

Table of Contents

<u>Specification Sections</u>	<u>Number of Pages</u>
01001 General Requirements	4
01560 Environmental Protection	2
02210 Site Grading	3
02260 Topsoil and Finish Grading	2
02512 Cart Paths	2
02710 Subgrade Drainage	4
02938 Sodding	2
02952 Tee Construction	4
02954 Bunker Construction	4
03330 Retaining Wall	4

<u>Drawing Index</u>	<u>Number of Pages</u>
SA1 Site Access 2018 Project - Kildonan Park Golf Course	1
L1 Kildonan Park No. 2, 10/11 & 15 Tee Renovation Plan	1
L2 Construction Details	1
L3 Construction Details	1

1. GENERAL INSTRUCTIONS**1.1 Codes & Standards**

- .1 Execute Work in accordance with all applicable, federal, provincial and local codes and all standards specified within the rest of this specification.

1.2 Workplace Hazardous Materials Information System

- .1 The Contractor shall comply with the Government of Canada Occupational Health and Safety Act, Hazardous Products, Transportation of Dangerous Goods Act including the requirements of Labour Canada.

1.3 Safety Requirements

- .1 Observe and enforce all construction safety measures by the Canadian Construction Safety Code supplemented to the National Building Code of Canada, applicable Worker Compensation Board requirements and Province of Manitoba Statutes and bylaws.

1.4 Layout of Work

- .1 Prior to commencing with Work, check and examine site conditions including existing services; obtain and confirm site dimensions. Notify the Contract Administrator, in writing, of any and all matters which could prejudice proper execution of the Work.
- .2 Commencement of Work, or any part thereof, constitutes acceptance of site conditions and indicates that dimensions and conditions have been verified and are acceptable.
- .3 Lay out main lines and levels of work, (as required) in relation to designated grade stakes, reference points and bench marks established by the Contract Administrator.
- .4 The Contractor shall be responsible for relocating all moved or damaged reference points and bench marks brought about by the Contractor's own operations. Repair such damage as directed by the Contract Administrator.

1.5 Working Limits / Temporary Easements

- .1 Confine all operations of Work within the property, on designated operating limits within the site and to designated travel routes within the site.

1.6 Transportation of Materials

- .1 All goods must be securely packed or covered according to their kind. Packing

must be adequate for conditions of shipping and in accordance to carrier requirements.

1.7 Signs & Advertisements

- .1 No sign or advertising shall be allowed or displayed without the approval of the Contract Administrator.
- .2 This project will not be used to advertise or promote systems, construction or assembly methods, tools or equipment used and/or incorporated therein without written approval of the Contract Administrator.

2. JOB PROGRESS MEETINGS

2.1 Job Meetings

- .1 After award of Contract, arrange job meetings at regular intervals at times and locations approved by the Contract Administrator. Notify all parties concerned, including major Subcontractors, to attend.
- .2 The Contractor shall record minutes of these meetings, and circulate minutes to all attending parties within three (3) days after meeting.

3. SCHEDULES

3.1 Construction Schedule

- .1 Prepare the schedule immediately after receiving the Contract Administrator's Notice of Award.
- .2 The Contractor shall schedule activities to avoid possible delays in construction. Maintain temporary access to all portions of the site as required and as directed by the Contract Administrator.
- .3 In order to coordinate the performance of work and to measure the progress of work, prepare and submit for the Contract Administrator's review, a Schedule of Activities of the work. Clearly indicate dates of commencement and completion of various phases or parts of the work.
- .4 Comply with the Schedule in all instances. Bear all costs necessary to meet the Schedule. If the progress of work falls behind, or is delayed, immediately engage additional labour and equipment, and work additional hours as may be required to bring the work back on schedule, at no additional cost.
- .5 The Construction schedule shall be updated when affected by any changes in the work or by weather related delays.

4. SUBMITTALS**4.1 Samples (N/A)**

- .1 Submit for review such samples as the Contract Administrator may reasonably require.
- .2 Submit samples with reasonable promptness and in an orderly sequence, so as to cause no delay in the work.
- .3 Notify the Contract Administrator in writing, at the time of submission, of any deviations in samples from requirements of Contract Documents.
- .4 Submit samples in sizes and quantities requested.
- .5 Where colour, pattern or texture is criterion, submit full range of samples.
- .6 Construct field samples at locations acceptable to the Contract Administrator.
- .7 Reviewed samples will become standards of workmanship and material against which, installed work will be checked on project.

4.2 As-Built Drawings

- .1 Contract Administrator will provide three (3) sets of white prints for the Contractors purposes.
- .2 The Contract Administrator will maintain a project record drawing and record accurately significant deviations from the Contract Documents caused by site conditions and changes ordered on site by the Contract Administrator. Copies of the project record drawing(s) will be provided to the Contractor for their records.

5. PRODUCTS / WORKMANSHIP**5.1 Quality of Equipment**

- .1 All equipment used in the performance of the work shall be in good operating condition for the duration of the work.
- .2 Should any dispute arise as to the quality or fitness of equipment or articles, the decision rests strictly with the Contract Administrator and in accordance with the requirements of the Contract Documents.

5.2 Availability of Equipment & Products

- .1 Immediately upon Contract signing, review equipment requirements and anticipate foreseeable delays for any items. If delays in supply of equipment are foreseeable, notify the Contract Administrator of such, in order that remedial

action may be authorized in ample time to prevent delay in performance of work.

5.3 Storage, Handling & Protection

- .1 Handle and store fuel and maintenance supplies in a manner to prevent damage, deterioration, soiling and site contamination, in accordance with manufacturers recommendations when applicable.
- .2 Products are to be stored in weatherproof condition.

