

SPECIFICATIONS FOR:

Green Restoration – 2021 Main Street

Tender N°: 560-2020

KILDONAN PARK GOLF COURSE

Winnipeg, Manitoba

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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 Definitions

- .1 Clearing consists of cutting off tree and brush vegetation growth to not more than a specified height above ground and disposing of felled trees and surface debris.
- .2 Close-cut clearing consists of cutting off or removing at or near flush with original ground surface; standing trees, brush, scrub, roots, stumps and embedded logs and disposing of fallen timber surface debris.
- .3 Clearing isolated trees consists of cutting off not more than a specified height above ground of trees designated for removal, grubbing out stumps and disposing of felled trees and debris.
- .4 Grubbing consists of excavation and disposal of stumps and roots, boulders and rock fragments to a minimum specified depth below the soil surface.

1.2 Protection

- .1 Prevent damage to trees, natural features, bench marks, site appurtenances, water courses, and root system of trees which are to remain. Make good on damage as directed by the Consultant.
- .2 Apply approved tree paint to cuts or scars suffered by vegetation designated to remain within 24 hours of damage or pruning.
- .3 Avoid rapid turning with tracked equipment in order to reduce distribution of soil surface and to minimize mixing topsoil and sub soil material.
- .4 Do not gouge soil surface while piling clearing material.

PART 2 - MATERIALS

Not applicable.

PART 3 - EXECUTION

3.1 Clearing

- .1 Ensure limits of clearing are approved by the Consultant prior to the start of clearing operations.
- .2 Clear trees, shrubs, uprooted stumps and surface debris not designated to remain.

- .3 Use dozer to push over trees within flagged areas or as directed by the Consultant in order to facilitate stump and root removal and reduce disruption of soil profile due to subsequent grubbing. Prevent trees from falling beyond the designated limit of clearing.
- .4 Close-cut trees, brush and scrub in primary and secondary clearing areas as indicated. In areas to be Subsequently grubbed, height of stumps left from clearing as directed by the Consultant.
- .5 Cut off unsound branches and cut down dangerous trees overhanging area cleared as directed by the Consultant.

3.2 Isolated Trees

- .1 Cut off isolated trees to maximum height of 18" (500 mm) or as directed by the Consultant.
- .2 Close-cut off isolated trees as directed by the Consultant.
- .3 Grub out stumps of felled trees.

3.3 Grubbing

- .1 Grub out stumps and all roots larger than 1" (25 mm) in diameter to a minimum depth of 8" (200 mm) below finished ground surface.
- .2 Grubbing of roots may be eliminated in areas where fill depths exceed 24" (600 mm).
- .3 Grub out visible rock fragments and boulders greater than 6" (150 mm) in the greatest dimension, as directed by the Consultant.

3.4 Underbrush Clearing

- .1 Clearing understorey shrubs, saplings, logs and debris within treed areas to remain will be completed with manual labour (provided and supervised by the Owner).
- .2 Hand cleared underbrush is to be piled in areas to allow for consolidation and piling by Contractor, or to be transported to a disposal site designated by the Consultant.
- .3 Grub out visible rock fragments and boulders greater than 6" (150 mm) in the greatest dimension, as directed by the Consultant.

3.5 Removal And Disposal

- .1 Cleared and grubbed vegetation and woody debris is to be piled at regular

- intervals along fairways. Piles must not exceed 12' (3.5 m) in height and 25' (8 m) in diameter.
- .2 Push material into tight piles in a manner which avoids incorporation of soil and material.
 - .3 Locate piles so as not to obscure centerline of fairways, as posted and staked by the Consultant.
 - .4 Do not locate piles within 100' (30 m) of staked green or tee location or within 40' (12 m) of vegetation to remain.
 - .5 Dispose of cleared and grubbed material by burning or burial, as directed by the Consultant.
 - .6 Do not start burning during windy conditions. Adhere to regulations governing burning permit issued by local authority. Monitor burning at all times.
 - .7 Re-pile and consolidate piles periodically during burning operation, as required, to prevent fires from extinguishing and to achieve maximum disposal.
 - .8 Upon completion of burning, bury remaining, unburned material in location(s) and at depths designated by the Consultant. Spread excess ash as indicated, suitable for incorporation.

3.6 Finished Surface

- .1 Leave ground surface in cleared areas in a condition which will not impede topsoil stripping or grading operations.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Method of Measurement

- .1 Clearing and grubbing shall be paid for on a Lump Sum basis for work completed in accordance with this specification, acceptable to the Consultant. No measurement will be made for this work.

