

# Niagara Falls Exchange Farmers' Market + Cultural Hub Landscape Specification

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Site Metal Fabrication- Landscape

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**Part 1 General**

**1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by Conditions of the Contract and Sections of Division 1.

**1.2 SECTION INCLUDES**

- .1 Supply and installation of materials and components for metal fabrications, including stair railings, miscellaneous metal components indicated on drawings and specified herein.

**1.3 RELATED WORK**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 32 13 13 – Site Concrete
- .3 Section 32 14 13 – Precast Concrete Unit Paver

**1.4 QUALITY ASSURANCE**

- .1 Execute Work only by company with adequate plant, equipment, and skilled workers to perform Work expeditiously, having been responsible for a high standard of workmanship in similar installation to that specified using architectural metals during a period of at least the immediate past 5 years. Specialized experience and capabilities are mandatory for work indicated herein. Capability in managing fine detailing will be required with respect to the following:
  - .1 Accuracy of metalwork
  - .2 Neatness of workmanship
  - .3 Hairline joinery
  - .4 Possessing proper equipment and know-how for the work
  - .5 Possessing keen understanding of cleanliness of shop, tools, methods, cleaning, blasting, and brushing work, so as to finish work with clean, consistent finishes free of staining.
- .2 Weld structural components in steel, to conform to requirements of CSA Standard W59-M, and by a fabricator fully certified by the Canadian Welding Bureau to conditions of CSA Standard W47.1 and W55.3, and other current applicable standards.

**1.5 REFERENCES**

- .1 Welding work in accordance with CSA W59.2-M unless specified otherwise.

**1.6 DESIGN**

- .1 Design Work of this Section by qualified Professional Engineer registered in the Province of Ontario and covered by a minimum \$1,000,000 professional liability insurance.
- .2 Exterior metal fabrication items shall be designed to withstand expansion and contraction of the component parts at an ambient temperature range of 80°C without causing harmful buckling, opening of joints, overstressing of fasteners, or other harmful effects.

**1.7 COORDINATION**

- .1 Coordinate the work in this Section with other appropriate Sections of the specifications to ensure proper scheduling for fabrication and installation of the work specified herein.

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- .2 Field measurements:
  - .1 Verify dimensions in the field prior to fabrication to assure proper fit. Perform Work to suit site dimensions and conditions.
  - .2 Detailed field measurements of structure dimensions and anchorage locations shall be undertaken prior to any fabrication. The Contractor shall adjust any dimensions on the drawings as necessary to ensure proper fit.
- .3 Provide cut-outs, templates, anchors, sleeves, inserts, and other accessories which are required for coordination of work of other trades including, but not limited to, cables, conduits, lighting, and as indicated on Drawings.
- .4 Be responsible for extra Work caused by, and time lost as result of failure to provide necessary cooperation, information or items to be fixed to or built in, in adequate time as determined by Project Schedule.

**1.8 SHOP DRAWINGS**

- .1 Submit electronic copies of detailed shop drawings to Consultant prior to fabrication.
- .2 Shop drawings shall include plans, sections and large scale details, and shall indicate components and methods of assembly, materials and their characteristics, fastenings, metal finishes, welds, and their structural characteristics relative to their purpose, and other fabrication information required.
  - .1 Indicate proposed site connections and methods.
  - .2 Shop drawings for work of this Section shall bear seal of qualified Professional Engineer licensed to practice in the Province of Ontario.
- .3 Alternative details may be considered by the Contract Administrator. Full details of any alternatives to be shown on shop drawings.
- .4 Submit design calculations for work of this Section bearing seal of qualified Professional Engineer licensed to practice in the Province of Ontario.

**1.9 SAMPLES**

- .1 Submit samples of shop finished materials, for each metal type, finish and finish direction, for approval by Consultant.
  - .1 Submit one (1) 30cm long 40x40 square stainless steel handrail for approval by consultant
  - .2 Stair nosing, (10) 150mm (6") long

**1.10 MOCK-UPS**

- .1 Construct mock-up panels at Metal Fabricators shop. Accepted Mock-ups may be retained as part of final installation work at discretion of the Consultant. Acceptance of workmanship shall establish basis for acceptance of remainder of work.
- .2 The purpose of the mock-up is to evaluate the proposed details and to assess the fabricator's workmanship.
- .3 Provide the following complete mock-up installations at least 10 days prior to fabrication:
  - .1 Mock-up; Hand Rail: provide one (1) railing panel, completely fabricated, including fasteners, finish, and support arm

**1.11 DELIVERY, STORAGE AND HANDLING**

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- .1 Store products in manufacturer's unopened packaging until ready for installation.
- .2 Label, tag or otherwise mark Work supplied for installation by other Sections to indicate its function, location in project and shop drawing designation.
- .3 Protect Work from damage during delivery, storage and handling. Handle with fabric slings, store and transport on non-staining wood blocking. Protect against scuffing during shipment.
- .4 Store products according to manufacturer's recommendations. Leave products wrapped or otherwise protected and under clean and dry storage conditions until required for installation.
- .5 Deliver Work to location designated by General Contractor and to meet requirements of construction schedule.
- .6 Exercise care not to scratch, mark, dent, or bend metal components during delivery, storage, and installation.

**1.12 PROJECT CONDITIONS**

- .1 Verify actual site dimensions by field measurements before fabrication; show recorded measurements on shop drawings.
- .2 Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

**1.13 SITE REVIEW**

- .1 Professional Engineer responsible for the production of the shop drawings and design calculations shall provide periodic site review during fabrication and installation and shall submit periodic site review reports.
- .2 Include cost of shop and field review.

**1.14 WARRANTY**

- .1 Warrant labour, materials and workmanship against defects and deficiencies for a period of 2 years from date of Substantial Performance of the Work.

**Part 2 Materials**

**2.1 GENERAL:**

- .1 Include materials, products, accessories, and supplementary parts necessary to complete assembly and installation of Work of this Section.
- .2 Incorporate only metals that are free from defects which impair strength or durability, or which are visible. Install only new metals, and free from scratches, surface contaminants, rust, waves, buckles, and that are clean, straight, and with sharply defined profiles.
- .3 Be responsible for structural design, member sizes, arrangement, supports, connections, and anchoring of Work of this Section. Coordinate and maintain materials, dimensions, layout and appearance.

**2.2 STAINLESS STEEL**

- .1 Stainless Steel railing: ASTM A269, Type 302 Commercial Grade, seamless welded.

**2.3 ALUMINUM MATERIALS**

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- .1 Aluminum Stair Nosing:
  - .1 Cast-in-place aluminum stair nosing c/w anti-slip epoxy/abrasive filler, fill-width of tread.
  - .2 Wooster products "spectra" type wp2c or similar approved; colour black.

## 2.4 FINISHES

- .1 Stainless Steel: Uniform finish to match samples accepted by Contract Administrator. Where grain direction is not indicated, verify with Consultant prior to fabrication.
  - .1 Handrails: AISI No. 4 linear brushed finish, grain direction as indicated on drawings.
- .2 Aluminum: Unexposed and exposed: Clear anodized to AAMA 611, designation AA-M10C22A41.
- .3 Galvanizing; hot dip after fabrication metal work: for irregular sections, zinc coating to meet specified requirements of CAN/CSA-G164. Use air cooling method (no water or chromate dipping treatment permitted).

## 2.5 FASTENINGS

- .1 Metal fastenings shall be uniform to metal materials and components being anchored or of a metal which will not set-up a galvanic action causing damage to the fastening or metal component under moist conditions.
- .2 Fastenings for pre-finished materials shall be of concealed type unless otherwise indicated, and when exposed finish is required, of matching pre-finishing materials.
- .3 Metal fastenings and accessories shall be of same texture, colour, and finish as material on which they occur, as selected by the Consultant.
- .4 All exposed fasteners to be tamper-proof.

## 2.6 WELDING MATERIALS

- .1 Steel: to CAN/CSA W59.
- .2 Aluminum: to CAN/CSA W59.2.

## PART 3 - EXECUTION

### 3.1 Fabrication

- .1 Examine site and field measure all previously executed and adjacent work which may affect work of this section. Show only field measurements on shop drawings. Report discrepancies between field measurements and dimensions on drawings.
- .2 Build work square, true, straight and accurate to required size, with joints closely fitted and properly secured. Where curved elements and components are required, ensure that fabricated elements match exactly the curves of elements and components adjacent.
- .3 Fabricate items from steel unless otherwise noted.
- .4 Where possible, fit and shop assemble work, ready for erection.
- .5 Join members with flush welds and mitre or notch as required. Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth, flush and make invisible.

Site Metal Fabrication- Landscape

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- .6 Use self-tapping shake-proof flat-headed stainless steel screws on items requiring assembly by screws or as indicated.
- .7 Form/assemble all components to shapes and sizes as indicated on drawings.
- .8 All site welds and damaged galvanized surfaces shall be coated with two coats of zinc rich paint.
- .9 Handrails and guards to meet the requirements of the building code.

**3.2 Drainage**

- .1 Provide drainage holes, at bottom of all vertical hollow members and on underside of horizontal hollow members to ensure complete drainage of all hollow members.

**3.3 Erection**

- .1 Install work square, plumb, straight, true and accurately and tightly fitted together, and to surrounding work.
- .2 Do welding work in accordance with CSA W59 M1989.
- .3 Provide suitable means of anchorage acceptable to Consultant such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Make field connections with bolts to latest edition CAN/CSA S16.1-94, or weld.
- .5 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .6 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .7 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .8 Grout metal posts in metal sleeves cast into concrete, with non-shrink quick setting epoxy anchor cement, unless detailed otherwise. Fabricate sleeves to 150mm minimum depth.

**END OF SECTION**

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Clearing & Grubbing

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**PART 1 - GENERAL**

**1.1 General Instructions**

- .1 Read and be governed by Conditions of the Contract and Sections of Division 1.

**1.2 Related Work**

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section: 02 41 13 – Site Demolitions and Removals
- .3 Section: 31 23 00 – Excavation, Trenching and Backfill

**1.3 Definitions**

- .1 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- .2 Grubbing consists of excavation and disposal of stumps and roots, boulders and rock fragments, to not less than a specified depth below existing ground surface.

**1.4 Protection**

- .1 Prevent damage to landscaping, buildings, pavements, and root systems of trees which are to remain. Repair any damaged items as directed by Consultant.
- .2 Replace any trees designated to remain, if damaged, as directed by Consultant.

**1.5 Public Safety**

- .1 Erect barricades to the approval of the Consultant such that all work of this section shall occur totally within areas not accessible to the public.