5.4 Workmanship

- .1 Workmanship shall be of the best quality and executed by workers experienced and skilled in the respective duties for which they are employed.

6. PROJECT CLEAN-UP

6.1 Clean-up & Final Cleaning of Work

- .1 Remove all waste materials and debris from the site at regular scheduled times or dispose of as otherwise directed by the Contract Administrator. Do not burn waste materials on site, unless otherwise directed by the Contract Administrator.

6.2 Removal of Temporary Facilities

- .1 On completion of project, remove all temporary offices and furniture, hoardings, fencing, tree and plant protection, stream crossings and all other items used to aid the performance of work.

7. TAKE OVER / PROJECT COMPLETION

7.1 Take Over Procedures

- .1 Prior to application for Certificate of Substantial Performance, the Contractor shall carefully inspect the Work and ensure that it is complete, that major and minor construction deficiencies are complete and/or corrected and that the site is clean and in condition for continuation of work by the Contract Administrator.
- .2 When the Contractor considers that all deficiencies have been corrected and that it appears the requirements of the Contract have been performed, request a final inspection by the Contract Administrator for Certification of Substantial Performance. Refer to The Builder's Lien Act, for specifics to application.

1. Disposal of Wastes

- .1 Remove waste materials from site unless burial in designated location is approved and in locations designated by the Contract Administrator.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or fuel on-site or into waterways.
- .3 Contractor must provide containment for all waste materials. Under no circumstances is spillage acceptable. The Contractor will bear all costs related to cleaning up such spills, as stipulated by the Contract Administrator.

2. Drainage

- .1 Provide temporary drainage and pumping as necessary to keep excavations and project site free from water.
- .2 Do not pump water containing suspended materials into waterways or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with city of Winnipeg requirements.

3. Site Clearing & Plant Protection

- .1 Trees and root systems, and native vegetation retained are to be protected by the use of snow fencing, where designated by the Contract Administrator.
- .2 Protect trees adjacent to construction site roadways or cart paths.
- .3 Protect roots of trees designated to be retained to their drip line (edge of canopy) and during excavation maintain a minimum setback of 6m (20') from all specimen trees marked to be retained to prevent disturbance or damage, unless expressly directed otherwise by the Contract Administrator. Avoid vehicle traffic over root zones.
- .4 Limit stripping of topsoil to areas designated in the field by the Contract Administrator.
- .5 Restrict vegetation removal to areas indicated by the Contract Administrator.

4. Work Adjacent to Waterways

- .1 Do not operate construction equipment in waterways or naturally occurring swales.
- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material or debris in waterways.

- .4 Construct and utilize temporary crossings as may be required, to minimize erosion into waterways. Use CMP culverts sized to suit each situation. Obtain the Contract Administrator's approval prior to installation of temporary culverts and crossings.
- .5 Do not skid construction materials across waterways.

5. Pollution Control

- .1 Maintain all temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to city of Winnipeg emission requirements.

PART 1 - GENERAL

1.1 Related Work

- | | | |
|----|---------------------------------|---------------|
| .1 | Environmental Protection | Section 01560 |
| .2 | Topsoil Stripping and Placement | Section 02260 |
| .3 | Tee Construction | Section 02952 |

1.2 Site Conditions

- .1 Confirm all surface and buried utility lines and structures with Contract Administrator, and obtain authorization to cross utility corridors, as required.

1.3 Protection

- .1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, surface or underground utility lines which are to remain. Make good any damage. Refer to section 01560 Environmental Protection.
- .2 Prevent damage to all areas within the project site designated to remain undisturbed.

1.4 Inspection & Supervision

- .1 The Contract Administrator will provide the Contractor with initial staking of all earthworks, and will advise and stake any modifications required while the works are in progress, in addition to establishing initial grades and perimeter staking for all golf course features.
- .2 The Contract Administrator or designated representative will be on-site as the majority of excavation and filling operations are being undertaken and will provide direction to the Contractor.
- .3 The Contractor will be required to shape fill as necessary to achieve earth forms suitable for each intended purpose (i.e., tee subgrades).
- .4 Should the Contractor be unable to progress with the shaping work at a rate acceptable to the Contract Administrator, excluding delays created by weather conditions and other site works, the Contract Administrator will be obligated to make alternate arrangements to complete the work in a prompt and satisfactory manner.

PART 2 - MATERIALS

2.1 Materials

- .1 Fill: Utilize native material from excavation, grading, or designated off-site borrow sources, approved by the Contract Administrator for use intended, unfrozen and free from rocks larger than 50 mm (2"), cinders, ashes, sods, refuse or other deleterious materials. Refer to Renovation Plans (L1 & L2) for location and estimated volumes of fill material.
- .2 Topsoil: Off-site soil material approved by the Contract Administrator for use as topsoil.
- .3 Protect approved material from contamination and erosion.

PART 3 - EXECUTION

3.1 Grading

- .1 Rough grade to grades and contours indicated by the Contract Administrator allowing for positive surface drainage at all times and intended surface treatment as indicated on the Tee Construction Detail (1/L4).
- .2 The process for staking and undertaking grading operations will be as follows:
 - .1 Extent of fill areas will be staked and elevations for cut or fill marked by the Contract Administrator.
 - .2 Contractor or designated site representative shall review the proposed works to confirm required material quantities and consistency with existing site elevations and proposed extent of work as shown on the Grading Plan.
 - .3 In order to ensure the overall quantities called for in the contract remain constant, the Contract Administrator must be notified immediately of all material discrepancies. Any added costs resulting from failure to notify the Contract Administrator of discrepancies, which materially affect the total quantity of material moved to achieve the proposed elevations shown on the drawings, will be the responsibility of the Contractor.
 - .4 Following the review of staking and grading, the Contractor will excavate, place and compact fill to locations and to within 150 mm (6") +/- finish subgrade elevations.
 - .5 The Contract Administrator will review and direct or /advise the Contractor on final shaping of subgrade contours to achieve proposed grades.
 - .6 Obtain the Contract Administrator's approval prior to spreading of topsoil.

