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**Appendix A to Bid:**  
**Landscape Bid Items - Design Option 1**

**1 SUBMISSION**

.1 The Contractor shall complete and submit this list with the Tender.

**2 BID PRICES**

.1 The following are my/our identified prices for the work listed hereunder and described in the applicable

.2 These Bid Prices are all-inclusive of labour, materials, equipment, services, fabrication, installation, overhead and profit, applicable taxes, and other related charges.

.3 Such work and amounts are included in my/our Bid Price

NO.	ITEM DESCRIPTION	COST PER ITEM
1	Site Clearance / Removals	\$ _____
2	Paving	\$ _____
3	Pea Gravel	\$ _____
4	Sod	\$ _____
5	Planting	\$ _____
6	Weeding / Soil improvement of existing beds	\$ _____
7	Subsurface drainage	\$ _____
8	12 Month Warranty and Maintenance	\$ _____
9	Irrigation	\$ _____
<b>TOTAL</b>		<b>\$ _____</b> EXCLUDING HST

Tenderer: \_\_\_\_\_

Signature: \_\_\_\_\_

**Part 1 General**

**1.1 SUBMISSION**

- .1 The contractor shall complete and submit the following list with the tender submission.

**1.2 ALTERNATIVE PRICES**

- .1 I/we propose the following adjustments to my/our bid price for the alternative work listed hereunder and described on the drawings and in the applicable specification sections.
  - .1 Alternative Price: Cost for a substituted item(s) or section(s) of work to be added or deducted from the base contract.
  - .2 These Alternative Prices are all-inclusive of labour, materials, equipment, services, fabrication, installation, overhead and profit, applicable taxes, and other related charges.
  - .3 These Alternative Prices are not included as part of the base contract.

ALTERNATIVE 1- Design Option 2 – New Layout – Landscape Drawing L3.0

**Base Contract:**

Design Option 1 – Proposed Landscape Drawing L2.0 – (Replace as Existing) including all works as indicated in Appendix A – Landscape Bid Prices – Option 1.

**Alternative Work**

Design Option 2 – Proposed Landscape Drawing L3.0 – (New Layout) including all works as indicated in Appendix C – Landscape Bid Prices – Option 2.

\$	\$
_____	_____
Total for Alternative Work	Difference between Landscape Base Contract and Landscape Alternative Price

Tenderer: \_\_\_\_\_

Signature: \_\_\_\_\_

**END OF SECTION**

**Appendix C to Bid:  
Landscape Bid Items - Design Option 2**

**1 SUBMISSION**

.1 The Contractor shall complete and submit this list with the Tender.

**2 BID PRICES**

.1 The following are my/our identified prices for the work listed hereunder and described in the applicable

.2 These Bid Prices are all-inclusive of labour, materials, equipment, services, fabrication, installation, overhead and profit, applicable taxes, and other related charges.

.3 Such work and amounts are included in my/our Bid Price

NO.	ITEM DESCRIPTION	COST PER ITEM
1	Site Clearance / Removals	\$ _____
2	Paving	\$ _____
3	Pea Gravel / Maintenance Edge	\$ _____
4	Flagstone Pavers	\$ _____
5	Planting	\$ _____
6	Weeding / Soil improvement of existing beds	\$ _____
7	Subsurface drainage	\$ _____
8	12 Month Warranty and Maintenance	\$ _____
9	Irrigation	\$ _____
<b>TOTAL</b>		<b>\$ _____</b> EXCLUDING HST

Tenderer: \_\_\_\_\_

Signature: \_\_\_\_\_



Site, Demolition and Removal

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**Part 1            General**

**1.1            SECTION INCLUDES**

- .1    Take over structures to be removed based on their condition on the date that tender is accepted.

**1.2            RELATED SECTIONS**

- .1    Section 32 01 90.33 - Section Tree and Shrub Preservation

**1.3            EXISTING CONDITIONS**

- .1    Take over structures to be demolished, based on their condition on the date that the tender is accepted.

**1.4            PROTECTION**

- .1    Prevent movement, settlement or damage of adjacent structures, services, walks, paving, trees, landscaping, and adjacent grades. Provide bracing, and shoring if required. Make good damage and be liable for injury caused by demolition.
- .2    Prevent debris from blocking drainage system, mechanical and electrical systems which must remain in operation.
- .3    Ensure protection of existing roof membrane and drainage layer. Immediately report to Consultant, any evidence of existing damage to drainage layer and/or roof membrane.

**1.5            PERMITS**

- .1    Contractor to obtain and pay for permits necessary to carry-out work.

**Part 2           Execution**

**2.1            WORK**

- .1    Dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.
- .2    Contractor shall pay for testing associated with and required for removal/disposal of all materials.

**2.2            PREPARATION**

- .1    Inspect site with Consultant and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage, and items to remain.
- .2    Locate and protect utilities.
- .3    Notify and obtain approval of utility companies before starting demolition.
- .4    Do not disrupt active or energized utilities traversing premises.

**2.3            DEMOLITION**

- .1    Remove unit pavers, sod, shrub, conifers and perennial planting in areas as indicated on drawings, sufficient to complete the work specified.
- .2    Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.

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Site, Demolition and Removal

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- .3 At the end of each day's work, leave work in safe condition so that no part is a danger to public safety.
- .4 Demolish to minimize dusting. Keep dusty materials wetted.
- .5 Do not sell or burn materials on the site.
- .6 Remove contaminated or dangerous materials from the site, and dispose of in a manner that minimizes any danger during disposal.
- .7 Remove any designated trees during demolition.

**2.4 STOCKPILING**

- .1 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.
- .2 Stockpile materials designated for alternative disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or handling procedures.

**2.5 REMOVAL FROM SITE**

- .1 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.

**2.6 CLEANING**

- .1 Remove debris, trim surfaces and leave work site clean, upon completion of work.
- .2 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

**END OF SECTION**

Tree and Shrub Preservation

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**Part 1            General**

**1.1            SECTION INCLUDES**

- .1            This work item includes the protection of existing trees and shrubs from damage during construction and methods to be used for compensation due to damage.

**1.2            RELATED SECTIONS**

- .1            Section 02 41 13.15 – Site, Demolition and Removal
- .2            Section 32 91 19.13 – Topsoil Placement and Grading

**Part 2            Products**

**Part 3            Execution**

**3.1            IDENTIFICATION AND PROTECTION**

- .1            Identify plants and limits of root systems to be preserved to the satisfaction of the Consultant.
- .2            Protect plant and root systems from damage, compaction, and contamination resulting from construction to the satisfaction of the Consultant.

**3.2            DAMAGES / COMPENSATION PLANTING**

- .1            The Contractor will compensate the client for any trees or shrubs damaged by the Contractor during construction.
- .2            Damages will include:
  - .1            Any physical damage on tree bark;
  - .2            Any broken branches;
  - .3            Equipment and materials stored within the protected areas and beyond the limits of the contract.
  - .4            Refuelling of equipment within the protected areas.
- .3            The Contractor will supply, install, maintain, and warranty trees and shrubs of the same size and species to every one tree / shrub damaged, as indicated by the Contract Administrator:
- .4            The exact location of the replacement trees/shrubs will be staked out to the approval of the Consultant before commencement of work.

**3.3            SOURCE QUALITY CONTROL OF COMPENSATION PLANTING**

- .1            Obtain approval from Consultant of new plant material at source prior to planting.
- .2            Imported plant material must be accompanied with necessary permits and import licenses. Conform to federal and provincial regulations.

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Tree and Shrub Preservation

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- .4 Any fertilizing of plant material applied on site, cannot contain more than 1% of phosphates (P205) by weight, unless it is during the first year, in which turf or managed grasses have been established (either by seed or sod).

3.4 MAINTENANCE OF COMPENSATION PLANTING DURING WARRANTY PERIOD

- .1 From time of acceptance by the Consultant to end of warranty period, do the following maintenance operations:
  - .2 Water plants to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion to the soil.
  - .3 Apply pesticides according to national Standard for Pesticide Education, Training, and Certification in Canada, Federal, Provincial and Municipal regulations as and when required to control insects, fungus, and disease. Obtain product approval from Contract Administrator before application.
  - .4 Apply fertilizer in early spring at the rate of 0.025 kg of nitrogen/m<sup>2</sup> or manufacturer's suggested rate.
  - .5 Remove dead, broken, or hazardous branches from plant material. Dispose of debris.