4.2 Basis of Payment

- .1 Clearing and grubbing shall be paid for at the Contract Lump Sum 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) Clearing and Grubbing

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 Site Grading Section 02210
- .2 Topsoil Stripping and Placement Section 02260

1.2 Source Quality

- .1 Obtain approval of plant material at source from the Owner.
- .2 Notify the Owner of source of material at least seven (7) days in advance of shipment. No work under this section is to proceed without approval.
- .3 Acceptance of plant material at its source does not prevent rejection on site prior to or after planting operation.
- .4 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal and Provincial regulations.

1.3 Shipment and Pre-Planting Care

- .1 Coordinate shipping of plants and excavation of holes to ensure minimum time lapse between digging and planting.
- .2 Tie branches of trees and shrubs securely and protect plant material against abrasion, exposure and extreme temperature change during transit. Avoid binding of planting stock with rope or wire which would damage bark, break branches or destroy the natural shape of plant. Give full support to root ball of large trees during lifting.
- .3 Cover plant foliage with tarpaulin and protect bare roots by means of dampened straw, peatmoss, saw dust or other acceptable material to prevent loss of moisture during transit and storage.
- .4 Remove broken and damaged roots with sharp pruning shears. Make clean cut and cover cuts over 25 mm (1") diameter with wound dressing.
- .5 Keep roots moist and protect from sun and wind. Heel-in trees and shrubs which cannot be planted immediately in shaded areas and water well.

1.4 Guarantee of Nursery Stock

- .1 Provide a written guarantee, stating that the plant material as itemized on plant list is guaranteed against defects for a period of two (2) years from the date of the Final Certificate of Completion for all deciduous trees over 75 mm (3") caliper and all evergreen trees over 3m (10') height and for one (1) year for all other nursery stock.

- .2 The Contractor agrees and guarantees to replace and replant any nursery stock found dead and/or in poor condition one (1) year from the recognized completion date, without cost to the Owner. "Poor Condition" shall be interpreted as meaning nursery stock on which branches are dead or dying, or have not shown satisfactory growth in leaves. Exempted is nursery stock damaged by accidental causes or vandalism, which stock shall be replaced at the cost of the Owner.
- .3 End-of-Warranty inspection will be conducted.
- .4 The Owner reserves the right to extend the Contractor's warranty responsibilities for an additional one year if, at the end of the initial warranty period, leaf development and growth is not sufficient to ensure future survival.

1.5 Replacements

- .1 During warranty period, remove from site any plant material that has died or failed to grow satisfactorily as determined by the Consultant. Remove such plants from site within 15 days of notice by the Owner. Stake and number plant locations for future replacement.
- .2 Replace any plant material in the next planting season.
- .3 Extend warranty on replacement plant material for a period equal to the original warranty period.
- .4 Continue such replacement and warranty until plant material is acceptable.
- .5 All required replacements shall be by plants of at least the same size and species as specified, and shall be supplied and planted in accordance with the original drawings and specifications, and the replaced material shall carry an additional one year guarantee. Should the replaced plant material not survive, the Contractor will be responsible to replace it a third time and guarantee it for one year unless it is determined that unique site conditions or inadequate maintenance causes the death of plants.

PART 2 - PRODUCTS

2.1 Plant Material

- .1 Quality and Source: Comply with The Canadian Standard for Nursery Stock, 2006 edition of Canadian Nursery Landscape Association referring to size and development of plant material and root ball. Measure plant material and root ball. Measure plants when branches are in their natural position. Height and spread dimensions refer to main body of plant and not from branch tip to branch tip. Measure caliper for trees minimum 300 mm (12") above grade.
- .2 Additional plant material qualifications:

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- .1 Plant material obtained from areas with milder climatic conditions from those of site acceptable only when moved to site prior to the breaking of buds in their original location and heeled-in a protected area until conditions are suitable for planting.
 - .2 Use trees with strong fibrous root system free of disease, insects, defects or injuries and structurally sound. Use trees with straight trunks, well and characteristically branched for species. Plants must have been root pruned regularly, but not later than one growing season prior to arrival on site. Plant material that has come out of dormant stage and is too far advanced will not be accepted unless prior approval is obtained.
 - .3 Cold storage: Approval required for plant material which has been held in cold storage.
 - .4 Container grown stock: Acceptable if containers large enough for root development. Trees 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 slow releasing fertilizer.
 - .5 Balled and burlapped: Coniferous and broad leaf evergreens over 500 mm (20") tall must be dug with soil ball. Deciduous trees in excess of 3m (10') height must have been dug with large firm ball. Root balls must include 75% of fibrous and feeder root system. This excludes use of native trees grown in light sandy or rocky soil. Secure root balls with burlap, heavy twine and rope. For large trees: wrap ball in double layer of burlap and drum lace with minimum 13 mm (1/2") diameter rope. Protect root balls against sudden changes in temperature and exposure to heavy rainfall.
 - .6 Tree spade dug material: Dig plant material with mechanized digging equipment of hydraulic spade or clam-shell type. Root balls to satisfy CNTA standards. Lift root ball from hole, place in wire basket designed for this purpose and line with burlap. Replace root ball and tie basket to ball with heavy rope. Take care not to injure trunk of tree with wire basket ties or rope.
 - .7 Collected or native plant material: Use only native trees indigenous to area into which they are to be transplanted. Select trees from reasonably open stands. Trees must have well developed crown and must be characteristically branched. Not more than 40% of overall tree height may be free of branches.
 - .8 Substitutions to plant material as indicated on Planting Plan not permitted unless written approval has been obtained from the Consultant as to type, variety and size. Plant substitutions must be of similar species and of equal size as those originally specified.