- .3 Prior to placing fill over existing ground, scarify surface to depth of 150 mm (6"). Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .4 Place and compact fill material in lifts not exceeding 300 mm (12") when compacted.
- .5 Repair all settlement damage resulting from inadequate compaction.

3.2 Spreading of Topsoil

- .1 Spread stockpiled topsoil on all re-graded fairway and tee surround areas to a minimum depth of 100 mm (4") or as otherwise directed by the Contract Administrator.
- .2 Spreading of topsoil at all fairways and tees is to be carried out following final shaping of golf course features, and installation of irrigation and drainage materials.

3.3 Surplus Material

- .1 Surplus fill material is to be hauled to onsite storage area as directed by the Contract Administrator.
- .2 Remove material unsuitable for fill, grading or landscaping to onsite disposal area.

PART 1 - GENERAL

1.1 Related Work

- | | | |
|----|--------------------------|---------------|
| .1 | Environmental Protection | Section 01560 |
| .2 | Site Grading | Section 02210 |
| .3 | Sodding | Section 02938 |

1.2 Protection of Existing Facilities

- .1 Protect elements surrounding the work of this section from damage or disfiguration.
- .2 Protect all natural features remaining as final work.
- .3 Protect structures, fences, paths, paving and golf course features (as may exist).

1.3 Scheduling of Work

- .1 In consultation with the Contract Administrator, schedule placing of topsoil to prevent delays to completion of work.

PART 2 - PRODUCTS

2.1 Materials

- .1 Off-site topsoil, consisting of 60% soil, 20% peat and 20% sand will be stockpiled during grading operations.

PART 3 - EXECUTION

3.1 Preparation

- .1 Fine grade subgrade, eliminating uneven areas and low spots. Removal of debris, roots, branches, stones in excess of 50 mm (2") diameter and building materials to be done by others. Remove subsoil that has been contaminated.
- .2 Cultivate entire area which is to receive topsoil to depth of 100 mm (4"). Repeat cultivation in those areas where equipment used for hauling and spreading has compacted soil.

3.2 Spreading of Topsoil

- .1 Do not spread topsoil until the Contract Administrator has inspected and

approved subgrade.

- .2 Spread topsoil in a layer of uniform depth during dry weather over approved, dry, unfrozen subgrade, on all areas where earthmoving has occurred.
- .3 Spreading of topsoil shall be to a minimum depth of 100 mm (4") on all excavated or filled areas unless advised by the Contract Administrator otherwise. Advise the Contract Administrator immediately of any shortfall in materials.
- .4 Remove stones, roots, grass, weeds, construction materials, debris and foreign non-organic objects from topsoil prior to adding topsoil amendments (if required).

3.3 Finish Grading

- .1 Fine grade entire topsoiled area to contours and elevations matching the subgrade contours. Eliminate rough spots, vehicle ruts, settlement over irrigation trenches as required, and low areas to ensure positive surface drainage.
- .2 Prepare loose friable bed by means of soil conditioning or light disking and subsequent harrowing. Roll lightly and rake wherever topsoil is too loose.
- .3 Roll or compact topsoil to provide a smooth, uniform and firm surface resistant against deep foot printing, with a fine loose texture.

3.4 Surplus Material

- .1 Dispose of surplus topsoil not suitable for fine grading and landscaping in an onsite location designated by the Contract Administrator.

PART 1 - GENERAL

1.1 Related Work

- | | | |
|----|------------------|---------------|
| .1 | Retaining Wall | Section 03330 |
| .2 | Tee Construction | Section 02952 |
| .3 | Site Grading | Section 02210 |

1.2 Source Sampling

- .1 If materials have been tested by an independent testing laboratory within previous two (2) months and have successfully passed tests equal to requirements of this specification, submit test certificates from testing laboratory showing suitability of materials for this project.

PART 2 - PRODUCTS

2.1 Materials

- .1 Crushed granular material to the following requirements:
- Crushed limestone or gravel consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
 - Gradations to be within limits specified below when tested to ASTM C136-83 and to have a smooth curve without sharp breaks when plotted on semi-log grading chart.

ASTM Sieve Designation	% Passing
19.0 mm (3/4")	100
12.5 mm (1/2")	50 - 75
9.5 mm	30 - 50
6.0 mm	10 - 20
0.425 mm	0 - 5
0.180 mm	nil
0.075 mm	nil

- .3 Crushed particles: At least 60% of particles by mass within each of following sieve designation ranges to have at least one (1) freshly fractured face. Material to be divided into ranges using methods of ASTM C136-83.

Passing		Retained On
50.0 mm	to	25.0 mm
25.0 mm	to	19.0 mm
19.0 mm	to	4.75 mm

PART 3 - EXECUTION

3.1 Subgrade Inspection

- .1 Verify grades of compacted subgrade and adjacent golf course features for conformity with elevations and sections before placing granular material.
- .2 Proof roll graded subgrade to check for unstable areas, obtain approval of subgrade by the Contract Administrator before placing granular base.
- .3 Remove and dispose of unsuitable sub base material as directed by the Contract Administrator.

