Section B – Part 5 – Tree Planting and Protection Guidelines (TPP)

1.0 Construction Specification and Description for Structural Soil

1.1 General

The work of this section consists of all Structural Soil work and related items as indicated on the drawings or as specified herein and includes, but is not limited to, the following:

CU Structural Soil is a proprietary material patented by Cornell University (US Patent #5,849,069). Only licensed producers are allowed to supply this material, meeting the specifications described in this text.

Samples and Submittals

At least 30 days prior to ordering materials, the Contractor shall submit to the Engineers representative samples, certificates, manufacturer's literature and certified tests for materials specified below. No materials shall be ordered until the required samples, certificates, manufacturer's literature and test results have been reviewed and approved by the Engineer. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The engineer reserves the right to reject, on or after delivery, any material that does not meet these specifications.

Submit representative samples of Clay Loam and representative samples Structural Soil mixes in this section for testing, analysis and approval, as directed by the Engineer and follow test analysis procedures as per manufacturer's specifications for Structural Soil. Samples shall be taken randomly throughout the field or stockpile at locations as directed by the Engineer.

Submit soil test analysis reports for each sample Clay loam and Structural Soil from an approved soil-testing laboratory. The test results shall report particle size and chemical/nutrient analysis.

Submit one 0.03 cu. metre sample per 400 cu.metres of required material, and for each sample, the following analysis for all Crushed Stone. The soil testing laboratory shall be approved by the Engineer.

Provide a particle size analysis including the following gradient of mineral content:

USDA Designation	Size in mm
3@	+76mm
2-1/2@	3-76mm
2@	50-63mm
1-12@	37-50mm
1@	25-37mm
¾@	19-25mm
Fine gravel	2-19mm
Sand	0.05-2mm
Silt	0.002-0.05mm
Clay	minus 0.002mm

Submit sample of each type of fertilizer purchased for the project prior to installation.

Submit the Pavement Material Contractor's qualifications outlining projects of similar quality, schedule requirements and
construction detailing over the last five years.

Delivery, Storage and Handling

Do not deliver or place soils in frozen, wet or muddy conditions. Material shall be delivered at or near optimum compaction moisture content.

Protect soils and mixes from absorbing excess water and from erosion at all times. Do not store materials unprotected from rain. Do not allow excess water to enter site prior to compaction. If water is introduced into the material after grading, allow material to drain or aerate to optimum compaction moisture content.

Examination of Conditions

All areas to receive Structural Soil shall be inspected by the Contractor before starting work and all defects such as incorrect grading, compaction and inadequate drainage etc. shall be reported to the Engineer prior to beginning this work.

The Contractor shall be responsible for judging the full extent of work requirements involved, including but not limited to the potential need for temporary storage and staging of soils, including moving soil stock piles at the site to accommodate scheduling of other work and the need to protect installed soils from compaction, erosion and contamination.

1.2 Materials

1.2.1 Clay Loam

Clay Loam shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than one-half inch, lumps, plants and their roots, debris and other extraneous matter over 25mm in diameter or excess of smaller pieces of the same materials. It shall not contain toxic substance harmful to plant growth.

Mechanical analysis for Loam/Clay Loam shall be as follows:

Textural Class	% of Total Weight
Gravel	less than 5%
Sand	20-45%
Silt	20-50%
Clay	20-40%

Chemical analysis: meet or be amended to meet the following criteria:

- pH between 5.5 to 7.0
- percent organic matter 2-5% by dry weight

1.2.2 Fertilizer

Commercial fertilizer complying with provincial standards and having the N-P-K nutrient ratio of 18-6-12 or approved equivalent. Deliver fertilizer in original unopened containers, which shall bear the manufacturer's certificate of compliance covering analysis, which shall be furnished to the Engineer. Fertilizer shall be formulated for mixing into the soil at the ratio of 0.45kg per 10 sq. metres and be certified by the manufacturer to provide controlled release of nitrogen continuously for a period of no less than nine months and no more than 12 months.

1.2.3 Crushed Stone

Crushed stone shall be in accordance to OPSS 1004. The size of the crushed stone shall be 2.0mm to 3.8mm allowing for 5-10% to be greater than 3.8mm, and 5-10% less than 2.0mm.

Minimum 90% with one fractured face, minimum 75% with two or more fractured faces.

1.2.4 Hydrogel

Hydrogel shall be as manufactured by Amereq Corp. (800) 832-8788.

1.2.5 Water

The Contractor shall be responsible to furnish their own supply of water to the site at no extra cost. Water shall be free from impurities injurious to vegetation.