**END OF SECTION**

Precast Concrete Unit Paving

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**Part 1            General**

**1.1            SECTION INCLUDES**

- .1            Work under this item includes supply and installation of precast unit pavers and levelling courses.

**1.2            REFERENCES**

- .1            ASTM International
  - .1            ASTM C117-13 'Standard Test Method for Materials Finer than 75- 956m (No. 200) Sieve in Mineral Aggregates by Washing'.
  - .2            ASTM C136/C136M-14 'Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates'.
  - .3            ASTM D698-12 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))'.
  - .4            ASTM D1557-12e1 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))'.
- .2            Canadian General Standards Board (CGSB)
  - .1            CAN/CGSB 8.1-88 'Sieves, Testing, Woven Wire, Inch Series'.
- .3            CSA Group
  - .1            CSA A23.1-14/A23.2-14 'Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concretes'.
  - .2            CAN/CSA A179-04(R2014) 'Mortar and Grout for Unit Masonry Includes Update No. 1 (2006), Update No. 2 (R2011) '.
- .4            Ontario Provincial Specifications (OPSS)
  - .1            OPSS 314 'Construction Specification for Untreated Granular Subbase, Base, Surface, Shoulder, and Stockpiling'.

**1.3            PRODUCT DATA**

- .1            Submit following test data:
  - .1            Sieve analysis for gradation of bedding and joint material.
  - .2            Unit paver test data.

**1.4            PROTECTION**

- .1            Prevent damage to landscaping, curbs, sidewalks, trees, fences, roads and adjacent property. Make good any damage.
- .2            Provide access to buildings at all times. Co-ordinate paving schedules to minimize interference with normal use of premises.
- .3            Independent Inspection and Testing

## Precast Concrete Unit Paving

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- .1 The Construction Manager will appoint an independent inspection and testing agency to inspect or test the work for compressive strength, freeze-thaw, and salt scaling resistance.
- .2 The Contractor will pay the cost of inspection/test. A minimum of one test will be allowed for each source of pavers. Additional tests due to failure to meet the requirements will be the responsibility of the Contractor.

### 1.5 SAMPLES AND APPROVALS

- .1 Provide to the Consultant for approval, representative samples of all materials to be supplied for the work before any work commences. All materials will correspond to the approved samples.

## Part 2 Products

### 2.1 MATERIALS

- .1 Unit Paver :
  - .1 Type 1: Paleo Paver, 150 x 150mm size, Bourbon Beige Colour by Permacon (or approved equal).
  - .2 Type 2: Paving Bands: Paleo Paver, 150 x 150mm size, Norvick Grey Colour by Permacon (or approved equal).
  - .3 Type 3 : Flagstone Pavers: Natural flagstone, size varies - minimum dimension 300mm x maximum dimension 600mm x 50mm thick, sample to be approved.
- .2 Levelling Course
  - .1 Manufactured Sand for Bedding: hard, durable, crushed stone particles, conforming to the gradation of concrete sand as specified in CAN/CSA A23.1-04/A23.2, Sand will be free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
  - .2 Gradation: within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1'Sieves, Testing, Woven Wire, Inch Series'.
- .3 Joint Sand: to CAN/CSA A179, hard, durable, angular particles, with polymer stabilizer.
- .4 Edging: Sure-loc PVC paver restraint 63 x 75 mm, or approved equal.

## Part 3 Execution

### 3.1 SUBGRADE

- .1 Ensure that subgrade preparation conforms to levels and compaction required to allow for installation of granular base.

### 3.2 GEOTEXTILE

- .1 Install Geotextile filters as indicated in Section 31 32 19.01 – Geotextiles

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Precast Concrete Unit Paving

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**3.3 GRANULAR BASE**

- .1 Base minimum thickness:
  - .1 Spread and compact crushed stone or gravel base in uniform layers not exceeding 100 mm compacted thickness.
  - .2 Compact base to a density of not less than 100% Standard Density in accordance with ASTM D698 or ASTM D1557.
  - .3 Shape and roll alternately to obtain a smooth, even and uniformly compacted granular base and ensure conformity of grades with finish surfaces.
  - .4 Apply water as necessary during compaction to obtain specified density. If granular base is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
  - .5 In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.
  - .6 Ensure granular base top does not exceed plus or minus 10 mm over a 3 m straightedge.

**3.4 EDGING**

- .1 Install edging true to grade, in location, layout and pattern indicated on drawings.

**3.5 BEDDING SAND**

- .1 Place and spread bedding sand to a 20 mm compacted thickness or as indicated on drawings.
- .2 Maximum thickness after compaction should be 25 mm.
- .3 Use material other than bedding sand to compensate for depressions exceeding specified tolerances in base surfaces. Do not use joint sand for bedding sand.

**3.6 SURFACE COURSE INSTALLATION**

- .1 Ensure bedding sand and granular bases are not saturated prior to placement of unit pavers.
- .2 Install unit paving true to grade on the bedding sand, in location, layout and pattern as indicated.
- .3 Cut units accurately without damaging edges. Chamfer cut edges to profiles of manufactured edge.
- .4 Protect all unit-paving materials before, during and after installations, and protect installed materials and work of all other trades. In the event of damage, make all necessary repairs to approval of the Construction Manager, and at no additional cost to the Owner.
- .5 Ensure that the concrete surfaces to accept sand/ mortar mix is clean and free of debris prior to installation.
- .6 A power saw will be used to do all cutting of the precast pavers.
- .7 Place levelling course to depths and profiles as shown on the drawings.

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Precast Concrete Unit Paving

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- .8 Place unit pavers to patterns as shown on the drawings. Provide joints of not more than 3 mm wide vibrate pavers to obtain finish grades, and profiles as shown on the drawings. Fill joints to surface, sweep all paved areas clean on completion of the work to prevent staining of blocks and surrounding paving or works by the mortar mix. Spray a light even spray of water over the unit pavers to slightly dampen the mortar mix between the joints.
- .9 Along some edges a joint width exceeding 3 mm may occur. These will be filled with levelling course type used for the area and thoroughly compacted. No joint will exceed 10 mm. Adjustments to bricks will be made to ensure this condition.
- .10 Profile tolerances will be 3mm in 3000 mm.

**Part 4 Payment**

**4.1 METHOD OF PAYMENT**

- .1 The unit paver bricks will be measured in square meters of installed paver bricks.

**4.2 BASIS OF PAYMENT**

- .1 The work of this item will be paid for at the Contract Unit Price per square meter for unit paver bricks installed. The payment made will be full compensation for the supply of all materials, labour, and equipment, necessary for the installation of paver bricks and levelling course.
- .2 Inspection of prepared surfaces, cutting of bricks, supply of water, and compaction will be considered incidental to the work of this item.
- .3 Base preparation will be paid for under the applicable Contract Item.

**4.1 WARRANTY**

- .1 Work to be free from defective workmanship for 2 years after the date of final acceptance. Warranty shall include filling of paver joints 1 year after installation at no additional cost. If within warranty period, it is found that the warranted work needs to be repaired or changed because of the use of defective materials, equipment, or inferior workmanship, or work not in accordance with the specification, the Contractor, upon notification, shall promptly and without additional expense to the Owner:
  - .1 Place such warranted work in a satisfactory condition.
  - .2 Repair or replace damage to the Project, or contents thereof, which is a result of such unsatisfactory warranted work.
  - .3 Repair or replace work, materials, and equipment that are disturbed in fulfilling the warranty, including disturbed work, materials, and equipment that may have been warranted under another Contract.

**END OF SECTION**

## Irrigation

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### Part 1

### General

#### 1.1 SECTION INCLUDES

- .1 The work under this section includes the supply of labour, materials and equipment necessary to complete the work required to design and reinstate an irrigation system for the upper terrace planting as indicated on the drawings. The Contractor will acquaint himself with all site conditions, review and identify the extent of the fire damage to the existing irrigation system and provide a design / shop drawings for reinstatement for approval of the Consultant.
- .2 The major items of work to be completed are generally, but are not limited to the following:
  - .1 The design and reinstatement of damaged irrigation system;
  - .2 Trenching and backfilling;
  - .3 Supply and installation of, backflow preventor, automatic controller, and irrigation system;
  - .4 Connections to existing capped cold water service as indicated on drawings;
  - .5 Testing of all systems to make sure they are in operative condition;
  - .6 A maintenance period of one year.