3.2 Areas Requiring Added Compaction & Granular Base

- .1 Place crushed granular material to a minimum compacted thickness of 100 mm (4"). Compact to 95% standard proctor density.
- .2 Add crushed granular material as required to replace unsuitable subgrade material. Place in layers not exceeding 200 mm (8") thickness and compact to 95% standard proctor density.
- .3 Finished surface to be within 25 mm (1") of specified grade, but not uniformly high or low.

PART 4 - MEASUREMENT & PAYMENT

4.1 Method of Measurement

- .1 Cart Paths repairs shall not be measured. The quantity to be paid for shall be included in the linear metres of concrete block curbing that are placed in the completed work in accordance with this specification, acceptable to the Contract Administrator.

4.2 Basis of Payment

- .1 Cart Paths shall be paid for at the Contract Unit Price per linear meter for the "Items of Work" listed below, which shall be payment in full for supplying and placing all materials herein described and all other items incidental to the work included in the specification.

Items of Work:

- i) Retaining Wall - Curb Construction

PART 1 - GENERAL**1.1 Related Work**

- .1 Site Grading Section 02210

1.2 Site Conditions

- .1 Contract Administrator to locate all irrigation system lines and any other underground utilities that may interfere with the works. Ensure the location of all irrigation lines and sprinkler heads are staked prior to the start of construction.

1.3 Protection

- .1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, existing cart paths, surface or underground utilities which are to remain. Make good any damage.
- .2 The Contract Administrator or designated representative will designate the area or areas in which the Contractor's activities may take place. The Contractor shall make good any damage caused by their activities within the construction area or areas. The Contract Administrator or designated representative will designate access routes to the designated work areas. The Contractor shall make good any damage caused by their activities along the access routes.
- .3 In order to minimize disruption to daily play and prevent turf damage, cuttings or excavated material from all trenches must be loaded directly, via conveyor system, into low ground pressure dump trailers and immediately hauled to approved onsite locations for construction of new features or stockpiled for future use, as directed by the Contract Administrator.

1.4 Supervision and Inspection

- .1 The Contract Administrator will provide the Contractor with preliminary staking for line and grade for all drainage works and will advise and stake all modifications while the works are in progress.
- .2 The Contract Administrator or designated representative will be on site as the majority of excavation and filling operations are being undertaken and will provide directions to the Contractor.

PART 2 - PRODUCTS**2.1 Materials**

- .1 Plastic pipe and fittings: to CGSB 41-GP-29Ma be manufactured from HDPE resin which shall meet the requirements of ASTM F667, Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings and ASTM D2729, Standard

Specification for Polyvinyl chloride (PVC) Sewer Pipe and Fittings. Big "0" Internal Snap Coupling System pipe (or approved alternate) perforated all around and non-perforated, nominal inside diameter 100 mm (4") or 150 mm (6"), non-perforated couplings (insert type), sleeves, reducers, connectors, T's, elbows, end caps (insert type). Refer to drawings for applicable pipe size and location.

- .2 Non-calcareous pea gravel: rounded and washed, free from clay and silt fines. Soft limestones, sandstones or shale are not acceptable. Particle size distribution:

<u>Particle Size</u>	<u>% Allowable</u>
≥ 12 mm	zero
6 mm to 9 mm	minimum 65%
≤ 2 mm	less than 10%
≤ 1 mm	less than 5%

Materials shall be tested for weathering stability (ASTM - C - 88), and must show a loss of material less than 12% by weight to be acceptable. ASTM D6928. Standard Test Method for Resistance of Coarse Aggregates to Degradation by Abrasion in the Micro-Deval Apparatus.

- .3 Drainage sand: Washed, non-calcareous sand, angular to sub-angular in shape only.

<u>Particle Size</u>	<u>% Allowable</u>
<0.25 mm	0%
0.25 mm to 0.50 mm	minimum 75%
0.50 mm to 1.00 mm	up to 25%
>1.00 mm	3% max.

- .4 Filter Fabric: permeable woven fabric approved by the Contract Administrator, to required widths and lengths (if required).

- .5 Catch Basins: Nominal inside diameter 150 mm (6"). National Diversified Sales NDS #201, Rainbird DB6R2, (or approved alternate). Nominal inside diameter 300mm (12"). National Diversified Sales NDS #1204, Rainbird DB12KITG (or approved alternate). Refer to drawings for applicable basin size and location. All basins to be complete with green, slotted insert drain covers unless noted otherwise on drawings.

- .6 Anti-Rodent Devices: shall be perforated plastic end caps, the same nominal diameter as the pipe to permit water to escape but to prevent rodents from entering.

- .7 Drainpipe end protection sleeves: Sized to suit application, PVC (13mm [1/2"] min. wall thickness) or HDPE pipe, 750 mm (32") in length. End to be cut on site to match existing slope.

PART 3 - EXECUTION**3.1 Inspection**

- .1 Ensure graded subgrade conforms with required drainage pattern before placing drainage material.
- .2 Report to the Contract Administrator where improper slopes, unstable areas, areas requiring additional compaction or other unsatisfactory conditions exist.
- .3 Begin installation of drainage materials after deficiencies have been corrected.

