Construction Specification for Continuous Soil Trench with Trees for New Construction

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TS 850.01 SCOPE

This specification describes the requirements for the installation of continuous soil trenches with new tree planting area(s) within the contract limits for new construction.

This specification includes requirements for the supply and installation of soil cell systems for planting and paving, including soil cell assemblies and related accessories; other materials including geotextile, geogrid, aggregate, subbase material, backfill, root barrier, stormwater distribution and aeration system, underdrains and placement of growing medium.

TS 850.02 REFERENCES

This specification refers to the following standards, specifications or publications:

City of Toronto Specifications

Flexible and Rigid Pavement Specifications

TS 3.50	Construction Specification for Concrete Curb and Concrete Curb and Gutter
TS 3.70	Construction Specification for Concrete Sidewalk and Concrete Raised Median
TS 3.80	Construction Specification for Concrete Unit Pavers

Material Specifications

TS 1010	Amendment to OPSS 1010.MUNI (Apr 2013) – Material Specification for Aggregates – Base, Subbase, Select Subgrade and Backfill Material
TS 1350	Amendment to OPSS 1350.MUNI (Nov 2014) – Material Specification for Concrete – Material and Production

Miscellaneous Specifications

TS 2.10	Construction Specification for General Excavation
TS 5.10	Construction Specification for Growing Medium
TS 5.30	Construction Specification for Planting
TS 501	Amendment to OPSS.MUNI 501 (Nov 2017) – Construction Specification for Compacting
TS 405	Construction Specification for Pipe Subdrains
TS 856	Construction Specification for Pipes in Green Infrastructure
TS 857	Construction Specification for Inlets in Green Infrastructure

City of Toronto Standard Drawings

T-850.026-1	Planting Details – Tree Planting Details
T-850.183-2	Continuous Soil Trench with Soil Cells – With Tree Grate – Typical Section at Tree Opening

Ontario Provincial Standard Specifications

OPSS 180	General Specification for the Management of Excess Materials
OPSS.MUNI 1004	Material Specification for Aggregates - Miscellaneous

Ontario Regulations

O. Reg. 413/12	Integrated Accessibility Standards
AODA	Accessibility for Ontarians with Disabilities Act

Canadian Standards Association

A23.2-16A	Resistance to Degradation of Small-size Coarse Aggregate by Abrasion and Impact
A23.2-17A	Resistance to Degradation of Large-size Coarse Aggregate by Abrasion and Impact
A23.1/A23.2	Concrete Materials and Methods of Concrete Construction/ Test Methods and Standard Practices for Concrete
A23.4/A251	Precast Concrete - Materials and Construction/Qualification Code for Architectural and Structural Precast Concrete Products
G30.18	Carbon Steel Bars for Concrete Reinforcement
G30.5-M1983 (R1998)	Welded Steel Bars for Concrete Reinforcement
G40.20	General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
O121-17	Douglas Fir Plywood
CAN3-O188.2	Waferboard
S6-19	Canadian Highway Bridge Design Code for Ontario (CL-625-ONT)
S269.1	Falsework and Formwork

American Society for Testing and Materials

A36M	Standard Specification for Carbon Structural Steel
D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

American Association of State Highway and Transportation Officials

M288	Standard Specification for Geosynthetic Specification for Highway Applications

TS 850.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Continuous Soil Trench means a structure designed and built to contain an adequate volume of continuous growing media to support tree growth to maturity under a paved boulevard.

Geotextile means a geosynthetic fabric, applied to either the soil surface or between materials, providing filtration, separation, or stabilization properties.

Granular Base (Choker Layer) means aggregate material between the bottom of the growing medium and the top of the granular sub-base (drainage layer) below, designed to prevent migration of finer growing medium into the coarser underlying drainage layers.

Granular Sub-base (Drainage Layer) means aggregate material between the granular base (choker layer) and the compacted subgrade below, designed to collect and drain water from the soil trench and into the underdrain.

Falsework means a temporary framework structure used to support permanent structural elements.

Passive Irrigation Distribution Pipe means a perforated pipe or pipes installed within the continuous soil trench for the purpose of distributing water to planting soil, and aeration of the growing medium.

Passive Irrigation Distribution Pipe Inlet means a solid pipe that connects the distribution pipe to the inlet.

Passive Irrigation Distribution Pipe Riser means a solid pipe connecting to a cleanout with an end that is covered with an open-grid cover to allow for water and air to enter the riser and distribution pipes.

Root Barrier means a physical structure installed in the growing medium to block root expansion. Also referred to as a root diversion device due to the blocking functions to redirect root expansion, typically downwards.

Soil Cells means a modular system designed to be filled with growing medium for tree rooting, stormwater management and support of vehicle loaded pavements.

Tree Planting Area means soil opening area. May be partially covered with metal or pre-cast concrete. See Tree Opening**.**

Tree Opening means an opening created by the surface cover.

TS 850.04 DESIGN AND SUBMISSION REQUIREMENTS

TS 850.04.01 General

Any required submissions shall be submitted in writing to the Contract Administrator at least three weeks prior to beginning of the work.

Continuous soil trenches shall be designed in accordance with Toronto Green Standard to provide a minimum of 30 m^3 growing medium per tree.

TS 850.04.02 Submittals

The requirements for submissions and design requirements for concrete shall be according to TS 1350.

The submissions requirements for growing medium shall be according to TS 5.10.

Upon seven Days prior to start of installation of items in this section, the Contractor shall provide submittals required in this section to the Contract Administrator for review and approval.

Compaction testing results: Submit results of all compaction testing required by the specifications including the bulk density test of the installed soil, and the compaction testing log of penetrometer and moisture meter readings to the Contract Administrator for approval.

Testing logs: Logs of bulk density testing for compacted subgrade soil, and penetrometer and moisture meter testing of installed growing medium should be submitted upon test completion and compiled to form part of close-out documents.

TS 850.04.02.01 *Shop Drawings*

For shop drawings where soil cells are used to achieve soil volume, include the following:

1) Manufacturer's site-specific soil cell layout in plan and sections to scale, signed and sealed by a Professional Engineer licensed to practice in civil engineering and a structural engineering in the Province of Ontario warranting that the product as proposed satisfies all City loading requirements.

2) Manufacturer's product and installation specifications.

Soil Volume Plan to be signed and sealed by a full member of the Ontario Association of Landscape Architects.