#### 1.2 RELATED SECTIONS

- .1 Section 32 14 13 – Precast Concrete Pavers
- .2 Section 32 91 19.13 – Topsoil Placement and Grading
- .3 Section 32 93 10 – Trees, Shrubs and Groundcover Planting

#### 1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
- .2 American National Standards Institute/American Society of Safety Engineers (ASSE)
  - .1 ASSE 1015-2011 (sanitary) 'Performance Requirements for Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies'.

#### 1.4 QUALITY ASSURANCE

- .1 Comply with all local codes relative to the installation of the work of this section. Additionally, comply with the regulations of the Ontario Hydro Electric Power Commission, and Ottawa Hydro for all electrical work and materials for all mechanical work and materials.

#### 1.5 PERMITS AND FEES

- .1 The Contractor will fully acquaint himself with all relevant provincial and municipal by-laws relating to the work of this contract, as he will be required to comply with such bylaws without extra compensation.
- .2 The Contractor will obtain and pay for all permits, approvals, and inspections relating to work of this section.

#### 1.6 APPROVAL AND SUBMITTALS

- .1 Submit shop drawings and product data, including catalogue cuts and manufacturer's data pertaining to standard component parts.
- .2 Prior to commencing the work of this section, submit a plan of all setting out zones, irrigation materials to be used including manufacturers' number, technical data and recommended method of installation of materials, submit these for the approval of the Consultant.

## Irrigation

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- .3 Receive Consultants approval of the material and methods in writing before commencing the work of this section.
  - .1 Any substitutions will be equivalent or better than the originally specified product.
  - .2 Prior to connecting the irrigation water system to water sources, receive, in writing, the approval from the Owner.
  - .3 Record and submit to the Consultant, the available static pressure downstream of the irrigation water shut-off valve.

### **1.7 PRODUCT HANDLING**

- .1 Protect all irrigation system materials before, during, and after installation, and protect installed materials and work of other trades.
- .2 In the event of damage, make all necessary repairs to the approval of the Consultant, and at no additional cost to the Owner.

### **1.8 WARRANTY AND MAINTENANCE**

- .1 The Contractor will guarantee all parts, materials, and workmanship for a period of one year from the date of final acceptance. The Contractor will repair or replace any defective materials, parts or work appearing during the one-year warranty period. Where the manufacturer's warranty extends beyond the one-year warranty period, such warranties will become effective at the expiry of the one-year warranty period. The Contractor will furnish a written warranty, in a form acceptable to the Owner, at the completion of the work. Also, he will furnish copies of all manufacturers' warranties to the Owner.
- .2 The Contractor will maintain the entire system for a period of one year, including all equipment adjustment, seasonal shut down and start-up operation. Turn over a proper and fully operating system at the end of the one-year maintenance period from date of Final Acceptance.
- .3 The maintenance and warranty period will run concurrently beginning upon acceptance of the system installation.

### **1.9 AS-BUILT DRAWINGS AND MANUALS**

- .1 On completion of work, prepare an accurate 'as-built' drawing of the irrigation system as installed indicating depth and location of conduits/sleeves, piping, sprinkler heads, control valves, controller(s) field wiring, complete with dimensions and reference points.
- .2 Submit one print and one USB Drive of the 'as-built' drawings to the Construction Manager.
- .3 Submit one copy and one USB Drive of operating manuals and maintenance guidelines to the Construction Manager.
- .4 Submit one copy and one USB Drive of all manufacturers warranties to the Construction Manager.
- .5 Submit one copy and one USB Drive of a written guarantee to the Construction Manager.

### **1.10 CO-ORDINATION AND SUBDIVISION OF WORK**

- .1 This section may consist of the work of more than one trade, supplier, or subcontractor.
- .2 The responsibility for determining which subcontractor will provide labour, material, equipment and service to complete the work, will rest solely with the Contractor.

### **1.11 FINAL ACCEPTANCE**

- .1 The Consultant will issue final acceptance upon the satisfactory completion of all work of this section.

## Irrigation

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### 1.12 GUARANTEE

- .1 The Contractor will guarantee all work of this section for a period of one year from date of final acceptance, against all defects in material, equipment, and workmanship.
- .2 The Contractor will promptly repair and/or replace any defective material, equipment, or workmanship during the guarantee period.
- .3 The Contractor will repair or compensate for any damage to any part of the premises resulting from leaks or other defects in material, equipment, and workmanship, to the satisfaction of the Owner.
- .4 An inspection will be conducted after the one year guarantee period.

### Part 2 Products

#### 2.1 MATERIALS

- .1 Pipe:
  - .1 PVC Plastic Pipe: class 160, 100 psi working pressure rating, to CSA specifications and bearing the CSA stamp of approval.
  - .2 Copper Pipe: type K copper tubing rated to CSA specification.
  - .3 Polyvinyl Chloride Pipe: class 160, rated to CSA specifications.
  - .4 Polyethylene Pipe: 100 psi working pressure, rated to CSA specifications.
- .2 Fittings:
  - .1 All metal fittings will be type K copper, compatible to pipe and bonded as per manufacturers' recommendations.
  - .2 All plastic fittings will be compatible to the pipe and bonded as per manufacturers' recommendations.
- .3 Controller: automatic controller to be a wall mounted model providing for full automatic operation of the irrigation system, and a solid state, capable of running two independent programs allowing concurrent operation, a 6 - 14 day calendar, 1 - 99 minute run time.
- .4 Valves:
  - .1 Remote control valves: electrically activated control valves (size as required).
  - .2 Master shut-off valve.
  - .3 Drain valve for winterization.
- .5 Backflow Preventor: double-check valve assembly with 1" brass, CSA approved, ANSI/ASSE 1015 with replaceable seats.
- .6 Sleeving: PVC rigid pipe conduit required as shown on drawings.
- .7 Control Wires: CSA approved 24 volt solid wire.
- .8 Sprinkler Heads & Nozzles: use types as indicated or specified on shop drawings to guarantee 100% coverage, while allowing for water differential of turf areas from shrub/flower areas.

#### 2.2 OTHER MATERIALS

- .1 All incidental materials, tools, and equipment not specifically described herein, but are required to complete the work of this section, in accordance with the manufacturer's recommendation.

## Irrigation

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### **Part 3 Execution**

#### **3.1 SITE EXAMINATION**

- .1 Examine areas where the system is to be installed. Conditions that will result in a poor installation will be reported to the Construction Manager prior to commencement of work.

#### **3.2 INSTALLATION**

- .1 Perform all necessary excavation, trenching, and backfilling for the installation of the system. Lateral lines will be at a minimum 300 mm depth and main lines at a 450 mm minimum depth. Backfilling will be completed with soft fill material, and compacted to 100% of original density. All main lines will be located in one trench when running together and as close as practically possible to ensure that they are at the edge of the planting beds or as directed by Construction Manager.
- .2 Plastic pipe and fittings will be solvent welded using solvents and methods as recommended by the pipe manufacturer. Make all connections between plastic pipe and metal valves or pipe with threaded fittings using plastic male adaptors.
- .3 Position and install spray heads on risers, with flexible swing joints.
- .4 Position and install pop-up shrub spray heads, with flexible swing joints. Set body plumb and firmly anchored in the ground.
- .5 Wire the control valves to the controller, as per manufacturer's specifications. Connect each control valve to one station. Controller will be installed in the basement mechanical room.
- .6 The connection of the irrigation system must be co-ordinated with the electrical services provided by others.
- .7 Flush all lines of dirt or debris prior to installation of heads.
- .8 Program the controller into a logical sequence as directed by the Construction Manager.
- .9 Zones should be established and programmed to water turf areas, separately from shrub/flower beds.

#### **3.3 WORKMANSHIP**

- .1 The Contractor will be responsible for full and complete coverage of all irrigated areas and will make any necessary minor adjustments at no additional cost.
- .2 Any major revisions to the system must be submitted and answered in written form, along with any change in contract price.

#### **3.4 EXCAVATING AND TRENCHING**

- .1 Perform all excavations as required for the work under this section.
- .2 Restore all surfaces, existing underground utilities, damaged or cut, to their original condition and in a manner approved by the Construction Manager.
- .3 Trenches for pipelines will be made of sufficient depths to provide the minimum cover from finish grade as follows:
  - .1 450 mm minimum cover over main lines.
  - .2 300 mm minimum cover over lateral lines to heads.
- .4 The Contractor will where required drill and core concrete walls to allow for passage of irrigation lines. Tradesmen competent in this work will conduct such coring and drilling.