3.2 Installation

- .1 Pipe Laying:
 - .1 Ensure pipe interior and coupling surfaces are clean before laying.
 - .2 Lay pipe to minimum slope, as indicated on drawings, to discharge site.
 - .3 Do not use shims or granular backfill to establish pipe slope.
 - .4 Use manufacturer recommended fittings.
 - .5 Protect pipe ends from damage and ingress of foreign material.
 - .6 Connect pipe to catch basins, sump pit or outlets by appropriate adapters manufactured for this purpose.
- .2 Outlet Protection:
 - .1 Install predrilled polyethylene end cap for rodent protection securely over end of drainpipe.
 - .2 In areas of play, to protect end of drain pipe from mower damage, depending on drain pipe diameter, place 150 mm (6") or 200 mm (8") diameter x 600 mm (24") length of PVC or HDPE sleeve over end of drain line (see detail 1/L3). Cut end of sleeve at appropriate angle to match existing slope of bank.
- .3 Drainage Trench Backfill:
 - .1 Place pea gravel backfill material after pipe installation is approved by the Contract Administrator. Provide 200 mm (8") min. cover over all drain lines.
 - .2 Perforated Drain lines: Place a layer of pea gravel backfill by hand to a depth which will allow for a 100mm (4") layer of drainage sand to finish flush with existing turf or sod. Consolidate by hand, tamping lightly. Prevent displacement of pipe.
 - .3 Solid Drain lines: Fill trench with drainage sand backfill to finish flush with existing turf. Consolidate by hand, tamping lightly to top of trench. Prevent displacement of pipe

- .4 The Contractor is responsible to make good any settlement that may occur in pipe trenches.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Method of Measurement

- .1 Subgrade Drainage shall be measured separately on a linear meter basis for;
- a) perforated drain lines
 - b) solid drain lines
 - c) slit trenches

Catch Basin installation will be measured on a per unit basis. The work to be paid for shall be the total number of linear meters of each type installed plus catch basins that are placed in the completed work in accordance with this specification, as staked and/or approved by the Contract Administrator.

4.2 Basis of Payment

- .1 Subgrade Drainage lines and trenches shall be paid for at the Contract Unit Price per linear meter. Catch basins shall be paid for on a per unit installed basis for the "Items of Work" listed below, which price shall be payment in full for supplying and placing all materials herein described and all other items incidental to the work included in the specification.

Items of Work:

- i) Subgrade Drainage

PART 1 – GENERAL**1.1 Related Work**

- .1 Topsoil and Finish Grading Section 02260

1.2 Source Quality Control

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

1.3 Scheduling

- .1 Schedule sod laying to coincide with completion of topsoil placement and tee construction.

PART 2 - PRODUCTS**2.1 Materials**

- .1 Nursery Sod: Quality and source to comply with The Canadian Standard for Nursery Stock, 2006 edition of Canadian Nursery Landscape Association.
- .1 Kentucky Bluegrass Sod: Sod grown from 100% Kentucky Bluegrass, consisting of 50% to 100% dwarf varieties.
- .2 Broken, dry, discoloured sod pieces will be rejected by the Contract Administrator.
- .3 Use sod grown on mineral soils only. Peat sod is not acceptable.
- .2 Fertilizer: Complete synthetic slow release fertilizer with maximum 35% water soluble nitrogen. Rate and Ratio as recommended by soil test results.
- .3 Herbicide: Type, rate, and method of application subject to approval by the Contract Administrator.

PART 3 - EXECUTION**3.1 Laying of Sod**

- .1 Prior to sodding, obtain approval from the Contract Administrator that finished grade and depth of topsoil are satisfactory.
- .2 Lay sod within 24 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 staggered joints. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .6 Provide close contact between sod and soil by means of light rolling. The use of heavy rollers to correct irregularities in grade is not permitted.
- .7 Water sod immediately after laying to obtain moisture penetration through sod and into the top 100 mm (4") of topsoil.

3.2 Acceptance

- .1 Sodded areas will be accepted as complete by the Contract Administrator provided that:
 - .1 Sod is free of bare and dead spots and without weeds.
 - .2 No gaps or overlapping pieces of sod are visible once it is in place.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Method of Measurement

- .1 Sodding shall be paid for on a square meter basis for work completed in accordance with this specification, acceptable to the Contract Administrator.

4.2 Basis of Payment

- .1 Sodding shall be paid for at the Contract Unit Price for the "Items of Work" listed below, which price shall be payment in full for supplying and placing all materials herein described and all other items incidental to the work included in the specification.

Items of Work:

- i) Mineral Sod

PART 1 - GENERAL**1.1 Related Work**

- | | | |
|----|----------------------------|---------------|
| .1 | Site Grading | Section 02210 |
| .2 | Topsoil and Finish Grading | Section 02760 |
| .3 | Sodding | Section 02938 |

1.2 Site Conditions

- .1 Locate underground and surface utility lines and buried objects.

1.3 Protection

- .1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, surface or underground utility lines which are to remain. Make good any damage.

PART 2 - MATERIALS**2.1 Materials**

- .1 Fill: Selected material from excavation, grading, or other sources, approved by Contract Administrator for use intended, unfrozen and free from rocks larger than 50 mm (2"), cinders, ashes, sods, refuse or other deleterious materials.
- .2 Use approved clay fill to expand tee surfaces and create tee surround contouring to elevations indicated on drawings and approved by the Contract Administrator.

- .3 Medium Sand: Non-calcareous, sub-rounded to rounded shape. Particle size distribution:

<u>Particle Size</u>	<u>% Allowable</u>
>3.4 mm	0% optimum
2.0 - 3.4 mm	less than 3%
1.0 - 2.0 mm	less than 10% of the total particles in this range, including a maximum of 3% fine gravel (preferably none)
0.25 - 1.0 mm	60% minimum of the particles may fall within this range
0.15 - 0.25 mm	less than 20% of the particles may fall within this range
0.05 - 0.15 mm	less than 5%
Silt	less than 5%
Clay	less than 3%

- .4 Reed/Sedge Peat Humus: Well decomposed. pH between 5.0 and 7.5 with a dry weight of 160 - 290 kg. per cubic metre (10 to 18 lbs. per cubic foot). Minimum 50% organic content.