The Contractor shall provide shop drawings and installation layout details for all specified materials. Shop drawings shall include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details. The Contractor shall not order any material until shop drawings have been approved. The City is not responsible for restocking or return charges or both for material ordered prior to the approval of the shop drawings.

TS 850.04.02.02 *Samples*

Samples for Verification: For each product and as noted in the specification under TS 850.05, submit samples as described.

TS 850.04.02.03 *Soil Cell Quality Control*

Installer Qualifications: Soil cells and related products shall be installed by a qualified installer whose work has resulted in successful installation of growing medium and planter drainage systems, underground piping, chambers and vault structures.

Installer's Field Supervisor: An experienced full-time supervisor employed by the installer shall be present at the Project site when Work is in progress. Utilize the same field supervisor throughout the Project, unless a substitution is submitted to and approved in writing by the Contract Administrator.

Installer will be required to take part in a training session provided by the manufacturer. Training session to be attended by all foremen and key personnel involved in installation.

The Contractor shall, engage the soil cell manufacturer to provide shop drawings, stamped by Ontario licensed professional engineers, and to provide construction review by an Ontario licensed professional engineer, in order to ensure that the soil cells are constructed in accordance with the construction documents.

TS 850.04.02.04 *Manufacturers Product Data*

Product Data: For each type of product, submit manufacturer's product literature with technical data sufficient to demonstrate that the product meets these specifications.

Provide manufacturer's catalog product data, installation instructions and material safety data sheets for the safe handling of the specified materials and products.

Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1) Manufacturer's certified analysis for standard products.
2) Soil cell manufacturer's letter of review and approval of the project, plans, details and specifications for compliance with product installation requirements.
3) Formwork lumber: plywood and wood formwork materials to CAN3-A23.1.
4) Falsework materials: to CSA S269.1.
5) Form release agent: chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms.
6) Form stripping agent: colourless mineral oil, free of kerosene, with viscosity between 70 to 110mm/s at 40°C, flash point minimum 150°C.
7) Form ties: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25mm diameter in concrete surface.
8) Form liner: Waferboard: to CAN3-O188.2, P1 grade, 6mm thick.

TS 850.04.02.05 *Incremental Installation of first 30 m^2 Section*

Installation of the first 30 m^2 section – minimum sized trench to accommodate one tree – of the soil cell system shall proceed incrementally to ensure appropriate construction.

The Contract Administrator shall be present to review each part of the installation, until one complete representative section has been constructed.

The Contract Administrator shall review the following activities: granular sub-base compaction, drainage installation, placement of granular base course and geotextile as required, placement of geogrids, backfill, placement of growing medium with compaction, and placement of top geotextile.

Once one completed section has been approved, it shall be considered the standard to which the remainder of the Work shall be held.

TS 850.04.03 Sequencing and Scheduling

Prior to the start of Work, prepare a detailed schedule of the work for coordination with other trades.

Schedule all utility installations prior to beginning work in this section.

Schedule soil cell system installation to accommodate requirements for delivery, storage and handling of growing medium according to TS 5.10.

Where possible, schedule the installation of soil cells after the area is no longer required for use by other trades and work.

Protect open excavations and partially completed soil cell installation from access, damage and inclement weather when work is in progress, and following completion with highly visible construction tape, fencing, tarp or appropriate surface covering or other means until all construction is complete.

Protect installed soil cells from damage in the event that work must occur over or adjacent to the completed soil cells. Prevent all non-installation related construction traffic over the completed soil cell installation; only allowing loads less than the design loads.

TS 850.04.03.01 *Weather Limitations*

Schedule soil cell system installation to avoid winter months and freezing conditions. Do not proceed with work when subgrades, soils and growing mediums are in a wet, muddy or frozen condition.

Where construction sequencing requires work during cold weather, protect subgrades and bulk materials from freezing using covers or as needed heated tenting. Subgrades that are sufficiently well drained to preclude the buildup of ice may be installed and built upon during freezing weather provided the surface is cleared of snow and any ice bound material.

TS 850.04.04 Product Delivery, Storage and Handling

All materials shall be inspected by the Contractor for damage in transit. No defective material shall be delivered to the site. Material subsequently damaged shall be removed from the site immediately.

Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer. Protect materials from deterioration during delivery and while on the project site.

Label manufactured, processed or otherwise prepared materials that are packaged to indicate manufacturer, contents, weight, and a detailed description of the material. If delivered in bulk, submit affidavits giving information required as specified for labels and certifying that materials meet specified requirements. Store and protect fertilizer, limestone, bone meal, mulching materials, and similar products to prevent damage from moisture.

Bulk Materials: Do not deliver or place backfill, soils and soil amendments in frozen, wet, or muddy conditions.

1) Bulk materials shall be temporarily stored on sidewalks, pavements and turf areas within the construction staging area. Provide protection including tarps, plastic and or matting between all bulk materials and any finished surfaces sufficient to protect the finish material.

2) Do not dump or store bulk materials near structures, utilities, and other facilities, or on existing trees or plants.

3) Any excess bulk materials shall be removed at completion of construction.

Provide erosion-control measures to prevent erosion or displacement of bulk materials and discharge of soil-bearing water runoff or airborne dust to adjacent properties, water conveyance systems, and walkways. Provide additional sediment control to retain excavated material, backfill, soil amendments and planting mix within the project limits as needed.

Soil cells: Protect soil cells from damage during delivery, storage and handling.

1) Store under tarp to protect from sunlight when time from delivery to installation exceeds one week. Storage should occur on smooth surfaces, free from dirt, mud and debris.

2) Handling is to be performed with equipment appropriate to the size – height – of Cells and site conditions, and may include, hand, handcart, forklifts, extension lifts, small cranes, and so on with care given to minimize damage to soil cells. Do not use backhoes, front-end loaders and skid steers for soil cell transport and placement.

TS 850.04.05 Project Conditions

Verification of Existing Conditions and Protection of New or Existing Improvements: Before proceeding with work in this section, the Contractor shall carefully check and verify all dimensions, quantities, and grade elevations, and inform the Contract Administrator immediately of any discrepancies.

1) Carefully review and verify geotechnical information, examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging. Verify the location of all aboveground and underground utility lines, infrastructure, other improvements, and existing trees, shrubs, and plants to remain including their root system, and take proper precautions as necessary to avoid damage to such improvements and plants.