**PART 2 – PRODUCTS**

**2.1 Not used**

**PART 3 - EXECUTION**

**3.1 Preparation**

- .1 Inspect site and verify with Consultant trees designated for removal and trees to remain.
- .2 Locate and protect all utility lines. Preserve in operating condition active utilities traversing site.
- .3 Drawings showing utilities cannot be guaranteed as to accuracy or completeness.
- .4 Notify utility companies and arrange for necessary stake outs and approvals before starting tree removal.

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Clearing & Grubbing

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- .5 Ensure that all permits necessary to undertake the work are in place.

**3.2 Grubbing**

- .1 Grub out stumps and roots to not less than 500 mm below ground surface.
- .2 Grub out visible rock fragments and boulders, greater than 50 mm in greatest dimension.

**3.3 Removal and Disposal**

- .1 Remove felled and grubbed materials off site to the approval of the Consultant.
- .2 Felled timber becomes the property of the Contractor.

**3.4 Finished Surfaces**

- .1 Leave ground surface in condition suitable for stripping of topsoil and other stipulated operations.

**END OF SECTION**



Filter Fabric

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**Part 1 General**

**1.1 General Instructions**

- .1 Read and be governed by Conditions of the Contract and Sections of Division 1.

**1.2 Section Includes**

- .1 Materials and installation of filter fabric for site work.

**1.3 Related Work**

- .1 Section 31 23 00 - Excavation & Backfill
- .2 Section 01 33 00 – Submittal Procedures
- .3 Section 32 92 19 - Topsoil & Finish Grading

**1.4 Submittals**

- .1 All submissions shall be in accordance with Division 1.
- .2 Product Data: Submit product data for each type of filter fabric for review prior to commencing work.
- .3 Samples: Submit 3 samples of filter fabric specified to Consultant for review prior to commencing work.

**Part 2 PRODUCTS**

**2.1 Materials**

- .1 Filter Fabric: spun bonded Terrafix 270R or approved equal.
- .2 Deliver, store, and handle landscape materials to prevent damage and deterioration.

**Part 3 EXECUTION**

**3.1 Installation**

- .1 Filter Fabric
  - .1 Examine subgrade, finished surfaces, and installation conditions. Do not start work until unsatisfactory conditions are corrected. Do not begin landscape accessory Work before completion of final grading or surfacing.
  - .2 Remove loose material and debris from base surface before placing materials.
  - .3 Locate and layout filter fabric. Obtain Consultant's acceptance of layout prior to installation.
  - .4 Place filter fabric material by unrolling onto graded surface in orientation, manner and locations indicated.
  - .5 Place filter fabric material smooth and free of tension stress, folds, wrinkles and creases.

Filter Fabric

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- .6 Place filter fabric material on sloping surfaces in one continuous length from toe of slope to upper extent of filter fabric.
- .7 Overlap each successive strip of filter fabric 600 mm over previously laid strip.
- .8 Any cuts in filter fabric (e.g. to accommodate building columns) to be covered with an additional sheet of filter fabric. Additional sheet to overlap the cut by 600mm on all sides.
- .9 Pin successive strips of filter fabric with securing pins at interval as recommended by filter fabric manufacturer at mid point of lap.
- .10 Protect installed filter fabric material from displacement, damage or deterioration before, during and after placement of material layers.
- .11 Replace damaged or deteriorated filter fabric to approval of Consultant.
- .12 Perform cleaning during installation of the Work and upon completion of the Work. Remove from site excess materials, debris, and equipment. Repair damage resulting from work.

**END OF SECTION**

Aggregate Base Courses

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**PART 1- GENERAL**

**1.1 General Instructions**

- .1 Read and be governed by Conditions of the Contract and Sections of Division 1.

**1.2 Related Work**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 31 23 10 – Excavating, Trenching & Backfilling
- .3 Section 32 13 13 – Site Concrete

**1.3 References**

- .1 ASTM C 117-90, Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C 131-89, Test method for Resistance to Degradation of Small-Size Coarse aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C 136-92, Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D 698-91, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>)
- .5 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire, Inch Series.
- .6 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.

**1.4 Delivery, Storage and Handling**

- .1 Stockpile minimum 50% of total aggregate required prior to commencing operation.
- .2 Store cement in weather tight bins or silos that provide protection from dampness and easy access for inspection and identification of each.

**PART 2 - PRODUCTS**

**2.1 Materials**

- .1 Granular base material: Granular 'A', conforming to OPSS 101 and 1010, latest edition.
- .2 Granular sub-base material: Granular 'B', conforming to OPSS 101 and 1010, latest edition.
- .3 Crushed pit-run or screened stone, gravel or sand consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.

**PART 3 - EXECUTION**

**3.1 Sequence of Operations**

- .1 Place granular base after finished sub-base surface or subgrade is inspected and approved by Consultant.
- .2 Placing

### Aggregate Base Courses

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- .1 Construct granular base to depth and grade in areas indicated.
  - .2 Ensure no frozen material is placed.
  - .3 Place material only on clean unfrozen surface, free from snow and ice.
  - .4 Place material using methods which do not lead to segregation or degradation of aggregate.
  - .5 Place material to full width in uniform layers not exceeding 150mm compacted thickness.
  - .6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
  - .7 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .3 Compaction Equipment
- .1 Compaction equipment to be capable of obtaining required material densities.
  - .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Consultant before use.
  - .3 Equipped with device that records hours of actual work, not motor running hours.
  - .4 Compacting in accordance with ASTM D 698 and ASTM D 1557.
    - .1 Compaction of Road Pavement Base: Compact to density of not less than 100% SPMDD.
    - .2 Compaction of Sidewalks Base: Compact to density of not less than 100% of SPMDD.
    - .3 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
    - .4 Apply water as necessary during compacting to obtain specified density.
    - .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Consultant.
    - .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

### 3.2 Site Tolerance

- .1 Finished base surface to be within plus or minus 10mm of established grade and cross section but not uniformly high or low.

### 3.3 Proof Rolling

- .1 For proof rolling use roller of 45400kg gross mass with four pneumatic tires each carrying 11350kg and inflated to 620kPa. Four tires arranged abreast with centre to centre spacing of 915mm maximum.
- .2 Consultant may authorize use of other acceptable proof rolling equipment.
- .3 Proofroll top of base upon completion of fine grading and compaction.
- .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .5 Where proof rolling reveals defective areas:

Aggregate Base Courses

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- .1 Remove base, sub-base and subgrade material to depth and extent directed by Consultant.
- .2 Replace base material and compact in accordance with this Section.

**3.4 Inspection and Testing**

- .1 Testing of materials and compaction will be carried out by testing laboratory designated by Owner. Frequency of tests will be determined by Consultant.
- .2 Owner will pay costs for inspection and testing.

**3.5 Protection**

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Consultant.

**3.6 Survey**

- .1 Perform topographical survey of completed finished grade and submit data to Consultant.

**END OF SECTION**

Site Concrete

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**PART 1 - GENERAL**

**1.1 General Instructions**

- .1 Read and be governed by Conditions of the Contract and Sections of Division 1.

**1.2 Related Work**

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 03 10 00 – Concrete Forming & Accessories
- .3 Section 31 23 10 – Excavating, Trenching & Backfilling
- .4 Section 32 11 23 – Aggregate Base Courses

**1.3 Standard**

- .1 Concrete materials and methods of construction: to CSA-A23.1 and testing in accordance with CSA-A23.2 unless otherwise specified.
- .2 Municipal concrete sidewalks to meet City of Niagara Falls Standards.

**1.4 Construction Quality Control**

- .1 Submit proposed quality control procedures for Consultant's approval, including, but not limited to, proposed methods of concrete protection during hot or cold weather conditions.

**1.5 Qualifications**

- .1 Contractor shall provide a foreman with a minimum of five (5) years' experience, competent and skilled in the work of this section to direct all of the work to be performed, and to be present at all times during the performance of the work.
- .2 All work must be executed by skilled tradesmen having at least five (5) years experience in this type of work.

**1.6 Quality Assurance**

- .1 Submit proposed quality control procedures for Consultant's approval including, but not limited to, proposed methods of concrete protection during hot or cold weather conditions.
- .2 All materials must conform to CAN3 - A23.1, latest edition. A copy must be kept on-site at all times during construction.
- .3 Furnish the Consultant with a certificate prepared by the ready-mix concrete suppliers stating that all requirements regarding strength, slump, air entrainment, mix, materials and ratio have been met and maintained.
- .4 Prior to pouring concrete obtain the approval of the Consultant of all form work, placement of reinforcing steel, consolidation of subgrade and placement and consolidation of granular base.
- .5 Ensure work complies with the Ontario Building Code and all pertinent local by-laws and regulations. These shall govern in case of conflict with the specifications. Obtain and pay for all necessary permits before starting work.
- .6 Consultant shall have authority to reject or call for improvements in workmanship where he considers that concrete work falls below acceptable standard. Contractor shall be given one day notice that all concreting shall cease unless such improvements are made.

**1.7 Product Delivery, Storage and Handling**

### Site Concrete

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- .1 Store all materials in accordance with CAN3-A23.2-M77, latest edition.
- .2 Store reinforcing steel on racks or skids. Protect from contamination by dirt or other materials. Maintain steel in its fabricated form.
- .3 Store forms off the ground and sufficiently supported to prevent warping or distortion. Protect from contamination by oil, grease, water, earth, etc.
- .4 All concrete is to be ready mixed at plant and transported to the site by truck in accordance with CAN3-A23.1-M77. Hand mixed concrete is not allowed unless approved in writing by the Consultant prior to starting any work.
- .5 Convey concrete from the mixer to the place of final deposit as rapidly as possible, with as little re-handling as is practical. Avoid segregation and/or loss of material.
- .6 Place concrete into final position and at such a rate that it remains plastic at all times and flows readily between reinforcement, into all corners and crevices and around all embedded fixtures. Pour in a continuous operation between expansion joints.
- .7 Thoroughly clean all equipment, used for mixing or transporting of concrete, of all hardened concrete and foreign material prior to placing concrete.
- .8 Do not allow concrete to be contaminated by foreign materials. Do not use re-tempered concrete unless approved in writing, by the Consultant.
- .9 Obtain the approval of the Consultant of the type, number and method of use of mechanical vibrators. Do not operate a vibrator for longer than 10 seconds in any one location.
- .10 Maintain constant control to ensure that finished concrete is dense, uniform, free of air holes or honeycombs and that no segregation of aggregates and cement paste occurs.

#### **1.8 Job Conditions**

- .1 Protect all concrete surfaces from damage or harmful effects of weather, water, mechanical shock or trespassers until concrete is properly cured.
- .2 There shall be no concrete pouring in temperatures below 10 deg C without written permission of the Consultant.