- .9 Refer to Plant Specification List: Section 2.3 for species/quality and size of plant.

2.2 Materials

- .1 Water: existing golf course irrigation system may be utilized subject to availability after existing golf course water requirements have been met. Alternative sources must be suitable for plant growth.
- .2 Topsoil mix for planting: well mixed and screened combination of the following:
1/3 clay textured or clay loam textured dark topsoil; 1/3 sand textured or sandy loam textured topsoil; 1/3 shredded peatmoss.
 - .1 pH value of 6.0 to 7.5.
 - .2 Conductivity value of less than 1.5 ms/cm
 - .3 Free of subsoil, roots, vegetation, debris, toxic materials, and stones over 40 mm (1-1/2") diameter.
 - .4 Free of couch grass or Canadian Thistle rhizomes.
- .3 Mulch: chipped or shredded wood fibre. Size gradation satisfactory to the Consultant. Submit samples for approval.
- .4 Tree anchors: underground 100mm (4") diameter steel disc tree anchors, screw in type.
- .5 Guy Wires: malleable, galvanized 9 gauge strand wire to CSA G4-M1977.
- .6 Tree rings: fabricated from 3 mm (1/8") galvanized wire encased in 13 mm (1/2") diameter, two ply reinforced rubber hose or equivalent.
- .7 Stakes: Hardwood stakes 2"x 2" x 18" (50 mm x 50 mm x 450mm) in length. Alternate: T-bar stakes.
- .8 Wire tighteners: "P.G. Wire Tightener" or approved equal.
- .9 Root ball burlap: 150g Hessian burlap, biodegradable.
- .10 Tree wrapping material: new, clean, plain burlap strips min. 2.5 kg/m mass and 150mm (6") wide.
- .11 Anti-desiccant: wax-like emulsion to provide film over surfaces reducing evaporation but permeable enough to permit transpiration.
- .12 Wound dressing: horticulturally accepted non-toxic, non-hardening emulsion.
- .13 Chicken wire: 25 mm (1") galvanized mesh, 900 mm (36") height.

2.3 Plant Specification List

- i) 3 - Scotch Pine 8' Tall (2.4 m)

PART 3 - EXECUTION

3.1 Workmanship and Planting Time

- .1 Plant deciduous plant material during spring dormant period before buds have broken or following full bud formation for fall planting. Plant material noted for fall planting must be planted in fall dormant period.
- .2 Plant material imported from region with warmer climatic conditions may only be planted in early spring.
- .3 When permission has been obtained to plant deciduous plant material after buds have broken, spray plants with anti-desiccant to slow down transpiration prior to transplanting.
- .4 Plant evergreens in spring before bud break. Planting of such stock with root balls may start after middle of August. Apply anti-desiccant to evergreens before digging. Contractor to verify to the satisfaction of the Consultant that anti-desiccant has been applied prior to digging.
- .5 When permission has been obtained, trees, shrubs and ground covers growing in containers may be planted throughout the growing season.
- .6 Plant only under conditions that are conducive to health and physical conditions of plants.
- .7 Provide the Consultant with a planting schedule prior to start of work. Extending planting operations over a long period using limited crew will not be accepted.

3.2 Excavation

- .1 Small trees up to 3 m (10'): excavate holes 600 mm (24") deep with diameter of 300 mm (12") greater than root spread or root ball.
- .2 Large trees: excavate to depth of at least 200 mm (8") deeper than height of root ball, with width of 750 mm (30") greater than diameter of root ball, or use hydraulic tree spade sized to suit.
- .3 Protect bottom of excavations against freezing.
- .4 Remove water which enters excavations prior to planting. Ensure source of water is not ground water.