#### **3.5 PIPELINE ASSEMBLY**

- .1 Plastic pipe and fittings will be solvent welded, using solvents and methods as recommended by manufacturer of the pipe, except where screwed connections are required. Pipe and fittings will be thoroughly cleaned of dirt, dust, and moisture before applying solvent with a non-synthetic bristle brush.

## Irrigation

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- .2 Pipe may be assembled and welded on the surface. Snake pipe from side to side of trench bottom to allow for expansion and contraction.
- .3 Make all connections between plastic pipe and metal valves or pipe with threaded fittings using plastic male adapters.

### **3.6 SPRINKLER INSTALLATION**

- .1 Install all sprinklers as indicated on drawings and/or specified plumb and anchor firmly in the ground.
- .2 Adjust the sprinkler top flush with finish grade.

### **3.7 CLOSING OF PIPE AND FLUSHING OF LINES**

- .1 Cap or plug all openings as soon as lines have been installed to prevent entrance of materials that would obstruct pipe. Leave in place until removal is necessary for completion of installation.
- .2 Flush out all water lines thoroughly before installing heads and valves.
- .3 Test in accordance with Hydrostatic Test.
- .4 Upon completion of the testing the Contractor will complete assembly and adjust sprinkler heads for proper distribution.

### **3.8 HYDROSTATIC TESTING**

- .1 Notify the Construction Manager at least 48 hours in advance of testing.
- .2 Testing will be done in the presence of the Construction Manager and Consultant.
- .3 Apply a continuous and static water pressure of 60 p.s.i., after the welded plastic joints have cured for at least for twenty-four (24) hours. Risers should be capped as follows:
  - .1 Water mainlines and sub-mains to be tested for 12 hours.
  - .2 Lateral lines are to be tested for two hours.
  - .3 Repair leaks resulting from tests.

### **3.9 AUTOMATIC CONTROL VALVES AND CONTROLLER INSTALLATION**

- .1 Install automatic control valves per manufacturers' specifications, in location(s) indicated or specified on drawings.
- .2 Install automatic controller(s) per manufacturer's recommendations in location(s) indicated or specified on drawings.
- .3 Wire the control valves to the controller as per manufacturer's specifications, and program them in a logical sequence to be approved by the Construction Manager.

### **3.10 BACKFILL AND COMPACTION**

- .1 Backfill excavations and trenches with clean soil, free of debris and large stones after the system is operating and the required tests and inspections have been made. Compact the soil to the minimum density of 90%.
- .2 Dress off all areas to required grade, and remove from site and debris resulting from work of this section.

### **3.11 INSPECTION AND DEMONSTRATION**

- .1 Prior to backfilling, pressure-test the system at 518kPa water pressure for four hours during which a zero pressure drop is required. Report all leaks and retest to Construction Manager's approval.
- .2 Upon completion of installation the Contractor will set controller and fully demonstrate the system to the Construction Manager and the Owner or representative or maintenance staff, showing that the system functions in accordance with the original design intent and manufacturer's specifications.

Irrigation

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- .3 Inspections will occur first, prior to backfilling, second upon completion of the installation of the system and finally at the end of the one year maintenance period. Acceptance of the installation of the system will occur at the second inspection.
- .4 Operate each turf zone to determine the precipitation rate performance of the system. The method and recording will be set up by the Owner or representative and mutually agreed by Owner, Construction Manager, and Contractor.

**END OF SECTION**

Topsoil Placement and Grading

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**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 32 01 90.33 – Tree and Shrub Preservation

**1.2 REFERENCES**

- .1 Canadian Council of Ministers of the Environment (CCME).  
  
CCME PN 1340 'Guidelines for Compost Quality' issued January 1996 (Revision 2005), Category (A) unrestricted, Category (B) restricted.'

**1.3 SOURCE QUALITY CONTROL**

- .1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions, and warranty requirements.
- .2 An independent testing laboratory will carry out inspection and testing of topsoil. Landscape Contractor will pay for costs of tests.
- .3 Test topsoil from source for clay, sand, and silt, Nitrogen (N), phosphorous (P), potassium (K) and magnesium (Mg), (N, P, K, Mg,) soluble salt content, pH value, growth inhibitors, soil sterilants organic matter, and conductivity. Submit 0.5 kg a sample of topsoil to a testing laboratory and indicate present use, intended use, type of subsoil and quality of drainage. Prepare and ship the sample in accordance with provincial regulations and testing laboratory requirements.
- .4 Determine required limestone treatment to bring pH value of soil ranges between 5.5 to 7.5 levels.
- .5 Submit two copies of soil analysis and recommendations for corrections to Consultant.

**1.4 SCHEDULING OF FINISH WORK**

- .1 Schedule the placing of the topsoil and grading to permit sodding and seeding within seven days.

**1.5 DEFINITIONS**

- .1 Compost: should be a mixture of soil and decomposing organic matter, for use as a fertilizer, mulch, or soil conditioner. Compost should be processed organic matter, containing 40% or more organic matter.
- .2 The product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (a carbon and nitrogen (C:N) ratio below 25 or 50) and contain no toxic or growth inhibiting contaminates. Composed bio-solids must meet the requirements of the Waste Management CCME PN 1340.
- .3 Friable: Soil, which is easily crumbled through fingers when held by hand.

Topsoil Placement and Grading

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**Part 2            Products**

**2.1                TOPSOIL**

- .1 All topsoil supplied by the Contractor will be fertile, friable, natural sandy loam containing not less than 4% of organic matter for sandy loams with an acidity value ranging from pH 6.0 to pH 7.0 and capable of sustaining vigorous plant growth. It will be free of stems or roots, stones and or other extraneous matter. Screening of topsoil will be required if designated by the Construction Manager. Topsoil will not be supplied in a frozen state.
- .2 Horticultural Topsoil: growing medium for plant material, consisting of a variable mixture of sand, silt, clay, organic material, and nutrients meeting the following criteria:
  - .1 45 to 70% sand
  - .2 0 to 35% silt
  - .3 14 to 20% clay
  - .4 4% minimum of organic material
  - .5 5.5 to 7.5 pH value.
- .3 Testing Laboratory: This represents a lab accredited by the Canadian Association for Environmental Analytical Laboratories (CAEAL) and/or Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA).

**2.2                SOIL AMENDMENTS**

- .1 Fertilizer:
  - .1 Complete commercial synthetic fertilizer with minimum 65% insoluble nitrogen.
  - .2 Formulation ratio - 10-6-4, 10% nitrogen, 6% phosphoric acid, 4% potash.
  - .3 Adjust fertilizer as per soil test recommendations.
- .2 Peatmoss:
  - .1 Derived from partially decomposed fibrous or cellular stems and leaves of species of Sphagnum Mosses.
  - .2 Elastic and homogeneous, brown in colour.
  - .3 Free of wood and deleterious material, which could prohibit growth.
  - .4 Shredded particle minimum size 5 mm.
- .3 Sand: washed course silica sand, medium to course textured.
- .4 Limestone:
  - .1 Ground agricultural limestone containing minimum calcium carbonate equivalent of 85%.

### Topsoil Placement and Grading

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- .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .5 Bonemeal: finely ground with a minimum analysis of 20% phosphoric acid.

#### **2.3 SOURCE QUALITY CONTROL**

- .1 Advise Consultant topsoil sources to be utilized with sufficient lead-time for testing.
- .2 Contractor is responsible for amendments to supply topsoil as specified.
- .3 Soil testing by recognized testing facility for pH, P and K, and organic matter.
- .4 A testing laboratory designated by the Consultant will carry out testing of topsoil. Soil sampling, testing, and analysis are to be in accordance with Provincial standards.

#### **Part 3 Execution**

##### **3.1 STRIPPING OF TOPSOIL**

- .1 Commence topsoil stripping of areas as directed by Construction Manager after area has been cleared of brush, weeds, and grasses and removed from site. Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
- .2 Strip Topsoil to depths as indicated by Construction Manager. Avoid mixing topsoil with subsoil.
- .3 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill.