- .5 Topsoil: Sandy Loam

<u>Type</u>	<u>Acceptable Range</u>
Clay	10% to 20%
Silt	10% to 20%
Sand	40% to 60%
Organic Matter	10% to 20%

- .6 Tee Sod: Dwarf Bluegrass, mixture grown on mineral soil, suitable to the Contract Administrator. Refer to Section 02938.
- .7 Fertilizer: C.I.L. Turfstarter 16-32-6 (or approved alternate).
- .8 Protect approved materials from contamination.

2.2 Materials Testing

- .1 Provide the Contract Administrator with two (2) samples, each weighing 500 gm (1.1 lbs.) of proposed tee mix for testing for particle size composition, bulk density and infiltration rate.
- .2 Testing will be conducted to determine:

<u>Test</u>	<u>Acceptable Range</u>
.1 Conductivity	moderate salinity
.2 pH	5.5 to 7.5
.3 Particle size analysis	(ASTM C136. Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates - (refer to 2.1.3 above)
.4 Fertility analysis	(determine amendment rate)
.5 Bulk density	1.0 gm to 1.4 gm/cu. cm (1.25 to 1.3 gm/cm ³ is ideal)

- .3 Provide samples a minimum of three (3) weeks prior to start of work or as directed by the Contract Administrator.
- .4 The Contract Administrator will determine acceptability of materials and conduct continuous testing on site during construction.

PART 3 - EXECUTION**3.1 Grading**

- .1 Fine grade subgrade at 0.5%, eliminating uneven areas and low spots. Remove debris, roots, branches, stones in excess of 25 mm (1") diameter. Remove subsoil that has been contaminated. Refer to layout drawings for dimensions and orientation of subgrade slope.

3.2 Tee Mix Preparation

- .1 Thoroughly mix medium sand, sedge peat and topsoil at a ratio of 60% sand, 20% organic matter, 20% topsoil (3:1:1 ratio by volume).
- .2 Deliver only off site mix to site as required, coordinate with other work to prevent on-site storage.
- .3 Protect mixed soil from segregating or contamination while in transport.

3.3 Placing Tee Mix

- .1 Do not spread tee mix until the Contract Administrator has approved subgrade contour.
- .2 Place tee mix material onto tee and spread evenly over tee.
- .3 Apply tee mix to a compacted depth of 150 mm (6"). Compact using spreading machinery, traveling in a circular or oval pattern.
- .4 Place material to approximate finish grades as directed by the Contract Administrator. (Note: hand level all ridges).
- .5 Do not disturb approved subgrade while placing material.
- .6 Feather out soil mix on tee surrounds at a maximum slope of 1:10.

3.4 Application of Fertilizer

- .1 Spread C.I.L. Turfstarter fertilizer (or approved alternate) over entire tee surface at a rate of 3.7 kg. (8 lbs.) per 100 sq. m. (1,075 sq. ft.).
- .2 Till into top 75 mm (3") with low velocity rotary tiller.

3.5 Finish Grading and Compaction

- .1 Fine grade entire tee area to 0.5% slope unless otherwise noted on drawings or as directed by the Contract Administrator. Eliminate rough spots and low areas to ensure positive drainage. Tees less than 6 m (20') wide may be graded level.

- .2 Roll surface with minimum 45 kg. (100 lb.) roller, minimum 900 mm (3') wide, to compact and retain surface.
- .3 Hand level any ridges left by roller.
- .4 Leave surface smooth, uniform and firm against foot printing.
- .5 Following the Contract Administrator's approval of finished contours and compaction, thoroughly soak entire tee profile to enhance compaction.
- .6 Eliminate remaining low spots or undulations.
- .7 Repeat as necessary to produce a firm, evenly contoured surface prior to sodding.

3.6 Sodding

- .1 Do not sod until surface contour has been approved by the Contract Administrator.
- .2 Lightly hand rake tee surface to prepare sod bed.
- .3 Place sod immediately after topsoil installation in order to prevent erosion and contamination of tee mix. Water as required.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Method of Measurement

- .1 Tees shall be measured on a lump sum basis for work completed in accordance with this specification, acceptable to the Contract Administrator.

4.2 Basis of Payment

- .1 Tees shall be paid for at the Contract Unit Price per tee for the "Items of Work" listed below, which price shall be payment in full for supplying and placing all materials herein described and all other items incidental to the work included in the specification.

Items of Work:

- i) Tee Construction
- ii) Sodding

PART 1 - GENERAL**1.1 Related Work**

- | | | |
|----|--------------------------|---------------|
| .1 | Site Grading | Section 02210 |
| .2 | Topsoil & Finish Grading | Section 02260 |
| .3 | Sodding | Section 02938 |

1.2 Site Conditions

- .1 Confirm underground and surface utility lines and buried objects as marked by Contract Administrator.

1.3 Protection

- .1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, surface or underground utility lines which are to remain. Make good any damage.