#### **1.9 Samples and Mock-Ups**

- .1 Contractor to provide a sample mock-up for approval of all concrete work (paving, walls, steps) per the detail shown on the drawings. The mock-up will show the sizes and final installation relationships between the various adjacent materials, and the finishes as specified.
- .2 The approved mock-up shall establish the standard by which all work shall be assessed. Work that fails to meet the standard set by the mock-up shall be replaced.
- .3 Mock-up shall not be incorporated into the work, and shall be protected for the duration of the contract.

Site Concrete

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**PART - PRODUCTS**

**2.1 Materials**

- .1 Portland Cement.
- .2 Water: to CSA-A23.1.
- .3 Aggregates: to Building Excavation & Backfilling.
- .4 Air entraining mixture.
- .5 Chemical admixtures: Obtain written approval of Consultant before using admixtures.
- .6 All other concrete materials: to CSA-23.1.
- .7 Pre-moulded joint fillers: Bituminous impregnated fibreboard: to ASTM D1751.
- .8 Curing Blanket: **UltraCure Sun**, manufactured by McTech Group Inc., and distributed by Geroquip Inc., Laval, Quebec, tel: 450.978.0200.

**2.2 Concrete Mixes**

- .1 Use ready mix concrete. Use water reducing agent in all concrete.
- .2 Proportion normal density concrete in accordance with CAN3-A23.1 to give following properties (unless noted otherwise on the drawings):
- .3 Minimum compressive strength: and 32 MPa at 28 days.
- .4 Minimum cement content: 309 kg/m<sup>3</sup> of concrete.
- .5 Class of exposure: to CSA A23.1-M90.
- .6 Slump at time and point of discharge: per CSA-A23.1
- .7 Air content: 5-8% exterior slabs.
- .8 Provide a corrosion inhibitor into the concrete mix per manufacturers specifications.
- .9 With the exception of air entraining agents, other admixtures may only be used with the written approval of Consultant. The use of agents to lower the freezing point of the mix will not be permitted.
- .10 Maximum size of coarse aggregate 20mm.
- .11 Slump shall be in accordance with Table 6 of CSA-A23.1 within the tolerances specified.
- .12 Provide certification that mix proportions selected will produce concrete of specified quality yield and strength.
- .13 Provide certification that plant, equipment and all materials to be used in concrete comply with requirements of CSA-A23.1.

**PART 3 - EXECUTION**

**3.1 Workmanship**

- .1 Place concrete in accordance with CSA-A23.1.
- .2 Prior to placing concrete for slabs on grade, verify that sub-grade and base courses have been compacted and tested.
- .3 Obtain Consultant's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.
- .4 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .5 Prior to placing of concrete obtain Consultant's approval of proposed method for protection of concrete during placing and curing in adverse weather.



## Site Concrete

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- .6 While placing concrete, compact thoroughly and uniformly by approved means to ensure a dense homogeneous structure free of air pockets, and honeycombs and closely bonded with reinforcement.
- .7 Ensure accurate stepped slabs to receive inlaid concrete unit paving and tree grate. Paver cutting will not be permitted to suit incorrect stepped slabs.

### 3.2 Finishes

- .1 Formed surfaces exposed to view to CSA-A23.1.
- .2 For typical concrete sidewalks and walkways: Medium broom finish perpendicular to road curb or across direction of walking.
- .3 For curbs: Apply smooth wood float finish.
- .4 For planters- See Layout plan for location and layout: Medium sandblast finish to concrete planters.

### 3.3 Joints

- .1 For walkways:
  - .1 Sawcut control joints per pattern shown on the drawings .
- .2 For curbs:
  - .1 Sawcut control joints at min. 4m on center; tooled radius on expansion joints; no margins.
  - .2 Provide expansion joints in accordance with CSA-A23.1 as shown on the drawings and between new concrete and all new or existing structures.
  - .3 No offsets will be allowed between adjacent sections of joint fillers and no plugs of concrete will be permitted anywhere within an expansion joint.

### 3.4 Joint Fillers

- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Consultant. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .2 Locate and form isolation joints as indicated. Install joint filler.
- .3 Use 10mm thick to separate slabs-on-grade from vertical surfaces or structures.
- .4 Do not install joint filler between road curbs and pavements.
- .5 Provide joint backing as required and caulking for expansion in all poured-in-place concrete work except for pavements. Caulking colour to match concrete.

### 3.5 Curing

- .1 Method of curing and curing blanket shall be per manufacturers specification.
  - .1 Cure for minimum 4 days with curing blanket.
  - .2 Apply specified curing blanket immediately after surface texturing.
  - .3 Protect formed or sawed joints from evaporation during curing period.

### 3.6 Field Quality Control

- .1 Inspection and testing of concrete materials will be carried out by a Testing Laboratory designated by Consultant in accordance with General Conditions.
- .2 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.

Site Concrete

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**END OF SECTION**

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Exterior Site Furnishings

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**PART 1 - GENERAL**

**1.1 General Requirements**

- .1 Read and be governed by Conditions of the Contract and Sections of Division 1.

**1.2 Related Work**

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 32 13 13 – Site Concrete
- .3 Section 32 14 13 – Precast Concrete Unit Paving

**1.3 Submittals**

- .1 Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.

**PART 2 - PRODUCTS**

**2.1 Manufacturers**

- .1 Custom Wood topper at Planter C

Street life or approved equal , Contact: 484 496 8281; [streetlife@streetlife.nl](mailto:streetlife@streetlife.nl);  
<https://www.streetlife.nl/us>

- .1 Product: Solid Crosswise Topseats
- .2 Size ; 70mm x 70mm hard wood slats – Seat depth : 1220 mm ; see plans for custom length
- .3 Quantity: See detail 7/L601 and L202 planter bench detail plan
- .4 Securely fastened onto precast concrete wall cap and as per manufacturer's requirements.

- .2 Custom Wood Topper at Planter A, B, D and E with Backrest

Street life or approved equal , Contact: Peter Koning 484 496 8281; [streetlife@streetlife.nl](mailto:streetlife@streetlife.nl);  
<https://www.streetlife.nl/us>

2.1 Wood Topper

- .1 Product: Solid Crosswise Topseats
- .2 Size ; 70mm x 70mm hard wood slats – Seat depth : 500 mm ; see plans for custom length
- .3 Quantity: See detail 7/L601 and L202 planter bench detail plan
- .4 Securely fastened onto precast concrete wall cap and as per manufacturer's instructions.

2.2 Backrest

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Exterior Site Furnishings

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- .1 Product: Backrest with vertical ; 70mm x 70mm hard wood slats and rounded top.
  - .2 Size : 350 x 1200- Use two segments as per layout plans
  - .3 Quantity: See detail 7/L601 and L202 planter bench detail plan
  - .4 Securely fastened onto wood topper as per manufacturer's instructions.
- .3 Bike racks
- Street life or approved equal , Contact: 484 496 8281; [streetlife@streetlife.nl](mailto:streetlife@streetlife.nl);  
<https://www.streetlife.nl/us>
- .1 Product: R&R-BP-CT
  - .2 Size :70x75x7cm
  - .3 Color: Powder coated steel with gray finish (RAL 7005 Mouse gray)
  - .4 Quantity: 6
  - .5 Securely fastened onto precast concrete wall cap and as per manufacturer's instructions.
- .4 Garbage and Recycling Container
- Equiparc, Contact: 416.521.5552; [info@equiparc.com](mailto:info@equiparc.com); [www.equiparc.com](http://www.equiparc.com)
- .1 Product: .EP 3990 as supplied by Equiparc (450.346.1882) or approved equivalent.
  - .2 Colour: .1 Meteor Gray with IPE coverings
  - .3 Quantity:4
  - .4 Surface mounted onto concrete slab below concrete unit paving as per manufacturer's requirements..
- .5 Standard Bollards:
- Street life or approved equal , Contact: Peter Koning 484 496 8281; [streetlife@streetlife.nl](mailto:streetlife@streetlife.nl);  
<https://www.streetlife.nl/us>
- .1 Product: R&R-BOL-75 TH
  - .2 Material : FSC hardwood with solid galvanized steel frame
  - .3 Size :75x15x15cm
  - .4 Quantity:15
  - .5 Place ground anchor in poured in place concrete as per manufacturer's instructions.
- .6 Removable Bollards
- Reliance Foundry or approved equal, Contact: 1-877-789-3245; [info@reliance-foundry.com](mailto:info@reliance-foundry.com)  
;<https://www.reliance-foundry.com/#gref>
- .1 Product: R-8464-RA Powder Coated Removable Bollard
  - .2 Colour: Black Semi Gloss with white reflective strips
  - .3 Quantity: 10
  - .4 Surface mounted onto concrete paving as per manufacturer's instruction

## Exterior Site Furnishings

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### .7 Light Bollards

Lithonia Lighting or approved equal, Contact: 800.279.8041; <https://lithonia.acuitybrands.com/>

- .1 Product: KBR8 LED- Refer to electrical drawings for electrical specification
- .2 Size: 101.6 cm
- .3 Colour: DBLXD Black
- .4 Quantity: Refer to electrical drawings
- .5 Refer to landscape material plans and detail 5/L602 for mounting details

### .8 Push Plate Bollards

WIKK or approved equal, contact 562-217-7811; [kyle@wikk.com](mailto:kyle@wikk.com); <https://wikk.com/>

- .1 size: 150mm x 200mm x 1450mm
- .2 Colour: Powder coated aluminum enclosure finish color gray (RAL 7005 Mouse gray)

### .9 Gator bags for tree irrigation:

- .1 Gather bag to be installed for each street tree – See Section 32 93 10 Trees, Shrubs and Groundcovers.

## 2.2 Fasteners

- .1 All items to manufacturer's recommendations and as included herein: all metal fastenings to be tamper-proof stainless steel or galvanized steel.

## 2.3 MORTAR, GROUT OR ADHESIVES

- .1 All items as per manufacturer's recommendation.

## PART 3 - EXECUTION

### 3.1 Examination

- .1 Examine areas and conditions for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 Installation

- .1 Comply with manufacturer's written installation instructions.
- .2 Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings, per manufacturer's specifications.

### 3.3 Cleaning

- .1 After completing site and street furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

Exterior Site Furnishings

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**END OF SECTION**

Precast Concrete Unit Paving

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## **PART 1- GENERAL**

### **1.1 General Instructions**

- .1 Read and be governed by Conditions of the Contract and Sections of Division 1.