##### **3.2 PREPARATION OF EXISTING GRADE**

- .1 Verify that grades are correct. If discrepancies occur, notify the Construction Manager and do not commence work until instructions have been received.
- .2 Grade the soil, eliminating uneven areas and low spots, ensuring positive drainage. Remove soil contaminated with toxic materials. Dispose of removed materials as directed by Consultant.
- .3 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.
- .4 Cultivate entire area that is to receive topsoil to depth of minimum 25 mm. Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.
- .5 Planting soil for planting of trees, shrubs, and ground covers: mix 4 parts topsoil with 1 part peatmoss. Incorporate bonemeal into planting soil at rate of 0.5 kg/m<sup>3</sup> of soil mixture.

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Topsoil Placement and Grading

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**3.3 PLACE AND SPREADING OF TOPSOIL - PLANTING SOIL**

- .1 Spread topsoil after subgrade has been approved. Refer to Drawings for direction of surface drainage.
- .2 Spread topsoil with adequate moisture in uniform layers not exceeding 150 mm, over approved, unfrozen subgrade, where sodding, seeding, and planting is indicated.
- .3 For sodded areas keep topsoil 15 mm below finished grade.
- .4 Spread topsoil to following minimum depths after settlement, **80%** compaction:
  - .1 150 mm for seeded areas
  - .2 135 mm for sodded areas
  - .3 400 mm for shrub beds
  - .4 500 mm for small trees
- .5 Apply planting soil as indicated on drawings.
- .6 Manually spread topsoil/planting soil around trees, shrubs, and obstacles.

**3.4 SOIL AMENDMENTS**

- .1 Apply soil amendments at rate as specified and as determined from soil sample test.
- .2 Mix soil amendments into full depth of topsoil prior to application of fertilizer.
- .3 Place topsoil at depth of 135 mm for sodded areas unless otherwise specified in the drawings.
- .4 Apply soil amendments to existing planting beds to be retained as indicated on the drawings. Incorporate into top 75mm of soil between existing plants without damaging existing root structures.
- .5 Apply planting soil as indicated on drawings and details.

**3.5 APPLICATION OF FERTILIZER**

- .1 Apply fertilizer at least one week after limestone application.
- .2 Spread fertilizer uniformly over entire area of topsoil at manufacturer's recommended rate of application or rate determined on basis of soil sample test.
- .3 Mix fertilizer thoroughly to the full depth of topsoil.

**3.6 FINISH GRADING**

- .1 Grade soil to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment approved by the Construction Manager. Leave surfaces smooth, uniform, and firm against deep foot printing.

Topsoil Placement and Grading

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**3.7 ACCEPTANCE**

- .1 Construction Manager and Consultant will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

**3.8 SURPLUS MATERIAL**

- .1 Dispose of materials, except topsoil off site or as directed by the Construction Manager.

**END OF SECTION**

Sodding

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**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            Section 32 91 19.13 – Topsoil Placement and Grading

**1.2                REFERENCES**

- .1            Canadian Nursery Landscape Association (CNLA)
- .2            'Canadian Standards for Nursery Stock – Eighth Edition'.
- .3            Government of Canada Department of Justice (GCDJ)
  - .1            F 10 'Fertilizers Act'.
  - .2            C.R.C., c. 666 'Fertilizers Regulations'

**1.3                SOURCE QUALITY CONTROL**

- .1            Conduct pre-installation meeting to verify project requirements, installation instructions, and warranty requirements.
- .2            Obtain sod approval at the source.
- .3            When the proposed sod source is approved, use no other without written authorization.

**1.4                DELIVERY AND STORAGE**

- .1            Schedule the deliveries in order to keep storage at the job site to a minimum without causing delays.
- .2            Deliver, unload, and store the sod on pallets.
- .3            Deliver the sod to site within 24 hours of being lifted and lay within 36 hours of being lifted.
- .4            Do not deliver small, irregular, or broken pieces of sod.
- .5            During wet weather allow to dry sufficiently to prevent tearing during lifting and handling.
- .6            During dry weather protect the sod from drying and water as necessary to ensure its vitality and prevent dropping of soil in handling. Any dry sod will be rejected.

**1.5                SCHEDULING**

- .1            Schedule the laying of sod to coincide with preparation of the soil surface.
- .2            Schedule the sod installation when frost is not present in ground.

**Part 2            Products**

**2.1                MATERIALS**

- .1            Nursery Sod: quality and source to comply with standards outlined in 'Canadian Standards for Nursery Stock' – Eighth Edition.
- .2            Water: Potable
- .3            Fertilizer:
  - .1            Fertilizer must meet standards of the Canadian 'Fertilizers Act' and 'Fertilizers Regulations'.
  - .2            Complete slow release fertilizer with maximum 35% water-soluble nitrogen.

## Sodding

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- .4 Herbicide: type, rate, and method of application will be subject to the approval of the Construction Manager.

### **2.2 SOURCE QUALITY CONTROL**

- .1 Obtain approval from the Construction Manager for the sod source.
- .2 When the proposed sod source is approved, use no other source without written authorization.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Verify that grades are correct and prepared in accordance with Section 32 91 21. If discrepancies occur, notify the Construction Manager; do not commence work until instructed.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Fine grade the surface until free of humps and hollows to smooth, even grade, to elevations indicated.
- .4 Clean immediately, any soil or debris, stone, oils contaminating soil, gasoline and other deleterious materials.

### **3.2 SOD PLACEMENT**

- .1 Lay the sod during the growing season. Placing sod during dry summer periods, freezing temperatures, or over frozen soil, will be unacceptable.
- .2 Lay the sod in rows, perpendicular to slope, smooth, and even with adjoining areas, and with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements. The sod should be staked on slopes greater than 2.5:1.
- .3 Provide close contact between sod and soil by means of a light roller. Heavy rolling to correct grade irregularities not permitted.
- .4 Water the sod immediately after laying the sod to obtain moisture penetration through the sod into top 100 mm of topsoil.
- .5 Provide adequate moisture protection of sodded areas against erosion and mechanical damage. Remove protection after lawn areas have been accepted.

### **3.3 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform following operations from time of installation until acceptance.
  - .1 Water sodded areas in sufficient quantities and at frequency required to maintain subsoil immediately under the sod continuously moist to depth of 75-100 mm.
  - .2 Cut grass for the first time to 50 mm when or prior to it reaching height of 70 mm. Remove clippings, which will smother, grassed areas as directed by the Construction Manager.
  - .3 Maintain the sodded areas to 95% weed free.
  - .4 Fertilize sodded areas one month after sodding with 2:1:1 ratio fertilizer. Spread the fertilizer evenly at the rate of 0.5 kg of nitrogen/<sup>100 m<sup>2</sup></sup> and water in well.

Sodding

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**3.4 ACCEPTANCE**

- .1 Sodded areas will be accepted at final inspection provided that:
  - .1 Sodded areas are properly established.
  - .2 Sodded areas are free of bare and dead patches.
  - .3 Sodded areas have been cut minimum of two times.
  - .4 Lawns sodded after September 30th will be accepted in following spring a month after the start of the growing season, provided acceptance conditions are fulfilled.
- .2 The contractor will not be held responsible for damage due to salt, snow removal, or vandalism.
- .3 Areas sodded in fall will be accepted in the following spring a month after the start of the growing season provided acceptance conditions are fulfilled.

**3.5 MAINTENANCE DURING WARRANTY PERIOD**

- .1 Perform following operations from time of acceptance until the end of warranty period (warranty period to be one year from the date of acceptance):
  - .1 Review sodded areas to ensure the irrigation system is maintaining optimum soil moisture level for continued growth of grass. Notify Consultant if irrigation system required modifications.
  - .2 Dead or bare patches must be repaired and resod, to the satisfaction of the Construction Manager.
  - .3 Fertilize areas in accordance with the fertilizing program. Spread half of the required amount of fertilizer in one direction and remainder at right angles and water in well.
  - .4 Eliminate weeds by means acceptable to Construction Manager.

**END OF SECTION**

Trees, Shrubs and Groundcover Planting

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**Part 1**

**General**

**1.1 SECTION INCLUDES**

.1 Install trees, shrubs and ground covers work in accordance with the Canadian Standards for Nursery Stock - Eighth Edition, except where specified otherwise. Perform all work and supply all materials as specified herein, including but not necessarily limited to the following:

- .1 Supply and installation of trees, shrubs and ground covers;
- .2 Maintenance of plant materials.