1.2.6 Structural Soil

A uniformly blended mixture of crushed Stone, Clay Loam and Hydrogel, mixed to the following proportions:

Material	Unit of Weight
Crushed Stone	100 Units of Weight
Loam	as determined by the test of the mix (approx. 20 units)
Hydrogel	0.03 units dry weight
Total moisture	AASHTO T-99 optimum moisture

1.3 Construction Methods

1.3.1 Mix Design

Prepare sample Structural Soil mixes to determine the ration of mix components

The Engineer may request additional Structural Soil mix ratio samples to be tested in the event that further refinement of the mix is necessary.

1.3.2 Soil Mixing and Quality Control Testing

All Structural Soil mixing shall be performed at the Producer's yard using appropriate soil measuring, mixing and shredding equipment of sufficient capacity and capability to assure proper quality control and consistent mix ratios. No mixing of Structural Soil at the project site shall be permitted.

Maintain adequate moisture content during the process. Soils and mix components shall easily shred and break down without clumping.

Add soil amendments to alter soil fertility including fertilizers and pH adjustment at the time of mixing at the rates recommended by the soil tests.

The Producer shall mix sufficient material in advance of the time needed at the job site to allow adequate time for final quality control testing as required by the progress of the work.

During the mixing process, the Contractor obtains two, 0.03 cu. metre quality control samples per 150 cu. metres of production from the final Structural Soil. Each sample shall be tested for particle size analysis and chemical analysis. Submit the results directly to the Engineer for review and approval.

1.3.3 Site Preparation

Do not proceed with the installation of the Structural Soil material until all walls, curb footings and utility work in the area have been installed. For site elements dependent on Structural Soil for foundation support, postpone installation until immediately after the installation of Structural Soil.

Install subsurface drain lines as shown on the Drawings prior to installation of Structural Soil material.

Excavate and compact the proposed subgrade to depths, slopes and widths as shown on the Drawings.

Confirm that the subgrade is at the proper elevation and compacted as required.

Clear the excavation of all construction debris, rubble and any foreign material. Fill any over excavation with approved fill and compact to the required subgrade compaction.

Do not proceed with the installation of Structural Soil until all utility work in the area has been installed. All subsurface drainage systems shall be operational prior to installation of Structural Soils.

Protect adjacent walls, walks and utilities from damage or staining by the soil.

Maintain all silt and sediment control devises required by applicable regulations.

1.3.4 Installation of Structural Soil Material

Install Structural Soil in 150mm lifts and compact each lift.

Compact all materials to peak dry density of 98% Standard Proctor or as directed by the Engineer.

Bring Structural Soil to finished grades as shown on the Drawings. Immediately protect the Structural Soil material from contamination by toxic materials, debris, water containing cement, clay, silt or materials that will alter the particle size distribution of the mix.

The Engineer may periodically check the material being delivered and installed at the site for consistency with the approved sample provide by the Contractor. Any soil which varies significantly from the approved testing results, as determined by the Engineer, shall be removed and new Structural Soil installed that meets these specifications.

1.3.5 Clean-Up

Upon completion of the Structural Soil installation operations, clean areas within the contract limits. Remove all excess fills, soils and mix stockpiles and legally dispose of all waste materials and debris. Sweep, do not wash, all paving and other exposed surfaces of dirt and mud until the paving has been

installed over the Structural Soil material. Do no washing until finished materials covering Structural Soil material are in place.

1.4 Street Trees in Structural Soil

1.4.1 Procedure for Installation of Trees

After the installation of the Engineered Soil is complete and adjacent pavement has cured and been approved by the Engineer, street trees can be installed. Do not excavate planting holes until irrigation and drainage systems are tested and approved by the Engineer.

Locate planting holes as shown on plans bringing any conflict with underground utilities to the attention of the Engineer.

Excavate holes to diameter and depth as shown on plans. Avoid over-excavating or contaminating Structural Soil with native soil. Stockpile excavated Structural Soil to use as backfill. Cover with plastic sheeting to protect stockpile from contamination and drying out. Structural Soil stockpiled longer than 2 (two) days shall be inspected for water content, rehydrated and remixed as required to meet optimum compaction moisture content.

Prior to planting, test drainage of plant pits by filling with water twice in succession. Conditions permitting the retention of water in tree pits for more than 12 hours shall be brought to the attention of the Engineer. Handle the tree carefully, set the root ball on bottom of pit and centre it in the tree well opening. Backfill with Structural Soil mix and settle with watering. Raise root balls that settle below accepted finish grade as shown on drawings.

1.5 Suppliers

CU Structural Soil is available through the following licensed suppliers:

- Earthco Soil Mixtures
  Concord, Ontario
  Contact: Gino Turchiaro
  416-798-7050 office
  416-676-3840 cell

- Coco Paving Inc.
  Windsor, Ontario
  Contact: Carlo Dimambro
  519-948-7133

References

These specifications have been adapted from those prepared for CU Structural Soil by Cornell University.