2) In the event of conflict between existing and new improvements notify the City in writing and obtain written confirmation of any changes to the work prior to proceeding.

3) When new or previously existing utility lines are encountered during the course of excavation, notify the City in writing and make recommendations as to remedial action. Proceed with work in that area only upon approval of appropriate remedial action.

Coordinate all work with the appropriate utility contractors, utility company or responsible public works agency.

TS 850.05 MATERIALS

TS 850.05.01 Concrete

The materials for and the production of concrete sidewalks on grade and concrete raised medians shall be according to TS 3.70. The materials for and the production of concrete curb and concrete curb and gutter shall be according to TS 3.50.

TS 850.05.02 Precast Structural Concrete Panels

Manufacturers shall be qualified in accordance with CSA A23.4/A251 Qualification Code for Manufacturers of Architectural and Structural Precast Concrete. The materials for and the production of precast structural concrete panels shall be according to the following:

1) White cement, water reducer, air entrainment, aggregates, water admixture: to CSA A23.4/A251 and CSA A23.1/A23.2.
2) Aggregate: in conformance with CSA A23.1/A23.2,
3) Sand: silica or sandstone as per Contract Documents if applicable.
4) Admixture: in accordance with CSA A23.1-A23.2. Introduce admixtures to concrete at time of batching in accordance with the manufacturer's recommendations. Under no circumstances, use calcium chloride on an admixture containing calcium chloride. Admixtures shall be subject to the approval of the City.
5) Reinforcing steel as required: billet steel bars conforming to CSA G30.18. Reinforcing larger than 6 mm dia. shall be deformed bars conforming to the same standard. Welded wire mesh shall conform to CSA G30.5. Galvanize reinforcing with less than 25 mm cover.
6) Water: in accordance with CSA A23.1/A23.2.
7) Structural steel: new material conforming to CSA G40.20, or ASTM A36M.
8) Concrete mix:

    a) Use concrete mix designed to produce minimum of 32 MPa compressive strength at 28 days in accordance with to CSA A23.4/A251.
    b) Use same brand and source of cement and aggregate for facing, for entire project to ensure uniformity of colouration and other mix characteristics.
    c) Cement colour in facing matrix to be determined by the City.
    d) Air entrainment of concrete mix: to CSA A23.1/A23.2, 5% minimum.
    e) Use of calcium chloride not permitted.

9) Forms: constructed or approved concrete, steel or fiberglass reinforced plastic or high-density overlaid plywood conforming to CSA O121 to obtain the quality of the finish specified.

TS 850.05.02.01 *Reinforcement*

The materials for and the production of the reinforcement shall be according to the following Substitution of difference bar sizes shall only be permitted in writing by Contract Administrator.

1) Reinforcing steel: billet steel, grade 400, deformed bars to CSA G30.18.
2) Reinforcing steel: weldable low alloy steel deformed bars to CSA G30.18.
3) Chairs, bolsters, bar supports, spacers: to CSA A23.1/A23.2.
4) Mechanical splices: subject to approval of Contract Administrator.

TS 850.05.02.02 *Concrete Void Form*

The materials for and the production of the reinforcement shall be in accordance with the following:

1) Formwork lumber: plywood and wood formwork materials to CAN3-A23.1.
2) Falsework materials: to CSA S269.1.
3) Form release agent: chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms.
4) Form stripping agent: colourless mineral oil, free of kerosene, with viscosity between 70 to 110mm/s at 40°C, flash point minimum 150°C.
5) Form ties: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25mm diameter in concrete surface.
6) Form liner: Waferboard: to CAN3-O188.2, P1 grade, 6mm thick.

TS 850.05.03 Granular Material

Granular base and subgrade layer separation at the base of the soil trench and the depth of the granular sub-base layer shall be confirmed by the Contract Administrator based on design requirements. For soil cell system applications, refer to manufacturer recommendations.

Granular A Native shall be according to TS 1010.

TS 850.05.04 Granular Base (Choker Layer)

The granular base material (choker layer) shall be open-graded crushed stone with 90% fracture faces and LA abrasion less than 40 according to CSA A23.2-16A or A23.2-17A. Rounded material or recycled concrete is not acceptable for vehicular applications. All materials shall be washed, with less than 2% passing the 0.075 mm sieve. Aggregate gradation for the granular base shall conform to CSA A23.1 Group II, 20-10 mm, per Table 1.

Table 1: 20-10 mm Granular Base Gradation

Sieve number	Per cent passing
28 mm	100
20 mm	85-100
14 mm	-
10 mm	0-20
5 mm	0-5

An equivalent granular base material to 20-10mm shall be 19 mm clear stone in according to OPSS.MUNI 1004.

TS 850.05.05 Granular Sub-base (Drainage Layer)

The granular sub-base material (drainage layer) shall be open-graded aggregate with 90% fracture faces and LA abrasion less than 40 as per CSA A23.2-16A or A23.2-17A. Rounded material or recycled concrete is not acceptable for vehicular applications. All materials shall be washed, with less than 2% passing the 0.075 mm sieve. Aggregate gradation for the granular sub-base or drainage layer shall conform to CSA A23.1 Group II, 40-20 mm, per Table 2.

Table 2: 40-20 mm Granular Sub-base Gradation

Sieve number	Per cent passing
56 mm	100
40 mm	90-100
28 mm	25-60
20 mm	0-15
14 mm	-
10 mm	0-5

An equivalent granular sub-base material to 40-20mm shall be 53 mm clear stone according to OPSS.MUNI 1004.

TS 850.05.06 Backfill Material

Backfill material shall be clean, compactable fill according to TS 1010 or according to soil cell manufacturer requirements.

Backfill material shall be free of organic material, trash and other debris, and shall be free of toxic material and materials that can negatively affect plant growth.

TS 850.05.07 Geotextile Fabric

For underdrain and filtration applications use non-woven needle punch, Class II according to AASHTO M288. For roadway applications use non-woven needle punch Class I according to AASHTO M288. Overlay of geotextile shall be according to AASHTO M288.

Geotextile to be used around the perimeter of the soil trench with 40-50 cm tucked under the bottom of the trench to secure the material. Geotextile is not required on the base of the trench.

Geotextile to be used across the top of the soil cell, exclusive of the Tree Planting area, and should be cut, not folded around to create an open area for planting of 1500 mm x 1500 mm.