### **1.2 Related Work**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 31 23 10 – Excavating, Trenching & Backfilling
- .3 Section 32 11 23 – Granular Bases
- .4 Section 32 13 13 – Site Concrete

### **1.3 Quality Assurance**

- .1 All unit paving work shall be carried out by an approved contractor having at least 5 years experience in the work similar to that specified here.
- .2 All required pavers are to be supplied from the same production run or the same quarry to ensure uniform colour throughout paved area.
- .3 Unit pavers shall be identical in form, colour and construction as approved samples.
- .4 Before commencing work, visit site and become familiar with the specifications governing the work of others, particularly drainage, backfill, concrete, mechanical and electrical work.
- .5 Commencement of work will denote acceptance of sub-surfaces and conditions. Subsequent failure of installed work of this Section due to sub-surface defects will be rectified at no cost to the Owner.

### **1.4 Protection**

- .1 Prevent damage to buildings, landscaping, curbs, sidewalks, and adjacent property. Make good any damage.

### **1.5 Warranty**

- .1 Concrete unit paving work shall be guaranteed for a period of two years in accordance with the General Conditions of the Contract.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Main street plaza and Market Plaza  
Bolduc Avenue Paver or approved equal <http://www.professionnels.bolduc.ca/en>  
Contact: Gary Ritcher 514-778-1717; grichter@bolduc.ca  
Size : 300x450x100mm

Precast Concrete Unit Paving

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Finish: Grenart Finish

Colour: 33% Light Gray; 33% Granit Gray; 33% Opal White

Pattern: Running bond, random color mix

Quantity: Verify quantities in field.

- .2 Concrete slab; 150mm thick below pavers.
- .3 Sand Setting Bed: Concrete Sand conforming to CSA A23.1-94 gradation for fine aggregate.
- .4 Joint Filler: polymeric sand
  - .1 Broom all sand into joints. Prior to watering of the paving surface, it is imperative to use a surface blower to remove excess sand on the paver surfaces to avoid polymeric hazing on the pavers which would be difficult to remove without a special purpose industry supplied cleaning product.
- .5 Sub-drainage to be specified and approved by Civil or Geotechnical Engineer.

.2 Tactile Paver

- .1 Bolduc Avenue Paver or approved equal <http://www.professionnels.bolduc.ca/en>  
Contact: Gary Ritcher 514-778-1717; gricher@bolduc.ca  
Size : 150x150x100mm  
Finish: Split Face  
Colour: 100% Anthracite  
Pattern: Stack pattern  
Quantity: Verify quantities in field.
- .2 Concrete slab; 150mm thick below pavers.
- .3 Sand Setting Bed: Concrete Sand conforming to CSA A23.1-94 gradation for fine aggregate.
- .4 Joint Filler: polymeric sand
  - .1 Broom all sand into joints. Prior to watering of the paving surface, it is imperative to use a surface blower to remove excess sand on the paver surfaces to avoid polymeric hazing on the pavers which would be difficult to remove without a special purpose industry supplied cleaning product.
- .5 Sub-drainage to be specified and approved by Civil or Geotechnical Engineer.



Precast Concrete Unit Paving

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**PART 2 - EXECUTION**

**3.1 Allowable Tolerances**

- .1 Finish paving surfaces within 6mm of established elevations and 3mm of other surfaces at joints between other paving types, manholes and other features within paved areas; and within 3mm under a 3m long straightedge.

**3.2 Site Conditions**

- .1 Carry out work of this Section only when surfaces are at least 5°C and the temperature is rising, or:
- .2 Carry out the work of this Section involving mortar and grout only when temperature is at or above that recommended by manufacturer.
- .3 Suspend paving operation when temperature falls below specified minimum.

**3.3 Excavation and Backfilling**

- .1 As per Section 31 23 10.

**3.4 Granular Base**

- .1 Place concrete to thickness as indicated on detail drawings.

**3.5 Sand Setting Bed**

- .1 Place sand to compacted thickness as indicated on detail drawings.

**3.6 Layout and Installation of Unit Paving**

- .1 Install unit paving true to grade, in location, layout and pattern as indicated on detail drawings.
- .2 Stake layout of unit paving for Consultant to approve prior to commencing installation.
- .3 Install edge restraint where pavers meet soft surfaces, per manufacturer's specifications.
- .4 Where required, cut paving units accurately with a concrete saw. Do not damage edges or exposed surfaces.
- .5 On tight radii, cut and fit pavers to maintain alignment. No pavers less than 50% of the original size shall be used.
- .6 Chipped, blemished or defective units shall not be installed.
- .7 Ensure that all grade transition zones are made gently and smoothly.
- .8 Clean surfaces of unit paver and maintain free of abrasive and staining substances.
- .9 All work within 1m of the laying face must be left fully compacted with sand-filled joints at the completion of each day.

Precast Concrete Unit Paving

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**3.7 Adjustment and Replacement**

- .1 At time of final acceptance at project completion, and again at termination of guarantee period, work of this section will be inspected by consultant, and adjustments and replacements shall be made under work of this section.
- .2 The warranty period begins after receipt of written acceptance of work of this Section by the Consultant.
- .3 Adjustment and replacement work shall be performed as specified in this Section with materials of same size, variety and quality of material replaced.
- .4 Replacement work shall be done under an additional guarantee of the same length and conditions as described in this Specification. It shall date from time of Consultant's approval of replacement work.

**END OF SECTION**

Topsoil Placement and Grading

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**PART 1 - GENERAL**

**1.1 Summary**

- .1 The work in this section includes, but is not limited to, the following:
  - .1 Mixing and testing of topsoil, sand or aggregate and pine bark or other organic material to create Planting Soils.
  - .2 Installation of Planting Soil.
  - .3 Compacting and grading of Planting Soil.
  - .4 Adding organic material to the surface layer of planting soils.
- .2 References:
  - .1 The following references and standards are use herein and shall mean:
    - .1 ASTM: American Society of Testing Materials.
    - .2 USDA: United States Department of Agriculture.
    - .3 U.S. Department of Agriculture, Natural Resources Conservation Service, 2003. National Soil Survey Handbook, title 430-VI. Available Online: <http://soils.usda.gov/technical/handbook/>.
    - .4 Agriculture and Agri-Food Canada
      - .1 The Canadian System of Soil Classification, Third Edition, 1998.
    - .5 Canadian Council of Ministers of the Environment
      - .1 PN1340-[2005], Guidelines for Compost Quality.

**1.2 Related Sections**

- .1 Division 1– Submittal Procedures
- .2 Excavating, Trenching & Backfilling by civil
- .3 Section 32 92 23 – Sodding
- .4 Section 32 93 10-Tree, Shrubs and Groundcovers

**1.3 Submittals**

- .1 CRITICAL PATH PROCESSING:
  - .1 The Contractor shall be responsible for recognizing that these critical project materials warrant timely attention, that the testing process to achieve approved materials SHALL BE CONSIDERED A LEAD TIME ITEM, and that under no circumstance shall failure to comply with all specification requirements be an reason for expedient substitution of unacceptable material(s).

Topsoil Placement and Grading

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- .2 Product Data: Submit manufacturer product data and literature describing all products required by this section to the City's Representative and/or consultant for approval. Provide submittal **twelve weeks** before the installation of Planting Soil.
- .3 Material source locations: Submit locations of soil material sources. The City's Representative and/or consultant shall have the right to reject any material source. Submit the name, address and telephone number of the source contact, and the location of the soil source including directions to the specific field location on the property. Provide submittal twelve weeks before the installation of planting soil.
- .4 Samples: Submit samples of each product and material where required by the specification to the City's Representative and/or consultant for approval. Label samples to indicate product, specification number, characteristics, and locations in the Work. Samples will be reviewed for appearance only. Compliance with all other requirements is the exclusive responsibility of the contractor. Delivered materials shall closely match the samples. Submit samples of all soil mix components a minimum of 12 weeks before the installation of planting soil.
  - .1 Submit 4 liter samples of all topsoil, soil mixes, and sand and soil additive products in this section. The number of samples shall be as required for each material.
    - .1 Samples should be labeled to include the location of the source of the material.
    - .2 Samples of all topsoil, sand, and planting soil shall be submitted at the same time as the particle size and physical analysis of that material.
    - .3 Each test report shall be marked with the following information:
      - .1 Date issued.
      - .2 Project Title and names of Contractor and material supplier.
      - .3 Name of material and reference identifying the type of material.
      - .4 Date, place, and time of sampling with a record of temperature and weather conditions.
      - .5 Location of material source.
      - .6 Testing laboratory name, address, and telephone number, and name(s), as applicable, of each field and laboratory inspector.
      - .7 Type(s) of test
      - .8 Results of tests including recommendations of acceptable ranges of the test data for the types of plants to be planted in the soil.
    - .4 Samples and Test reports for each material must be submitted at the same time. Samples and analysis of Topsoil, and Planting Soil, must be submitted within 28 calendar days of sampling.
    - .5 Samples of all products and Planting soil components shall be submitted twelve weeks before the installation of Planting soil. Planting soils shall be submitted no less than two weeks after the approval of the mix component.

Topsoil Placement and Grading

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- .6 Do not submit Planting Soil for approval until all mix components have been approved by the City's Representative and/or consultant.
- .5 Submit for approval soil test analysis report to the City's Representative and/or consultant for each sample of topsoil and planting soil from an approved soil-testing laboratory.
- .1 The testing laboratory shall be approved by the City's Representative and/or consultant in advance. All soil and planting soil tests shall be conducted by soil laboratories accredited by The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), except as noted below. Current listing of accredited laboratories may be obtained on the web at <http://www.omafra.gov.on.ca/english/crops/resource/soillabs.htm>. Submit the name of the soil lab for approval prior to starting the testing process.
- .2 All soils shall also be tested for chemical characteristics in compliance with environmental standards established for the Project. See Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act* Table 3 (<http://www.ene.gov.on.ca/envision/gp/4697e.pdf>).
- .3 All tests shall be performed in accordance with the current standards of the Association of Official Agriculture Chemists or the "Methods of Soil Analysis Part 1-3 as published by the Soil Scientist Society of America.
- .4 Provide a particle size analysis for all topsoil and planting soils including the following gradient of mineral content:
- | <u>USDA Designation</u> | <u>Size in mm.</u> |
|-------------------------|--------------------|
| Gravel                  | +2mm               |
| Very Coarse Sand        | 1-2 mm             |
| Coarse Sand             | 0.5 -1 mm          |
| Medium Sand             | 0.25-0.5 mm        |
| Fine Sand               | 0.1-0.25 mm        |
| Very Fine Sand          | 0.05-0.1 mm        |
| Silt                    | 0.002-0.05 mm      |
| Clay                    | minus 0.002 mm     |
- .1 Particle size analysis for topsoil and planting soils to include sand sieve analysis shall be performed and compared to the USDA Soil Classification System per ASTM D422 (hydrometer test) or ASTM F1632 (pipette test). The silt and clay content shall be determined on soil passing the #270 sieve and shall be reported separately.
- .5 Provide a chemical analysis including the following:
- .1 pH (Reaction)
- .2 Nutrient levels by parts per million including, phosphorus, potassium, calcium, magnesium, manganese, iron, copper, zinc and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the planting soil.
- .3 Soluble salt by electrical conductivity of a 1:2 soil water sample measured in Milliohm per cm.