- Contact: Nina Bassuk
  20 Plant Science
  Urban Horticulture Institute
  Cornell University
  Ithaca, New York 14853
  607-255-4586
  607-255-9998 Fax

2.0 Tree Protection Guidelines

All tree protection barriers shall be erected prior to the commencement of any onsite operations as detailed on the Construction Drawing Tree Management Plans and shall remain for the duration of the project or as directed by the Contract Administrator.

Barriers for tree protection zones shall be in accordance with OPSS 801.07.02, except where the tree is flanked by curb, sidewalk, roadway, etc. which limit the barrier placement to the furthest extent of the boulevard area, as approved by the Contract Administrator.

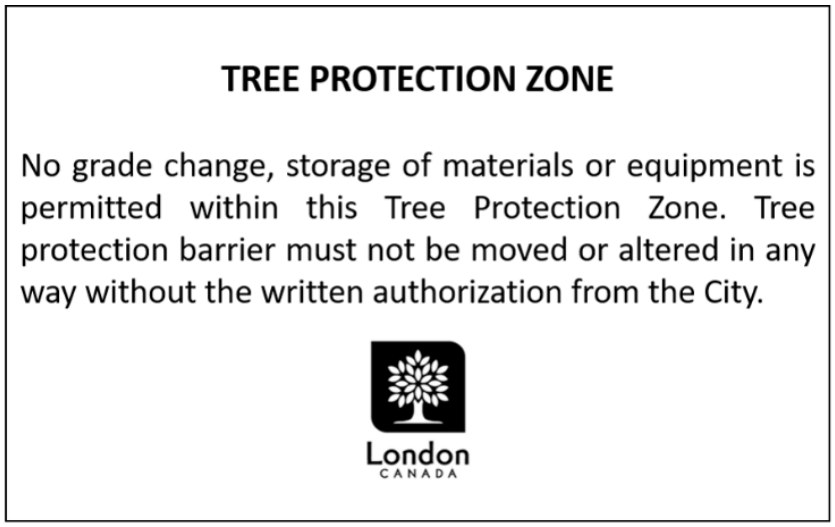
Should the location of the tree(s) limit or prevent the use of a barrier as identified above, the trunk of the tree shall be protected from mechanical damage by banding boards together to form a protective barrier immediately adjacent to the tree trunk.

Such a barrier shall be self-supporting upon completion and installed with the approval of the Contract Administrator.

Unless directed by the Contract Administrator in an emergency situation, operational constraints as per OPSS 801.07.01 apply for all work in and around the immediate area of trees.

The following tree protection signage must be attached to tree protection fencing for duration of project:

18 inches



24 inches

A minimum $500 penalty per incident (plus administration fees) will be deducted for trees unnecessarily damaged during construction by the Contractor or their sub-Contractors as determined by the Contract Administrator. If the damage to the tree is determined by the Contractor administrator to threaten the survival of the tree and requires removal, the Contractor shall pay all costs associated with the removal of the damaged tree, in addition to the penalty in accordance with the following schedule. The Corporation may deduct any and all penalties due under this paragraph from any monies that may be due or payable to the Contractor on any account whatsoever.

PENALTY TABLE

Infraction: Tree damaged by Contractor or Sub-Contractor

Diameter at breast height*	Additional Penalty
<10cm	$1,240
11cm-20 cm	$1,890
21cm-30cm	$2,240
31cm-40cm	$2,590
41cm-50cm	$3,740
51cm-60cm	$4,090
61cm-70cm	$4,440
71cm-80cm	$5,490
81cm-90cm	$5,840
91cm-100cm	$7,190
101cm-120cm	$9,040
121cm-130cm	$9,390
131cm-140cm	$10,940
141cm-150cm	$11,290
151cm-160cm	$11,640
161cm-170cm	$11,990
171cm-180cm	$12,340
181cm-190cm	$12,690
>191cm	$13,040
To be deducted per incident, in addition to any other fines associated with tree damage	$250 **

* Diameter of tree 1.5m above ground level

** Plus administration fees

Infraction: Failure to maintain or remove (without permission of Construction Administration) tree protection zone barrier

Diameter at breast height*	Additional Penalty
To be deducted per incident, in addition to any other fines associated with tree damage	$250 **

* Diameter of tree 1.5m above ground level

** Plus administration fees

Tree Pruning

All trees identified for pruning must be pruned before the commencement of any on-site operations and must be carried out by a certified arborist as approved by the Contract Administrator.

Root Protection

Roots 25mm or larger that are exposed during construction should be covered with wet burlap or soil as soon as possible and watered regularly to prevent them from drying out. Watering is required until such time as topsoil and sod has been replaced satisfactorily or as otherwise directed by the Contract Administrator.

The price bid to provide and maintain tree protection, which includes Tree Pruning and Root Protection, shall include all labour, equipment and material required to provide proper tree protection as detailed on the Construction Drawing Tree Management Plans.