TS 850.05.08 Geogrid

Geogrid shall be according to soil cell manufacturer's requirements.

TS 850.05.09 Root Barrier

Root barrier – root diversion device – shall be a geo-composite membrane to prevent root penetration under hard boulevard surfaces. The material shall be impermeable and ribbed with a thickness of 1 – 2 mm. Provide sample and proof of source to the Contract Administrator for approval prior to delivery and installation.

TS 850.05.10 Soil Cells

Soil cells shall be modular structural units designed to be filled with growing medium for tree rooting, stormwater management and support of vehicle loaded pavements. Soil cell types include:

1) Type 1 Soil Cells: Load-bearing assemblies with flat top and bottom decks and supporting vertical posts or panels.

2) Type 2 Soil Cells: Concrete Pavement Forming Assembly. Not to be used over or in proximity to water and wastewater infrastructure.

Selection of soil cell type and manufacturer shall be subject to City approval.

The soil cell system shall be designed to support loads up to and including the Canadian Highway Bridge Design Code for Ontario (CL-625-ONT).

The soil cell system shall be designed to be filled with the growing medium as specified in TS 5.10 including the type of soil specified; the required limitations of delivery, storage, and handling; the requirement to retain soil peds; and requirements to compact and in-situ test soil compaction to the ranges specified.

The structural design of each soil cell unit shall facilitate the movement of roots and water between each cell and between the edges of the cell system and the surrounding soils. The design shall facilitate the installation, compaction, and in-situ soil compaction testing; installation and maintenance of utilities within and under the soil cells; the movement and expansion of roots; and the lateral capillary movement of water.

Critical to the soil cell design is that each soil cell or stack of soil cells shall be structurally independent of all adjacent soil cell stacks such that a single stack or group of stacks can be removed after the completion of installation to facilitate future utility and subsurface infrastructure installation and repair. If laterally connected, the connections must have the capacity to break during emergency or planned access. It is also critical that the removed soil cells can be reinstated or replaced following access, in order to maintain the continuity and pre-access properties of the soil trench.

TS 850.05.11 Passive Irrigation Distribution Pipe

Passive irrigation distribution pipe shall be 200 mm diameter for catch basin inlets or 100-150 mm diameter for trench drain inlets, rigid HDPE or PVC pipe with minimum ring stiffness of 320 kPa according to TS 856 or as specified on Contract Drawings. Pipes shall have perforations installed below the springline. Capacity of the perforated pipe and specification of perforations to be confirmed by the Contract Administrator based on hydraulic requirements. A 0.5 m solid wall transition zone shall be provided from pipe bends at cleanouts to the start of the perforated pipe segment within the soil cell system.

TS 850.05.12 Passive Irrigation Distribution Pipe Inlet

The passive irrigation distribution pipe inlet shall be the same diameter as the distribution pipe, rigid HDPE or PVC solid wall pipe in accordance with TS 856 or as specified on Contract Drawings.

The pipe inlet shall be connected to the distribution pipe system with prefabricated PVC tee fittings and flexible rubber couplings. Inlet pipes shall connect to inlet systems listed in TS 857 or as specified on Contract Drawings.

TS 850.05.13 Underdrain

The underdrain shall be a 200 mm diameter perforated HDPE or PVC pipe according to TS 856, or according to soil cell manufacturer requirements. Spacing of underdrain outlets to the minor system shall not exceed 100 m.

Underdrain is required when capturing stormwater through a catch-basin connection, where soil infiltration rates are less than 15mm/hr or when tree trench is membrane lined.

TS 850.05.14 Pipe Riser and Cleanout

Pipe risers shall be the same diameter as the distribution pipe rigid HDPE or PVC solid wall pipe according to TS 856 or as specified on Contract Drawings. Pipe risers shall be connected to the passive irrigation distribution pipe with prefabricated PVC tee fitting and flexible rubber couplings.

Passive irrigation distribution pipe and underdrain pipe cleanouts shall be spaced at 30 m maximum or at pipe ends. Pipe fittings for cleanouts shall be 45 degrees maximum to allow for cleaning.

Covers for pipe risers connected to passive irrigation distribution shall be cast aluminum ventilation grilles with tamper-resistant grating. Covers for pipe riser cleanouts connected to the underdrain shall be a sealable cap that can be removed periodically for inspection and maintenance.

TS 850.05.15 Tree Opening

TS 850.05.15.01 *Tree Grate*

Tree openings shall have a minimum dimension of 1500 mm x 1500 mm. Tree grates and supporting structures shall be sized to cover the tree opening without encroachment into the minimum tree opening.

Tree grate opening shall be a minimum of 600 mm^2, square or round.

Trees must be centered within the tree grate openings.

Tree grates must meet standards for grating in sidewalks as outlined in O. Reg. 413/12 and AODA.

Tree grates shall be installed to be flush with surrounding pavement and shall not be fastened to frames with screws or bolts.

TS 850.05.15.02 *Tree Fence*

Tree fences shall be metal and a minimum height of 400 mm

Tree fences shall be provided as specified on the Contract Drawings.

TS 850.05.15.03 *Open Planter Curb*

Planter curbs shall be concrete or natural stone.

Raised planter curb shall be 200 mm x 200 mm or as shown on Contract Drawings.

Curb inlet openings shall be provided as specified on Contract Drawings.

TS 850.05.16 Linear Trench Drain and Drain Cover

Linear trench drain and drain cover or other inlet structures shall be according to TS 857.

TS 850.05.17 Growing Medium

Growing medium shall be according to TS 5.10 and shall be one of the following:

- Type 3 – Boulevard Mix: For tree planting in hardscaped boulevards.
- Type 4 – Bioretention Mix: For bioretention and rain gardens requiring high infiltration or pre-treatment.

TS 850.05.18 Mulch

Mulch shall be according to TS 5.30.

TS 850.05.19 Water

Potable water shall be used unless the Contractor provides testing results that demonstrate the water to be used is free of contaminants or impurities that would adversely affect the germination and growth of vegetation.

TS 850.06 EQUIPMENT – Not Used

TS 850.07 CONSTRUCTION

TS 850.07.01 Preconstruction Meeting

Prior to the start of the installation of soil cells, meet at the site with the City, Contractor, soil cell manufacturer's representative and the soil cells installer to review installation layout, procedures, means and methods.