Topsoil Placement and Grading

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- .4 Cation Exchange Capacity (CEC).
- .5 Report suitability of topsoil or Planting Soil for growth of applicable planting material. Soil analysis tests shall include recommendations for normal acceptable ranges of soil chemical attributes for the type of plants included in the project in the same units as the test data.
- .6 Provide percent of organic matter by weight as determined by ignition (Ash Burn Test or Walkley/Black Test, ASTM F1647) with the following modification. Samples of planting soil shall be screened through a 6mm screen rather than the standard 2mm screen. Planting soil samples shall not be "floated" to remove plant matter prior to testing for organic matter.
- .7 Provide a physical analysis of each planting soil to include the following test results:
  - .8 Water permeability with the sample compacted to 80% and 85% maximum proctor density utilizing proctor test (ASTM D 698-91).
  - .9 The City's Representative and/or consultant may request additional Planting soil test on different mix component ratios in order to attain results that more closely meet the mix requirements.
- .6 Submit the manufacturer's particle size analysis for all sand and gravel to the City's Representative and/or consultant for approval. Provide the manufacturer's Fines Modulus Index for each sand source.
- .7 Submit the manufacturer's particle size analysis, pH and certificate of length of composting period for all pine bark and other organic materials to the City's Representative and/or consultant for approval. The analysis performed shall include:
  - .1 Reaction (pH)
  - .2 Salinity
  - .3 % Organic matter
  - .4 Carbon : Nitrogen (C:N) Ratio
  - .5 Solvita Maturity Index
  - .6 Percent Moisture
  - .7 Testing for physical, chemical and biological contaminants and pathogens as required by local government regulations.
  - .8 Certified reports shall be from samples taken within four months of the date of the sample submission.
- .8 Compaction testing results: Submit results of all compaction testing required by the specifications including the bulk density test of the mock up and installed soil, and the compaction testing log of penetrometer and moisture meter readings to the City's Representative and/or consultant for approval.
- .9 Laboratory's comments or recommendations regarding amendment requirements or procedures shall not be interpreted to prescribe or dictate procedures or quantities of soil materials for the work of this Contract. Final approval of soil amendment procedures shall be approved by the City's Representative and/or consultant.
- .10 The City's Representative and/or consultant reserves the right to require additional soil analysis at any time such additional samples of materials are deemed necessary for

### Topsoil Placement and Grading

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verification of conformance to specification requirements. Contractor shall furnish samples for this purpose upon request and shall perform testing as requested.

- .11 For Topsoil and Planting Soil, submit sufficient testing to convey the range of material quality expected from these natural materials.
- .12 All testing will be at the expense of the Contractor.

#### **1.4 Sequencing and Scheduling**

- .1 General: Prior to the start of Work, prepare a detailed schedule of the work for coordination with other trades.
- .2 Schedule the installation of Planting Soil after the area is no longer required for use by other trades and work.
- .3 Schedule all utility installations prior to beginning work in this section.

#### **1.5 Quality Assurance**

- .1 Contractor is solely responsible for quality control of the Work.
- .2 Comply with applicable requirements of the laws, codes, ordinances and regulations of federal, State and municipal authorities having jurisdiction. Obtain necessary permits and approvals from all such authorities.
- .3 Comply with all requirements for control of silt and sediment during soil installation work as indicated in the contract documents. Use any other methods and procedures requested by the City's Representative and/or consultant to control silt and sediment as project conditions warrant.

#### **1.6 Delivery, Storage, And Handling**

- .1 Weather: Do not mix, deliver or place soils in frozen, wet, or muddy conditions.
  - .1 Where construction sequencing requires work during cold weather, protect sub grades and bulk materials from freezing using covers or as needed heated tenting. Sub grades 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.
  - .2 Harvest topsoil and prepare soil mixes ahead of the scheduled work during periods of warm weather. Protect stockpiles of soil and soil mixes from freezing and saturation. Remove soil from within the interior of the stockpile where soil and soil mixes are not frozen. At the end of each day cover the exposed working face of the stockpile sufficient to keep the pile from freezing.
- .2 Protect soil stock piles from rain and washing that can separate fines and coarse material. Cover stockpiles with plastic sheeting at the end of each work day.

### Topsoil Placement and Grading

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- .3 Protect Planting Soil stock piles from contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage.

## Part 2 Products

### 2.1 Topsoil

- .1 Top soil shall be fertile, loam, sandy loam to sandy clay loam, suitable for the germination of seeds and the support of vegetative growth, which is a naturally produced soil harvested from the O or A horizon of the soil profile and meeting the following requirements.
  - .1 Top soil texture shall be loam, sandy loam to sandy clay loam. Topsoil shall have clay content between 15 and 23%; combined silt and clay content between 35 and 60% and gravel/ stone content of no more than 5%.
  - .2 It is the intent of this specification to use naturally occurring soils available within the Toronto region
  - .3 Top soil shall retain a significant portion of the soils ped structure when stockpiled. Peds are defined as the clumps of soil naturally aggregated during the soil building process, by clays and soil biology.
  - .4 Top soil shall contain between 2.5 to 5 percent, by dry weight, organic matter.
  - .5 Top soil shall not contain materials and contaminants at levels that would be harmful to plant growth; or impair drainage, installation or maintenance of the resulting soil mix; or adversely impact its intended use including the following: refuse; roots; heavy or stiff lumps of clay; stones larger than 75 mm (3"); wood or sticks larger than 25mm (1 inch) in diameter; construction debris; brush; litter; large clumps of root mats of plants; deleterious substances; subsoil; plant or soil pests; undesirable grasses including crabgrass or couch grass, noxious or weeds or weed seeds; foreign objects; and/or toxic materials. The City's Representative and/or consultant shall determine if the quantities of any of these materials is sufficient to cause rejection of the Top Soil
  - .6 Top soil shall not contain quack-grass rhizomes, *Agropyron repens*, and the nut-like tubers of nutgrass, *Cyperus esculentus*, and all other primary noxious weeds.
  - .7 Top soil pH value shall be between 6.5 and 7.8.
  - .8 Top soil shall have a maximum salinity of saturation extract conductivity: 3.0 mmhos/cm or dS/m at 25 degrees C.
- .2 Top soil shall be harvested from approved source locations that comply with all regulations governing the removal of topsoil.
- .3 Top soil may be purchased from a source of collected topsoil from development sites provided the sources of the soil stock pile is of similar textures and meets the requirements of this specification.
- .4 Top soil shall not be a soil mix including sand, fertilizer, or compost added to soil in order to meet the texture, chemical or organic requirements for top soil. The organic matter content of the soil shall be residue of long term, natural soil building processes and not from added Compost.



Topsoil Placement and Grading

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- .5 Top soil shall not be screened through sieves or screens smaller than 500mm to avoid eliminating the required soil ped sizes.
- .6 Submit source location and a list of all crops grown on the soil and any herbicides and pesticides applied over the previous three years.
- .7 Submit 4 liter samples from each topsoil source with soil testing results. The sample shall be a mixture of the random samples taken around the source field or stockpile.

**2.2 Coarse Sand**

- .1 Coarse concrete sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index between 2.8 and 3.2.

- .2 Physical Analysis

| Sieve Size | % Passing | % Retained | %Dimension Class   |
|------------|-----------|------------|--------------------|
| 25mm       | 100.0     | 0.0        | Gravel             |
| 6mm        | 100.0     | 0.0        | Fine Gravel        |
| #10        | 96.6      | 3.4        | Very Coarse Sand   |
| #20        | 82.8      | 13.8       | Coarse Sand        |
| #40        | 38.4      | 44.4       | Coarse Sand        |
| #60        | 12.0      | 26.4       | Medium Sand        |
| #80        | 5.5       | 6.5        | Fine Sand          |
| #100       | 3.7       | 1.8        | Very Fine Sand     |
| #200       | 1.4       | 2.3        | Very Fine Sand     |
| Pan        |           | 1.4        | Silt/Clay combined |

- .3 The results must be submitted for Fines Modulus Index, percent (%) retained as well as (%) passing for all sieve sizes. Failure to include any of the aforementioned criteria will be cause for rejection of the test report.
- .4 Coarse Sand shall be clean, sharp, mineral sand.
- .5 Chemical analysis shall be as follows:
  - Organic matter content (% oven dry weight of soil) 0-0.5%.
  - pH shall be less than 8.6
  - Soluble salt content (Conductivity) Less than 0.5 mmhos/cm for 1:2 sample to water ratio.
  - Sand shall not contain toxic substance content at levels harmful to plant growth.
- .6 Provide an eight liter sample with manufacturers literature and material testing certification that the product meets the requirements.

**2.3 Pine Bark**

- .1 Horticultural grade milled pine bark size 0.1 mm - 15.0 mm. Pine bark shall be composted at least nine months. PH shall range between 4 and 5.0. Sap wood content less than 10%

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- .2 Pine Bark shall be composted long enough to exhibit a dark brown color, approximately the color of dark chocolate candy with 70% chocolate content. Pine Bark the color of milk chocolate or lighter, or with an anaerobic odor or a pine sap odor shall be rejected.
- .3 Provide a two 4 liter sample with manufacturer’s literature and material testing certification that the product meets the requirements.