**1.2 RELATED SECTIONS**

- .1 Topsoil Placement and Grading
- .2 Section 32 92 23 – Sodding

**1.3 REFERENCES**

- .1 Canadian Nursery Landscape Association (CNLA)
  - .1 'Canadian Standards for Nursery Stock – Eighth Edition'.

**1.4 SCHEDULING**

- .1 Obtain approval from Construction Manager of schedule seven days in advance of shipment of plant material.
- .2 Schedule to include:
  - .1 Date for selection of plant material at source by Contract Administrator.
  - .2 Quantity and type of plant material.
  - .3 Shipping dates.
  - .4 Arrival dates on site.
  - .5 Planting Dates.

**1.5 DELIVERY, STORAGE AND PROTECTION**

- .1 Tie branches of trees and shrubs securely and protect plant materials against abrasion, exposure and extreme temperature change during transit. Avoid binding of plant stock with rope or wire, which would damage bark, break branches or destroy natural shape of plant. Give full support to root ball of trees during lifting.
- .2 Shade plant foliage with tarpaulin or in a closed facility and protect bare roots by means of dampened straw, peat moss, sawdust or other acceptable material to prevent loss of moisture during storage or transport. Ensure proper ventilation so no excessive heat will build up.
- .3 Remove broken and damaged roots or limbs with sharp pruning shears. Make clean cut.
- .4 Keep roots moist and protected from sun and wind. Heel-in trees and shrubs, which cannot be planted immediately, in shaded areas and water well.

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Trees, Shrubs and Groundcover Planting

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**1.6 WARRANTY**

- .1 Provide a signed, written guarantee, stating that the plant material as itemized on plant list is guaranteed against defects for a period of one year from the date of substantial completion.
- .2 Construction Manager will conduct an end-of-warranty inspection.
- .3 Construction Manager reserves the right to extend the Contractor's warranty responsibilities for an additional year if at the end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

**1.7 REPLACEMENTS**

- .1 During warranty period, remove from site any plant material that has died or failed to grow satisfactorily as determined by consultant and replace with same plant material.
- .2 Extend warranty on replacement plant material for a period equal to the original warranty period.
- .3 Continue such replacement and warranty until plant material is acceptable.

**1.8 SUBSTITUTIONS**

- .1 Substitutions to plant material as indicated on drawings shall not be allowed without written approval by consultant.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Plant Material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system. Root pruned regularly, but not later than one growing season.
- .2 Trees: with straight trunks, well and characteristically branched for species except where specified otherwise.
  - .1 Trees larger than 200 mm in caliper; half root pruned during each of two successive growing seasons, the latter at least one growing season prior to arrival on site. Bare Root Stock: nursery grown, in dormant stage, not balled and burlapped or container grown.
- .3 Collected Stock: maximum 40 mm caliper well developed crowns and characteristically branched; no more than 40% of overall height may be free of branches.
- .4 Water: potable and free of minerals, which may be detrimental or inhibit plant growth.
- .5 Stakes: T-bar steel stakes 40 x 40 x 5 x 2440 mm. Two coats black rust inhibitive paint.
- .6 Wire Tightener: Type 1 - steel, Type 2 - turn-buckle, steel, 9.5 mm diameter with 270 mm open length.

### Trees, Shrubs and Groundcover Planting

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- .7 Guying Wire: 9 gauge galvanized wire
- .8 Tree Rings: fabricated from 2 mm galvanized wires encased in two ply reinforced 12 mm diameter rubber garden hose or equivalent.
- .9 Root Ball Burlap: 150 g Hessian burlap.
- .10 Tree Wrapping Material: new, clean, plain burlap strips minimum 2.5 kg per square metre mass and 150 mm wide.

## 2.2 MULCH

- .1 Provide sample for approval of Wood chips varying in size from 50 to 75 mm and 5 to 20 mm thick, free of bark, small branches and leaves.

## 2.3 PLANT MATERIAL

- .1 Quality and Source: comply with metric Guide of CNLA referring to size, development, and rootball of plant material. Measure plants when branches are in their natural position. Use trees and shrubs of No.1 Grade.
- .2 Additional Plant Material Qualifications:
  - .1 Plant material obtained from areas with milder climatic conditions from those of site are acceptable only when moved to site prior to the breaking of the buds in their original location, and are heeled-in, in a protected area until conditions are suitable for planting.
  - .2 Use trees and shrubs with strong fibrous root systems free of disease, insects, defects, or injuries and structurally sound. Use trees with straight trunks, well and characteristically branched for species. Plants must be root pruned regularly, but not later than one growing seasons prior to arrival on site.
  - .3 Container-grown stock: acceptable if container is large enough for root development. Trees and shrubs must have grown in container for minimum of one growing season, but not longer than two. Root system must be able to hold soil when removed from container. Plants that have become root bound are not acceptable. Container stock must have been fertilized with a slow releasing fertilizer.
  - .4 Balled and burlapped: coniferous and broad-leafed evergreens over 500 mm tall must be dug with soil ball. Deciduous trees in excess of 3.0 m height must have been dug with large firm ball. Root balls must include 75% of fibrous and feeder root system. Secure root balls with burlap, heavy twine and rope. Protect root balls against sudden changes in temperature and exposure to heavy rainfall.
  - .5 Tree spade dug material: dig plant material with mechanized digging equipment or hydraulic spade or clamshell type. Root balls to satisfy CNLA standards. Lift root ball from the hole, place in wire basket designed for purpose and lined with burlap. Replace root ball and tie basket to ball with heavy rope. Take care not to injure trunk of tree with wire basket or rope.
  - .6 Planting in clay soils: in planting locations with clay soils, use only plant material grown in clay. Excavate planting hole three times diameter of root ball at surface with taper to root ball diameter at bottom of planting hole. Place minimum 300 mm planting soil under root ball, and base of tree 150 mm above surrounding grade.

Trees, Shrubs and Groundcover Planting

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**2.4 SOURCE QUALITY CONTROL**

- .1 Obtain approval from Construction Manager and Consultant of plant material at source prior to planting.
- .2 Imported plant material must be accompanied with necessary permits and import licenses and conform to federal and provincial regulations.
  - .1 Acceptable certification includes: **Grower's Certification** as to when the trees will be shipped directly from the grower's facility to the site.
- .3 The contractor shall notify Construction Manager a minimum of 48 hours prior to delivery.

**Part 3 Execution**

**3.1 PREPARATION OF PLANTING BEDS**

- .1 Stake out or set out location of shrubs and groundcovers as per planting plan. Obtain approval from Construction Manager prior to excavating planting holes.

**3.2 PLANTING TIME**

- .1 When permission has been obtained, trees, shrubs and ground covers growing in containers may be planted throughout growing season.
- .2 Plant only under conditions that are conducive to health and physical conditions of plants.

**3.3 PLANTING**

- .1 Plant trees and shrubs vertically with roots placed straight out in hole. Adjust plant material to give best appearance in relation to structure, roads and walks.
- .2 Place plant material to depth equal to depth they were originally growing in nursery. Plant directly into existing soil found in planters.
- .3 With balled and burlapped root ball, loosen and remove ties and burlap, without disturbing root ball. With container stock, remove entire container without disturbing rootball. Non-bio-degradable wrapping must be removed. With fibre pots slit side and remove pot.
- .4 Remove entire wire basket taking care not to disturb rootball.
- .5 Tree Spade Excavated Material: Dig tree pit with same mechanical equipment as used to dig plant material. Ensure hole dug is upright. Place in hole a mixture of 40 L of planting soil and fertilizer mixed with water to soupy consistency.
- .6 During planting of bare-rooted stock, first shake excavated planting soil from pit among roots.
- .7 Tamp planting soil around root system in layers of 15 mm eliminating air voids. Frozen or saturated planting soil is unacceptable. When planting soil has been placed, fill hole with water. After water has completely penetrated soil, complete backfilling.
- .8 For shrub material build 150 mm deep saucer around outer edge of hole.

### Trees, Shrubs and Groundcover Planting

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- .9 When planting is completed, give surface of planting saucer dressing of organic 10-6-4 fertilizer at rate of .12 kg/m<sup>2</sup> for shrub beds and 40 g/mm for trees. Mix fertilizer thoroughly with top layer of planting soil and water in well.
- .10 Plant bulbs in areas as indicted on drawings. Spacing at 150 mm - 200 mm. Maximum depth of 150 mm minimum to 200 mm maximum.