The installer's field supervisor shall be identified during the pre-installation meeting, with appropriate contact information provided, as necessary.

TS 850.07.02 Examination

Examine the conditions under which the soil cells are to be installed.

Carefully check and verify dimensions, quantities, and grade elevations.

Carefully examine the Drawings to become familiar with the existing underground conditions before digging. Verify the location of aboveground and underground utility lines, infrastructure, other improvements, and existing trees, shrubs, and plants to remain including their root system.

Confirm that the layout of the soil cells is not in conflict with any existing or proposed utility lines or structures. In event that there is a conflict notify the City and take remedial actions to resolve the conflict as instructed by the City. Where needed and approved by the utility, lines may be installed through the spaces within the soil cell frames.

Notify the Contractor and the Contract Administrator in writing in the event of conflict between existing and new improvements, of discrepancies, and other conditions detrimental to proper and timely completion of the installation.

Obtain written approval of changes to the Work prior to proceeding. Proceed with installation only after changes have been made and unsatisfactory conditions have been corrected.

TS 850.07.03 Preparation

Take proper precautions as necessary to avoid damage to existing improvements and plantings.

Prior to the start of Work, layout and stake the limits of excavation and horizontal and vertical control points sufficient to install the complete soil cell system and required drainage features in the correct locations.

Coordinate installation with other trades that may impact the completion of the Work.

TS 850.07.04 Layout and Elevation Control

Provide layout and elevation control during installation of soil cells. Utilize grade stakes, benchmarks, surveying equipment and other means and methods to assure that layout and elevations conform to the layout and elevations indicated on the Contract Documents.

TS 850.07.05 Excavation

Prior to any excavation, the Contractor shall have all utilities located and clearly marked.

The excavation shall be to the lines and grades shown on the Contract Drawings. Care shall be taken to prevent damage to utilities, window openings, areaways, and other appurtenances such as hydrants, poles and gas valves which may be in or under the proposed continuous soil trench. All surplus or unsuitable material is to be disposed of, off the site, according to OPSS 180.

Maintain all required angles of repose of the adjacent materials as shown on the Contract Drawings or as required to support adjacent materials or structures. Do not undermine existing tree roots. Do not over excavate compacted subgrades of adjacent pavement or structures.

The subgrade shall be prepared according to TS 2.10 and using techniques according to soil cell manufacturer's instructions. Base of excavation shall be smooth soil, level and free of lumps or debris.

The Contractor shall be required to make good all damage caused during the course of the construction to any part of the roadway, boulevard and private property and to restore the same, to as good or better condition as existed prior to commencement of work.

TS 850.07.06 Subgrade

Check compaction of the subgrade below the soil cells and confirm that the subgrade soil is compacted to a minimum of 95% of maximum dry density at optimum moisture content in accordance with TS 501 and ASTM D698 Standard Proctor Method, or according to soil cell manufacturer requirements. Proof compact the subgrade with a minimum of three passes of a suitable vibrating compacting machine or apply other compaction forces as needed to achieve the required subgrade compaction rate. Apply additional compaction forces when subgrade is at less than optimum moisture level.

Ensure that subgrade preparation and drainage is satisfactory for plant material growth according to TS 5.10.

TS 850.07.07 Installation of Underdrain

The underdrain shall be laid out and surrounded by 100 mm of open graded drainage layer aggregate according to TS 856. Underdrains shall be sloped minimum 0.5 per cent towards the outlet and cleanout spacing shall not exceed 30 m.

TS 850.07.08 Installation of Granular Base and Granular Sub-base

For installation of granular base (Choker Layer) and granular sub-base (Drainage Layer) below soils sells, refer to manufacturer's instructions.

Install granular base and sub-base to the depths indicated on the Contract Drawings.

The grade and elevations of the base under the soil cells shall be approved by the City prior to proceeding with the installation of the soil cells.

TS 850.07.09 Installation of Soil Cells and Growing Medium

Identify the outline layout of the continuous soil trench on the floor of the excavation, using spray paint or chalk line. The layout shall be calculated to include shift in layout locations due to depth and the slope of the cells.

Check each soil cell unit for damage prior to placing in the excavation. Any cracked or chipped unit shall be rejected.

Assure that each soil cell sits solidly on the surface of the sub-base. Soil cells shall not rock or bend over any stone or other obstruction protruding above the surface of the sub-base material. Soil cells shall not bend into dips in the sub-base material.

Install geogrid, geotextile, soil cells, growing medium, edge backfill and passive irrigation distribution system as indicated on the Contract Drawings and in this specification. The process of installation requires that these materials be installed and compacted together in several alternating operations to achieve correct compaction relationships within the system.

TS 850.07.09.01 *Type 1 Soil Cells*

For Type 1 soil cells with structural assemblies with flat top and bottom decks and supporting posts, refer to manufacturer's instructions.

1) Lay out soil cell bases and posts on the sub-base. Verify that the layout is consistent with the required locations and dimensions of the continuous soil trench and locations of tree planting areas.
2) Where approved, install utility lines within the soil cells during the installation of the system. Secure and brace all utility lines placed within the frames.
3) Attach geogrid around the soil cells according to T-850.183-2. Attach temporary bracing, post caps or half of all soil cell tops.
4) Use backhoe loader bucket to drop the growing medium into the soil cell structures with a maximum lift of 300 mm. If working in constrained space where a backhoe cannot be accommodated, and a soil slinger is used, the belt speed should be minimized to reduce velocity such that the soil drops off the belt–water-falling, forming a pile underneath. The soil is not to be projected over a horizontal distance.

5) Remove temporary bracing, post caps or soil cell tops.
6) Grade growing medium by hand with rake and shovel.
7) Compact installed lift of growing medium by walk through foot packing method.
8) Perform soil cone penetrometer tests on compacted growing medium to ensure foot packing was sufficient to achieve between 70,000 and 140,000 kg/m² when the soil is between 12 and 20 per cent moisture in accordance with TS 5.10.
9) Fold the pieces of geogrid installed along sides over the top of soil cell structures.
10) Backfill excavation edges with granular material using backhoe loader bucket with a maximum lift of 300 mm.
11) Backfill shall be according to TS 1010 or as specified in soil cell manufacturer requirements. If 19 mm diameter crushed limestone is used to backfill excavation edges, use plate tamper or jumping jack tamper to compact the granular material. If 19 mm diameter clear stone is used to backfill excavation edges, use vibrating tamper to compact the granular material.
12) Remove growing medium from post caps or top attachment connector pieces.
13) Install next layer of soil cell structures. For additional layers, comply with manufacturer's requirements to correctly register and connect the soil cells together.
14) Replace caps on all soil cell structure posts or attach half of all tops.
15) Repeat steps 4 to 15 until soil cell structures are filled to just below top attachment.
16) Install passive irrigation distribution system pipes and couplings.
17) Remove temporary bracing or post caps and attach all soil cell tops.
18) Sweep additional growing medium into openings on soil cell tops until full.
19) Install geotextile, geogrid and aggregate over soil cells as per manufacturer's instructions.