**2.4 Compost**

- .1 Compost for blending planting soil mixtures shall be a stable, humus-like material produced from the aerobic decomposition. Feedstock shall be yard waste trimmings and/or source-separated municipal solid waste of types that produce a fugally dominated Compost, composted and cured until the maturity status complies with indices specified below. Except as specified herein, Compost shall conform to the requirements for Category A Compost as defined in the Guidelines for Compost Quality (2005), Canadian Council of Ministers of the Environment.
- .2 Compost shall not contain debris such as sharp objects, plastics, trace elements and foreign matter in excess of that defined for Category A Compost. Total of all stones, recognizable branches, wood chips and roots larger than 25mm in diameter shall be less than 5% by volume. A maximum of 10% of the Compost (by volume) can be derived from bark feedstock.
- .3 Compost shall not be saturated with water or so dry as to produce dust.
- .4 Compost and Pine Bark shall be composted long enough to exhibit a dark brown color, approximately Munsell colour 7.5 R; Value 3 or lower; Chroma 2 or lower. Color shall be determined by visual comparison of the sample to the “Munsell Soil Color Chart”, most current edition.
- .5 Compost shall solely support the germination (greater than 90%) and establishment of perennial ryegrass (certified Canada #1 Grade). Test grasses shall not exhibit any phototoxic effects.
- .6 Compost shall have a strong aerobic (sweet) odor. Compost lacking a strong aerobic odor or which has an anaerobic (sour) or pine or alcohol odor shall be rejected.
- .7 Certification: provide the following documentation:
  - .1 A statement that the Compost meets all health and safety regulations.
  - .2 Feedstock type and percentage in the final Compost product.
- .8 Testing: Compost shall have one (1) composite sample tested from each 100 cubic meters of material intended for use in soil mixes. The results of Compost analysis shall be provided by the Compost supplier for approval. Compost shall meet the following criteria as reported by the following laboratory tests:
  - .1 Chemical and physical testing shall be conducted by soil laboratories accredited by The Compost Quality Alliance (CQA) utilizing test methods specified in The Test Methods for Examination of Composting and Compost (TMECC) except as specified herein.

| Parameter | Range   | Testing Method |
|-----------|---------|----------------|
| pH        | 5.5-7.5 | TMECC 4.11A    |

Topsoil Placement and Grading

|  |  |              |
|--|--|--------------|
| Soluble Salt Concentration                 | < 4dS/m  | TMECC 4.10-A |
| Moisture                                   | 35-55% wet weight basis  |              |
| Organic Matter                             | >35% dry weight basis  | TMECC 5.07-A |
| Carbon to nitrogen ratio                   | 15:1 - 25:1  |              |
| Particle Size                              | 99% pass through 50mm screen<br>or smaller; 25% pass through<br>10mm screen or smaller | TMECC 2.02-B |
| Solvita Maturity Index                     | 6 to 8   | Solvita      |
| Physical contaminants<br>(man-made inerts) | <1% dry weight basis   | TMECC 3.08-A |

- .2 Metal content shall comply with Interim Guidelines for the Production and Use of Aerobic Compost in Ontario (2004) except for copper and zinc, which must comply with Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act* Table 3 (medium to fine textured soils).
- .3 Pathogen reduction shall meet Section 6.0 of Interim Guidelines for the Production and Use of Aerobic Compost in Ontario (2004).
- .9 Provide four liters sample with manufacturer's literature and material testing certification that the product meets the requirements.

**2.5 Planting Soil For Trees, Shrub And Perennial Beds**

- .1 Planting mixture of topsoil, pine bark, and coarse sand mixed to the following proportion.

| Material    | % by volume |
|-------------|-------------|
| Pine Bark   | 10%         |
| Top soil    | 40-45%      |
| Coarse Sand | 45-50%      |

- .2 Mix design: Adjust the soil mix proportions to achieve a drainage rate of between 40mm and 75mm per hour when compacted between 80 and 85% of maximum dry density proctor. The contractor and the City's Representative and/or consultant shall review the test results to develop a final mix that best achieves the project goals.
  - .1 This specification is based on the assumption that the soil products to be provided are natural and will vary in quality from location to location within the soil sources, and that mixing of soil will result in variety within the mix. The contractor is expected to provide samples that represent the range of product quality to be provided.
  - .2 Prepare a minimum of 3 sample mixes of Planting Soil, using topsoil taken from different areas of the approved top soil source, to determine the ratio of mix components to be added to the planting soil. Submit mix samples along with the test results for approval. Multiple rounds of testing and evaluations may be required before an approved planting soil can be determined.
  - .3 Schedule the Planting Soil testing phase such that all testing and mix design is completed a minimum of twelve weeks prior to the installation of planting soils

Topsoil Placement and Grading

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- .3 Mixing procedure: Mix the Coarse Sand, Pine Bark and any required soil amendments recommended by the soil test together to the approved proportions separate from the soil. Spread the Top Soil in a layer approximately 300mm (12 inches) thick. Spread the Coarse Sand/Pine Bark mixture over the Top Soil layer at the approved proportion. Mix the components with a front end loader, or similar equipment. Do not over mix. Mix as little as possible to lightly blend the different components together. 50 to 75mm sized soil peds shall be evident in the final Planting Soil.

Planting Soil shall not be mixed in a blending machine or screened in such a manner that soil peds are crushed or removed.

- .4 Provide 4 liter sample with soil test results for approval of the mix ratio.

**2.6 Chemical Additives**

- .1 Chemicals and materials designed to increase soil fertility. All material shall be delivered to the site in unopened containers and stored in a dry enclosed space suitable for the material and meeting all environmental regulations. Biological additives shall be protected from extreme cold and heat. All products shall be freshly manufactured and dated for the season in which the products are to be used.

- .1 Fertilizer for planting shall be organic fertilizer, produced from organic sources. Fertilizer selections shall be based on the recommendations of the soil test. Submit manufacturer's product literature.

- .2 Sulfur shall be granular, bio-degradable sulfur, sized as follows:

| <u>Percent Passing</u> | <u>Sieve Size</u> |
|------------------------|-------------------|
| 100%                   | #6 mesh           |
| 0 – 10%                | #4 mesh           |

- .1 Sulfur content 90% minimum.

- .2 Sulfur shall be "Lightning 90%" manufactured by International Sulfur, Inc., Mt. Pleasant, Texas. Submit manufacturer's product literature.

**Part 3 - EXECUTION**

**3.1 Site Examination**

- .1 Examine the surface grades and soil conditions for any circumstances that might be detrimental to soil drainage, such as uneven sub grades and waterproofing that may hold or pond water, deposits of construction-related waste or soil contamination, storage of material or equipment, soil compaction or poor drainage. Confirm that all utility work and installation of planter drainage has been completed and tested. Examine the grading, verify all elevations. Confirm that all other work in the area of Planting Soil installation is completed. Notify the City's Representative and/or consultant in writing of any unsatisfactory conditions.

Topsoil Placement and Grading

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**3.2 Coordination With Project Work**

- .1 The Contractor shall coordinate with all other work that may impact the completion of the work. Protect installed planting soil from compaction by other trades.

**3.3 Site Preparation**

- .1 In areas not above structure, excavate to the proposed sub grade. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not over excavate compacted sub grades of adjacent pavement or structures. Remove all construction debris and material including any temporary construction roads.
- .2 Confirm that the sub grade is at the proper elevation and compacted as required. Sub grade elevations shall slope parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.
- .3 Do not proceed with the installation of Planting Soil, until all utility work in the area has been installed.
- .4 Protect adjacent walls, walks and utilities from damage or staining by the soil. Use 12mm plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
  - .1 Clean up any soil or dirt spilled on any paved surface, including at the end of each working day.
  - .2 Any damage to the paving or architectural work shall be repaired by the contractor at the contractor's expense.

**3.4 Planting Soil Installation**

- .1 Prior to installing any planting soil, the contractor shall examine the condition of the sub grade prior to start of soil placement.
- .2 In areas of soil installation above existing subsoil, till the planting soil into the bottom layer of subsoil.
  - .1 Loosen or till the subsoil of the sub grade to a depth of 50-75 mm with a backhoe or other suitable device.
  - .2 Spread a layer of the specified planting soil 50-75mm deep over the sub grade. Thoroughly till the planting soil and the sub grade together.
  - .3 Immediately install the remaining planting soil in accordance with the following specifications. Protect the tilled area from traffic. DO NOT allow the tilled sub grade to become compacted.
  - .4 In the event that the tilled area becomes overly compacted, re-till the area again prior to installing the planting soil.
- .3 In soil areas within enclosed containers, assure that all required drain holes open and are clear of debris.
- .4 Install the remaining planting soil in 300-400mm lifts to the required depths. Work out from the installed soil such that equipment does not have to pass over the installed soils.

### Topsoil Placement and Grading

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- .5 The depths and grades shown on the drawings are the final grades after settlement and shrinkage of the organic material. The contractor shall install the planting soil at a higher level to anticipate this reduction of planting soil volume depending upon predicted settling properties for each type of planting soil as indicated on the drawing.

#### **3.5 Planting Soil Compaction**

- .1 Compact Planting soil under and beside the rootballs of all trees to between 85 and 90% of maximum dry density to reduce settlement and provide a stable base for the tree as indicated on the drawings.
- .2 Maintain moisture conditions within the planting soils during installation to allow for satisfactory compaction. Suspend installation operations if the planting soil becomes wet. Do not place planting soils on wet or frozen sub grade.
- .3 Provide adequate equipment to achieve consistent and uniform compaction of the planting soils. Use the smallest equipment that can reasonably perform the task of spreading and compaction.

#### **3.6 Protection**

- .1 Protect planting soil from compaction and contamination by dust, debris, and any toxic material harmful to plants or humans after placement. Any area, which becomes compacted, shall be tilled to a depth of 150mm. Any uneven or settled areas shall be filled and re graded.
- .2 Phase the installation of the planting soil such that equipment does not have to travel over already installed planting soil.

#### **3.7 Clean-Up**

- .1 During installation, keep pavements clean and work area in an orderly condition.
- .2 Keep the site clear of garbage at all times. Immediately dispose of wrappings or waste materials associated with products necessary for the completion of the work.
- .3 All garbage shall be kept in a central collection container. Do not bury garbage in back-fill.
- .4 Once installation is complete, remove any excess soil from pavements or embedded fixtures.

#### **3.8 Protection During Construction**

- .1 The Contractor shall protect landscape work and materials from damage due to landscape operations, operations by other Contractors or trespassers. Maintain protection during installation until acceptance. Treat, repair or replace damaged planting soil installation work immediately.
- .2 Till compacted planting soil and replace planting soil that has become contaminated. Planting soil shall be tilled or replaced by the Contractor at no expense to the City.

Topsoil Placement and Grading

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**3.1 Finish Grading**

- .1 Consolidate topsoil to required bulk density using equipment approved by Consultant. Leave surfaces smooth, uniform and firm against deep footprinting.
- .2 Finished grade of planting beds to be as indicated on drawings.
- .3 Make good any damage caused by topsoil spreading and finish grading activities.

END OF SECTION 32 91 21

SODDING

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**Part 1 General**

**1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by Conditions of the Contract and Sections of Division 1.

**1.2 RELATED WORK**

- .1 Section 32 92 19 – Topsoil and Finish Grading

**1.3 SOURCE QUALITY CONTROL**

- .1 Obtain approval from Consultant of sod at source.
- .2 When proposed source of sod is approved, use no other source without written authorization.