PART 2 - PRODUCTS**2.1 Materials**

- .1 Fill: Clay fill material obtained from excavation of drainage lines and trenches, or other sources, approved by the Contract Administrator for use intended, unfrozen and free from rocks larger than 50 mm (2"), cinders, ashes, sods, refuse or other deleterious materials. Use approved clay fill to create bunker surrounds as indicated on layout drawings and approved by the Contract Administrator.
- .2 Bunker sand: Washed, non-calcareous sand, angular to sub angular in shape only. Colour to be tan to light brown and approved by the Contract Administrator. Minimum infiltration rate (saturated hydraulic conductivity) of 500mm (20") per hour.

<u>Particle Size</u>	<u>% Allowable</u>
<0.05 mm	less than 1%
<0.25 mm	less than 5%
0.25 - 0.50 mm	minimum 60%
0.50 - 1.00 mm	up to 25%
>1.00 mm	less than 3%

- .3 Drainpipe: 100 mm (4") diameter, solid and perforated high density polyethylene pipe with 1.3mm to 12.7mm (1/16" x 1/2") slots.

- .4 Non-calcareous pea gravel: rounded and washed, free from clay and silt fines. Soft limestones, sandstones or shale are not acceptable. Particle size distribution:

<u>Particle Size</u>	<u>% Allowable</u>
≥ 12 mm	zero
6 mm to 9 mm	minimum 65%
≤ 2 mm	less than 10%
≤ 1 mm	less than 5%

Materials shall be tested for weathering stability (ASTM - C - 88), and must show a loss of material less than 12% by weight to be acceptable. LA Abrasion Test (ASTM C - 131) for mechanical stability, values must not exceed 40.

- .5 Sod: Dwarf Bluegrass, mixture grown on mineral soil, suitable to the Contract Administrator. Refer to Section 02938.
- .6 Protect approved materials from contamination.

2.2 Materials Testing

- .1 Provide the Contract Administrator with three (3) different sand samples, each weighing samples 500 gm (1.1 lbs.), dry and suitable for testing.

Testing will be conducted to determine:

- .1 Particle size distribution
 - .2 Visual shape analysis
 - .3 Percolation rate
 - .4 Mechanical weathering
- .2 Provide samples a minimum of three (3) weeks prior to start of bunker construction work or as directed by the Contract Administrator.
- .3 The Contract Administrator will determine acceptability of materials and may conduct random testing on site during construction to confirm suitability of materials.

PART 3 - EXECUTION

3.1 Layout

- .1 The Contract Administrator will provide initial layout of bunkers as indicated on drawings and stake proposed elevations. Obtain approval from the Contract Administrator before proceeding with excavation.

3.2 Excavation and Drain Pipe Installation

- .1 Place fill as required.
- .2 Excavate bunker to approved grades. Unless otherwise directed by the Contract Administrator, using back hoe equipped with articulating ditching bucket; maximum width of 1.2m (4'). Maximum slopes allowable are 60% for bunker faces with a minimum subgrade slope of 2% toward all drainpipe.
- .3 Contour subgrade to allow for installation of a typical compacted sand depth of 100 mm (4"). Receive approval of subgrade elevations from the Contract Administrator. Adjust and fine grade as required.
- .4 Drainage trenches in bunker to be cut to a minimum depth of 250 mm (10") and located as indicated on drawings. Place pipe in trench and back fill with pea gravel to 25mm (1") below bunker floor. Ensure that pipe is not displaced during backfilling procedures. Remove excess materials.

3.3 Sodding Bunker Surrounds

- .1 Place sod along bunker edges immediately after topsoil installation in order to prevent erosion of edges and contamination of bunker floor and drainlines. Refer to construction detail drawing 2/L4. Water as required.

3.4 Placing and Compacting Bunker Sand

- .1 Stockpile sand in bunker bottom prior to topsoil and sod installation. To prevent contamination of bunker sand, do not spread until sod installation is complete. Spread and compact to 100 mm (4") depth, to contours approved by the Contract Administrator.
- .2 Compact sand to density which will resist foot printing to depths of greater than 12.7 mm (1/2"). To improve compaction on less stable sands, place sand in 50 mm (2") lifts and compact with vibratory compaction equipment.
- .3 Water thoroughly and add sand to bring elevation up to finish grade. Hand rake and compact sand on to bunker face as instructed by the Contract Administrator.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Method of Measurement

- .1 Sand bunkers shall be measured on a lump sum basis, including shaping, excavation, drainage installation and sand placement, for work completed in accordance with this specification, and acceptable to the Contract Administrator.

4.2 Basis of Payment

- .1 Sand bunkers shall be paid for at the Contract Unit Price for the "Items of Work" listed below, which price shall be payment in full for excavating, shaping and placing all materials herein described and all other items incidental to the work included in the specification.

Items of Work:

- i) Bunker Construction

PART 1 – GENERAL

1.1 Description

The work covered by this section includes the furnishing of all labour, materials, equipment and incidentals for the design, inspection and construction of a modular concrete retaining wall including drainage system as shown on the Construction Drawings and as described by the Contract Specifications. The work included in this section consists of, but is not limited, to the following:

- a) Excavation and foundation soil preparation.
- b) Furnishing and placement of the levelling base.
- c) Furnishing and placement of geotextiles.
- d) Furnishing and placement of segmental retaining wall facing units.
- e) Furnishing and compaction of granular backfill and retained soils.

1.2 Related Work

- | | | |
|----|----------------------------|---------------|
| .1 | Site Grading | Section 02210 |
| .2 | Topsoil and Finish Grading | Section 02260 |

1.3 Approved Products

1. Pisa2[®] Segmental Retaining Wall System as supplied by Authorized Manufacturer.
2. Colour to be Sierra Grey.

1.4 The Contractor

1. The term Contractor shall refer to the individual or firm who will be installing the retaining wall.
2. The Contractor must have the necessary experience for the project and have successfully completed projects of similar scope and size.