TS 850.07.09.02 *Type 2 Soil Cells*

For Type 2 soil cells with concrete pavement forming assembly, refer to manufacturer's instructions.

1) Lay out soil cell bases and posts on the sub-base. Verify that the layout is consistent with the required locations and dimensions of the continuous soil trench.
2) Where approved, install utility lines within the soil cells during the installation of the system. Secure and brace all utility lines placed within the frames.
3) Attach geogrid around the soil cells as per the manufacturer's specification.
4) Place caps on all soil cell structure posts.
5) Use backhoe loader bucket to drop the growing medium into the soil cell structures with a maximum lift of 300 mm. If working in constrained space where a backhoe cannot be accommodated, and a soil slinger is used, the belt speed should be minimized to reduce velocity such that the soil drops off the belt–water-falling, forming a pile underneath. The soil is not to be projected over a horizontal distance.
6) Grade growing medium by hand with rake and shovel.
7) Compact installed lift of growing medium by walk through foot packing method.
8) Perform soil cone penetrometer tests on compacted growing medium to ensure foot packing was sufficient to achieve between 70,000 and 140,000 kg/m² when the soil is between 12 and 20 per cent moisture in accordance with TS 5.10.
9) Fold the pieces of geogrid installed along sides over the top of soil cell structures.
10) Backfill excavation edges with granular material using backhoe loader bucket with a maximum lift of 300 mm.
11) Backfill shall be according to TS 1010 or as specified in soil cell manufacturer requirements. If 19 mm diameter crushed limestone is used to backfill excavation

edges, use plate tamper or jumping jack tamper to compact the granular material. If 19 mm clear stone is used to backfill excavation edges, use vibrating tamper to compact the granular material.

12) Remove growing medium from post caps or top attachment connector pieces.
13) Repeat steps 4 to 12 until soil cell structures are filled to just below top attachment.
14) Install passive irrigation distribution system pipes and couplings.
15) Remove post caps and attach all soil cell tops.
16) Place concrete into soil cell dome tops and posts as per manufacturer's instructions. Use a vibrating rod to ensure concrete fills the full depth of the tops and posts. Installer's Field Supervisor shall perform inspections to ensure the vibrating rod is inserted into each post and all tops of the soil cell system during concrete installation.

TS 850.07.10 Installation of Backfill

For installation of backfill, refer to soil cell manufacturer's instructions.

1) Install and compact backfill material in the space between the soil cells and the sides of the excavation in lifts.
2) Compact backfill to minimum 95% of maximum dry density using a powered mechanical compactor. Use a pneumatic compacting tool or narrow foot jumping jack compactor for spaces less than 300 mm wide and a 300 mm wide jumping jack compactor or larger equipment in wider spaces.
3) Maintain the geogrid and geotextile curtain between the soil cells and the backfill material as required by manufacturer's instructions.
4) Install backfill in alternating lifts with the growing medium placement and foot compaction inside the soil cells.
5) Continue to install and compact the growing medium within the soil cells and the backfill material outside the frames in alternating lifts until the desired elevations and density is achieved in both soils.
6) When using mulch, add a final layer of growing medium as required to bring the growing medium level to not more than 25 mm below the bottom of the soil cell when installed.
7) Obtain final approval by the City for the soil installation.
8) Install and compact remaining backfill material such that the backfill is flush with the top of the installed soil cells.

TS 850.07.11 Installation of Passive Irrigation Distribution Pipe, Inlet Pipe and Pipe Riser

Passive irrigation distribution pipe, inlet pipe, and pipe riser installation shall be according to TS 856 and as specified below.

The distribution pipes shall be wrapped in a geotextile sock and laid level (0% slope) with the growing medium at the depths shown on the Contract Drawings. Pipes with perforations shall be installed with perforations down or oriented with perforations below the springline. Configure and connect the distribution pipes to the inlet pipe using flexible rubber couplings or as shown on the Contract Drawings.

Install flexible rubber coupling to connect irrigation system pipes to tee coupling to prevent damage to couplings and facilitate future repair.

Passive irrigation system trenches dug into installed growing medium shall be backfilled with growing medium to maximize soil volume achieved.

During the installation of irrigation system pipes and couplings, securely cover irrigation system tee-couplings with geotextile prior to placing concrete paver bedding material to prevent clogging during construction.

Temporarily cap off the end of the cleanouts and pipe risers to protect the distribution pipes from construction debris. Remove the temporary cap and install the riser pipe cover flush with finished grade upon completion of construction.

Pipe risers and cleanouts shall be installed at end sections of the distribution pipe and cleanout spacing shall not exceed 30 m.

TS 850.07.12 Installation of Pavement Above Continuous Soil Trench

Take care when placing surface paving materials or other backfill on top of the soil cell system not to damage the system components.

TS 850.07.12.01 *Surface Identification of Soil Cell Zones*

The Contractor shall identify the extent of the soil cell system with a visible marker embedded into the surface pavement materials.

Markers shall be a concrete stamp or as indicated on the Contract Drawings and shall indicate “SOIL CELL ZONE” and the date of construction.

Soil cell zone markers shall be placed at each corner of the soil cell system, and along each edge at 10 m intervals.