**1.4 DELIVERY AND STORAGE**

- .1 Schedule deliveries in order to keep storage at job site to minimum without causing delay.
- .2 Deliver and store sod on pallets on site within 24 hours of being lifted.
- .3 During wet weather allow sod to dry sufficiently to prevent tearing during lifting and handling.
- .4 During dry weather protect sod from drying and water sod as necessary to ensure its vitality and prevent dropping of soil in handling. Dry sod will be rejected.
- .5 Broken, dry, discoloured pieces will be rejected by Consultant.

**1.5 SCHEDULING**

- .1 Schedule sod laying to coincide with growing medium and fine grading operations.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Nursery sod: Quality and source to comply with standards outlined in "Guide Specification for Nursery Stock", Section 17, latest edition, published by Canadian Nursery Trades Association.
  - .1 Number one Kentucky Bluegrass sod: grown from minimum mixture of 3 Kentucky Bluegrass cultivars.
- .2 Mesh: jute or synthetic plastic.
- .3 Wooden Pegs: 17 X 17 X 300 mm or approved 200 mm long steel staples.
- .4 Water: potable.
- .5 Fertilizer: complete synthetic slow release fertilizer with maximum 35% water soluble nitrogen. Apply fertilizer at rates based on soil analysis.
- .6 Herbicide: type, rate, and method of application subject to approval by Consultant.



## SODDING

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- .7 Growing Medium: Type 1 Growing Medium, refer to City of Toronto Specification TS 5.10 – Construction Specification for Growing Medium

### **Part 3 Execution**

#### **3.1 WORKMANSHIP**

- .1 Keep site well drained.
- .2 Clean up immediately soil and debris spilled onto pavements and dispose of deleterious materials.
- .3 Prevent damage to new and existing pavements with temporary plywood during sodding operations.

#### **3.2 PREPARATION OF GROWING MEDIUM SUBSTRATE**

- .1 Verify that grades are correct. If discrepancies occur, notify Consultant and do not commence work until instructed by Consultant.
- .2 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products. Remove debris which protrudes more than 75 mm above surface. Dispose of removed material off site.
- .3 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.
- .4 Where new sod is to be installed in existing sodded areas not disturbed by construction, rototill the area, apply a topdressing of growing medium, and install sod as specified.

#### **3.3 LAYING OF SOD**

- .1 Prior to sodding, obtain approval from Consultant that finished grade and depth of growing medium are satisfactory.
- .2 Lay sod within 36 hours of being lifted.
- .3 Sodding during excessively wet conditions, at freezing temperatures or over frozen soil is not acceptable.
- .4 Lay sod in rows, perpendicular to slope, and with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .5 Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.
- .6 Water sod immediately after laying to obtain moisture penetration into top 75 mm of topsoil.
- .7 Provide adequate protection of sodded areas against erosion and mechanical damage. Remove protection after lawn areas have been accepted.

#### **3.4 LAYERING OF PEGGED SOD**

- .1 Place mesh on top of growing medium on slopes steeper than 3:1. Secure mesh in place with wooden pegs or staples at maximum intervals of 600 mm. Cover with topsoil.
- .2 Lay sod sections perpendicular to slopes greater than 4:1 and secure with wooden pegs. Place pegs 3 per m, 100 mm below top edge of sod roll to prevent shifting of sod. Drive pegs flush with top of sod soil.

SODDING

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**3.5 MAINTENANCE**

- .1 Maintain sodded area from start of installation until final acceptance.
- .2 Water sodded areas in sufficient quantities and at frequency required to maintain soil under sod continuously moist to depth of 75 to 100 mm.
- .3 Cut grass when height is 30 % greater than 50 mm and cut to these heights. Remove clippings which will smother grassed areas.
- .4 Maintain sodded areas weed free.
- .5 Fertilize sodded areas one month after sodding with fertilizer at rate per soil analysis. Postpone fertilizing until following spring if application falls within four week period to expected end of growth season.

**3.6 ACCEPTANCE**

- .1 Sodded areas will be accepted at final inspection provided that:
  - .1 Sodded areas are properly established.
  - .2 Sod is free of bare and dead spots and without weeds.
  - .3 No surface soil is visible when grass has been cut to height of 40 mm.
  - .4 Sodded areas have been cut minimum 2 times.
- .2 Lawns sodded after September 30 will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

**3.7 RESTORATION**

- .1 At the completion of all sodding operations, all areas disturbed or damaged from this work shall be restored to its original condition to the Consultants approval.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 General Requirements**

- .1 Read and be governed by conditions of the Contract and sections of Division 1.

### **1.2 Related Work**

- .1 Division 1- Submittal Procedures.
- .2 Excavating-Trenching-Backfilling by Civil
- .3 Rough Grading by Civil
- .4 Section 32 13 15 – Exterior Site Furnishings
- .5 Section 32 91 21 – Topsoil Placement and Grading

### **1.3 Scope of work**

- .1 This section includes the supply and installation of the following:
  - .1 Supply and installation of trees, shrubs and groundcovers.
  - .2 Regular maintenance of plant material for duration of guarantee period – see Article 3.9.

### **1.4 Reference Standards**

- .1 Do trees, shrubs and groundcovers work in accordance with the Metric Guide Specification for Nursery Stock Latest Edition of the Canadian Nursery Trades Association except where specified otherwise.

### **1.5 Quality Assurance**

- .1 The Work of this Section to be executed only by a subcontractor who has adequate facilities, equipment, and skilled supervisors and tradesmen to perform it expeditiously, and is known to have been responsible for satisfactory installations similar to that specified during a period of at least five (5) years.
- .2 Plant Material:
  - .1 Make arrangements for approval at source of plant material by the Consultant at a time mutually agreed upon.
  - .2 Prior approval shall not invalidate rejection of stock at later inspection at site should it prove defective, damaged or substandard.
  - .3 All plants shall conform to the varieties specified in the plant list and be legibly tagged with their proper name and size. No substitutions will be accepted without written approval by the Consultant.
  - .4 Prior to installation, the Contractor shall advise the Consultant in writing if in the contractor's opinion any of the specified plant material will not perform as per the Specifications. The Consultant retains the right to direct the contractor to proceed with the specified plant material including guarantee and as tendered.
  - .5 Topsoil: as specified in Section 32 91 21.
  - .6 Tagged material to be purchased and secured for project.
  - .7 Consultant fees and expenses to be paid by contractor for re-sourcing and retagging of plant material.
- .8 All plant material industry suppliers will be considered for material supply, not only those having pre-existing or current supply accounts with the landscape contractor.

Tree , Shrubs and Groundcovers

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.9 If plant material is undersized, plant quantities will increase according to the following schedule:

- .1 (1) 5 gal container shrub = (2) 3 gal container shrub
- .2 (1) 3 gal container shrub = (2) 2 gal container shrub
- .3 (1) 2 gal container shrub = (3) 1 gal container shrub / grass
- .4 (1) 70mm caliper tree = (2) 50mm caliper tree.

All other sizes at equivalent replacement ratio. Notify the landscape architect (7) days prior to plant material delivery for new plant material locations.

### 1.6 Submittals

- .1 Affidavits: Submit affidavits to certify that manufactured or processed materials supplied in bulk meet specified requirements.
- .2 Maintenance Instructions: Submit instructions on maintenance procedures to be followed after end of specified maintenance period.
- .3 Inspection Laboratory Reports: Submit reports on topsoil as specified in Section 32 91 21.
- .4 Submit sample of bark mulch to Consultant for approval before installation.

### 1.7 Product Delivery, Storage & Handling

- .1 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.
- .2 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.
- .3 No plant shall be accepted when the ball of earth surrounding its root system has been cracked or broken preparatory to or during planting or after the burlap, staves, ropes or platform required in transplanting has been removed.
- .4 Transport plants specified "B&B" (balled and burlapped) or "S.B." with solid balls wrapped with 5 oz. hessian burlap. Wrap balls under 460mm dia. with single thickness, between 460mm dia. and 900mm dia. with double thickness and drum laced with 15mm rope at 200mm spacing.
- .5 Transport plants with frozen ball only when they are complete with root systems intact.
- .6 Transport plants with branches tied to prevent damage, and padded to avoid abrasion from equipment.
- .7 Prevent drying out of roots, root balls, trunks, branches, and leaves of plants from time of removal at place of origin until they are planted. While temporarily stored at site, protect them with soil, or similar materials and keep moist.
- .8 Spray plant material with an anti-desiccant immediately before moving them from their original location. Apply a sufficient amount over trunks, branches, and foliage.
- .9 Plants shall be re-sprayed after planting.

### 1.8 Job Conditions

- .1 Installation of Work of this Section shall be done under weather conditions and in suitable growth season for each specified material, and as approved by Consultant.

Tree , Shrubs and Groundcovers

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**1.9 Warranty**

- .1 All plants shall be guaranteed for a period of two (2) years in accordance with the General Conditions of the Contract, and shall be alive and in vigorous growth at the end of the guarantee period.
- .2 All plant material, that in the opinion of the Consultant is not in a healthy growing condition, shall be replaced by the Contractor at his own expense prior to terminating his responsibilities under this Contract.
- .3 All replacements shall be plants of the same size and variety as specified. The cost shall be borne by the Contractor, except for possible replacement resulting from theft, vandalism, or carelessness on the part of others. The Consultant shall be the sole judge in case of dispute regarding responsibility for replacement of plant material.

**PART 2 - PRODUCTS**

**2.1 Plant Material**

- .1 Type of root preparation, sizing, grading and quality: comply with Metric Guide Specification for Nursery Stock, Latest Edition of Canadian Nursery Trades Association.
- .2 Source of plant material: grown in Zone 5 in accordance with Agriculture Canada Plant Hardiness Zone Map.
- .3 Plant material: freshly dug, free of disease, insects, defects or injuries and structurally sound with strong fibrous root system and densely foliated, root pruned regularly, but not later than one growing season prior to arrival on site.
- .4 Trees (general): with straight trunks, well and characteristically branched for species.
- .5 Measure plants with branches in normal position, finish grade to top of main body of plant, not from branch tip to branch tip or from root base to branch tip. Caliper dimension shall refer to diameter of trunk measured 300mm above ground in original growing state.
- .6 Plants larger than specified will be accepted without liability to extra charges if approved by the Consultant, and they meet all specified requirements for their size.
- .7 "Collected plants", those dug from native stands, wood lots, orchards or neglected nurseries, and having received no cultural maintenance, will not be accepted unless approved by the Consultant.
- .8 Plant varieties required for Project are specified in plant schedules on the drawings. In case of discrepancy in quantity between the plant schedule and the drawing, the drawing shall take precedence.
- .9 All street trees in R.O.W. to be installed in soil trench as per City of Toronto standards and requirements and with soil volume indicated on Layout and planting plan – sheet L200 and related details.
- .10 All street trees in R.O.W. to be installed in planter as specified in Section 32 13 15 - Exterior Site Furnishings.
- .11 Gather bag to be installed for each street tree in R.O.W. – See item 2.3 below.
- .12 Green Roofs Drain Covers on vegetative roofing areas on levels 8, 9 and 10 – See Section 32 13 15 Exterior Site Furniture.