1.5 Delivery, Material Handling and Storage

1. The installing contractor shall check all materials delivered to the site to ensure that the correct materials have been received and are in good condition.
2. The Contractor shall store and handle all materials in accordance with manufacturer's recommendations and in a manner to prevent deterioration or damage due to moisture, temperature changes, contaminants, breaking, chipping, or other causes.

1.4 Scheduling

- .1 Schedule installation of retaining wall prior to tee construction and topsoil placement.

PART 2 - PRODUCTS**2.1 Materials****1. Concrete Segmental Retaining Wall Units**

- a) The concrete wall modules shall be 150 x 200 x 300 mm (6 x 8 x 12 inches) with a maximum tolerance of plus or minus 3 mm (1/8 in.) for each dimension.
- b) The retaining wall modules shall be solid units and have a minimum weight of 20.4kg (45 lbs.) per unit.
- c) The concrete wall modules shall have an integral shear key connection that shall be offset to permit a minimum wall batter of 1H : 8V.
- d) The concrete wall modules shall have a minimum 28-day compressive strength of 35 MPa (5000 psi) as tested in accordance with ASTM C 140. The concrete shall have a maximum moisture absorption rate of 5 percent to ensure adequate freeze-thaw protection.

2. Retained Soil

The retained soil shall be on site soils unless specified otherwise in the Construction Specifications or as directed by the Contract Administrator.

3. Foundation Soil

The foundation soil shall be the native undisturbed on site soils. The foundation soil shall be examined and approval by the Contract Administrator prior to the placement of the base material.

4. Levelling Base Material

The footing material shall be non-frost susceptible, well graded compacted crushed stone as shown on the Construction Drawings.

5. Geotextile Filter

The woven geotextile shall be installed as specified on the construction drawings. Although selection of the appropriate geotextile specifications is site soil specific, a commonly used geotextile for filtration will have an Apparent Opening Size ranging between 0.149 and 0.210 mm (U.S. Sieve Sizes 100 to 70) and a minimum unit weight of 135 grams per square meter (5.0 oz /square yard). The coefficient of permeability will typically range between 0.1 and 0.3 cm/second.

6. Concrete Adhesive

- a) The adhesive is used to permanently secure the coping stone to the top course of the wall. The adhesive must provide sufficient strength and remain flexible.

PART 3 - EXECUTION**3.1 Design Geometry**

- a) The length, height, and overall elevations of the retaining wall must comply with the requirements of the proposed elevation detail and site grading plan.
- b) The structures' design height, shall be measured from the top of the levelling pad to the top of the wall where ground surface intercepts the wall facing.
- c) Slopes above and below all sections of the segmental retaining wall are detailed in the site grading plan.

3.2 Installation of Modular Concrete Retaining Wall Units

- a) The bottom row of retaining wall modules shall be placed on the prepared levelling base as shown on the Construction Drawings. Care shall be taken to ensure that the wall modules are aligned properly, levelled from side to side and front to back and are in complete contact with the base material.
- b) The wall modules above the bottom course shall be placed such that the tongue and groove arrangement provides the design batter (i.e. setback) of the wall face. Successive courses shall be placed to create a running bond pattern with the edge of all units being approximately aligned with the middle of the unit in the course below it.
- c) The wall modules shall be swept clean before placing additional levels to ensure that no dirt, concrete or other foreign materials become lodged between successive lifts of the wall modules.
- d) The contractor shall check the level of wall modules with each lift to ensure that no gaps are formed between successive lifts.
- e) Care shall be taken to ensure that the wall are not broken or damaged during handling and placement.

3.3 Retained Soil

- a) Retained soils shall be placed and compacted behind the drainage material in maximum lift thickness of 150 mm (6 in.). The retained soils shall be undisturbed native material or fill compacted to a minimum density of 95% Standard Proctor.
- b) No heavy compaction equipment shall be allowed within 1 m (3 ft.) of the back of the wall modules.

3.4 Finishing Wall

- a) Coping units shall be secured to the top of the wall with two 10mm (3/8 in.) beads of the approved flexible concrete adhesive positioned 50mm (2 in.) in front and behind the tongue of the last course of retaining wall units.

b) Finish grading above the wall to direct surface run off water away from the segmental retaining wall. Use a soil with a low permeability to restrict the rate of water infiltration into the retaining wall structure.

3.5 Acceptance

a) The Contract Administrator is responsible for verifying that the contractor meets all the requirements of the specification. This includes the use of approved materials and their proper installation.

b) The Contractor's field construction supervisor shall have demonstrated experience and be qualified to direct all work related to the retaining wall construction.

Construction Tolerances

The following tolerances are the maximum allowable deviation from the planned construction,

Vertical Control: +/- 30mm over a 3.0m distance, +/- 50mm total

Horizontal Control: +/- 30mm over a 3.0m distance, +/- 50mm total Rotation: +/- 2 degrees from planned wall batter

Bulging: 25mm over a 3.0m distance

PART 4 - MEASUREMENT AND PAYMENT

4.1 Method of Measurement

.1 Retaining walls shall be measured on a linear meter basis for work completed in accordance with this specification, acceptable to the Contract Administrator.

4.2 Basis of Payment

.1 Retaining walls shall be paid for at the Contract Unit Price per linear meter for the "Items of Work" listed below, which price shall be payment in full for supplying and placing all materials herein described and all other items incidental to the work included in the specification.

Items of Work:

i) Curb Construction