TS 850.07.12.02 ***Precast Structural Concrete Panels***

The fabrication of precast structural concrete shall be in accordance with the following:

1) Exposed faces of precast concrete members shall be made to requirements of CSA A23.4/A251, Finish Grade ‘A’.
2) Precast concrete exposed surface finish shall match approved samples. Colour and texture shall be uniform and consistent throughout, free from air pockets, imperfections, blemishes and discolourations.
3) Fabricate units to profiles and sizes detailed and in accordance with shop drawings and to requirements of the City.
4) Execute work accurately, true to dimensions, square, in true planes, free from waves, twists, cracks, checks and broken edges. Warped, cracked, chipped or broken units shall not be placed in work. Edges shall be straight and with clean accurate arises.
5) Quality of concrete, placing materials in forms, vibrating, curing, stripping and handling shall be in accordance with CSA A23.4/A251.
6) Fabricate precast work within dimensional tolerances as specified in CSA A23.4/A251.
7) Identify precast units with a number on back face as well as mark identifying orientation of unit in final position.
8) Curing shall be in accordance with the requirements of CSA A251.

Design precast concrete work and connections in according to CSA A23.4/A251. Check dimensions at site before commencing shop drawings and before fabrication and report discrepancies to the Contract Administrator.

The installation of precast structural concrete shall be in accordance with the following unless otherwise indicated on Contract Drawings:

1) Erect precast concrete units in accordance with CSA A23.4/A251.
2) Apply setting adhesive in accordance with manufacturer's instructions.
3) Set work plumb, true and square with joints parallel and uniform. Set elevations and alignment between units to within allowable tolerances before connecting units.
4) Where tolerances will interfere with work of other sections that will force other work to be out of plumb, level, or deviate from straight lines indicated, provide remedial work for this defect.
5) Install each precast concrete unit in a way to permit removal and replacement of a defective and condemned panel without damaging adjacent panels.
6) Supply adequate information on handling and installation methods.

Any concrete units containing concrete which has failed to meet strength requirements of plans and specification shall be cored. Unit may be rejected and replaced at the City’s discretion after core test. Units fabricated out-of-square, out-of-dimension, without proper reinforcement, proper opening or inserts, shall be rejected and replaced at the City’s discretion. The costs of these tests shall be borne by the Contactor. Damaged, chipped, rust stained, and discoloured units shall be replaced, patched or refinished. The City will be the sole judge of the acceptance of any patched, repaired or refinished panels. Except for hair cracks which are defined as surface cracks of minute width, visible but not measurable by ordinary means, units which have become cracked or broken will be rejected and shall be replaced.

Remove, as work progresses, excess or foreign materials which would set up or become difficult to remove from finished surfaces. At completion, clean exposed surfaces of precast units. Remove dirt and other extraneous matter. Do not use acids without the City's acceptance. Take precautions to prevent staining the material of others during cleaning operations.

TS 850.07.12.03 *Concrete Sidewalk*

The concrete sidewalk shall be constructed according to TS 3.70, and placed to the specified thickness, line and grade shown on the Contract Drawings.

TS 850.07.12.04 *Unit Pavers on Concrete Base*

Unit pavers on concrete base shall be as shown on the Contract Drawings and constructed according to TS 3.80.

TS 850.07.13 Installation of Root Barriers

Install root barrier in accordance with manufacturer's reviewed installation instructions.

Install with vertical root directing ribs facing inwards towards trees or plants.

Root barriers shall not protrude above finished grade.

TS 850.07.14 Installation of Growing Medium Within the Tree Planting Area

Prior to planting trees, install additional growing medium according to TS 5.10, to the depths indicated, within the tree opening adjacent to paving supported by soil cells. For planting details, see TS 5.30.

Remove all rubble, debris, dust and silt from the top of the growing medium that may have accumulated after the initial installation of the growing medium within the soil cells.

Assure that the growing medium is compacted to 90% under root ball to full depth of tree pit to prevent settlement of the root ball.

The growing medium within the tree opening shall be the same soil as in the adjacent soil cells.

TS 850.07.15 Protection from Construction Traffic

Ensure that all construction traffic is kept away from the limits of the continuous soil trench until the final surface materials are in place.

Refer to soil cell manufacturer requirements for allowed vehicular loading over soil cells during construction. Do not operate equipment directly on top of the soil cell system until paving installation has been completed. No vehicles shall drive directly on exposed soil cells. Provide fencing and other barriers to prevent vehicles from entering into the soil cell area.

When vehicles must cross soil cells that do not have final paving surfaces installed, use construction mats and thicker aggregate layers designed to distribute vehicle loads to levels that would be expected at the soil cell surface once final paving has been installed. Use only low impact track vehicles with a maximum surface pressure under the vehicle of 20 kg/m², on top of the mats over soil cells prior to the installation of final paving.

When the soil cell installation is completed and the permanent pavement is in place, limit traffic and construction related activities to only loads less than the design loads.

TS 850.07.16 Installation of Tree Opening

TS 850.07.16.01 *Tree Grate*

Install tree grates according to the manufacturer's instructions.

Tree grates shall be installed to be flush with surrounding pavement and shall not be fastened to frames with screws or bolts.

TS 850.07.16.02 *Tree Fence*

Install tree fences according to the manufacturer's instructions.

A minimum 2100 mm pedestrian clearway shall be maintained on public sidewalks. Tree fences shall not encroach into the pedestrian clearway.

TS 850.07.16.03 *Planter Curb*

Planter curbs shall be constructed to the specified height, width line and grade shown on Contract Drawings.

A minimum 2100 mm pedestrian clearway shall be maintained on public sidewalks. Planter curbs shall not encroach into the pedestrian clearway.

TS 850.07.17 Mulching

Mulch shall be applied only at tree opening locations according to T-850.026-1.

Ensure soil settlement has been corrected prior to mulching.

Provide a continuous cover of mulch within each tree planting area opening and each open planter.

Ensure ground is not frozen prior to mulching.

TS 850.07.18 Clean Up

Perform cleanup during the installation and upon completion of the work. Maintain the site free of soil and sediment, free of trash and debris. Remove from site all excess soil materials, debris, and equipment.

Repair any damage to adjacent materials and surfaces resulting from installation of this work.

TS 850.08 QUALITY ASSURANCE

TS 850.08.01 Surface Tolerance

Lippage: No greater than 3 mm difference in height between concrete sidewalk and concrete panels.

TS 850.08.02 Tree and Product Warranty

Any tree that in the opinion of the Contract Administrator has not survived the first winter based on a site inspection by the Contract Administrator in early spring shall be replaced by the Contractor within two weeks of notification by the Contract Administrator according to TS 5.30.

Submit manufacturer's product warranty. Soil cell manufacturer's product warranty shall be provided for a minimum period of 20 years.

