
proportions, by volume:

1. Topsoil - 40-45%
2. Course Sand - 40-50%
3. Pine Bark Compost - 10-15%

The Growing Medium shall meet the following parameters as measured by dry weight:

1. Total sand/gravel sized 0.25mm - 5mm: Minimum 45%
2. Total combined silt and clay: Between 18 and 35%
3. Organic matter: Between 3.0 and 8.0%
4. pH: Between 7.0 and 7.8.

Note to specifiers: The pH minimum of 7.8 will be acceptable for most trees
and other plants in the Toronto area. However, if the design team specifies
species sensitive to lower pH levels, the pH maximum should be lowered to an appropriate
level for those trees. Note that lower pH growing medium will cost more due to
the lack of availability of lower pH components. Coordinate the specification with
the design team on species requirements.

4. Chemical analysis: Acceptable ranges in ppm

1. Phosphorus ppm: 10-20
2. Potassium ppm: 100-250
3. Calcium ppm: 100-300
4. Magnesium ppm: 100-200
5. Soluble salts ppm: <1.5

Mix the Growing Medium with a leader bucket to preserve Topsoil and use the
following method:

1. Mix the Course Sand and Compost together separately.
2. Spread a layer of Topsoil approximately 300 mm thick and apply the required
proportions of Course Sand/Compost mix over the Topsoil.
3. Push the Topsoil, Course Sand and Compost into a pile and then dug out into
a layer mixing the soil with the bucket. Repeat the mixing action a second time to
gain an approximate mixture of the material. Do not over mix.
4. This method assumes that there is an additional mixing of the materials as it is
moved to the final location, placed into the delivery truck, deposited at the
project site, and spread into the planting space.
5. This method assumes that soil will not be installed using soil blower or soil
slinging equipment.
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