**2.2 Water**

- .1 Free of impurities that would inhibit plant growth.

### 2.3 Irrigation by Gather Bag

- .1 Each tree to be installed with a gather bag, monitored and irrigated successfully for the first two (2) years of planting:
  - .1 Product: Treegator Original or approved equal – slow release watering bag for shade trees( Single Bag). Spectrum Products, Inc. Youngsville NC 1-866-treegator (873-3428).
  - .2 Quantity: 28

### 2.4 Rodent Guards

- .1 Plastic rodent guard to approval of Consultant.

### 2.5 Mulch

- .1 All planting beds
  - .1 Gro Bark 'Shredded Pine Mulch' or approved equal. Provide sample to Consultant for approval prior to installation – 100mm depth.

### 2.6 Soil Amendments

- .1 Topsoil: as specified in Section 32 91 21.
- .2 Peat Moss: Partially decomposed, fibrous cellular stems and leaves of sphagnum moss varieties varying in texture from porous to spongy; crumbly or compact, and fairly elastic or homogeneous in texture; free of decomposed colloidal residue, wood, sulphur and iron; brown; finely shredded with no particles over 7mm; and with an acidity range from 4.0 pH to 6.0 pH.
- .3 Bonemeal: Raw, commercial, finely ground and with a minimum content of 4% nitrogen and 20% phosphoric acid.
- .4 Manure: Well-rotted, unleached cattle manure; free from harmful chemicals and other injurious substances, and sawdust, shavings, or similar refuse; at least 8 months old, but not more than 2 years old; and with no more than 25% straw, leaves, or other unacceptable materials for planting use.
- .5 Fertilizer: Supply complete, commercial fertilizers from approved manufacturer, containing not less than 60% urea formaldehyde and the following percentages by weight:

| <u>Nitrogen</u> | <u>Phosphoric Acid</u> | <u>Potash</u> |
|-----------------|------------------------|---------------|
| 10              | 6                      | 4             |
| 12              | 6                      | 6             |

and subject to modification in accordance with the results of the soil analysis.

### 2.7 Anti-Desiccant

- .1 Anti-desiccant: Emulsion to form permeable film over plant surfaces, and mixed according to manufacturer's directions.

### 2.8 Root barrier

- .1 Install at all planting beds with tree planting ( Planter A, B and E )
  - .1 Deep Root UB 24-2 ( 36" Ht) root barrier or approved equal.

## PART 3 - EXECUTION

### **3.1 Pre-Planting Operations**

- .1 Ensure plant material acceptable to Consultant.
  - .1 Arrange for nursery approval of trees.
  - .2 Arrange for approval sample of each shrub type on site, prior to general order and delivery.
- .2 Remove damaged roots and branches from plant material.
- .3 Apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.
- .4 Ensure that subgrade preparation and drainage is satisfactory for plant material growth as specified.
- .5 Ensure adequate subsoil drainage by filling bottom 1/3 of tree pit with water and checking for complete drainage after 24 hours. Obtain approval of drain test prior to planting and backfilling.

### **3.2 Excavation and Preparation of Planting Beds**

- .1 Preparation of planting beds is specified in Section 32 91 21.
- .2 For individual planting holes:
  - .1 Stake out location and obtain approval from Consultant prior to excavating.
  - .2 Excavate to depth and width as indicated.
  - .3 Scarify sides of planting hole.
  - .4 Remove water which enters excavations prior to planting. Notify Consultant if water source is ground water.
- .3 Mix planting soil of five parts topsoil mixture or four parts topsoil and one part manure, to which add one part peat moss, one pound of bonemeal for each cubic yard of the above soil mix, and specified fertilizers in sufficient quantity to overcome chemical deficiencies that are revealed by soil analysis.
- .4 Mix just before planting, but not when frozen or muddy. Do not stockpile more than two days.
- .5 Excavate plant pits to allow at least 150mm of planting soil under root ball or as indicated on drawings.
- .6 When planting in late fall or early spring, prevent freezing of bottom of plant pits. adequate for the plants survival.
- .7 Placing of Topsoil: as specified in Section 32 91 21.
- .8 Fertilizer, in accordance with soil analysis, shall be applied during the final operation of fine grading, but not longer than one week prior to planting.

### **3.3 Planting**

- .1 Final placement at shrubs to be approved by Consultant prior to backfilling with planting soil.
- .2 Final placement of trees to be approved by Consultant prior to pit excavation.
- .3 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball. Do not pull burlap or rope from under root ball.
- .4 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
- .5 Plant vertically in locations as indicated. Orient plant material to give best appearance in relation to structure, roads and walks.

Tree , Shrubs and Groundcovers

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- .6 For trees and shrubs:
  - .1 Backfill soil in 150mm lifts. Tamp each lift to eliminate air pockets. When two third (2/3) of depth of planting pit has been backfilled, fill remaining space with water. After water has penetrated into soil, backfill to finish grade.
  - .2 Form watering saucer as indicated.
- .7 Water plant material thoroughly.
- .8 After soil settlement has occurred, fill with soil to finish grade.
- .9 Dispose of burlap, wire and container material off site.

**3.5 Trunk Protection and Tree Support**

- .1 Wrap main tree stems of 50cm caliper or greater at trunk base with plastic tree protector as per City of Toronto detail PD-101.
- .3 Burlap wrap to remain on trunk through the first winter.
- .4 Brace upright trees with anchor support as detailed.

**3.6 Mulching**

- .1 Ensure soil settlement has been corrected prior to mulching.
- .2 Ensure ground is not frozen prior to mulching.
- .3 Spread mulch at 100mm depth and as such that the entire planting bed is covered in mulch but mulch does not cover the stem of the plant emerging out of the soil.

**3.7 Pruning**

- .1 Prune plants as per detail sufficiently to remove dead or injured members, to compensate for loss of roots when transplanted, and to shape the plant into natural character as intended by landscape design.
- .2 Do not remove leaders.
- .3 Make cuts smooth, clean and flush to base members. Leave no stubs.
- .4 Cut back cambium to living tissue where cuts are made, and at bruises, scars and other injuries. Shape wood to prevent retention of water.
- .5 Top prune all plants properly to compensate for any loss of root when dug at the nursery. Pruning shall be done at the centre rather than heading back.

**3.8 Watering**

- .1 Watering bags to be installed around the trunk of each tree at its base. Refer to manufacturers recommendations for volume capacity and filling frequency.
- .2 The contractor shall be responsible for ensuring that the trees are adequately watered for establishment during the warranty period.
- .3 The Contractor shall be fully responsible to ensure that adequate water is provided to all plants from the point of installation until the date of acceptance. The contractor shall adjust the automatic irrigation system, if available, and shall apply additional water, using hoses as required.
- .4 During the initial establishment period, and particularly immediately after installation do not rely on the irrigation system to water the plants. Plants will uptake water only within the root ball and a short distance outside the ball. It is possible to over water the soil while under watering the root ball with the irrigation system.



Tree , Shrubs and Groundcovers

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- .5 Hand water root balls of all plants and the soil immediately around the root ball to assure that the root balls have adequate moisture. Test the moisture content in each root ball to determine the water content. Maintain root ball and soil moisture between 10 and 20% as measured using a General Digital Moisture Meter. Do not over water the soil around the plants. Use "Tree Gator Bags" to assist in watering trees.
- .6 Maintain a log of all irrigation controller settings and adjustments, all times that the plants are hand watered and the times trees are tested for moisture with results.

### 3.9 Maintenance during Establishment Period

- .1 Perform following maintenance operations from time of planting to acceptance by Consultant.
  - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion as outlined in watering section.
  - .2 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
  - .3 Remove weeds monthly.
  - .4 Replace or respread damaged, missing or disturbed mulch.
  - .5 For non-mulched areas, cultivate as required to keep top layer of soil friable.
  - .6 Apply pesticides in accordance with Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from Consultant prior to application.
  - .7 Remove dead or broken branches from plant material.
  - .8 Keep trunk protection and guy wires in proper repair and adjustment.
  - .9 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

### 3.10 Acceptance, Adjustment and Replacement

- .1 Plant material will be accepted by Consultant 90 days after planting operation is completed provided that plant material exhibits healthy growing condition and is free from disease, insects and fungal organisms.
- .2 Plant material installed less than 90 days prior to frost will be accepted in following spring, 30 days after start of growing season provided that acceptance conditions are fulfilled.
- .3 At time of final acceptance at Project Completion, and again at termination of guarantee period, Work of this Section will be inspected by Consultant, and adjustments and replacements shall be made under work of this Section in accordance with the following.
- .4 Commencement of guarantee period is predicated on written acceptance by the Consultant of work of this Section.
- .5 Adjustment and replacement work shall be performed as specified in this Section with materials of same size, variety and quality of material replaced.
- .6 Replacement work shall be done under an additional guarantee of the same length and conditions as described in this Specification. It shall date from time of Consultant's approval of replacement work.
- .7 Replace plant stock that in the opinion of the Consultant is dead, or not in satisfactory growing state, or does not meet specification requirements. Remove dead stock immediately. Replace stock at proper time during planting season. At the discretion of the Consultant unacceptable plant material may be left, its guarantee period extended, and again inspected next planting season. At this time, Consultant will decide if replacement will be made and the guarantee extended accordingly.

Tree , Shrubs and Groundcovers

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- .8 After settlement has occurred at planting pits fill in to specified grade as per the detail.

**3.11 Maintenance**

- .1 Work of this Section shall include maintenance of installations to ensure vigorous and healthy growth until the end of the guarantee period.
- .2 For Plant Material: Pruning; treatment of pruning wounds; cultivating; weeding; mulching; watering, repairing of wrappings, protections and guys; tightening of guys; resetting to proper grade or to upright positions; spraying to keep free from pests, insects and disease; and barriers to prevent damage by persons or animals.
- .3 Maintenance shall begin immediately following installation of Work and shall continue until the end of the guarantee period to ensure healthy, vigorous plant growth at all times. Watering to be coordinated with irrigation system in order to prevent overwatering or underwatering. Contractor to be responsible for ensuring adequate watering of plant material during guarantee period in the event that irrigation system is not operating optimally.
- .4 Watering for tree/shrub beds: To ensure saturation of full depth of planting soil. Care to be taken to avoid over-watering in the event of slow draining subsoil conditions.

**END OF SECTION**