#### 3.4 WRAPPING

- .1 Wrap deciduous trees, whose calliper is 50 mm to 150 mm, spirally up to height of second branches. Treat trunk with paste of long residual insecticide, lindane or equivalent before applying wrapping. Secure burlap with binder twice wound in opposite direction to burlap at 100 mm intervals. Place wrapping neatly and snugly with 40 mm overlap.

#### 3.5 PRUNING

- .1 Prune trees and shrubs after planting, to compensate for loss of roots suffered during transplanting. Employ clean, sharp tools; make cuts flush with main branch, smooth and sloping to prevent accumulation of water. Remove projecting stumps on trunk or main branches.
- .2 Remove dead, injured branches and branches that rub causing damage to bark.
- .3 Trim out crown of trees and shrubs without changing natural shape. Be careful not to damage lead branches or remove small twigs along main branches. Treat cuts in excess of 20 mm diameter, and/or damaged parts, with application of wound dressing.

#### 3.6 MAINTENANCE

- .1 From time of acceptance by Consultant to end of warranty period, perform the following maintenance operations. Such maintenance shall include all measures necessary to establish and maintain vigorous growth, including but not necessarily limited to:
  - .1 Ensure Irrigation system is operational for upper terrace planting, review soil moisture conditions to ensure optimum growing conditions and advise consultant if modifications to irrigation system are required. If irrigation is not in place (and for ground level planting), water trees and shrubs twice weekly for first (4) four weeks and then biweekly or as required thereafter to obtain optimum growing conditions. Ensure adequate moisture in root zone at freeze-up.
  - .2 Keep soil, within confines of planting saucer around trees and planting beds, shallowly cultivated, free from weeds.
  - .3 Spray plants to combat pests and diseases. Do not use DDT or sprays prohibited by Agriculture Canada.
  - .4 Keep tree stakes, wrapping, guy-wires, and rodent protection in proper repair.
  - .5 Provide adequate protection against winter damage including damage caused by rodents. Fertilize in spring and fall with appropriate fertilizers.
  - .6 Maintain plant material from date of acceptance up to end of warranty period.
  - .7 Remove trunk wrapping tree stakes and guy wires at end of warranty period.
  - .8 Contractor will not be held responsible for damage due to salt, snow removal, or vandalism.

**END OF SECTION**

Planting – Warranty Period Maintenance

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**Part 1 General**

**1.1 SCOPE**

- .1 The Contractor shall provide maintenance and warranty of all plant material. The maintenance work of this section shall include watering, weeding, fertilizing, pruning and other incidental maintenance deemed necessary to ensure healthy plant material for a period of one year upon completion of planting. The warranty shall cover any defects in materials and workmanship. Any damage to existing turf areas, vegetation, hard surfaces, structures or services caused as a result of the Contractor's work methods and practices for plant material maintenance shall be reinstated or repaired to the satisfaction of the Consultant. The cost of such reinstatement or repair shall be solely at the Contractor's expense.

**1.2 RELATED SECTIONS**

- .1 Section 32 91 19.13 – Topsoil Placement and Grading  
.2 Section 32 93 10 – Trees, Shrubs and Groundcover Planting

**1.3 REFERENCES**

- .1 All methods of maintenance shall be in accordance with accepted horticultural / arboricultural practices and standards.

**Part 2 Materials**

**2.1 WATER**

- .1 Water shall be free from any contaminants that could adversely affect plant growth.

**2.2 FERTILIZER**

- .1 Fertilizer shall be a complete commercial type. Formulation and application rate to be determined by soil tests. For estimating purposes, use 10-52-10 applied at a rate of:  
1. **0.9 kg** for each **25 mm** of tree caliper (water soluble). Deliver to site in fully labeled bags.

**2.3 TOPSOIL**

- .1 Any additional topsoil required shall originate from the same source as the initial approved product.

**2.4 RODENT GUARDS**

- .1 Rodent guards shall originate from the same source as the initial approved product.

**2.5 MULCH**

- .1 Mulch shall originate from the same source as the initial approved product.

**2.6 CONIFEROUS TREE WRAP**

- .1 Wrapping material for winter protection of coniferous trees shall be new burlap, at least 270 g/m<sup>2</sup> in weight supplied in 1.0 m wide or 1.5 m wide rolls.

Planting – Warranty Period Maintenance

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**Part 3            Equipment**

**3.1                PUMPS AND HOSES**

- .1            Hoses used for watering plant material shall be capable of reaching the limits of the contract area. Pumps shall be under pressure. The outlet end of the hose(s) shall be 25 mm in diameter with a suitable adjustable nozzle(s) and a quick shut-off valve.

**3.2                TANKS**

- .1            Tanks used for storage or application of water shall be clean and free of any contaminants that may be hazardous to the growth and development of plant material or to the environment in general.

**3.3                PRUNING TOOLS**

- .1            All pruning equipment shall be designed specifically for tree work and shall be clean, sharp and in proper, safe, working order. Pruning equipment shall be capable of producing clean, flush cuts without tearing or fraying the bark.

**Part 4            Construction**

**4.1                DURATION**

- .1            All plant material shall be warrantied for a period of one year from the date of SUBSTANTIAL COMPLETION of landscape works. The Contractor shall provide maintenance immediately after each portion of planting is completed and continue throughout the period of warranty to the satisfaction of the Consultant.”

**4.2                OPERATIONAL CONSTRAINTS**

- .1            The Contractor shall be responsible to obtain any permits or certificates for water usage. No maintenance equipment, materials or other miscellaneous items may be stored on site unless approved by the Consultant. All debris, waste and other extraneous material resulting from the maintenance operation shall be removed from the site daily upon completion of maintenance, unless otherwise directed or approved by the Consultant. The Contractor shall be fully acquainted with all relevant Provincial and Municipal By-laws relating to the work of this contract, and will be required to comply with such by-laws without extra compensation.

**4.3                WATERING**

- .1            During the first year of the warranty period, between May 15 and September 15 the contractor shall ensure the irrigation system is operational for the upper terrace planting, review soil moisture conditions to ensure optimum growing conditions and advise consultant if modifications to irrigation system are required. If irrigation system is not yet in place (and for ground level planting), water trees and shrubs twice weekly for first (4) four weeks and then biweekly or as required thereafter to obtain optimum growing conditions. Ensure adequate moisture in root zone at freeze-up.
- .2            The Contractor shall uniformly soak reforestation and shrub areas to a depth of 300 mm using a soft spray nozzle to avoid "packing" of soil and damage to vegetation. Each nursery stock tree (greater than 40 mm caliper or 1.20 m height) shall be watered in

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accordance with Table 1 and using one of the following watering methods.

- .1 Water Injection Method: Each tree shall be watered by two injection applications directly into the soil. Both injections shall be located at the outer edge of the planting pit area and shall penetrate the ground to a depth of 450mm at the commencement of the watering operation. The second injection shall be located 180 degrees from the initial injection.
- .2 Soak Method: The planting saucer of each tree shall be filled with water and the water allowed to percolate into the soil before being re-filled as many times as necessary to meet the volume requirements of Table 1.

**TABLE 1:** Water application rates for each tree:

Tree Caliper			Tree Height			Litres per Watering
40	-	70 mm	1.20	-	1.8 m	170
71	-	100 mm	1.81	-	2.50 m	230
101	-	125 mm	2.51	-	3.00 m	270
126	-	150 mm	3.01	-	3.50 m	360
151	-	200 mm	3.51	-	4.00 m	460

- .3 All coniferous trees shall be watered in late fall, just prior to freeze-up.
- .4 Water shall be applied so that the washing of the soil or dislodging of mulching or tree guards does not occur.
- .5 Damage shall be immediately repaired to the satisfaction of the Consultant at no additional cost.

**4.4 FERTILIZING**

- .1 Apply fertilizer at the same time or as part of a watering application. Apply fertilizer as recommended by soil analysis report, subject to adjustment by the Consultant.

**4.5 MULCHING**

- .1 In the autumn and spring of the warranty period the Contractor shall re-staple or replace plastic blankets or woodchip mulch to meet the specifications.

**4.6 WEEDING**

- .1 All weeds and grasses within saucers, beds and mulched areas around plant material shall be removed by hand. Weed whackers or whipper-snippers shall not be used to remove weeds in the vicinity of plant material. The application of herbicides shall not be permitted unless otherwise approved by the Consultant. Removed weeds and grasses shall be disposed of the Contract site. At a minimum, weeding shall occur at one month intervals, with the first operation occurring at the beginning of July and the final operation occurring in early October. All areas shall be weeded immediately prior to the final warranty inspection.