TS 850.09 MEASUREMENT FOR PAYMENT

TS 850.09.01 Tree Grate

For measurement purposes, a count shall be made of the number of tree grates installed.

TS 850.09.02 Tree Fence

Measurement of tree fence shall be by length in metres (m).

TS 850.09.03 Planter Curb

Measurement of planter curb shall be by length in metres (m).

TS 850.09.04 Growing Medium

Type 3 – Boulevard Mix
Type 4 – Bioretention Mix

Measurement of growing medium shall be measured by volume in cubic metres (m^3).

TS 850.09.05 Trench Drain

Measurement of trench drain shall be by length in metres (m) measured along the horizontal centerline of the trench drain. Trench drain inlet and linear connections shall be included in the price per linear metre item.

TS 850.09.06 Inlet Structures

Measurement for payment shall be in according to TS 857.

TS 850.09.07 Concrete Sidewalk, Concrete Base, Concrete Panel and Concrete Shoulder

Measurement of concrete sidewalk, concrete base, concrete panel and concrete shoulder shall be by surface area placed in square metres (m^2).

TS 850.09.08 Unit Pavers

Measurement of unit pavers shall be of the surface area, including any edge restraints, in square metres (m^2). No deduction will be made for poles or utility frames and covers.

TS 850.09.09 Passive Irrigation Distribution Pipe

Measurement of passive irrigation distribution pipe shall be by length in metres (m).

TS 850.09.10 Underdrain

Measurement of underdrain shall be by length in metres (m).

TS 850.10 BASIS FOR PAYMENT

TS 850.10.01 Tree Grate – Item
Tree Fence – Item
Planter Curb – Item
Growing Medium Type 3 – Boulevard Mix – Item
Growing Medium Type 4 – Boulevard Mix – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work.

TS 850.10.02 Trench Drain – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work.

TS 850.10.03 Inlet Structures – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work.

TS 850.10.04 Concrete Sidewalk, Concrete Base, Concrete Panel and Concrete Shoulder – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include the supplying, placing and removal of the formwork, the supplying, placing, consolidating and finishing of the concrete and the curing and protection of the concrete sidewalk, concrete base, concrete panel and concrete shoulder.

At the discretion of the Contract Administrator, payment for the item may be adjusted according to TS 3.70. The cost of thickness testing shall be borne by the City unless the results indicate a thickness deficiency of 5 per cent or more, in which case the Contractor shall bear all costs of testing.

TS 850.10.05 Unit Pavers – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include all excavation, the supply, placing, levelling and compacting of all granular, the supply and placement of concrete base and edge restraints, the supply and placement of drains, the supply and placement of concrete pavers and bedding sand, and the filling of all joints.

TS 850.10.06 Passive Irrigation Distribution Pipe – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include the supplying and placing of watering and aeration distribution pipe.

TS 850.10.07 Soil Cells – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include all excavation, the supply, placing, levelling and compacting of all granular, the supply and placement of soil cells, geotextiles and all required continuous soil trench components.

All costs associated with this Work shall be incidental to all related items of Work. No separate payment shall be made.

TS 850.10.08 Underdrain – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include the supplying and placing of perforated underdrain, geotextile and clear stone granular surround.

Appendix 850-A, January 2023
For Use While Designing and Administrating City Contracts

Note: This is a non-mandatory commentary appendix intended to provide information to a designer and contract administrator during the design and construction stage of a contract on the use of this TS specification in a City contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an owner's design decisions and methodology.

Notes to Designer:

The designer should insert the text in item 1) and append the form in Item 2) as indicated below.

1. *The designer should include example new wording in item 3 b) Contractor Soil Trenches Qualifications as part of Part 4 – Form C Experience and Qualifications Requirements in your request for tender document.*

Part 4 - Form C - Experience and Qualifications Requirements

RFT No. [insert Ariba Doc #], Contract No. [insert Contract #]

1. **Experience Requirements**

   [The Supplier must have the following experience in order to be considered for award of the Contract:

   a. **●]**

   [Note to Finalization: If specific experience or qualification requirements are necessary, any experience requirements must be worded as a clear pass/fail requirement so that there is no ambiguity as to what constitutes a pass vs. a fail. Experience requirements must be justified as a legitimate business objective and must not demonstrate a local preference or other unfair supplier bias or undisclosed preference. If no specific experience is required, then delete this Section 1 and replace with "Not Used".]

2. **Project Experience / Comparable Projects**

   The Supplier must provide reference projects for the purpose of confirming the Supplier's experience and track record of success. The Supplier shall provide the requested references for clients who have obtained construction services similar to those required for the Project from the Supplier in the last **[●][Note to Finalization: City to insert number.]** years. Failure to provide verifiable experience shall result in the bid being declared non-compliant.

3. **Qualification Requirements**

   a. **Current Certificate of Recognition (COR™) or equivalent OHS Certification**

      Each Supplier shall acquire and upload a copy of a valid Certificate of Recognition (COR™) or Equivalent OHS Certification in the legal name of the Supplier or in the case of a joint Bid, for, and in the name of, each member of the Joint Bid Team.

   b. **Contractor Soil Trenches Qualifications and Experience**

      Each Supplier shall provide name of qualified soil trench installer and field supervisor in Part 4 – Form E – Contractor Soil Trenches Qualification and Experience.

2. *The designer is to append example Form E – Contractor Soil Trenches Qualification and Experience in Part 4 of your request for tender document. If the form is not filled in to the satisfaction of the Contract Administrator, this may result in disqualification of the Bid.*

Part 4 – Form E – Contractor Soil Trenches Qualification and Experience

Pursuant to Section 1.9.7 (Other Mandatory Submission Requirements), the Supplier shall provide name of qualified soil trench installer and field supervisor.

Soil Trenches Experience Requirements	Response	Pass / Fail
Provide name of qualified installer whose work has resulted in successful installation of growing medium and planter drainage systems, underground piping, chambers and vault structures		
Does the qualified installer have at least 5 years of experience with projects of similar size, scope and complexity in dense urban areas (Yes/No)		
List company name where this person has worked for in the past 5 years.		
Provide name of field supervisor who is an experienced full-time supervisor employed by the installer who shall be present at the project site when work is in progress		
Does the field supervisor have at least 5 years of experience with projects of similar size, scope and complexity in dense urban areas (Yes/No)		
List company name where this person has worked for in the past 5 years.		