**4.7 RODENT GUARDS**

- .1 In the autumn and spring of each warranty year, the Contractor shall re-position or replace rodent guards to meet the specifications.

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**4.8 STAKES**

- .1 In the autumn of the first warranty year, the Contractor shall ensure that all stakes are secure and functioning properly. Remove all stakes one year from the date of final acceptance of plant material, unless otherwise directed by the Consultant.

**4.9 CONIFEROUS TREE WRAPPING**

- .1 In the autumn of each warranty year, the Contractor shall wrap all coniferous trees greater than 600 mm in height. The entire needle area shall be completely covered with burlap wrap. Edges of the wrap shall be overlapped a minimum of 100 mm with the exposed edge folded back under and fastened with metal fasteners. After each tree is wrapped, the burlap will be securely fastened with nylon twine or wire to ensure that the wrapping does not unravel. All wrapped trees shall be unwrapped by the Contractor during the following spring, prior to bud break. All materials used to wrap and unwrap the trees shall be removed from the contract site.

**4.10 REMOVAL OF SALT SPRAY**

- .1 When natural spring precipitation (Apr 1 - 30) of each warranty year is less than 80 mm, the above ground parts of all plant material, within 10 m of the roadway edge upwind of prevailing winds and within 100 m of the roadway edge downwind of prevailing winds, shall be thoroughly sprayed with water to remove salt spray deposits prior to May 15. A soft spray nozzle shall be used. Precipitation data shall be as per Environment Canada from the Macdonald-Cartier Airport weather station.

**4.11 INFESTATION**

- .1 Monitor plant material throughout the warranty period for any sign of disease or insect problems. Ensure immediate treatment to control and repair damage. Cultural or non-toxic methods of control shall be given first priority. Do not use D.D.T. or other chemicals prohibited by Agriculture Canada. All chemicals must be approved by the Consultant prior to use. It is the Contractor's responsibility to inform the Consultant before applying any corrective actions.

**Part 5 Quality Assurance**

**5.1 QUALIFICATIONS OF WORKERS**

- .1 Contractor shall provide proof of a foreman with a minimum of five 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. Acceptable forms of proof:
  - .1 ISA Certification as an arborist
  - .2 Diploma in horticulture from a recognized College
  - .3 Ontario Tradesman Certificate
  - .4 An acceptable combination of education, training and experience (as determined by the Consultant)

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**5.2 INTERIM REPLACEMENT PLANT MATERIAL**

- .1 Throughout the maintenance and warranty period, units of plant material that are found to be unacceptable will be replaced by the Contractor at the earliest opportunity. At the discretion of the Consultant, plant material that is identified as dead or in a poor or diseased condition shall be immediately removed from the site. All replacement plant material shall be as per the size indicated on the drawings. These sizes are the minimum allowable.

**5.3 FINAL WARRANTY INSPECTION**

- .1 A one-time inspection of all plant material shall be carried out by the Consultant upon completion of the maintenance and warranty period. Plant material shall be acceptable when it meets the quality requirements set out in the specifications for plant material. All planting pits, beds, and other areas worked by the Contractor shall be free of weeds and in good order, including the removal of all stakes. Plant material shall be unacceptable when it does not meet this quality standard. Units of plant material that are found to be unacceptable will be replaced by the Contractor at the earliest opportunity. The Consultant reserves the right to extend the Contractor's maintenance and warranty responsibilities for an additional one-year for replacement plant material. In the event that this inspection is satisfactory to the Consultant, and that there are no outstanding commitments to the contracted works, the Contractor will be given final approval of the maintenance and warranty requirements.

**Part 6 Scope of Maintenance**

**6.1 PLANT MATERIAL MAINTENANCE**

- .1 Where maintenance and replacement of plant material is required during the warranty period, all such costs will be the responsibility of the contractor. No additional costs will be borne by the Owner.
- .2 **Where, in the opinion of the Consultant, the Contractor has failed to complete obligations as detailed in this Specification; and further, fails to rectify said deficiency within two days of written notification from the Consultant, the Owner reserves the right to complete the work and deduct incurred expenses from monies owing to the Contractor.**

**END OF SECTION**

Maintenance Edge

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**Part 1            General**

**1.1                SECTION INCLUDES**

- .1            The maintenance edge is as shown on the drawings and includes, but not necessarily limited to pea gravel, precast concrete edging and polyethylene sheets.

**1.2                RELATED SECTIONS**

- .1            Section 32 91 19.13 – Topsoil Placement and Grading
- .2            Section 32 93 10 – Trees, Shrubs and Groundcover Planting

**1.3                SUBMITTALS**

- .1            Samples: provide the Construction Manager for approval, in a suitable container, a representative quantity of the aggregate mix proposed for installation and tagged to identify the source. If more than one source exists, provide a sample of each.
- .2            Submit a sample of precast edger for approval by Construction Manager and Consultant.

**1.4                JOB CONDITIONS**

- .1            Protection: Protect installed materials and work of all other trades.
- .2            If damage occurs, make all the necessary repairs to the approval of the Construction Manager and Consultant, and at no additional cost to the Owner.

**Part 2            Products**

**2.1                MATERIALS**

- .1            Aggregates: Screened granite - rounded pea gravel in following proportion:
  - .1            100% - 18 mm and less
  - .2            75% - 12 mm and less
  - .3            50% - 9 mm and less
- .2            Precast concrete edger to dimensions and form as indicated on the contract drawings.
- .3            Use two mil polyethylene sheets, perforated.

**Part 3            Execution**

**3.1                SURFACE CONDITIONS**

- .1            Inspection: Before commencing the work of this section, carefully inspect the installed work of other trades to verify that the work for this section has been correctly installed.
- .2            Discrepancies: In case of any discrepancies, immediately notify the Construction Manager. Do not proceed with work until the Construction Manager has given direction.

Maintenance Edge

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**3.2           INSTALLATION**

- .1       Excavate to line and grade shown on drawings. Remove excavated material from site and rake bottom smooth.
  
- .2       Install a precast concrete edge to location and grades shown on the contract drawings. All corners to be mitered.
  
- .3       Place polyethylene liner in excavated area to provide a continuous liner.
  
- .4       Place aggregate to location and profile shown on the contract drawings.

**END OF SECTION**

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Landscape Subgrade Drainage

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- Part 1            General**
- 1.1            SECTION INCLUDES**
- .1            The work under this section includes the supply of labour, materials and equipment necessary to replace existing 6" round area drains as indicated on the drawings and flush all existing roof terrace drainage pipe of dirt and debris to ensure no blockages to the existing roof drainage system.
- 1.2            RELATED SECTIONS**
- .1            Section 32 91 19.13 – Topsoil Placement and Grading
- 1.3            REFERENCE**
- .1            CSA Group
- .1            CSA B1800-15 'Thermoplastic Nonpressure Piping Compendium'.
- 1.4            MATERIAL CERTIFICATION**
- .1            Submit manufacturer's test data and certification that drain pipe materials meet requirements of this section at least four weeks prior to commencing work with certification to be marked on pipe.
- Part 2            Products**
- 2.1            MATERIALS**
- .1            Area drains: NDS 6" round Spee-D Catch Basins and Grates
- .2            Perforated plastic pipe and fittings: to CSA B1800 Nominal pipe sizes 100 mm.
- .3            Bedding gravel or crushed stone, hard, durable particles, graded evenly in size.
- Part 3            Execution**
- 3.1            TRENCHING**
- .1            Do grading in accordance with the drawings.
- 3.2            INSTALLATION OF PIPE SUB-DRAINS**
- .1            Lay pipe drains on prepared grade, true to line and grade with inverts smooth and free of sags or high points. Ensure barrel of each pipe is in contact with bed throughout full length.
- .2            Commence laying the pipe at outlet and proceed in upstream direction.
- .3            Make joints tight in accordance with manufacturer's instructions.

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Landscape Subgrade Drainage

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- .4 Make watertight connections to catch basins where indicated or as directed by Contract Administrator.
- .5 Backfill the remainder of the trench with clean fill, as described in Section 31 22 13 per Rough Grading.
- .6 Do not place bedding surround and backfill materials in frozen condition.
- .7 Protect sub-drains against flotation during installation.

**END OF SECTION**