3.3 Planting

- .1 Loosen bottom of planting hole to depth of 150-200 mm (6"-8"). Cover bottom of

-
- each excavation with minimum of 100 mm (4") of topsoil mixture.
- .2 Plant trees and shrubs vertically with roots placed straight out in hole. Orient plant material to give best appearance in relation to golf course features such as tees, greens and cart paths.
 - .3 Place plant material to depth equal to depth they were originally growing in nursery.
 - .4 With balled and burlapped root balls, loosen burlap and cut away minimum top 1/3 without disturbing root ball. Do not pull burlap or rope from under root ball. With container stock, remove entire container without disturbing root ball. Non-biodegradable wrappings must be removed.
 - .5 Tamp planting soil around root system in layers of 150 mm (6") eliminating air voids. Frozen or saturated planting soil is unacceptable. When 2/3 of planting soil have been placed, fill hole with water. After water has completely penetrated into soil, complete backfilling.
 - .6 When planting is completed, give surface of planting saucer dressing of organic 10-6-4 fertilizer at rate of 40 to 50 g/mm caliper of trees. Mix fertilizer thoroughly with top layer of planting soil and water in well.
 - .7 Place mulch to a depth of 100 mm (4").

3.4 Tree Support

- .1 Tree support is shown on planting details.
- .2 Staking for trees up to 3 m (10') and evergreens up to 2 m (6') in height: backfill planting hole 2/3, drive T-rail stake 900 mm (36") into bottom of pit, taking care not to damage main roots. Place stake or anchor 150 mm (6") away from trunk on side of prevailing wind. Fasten trunk to stake or anchor with tree-ring. Different methods of fastening tree trunk to stake or anchor are acceptable if no damage to bark of tree will occur. Obtain the Consultants approval prior to using alternate methods and securing details.
- .3 Guy wires for trees up to 150 mm (6") caliper:
 1. For deciduous trees taller than 3 m (10') and evergreen taller than 2 m (6'), fasten three wires to tree where a branch will prevent slipping down. Use tree rings to prevent abrasion of bark.
 2. Fasten wires to anchors at distance from tree base equal to height where wire is attached to trunk. Install wire tighteners and tighten slightly.
 3. Where guy wires are used close to pedestrian traffic ways, fasten metal flags to wires to make them clearly visible.
 4. Use sufficient number of guy wires to support large shrubs.

3.5 Rodent Protection

- .1 Wrap chicken wire loosely around trunk of all deciduous trees from grade to 900 mm (36") above grade. Fold wire in to prevent sharp projections outward or inward.

3.6 Wrapping

- .1 Where indicated on Plant Specification List, wrap deciduous trees spirally from ground up, to height of second branches. Treat trunk with paste of long residual insecticide, lindane or equivalent before applying wrapping. Secure burlap with binder twine wound in opposite direction to burlap at 100 mm (4") intervals. Place wrapping neatly and snugly with 40 mm (1-1/2") overlap.

3.7 Pruning

- .1 Prune trees after planting, as indicated, to compensate for loss of roots suffered during transplanting. Postpone pruning of those trees where heavy bleeding may occur, until in full leaf. Employ clean sharp tools and make cut flush with main branch, smooth and sloping as to prevent accumulation of water. Remove projecting stumps on trunks or main branches and branches that rub causing damage to bark. Trim out crown of trees and shrubs without changing their natural shape. Do not damage lead branches or remove smaller twigs along main branches. Treat cuts in excess of 25 mm (1") diameter and damaged parts with application of wound dressing.

3.8 Maintenance

- .1 Maintain plant material from date of installation to date of completion of contract.
- .2 Refer to Section 02498 for detail maintenance requirements. (N/A)

PART 4 - MEASUREMENT AND PAYMENT

4.1 Method of Measurement

- .1 Trees shall be measured on a Unit basis. The units to be paid for shall be the total number of trees that are placed in the completed work in accordance with this specification, acceptable to the Consultant.

4.2 Basis of Payment

- .1 Tree Planting shall be paid for at the Contract Unit Price per unit 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) Tree Planting

PART 1 - GENERAL

1.1 Related Work

- .1 Site Grading Section 02210
- .2 Topsoil & Finish Grading Section 02260

1.2 Site Conditions

- .1 The Contractor shall examine the work of other Sections upon which the work of this Section depends and correct any defects.

1.3 Laying Out Work & Inspections

- .1 All work shall be laid out by the Contractor who shall be fully responsible for the accuracy thereof.
- .2 The Contractor shall stake locations of heads and valves and receive approval from the Consultant prior to excavation and installation.
- .3 The Contractor shall have all materials inspected and approved by the Consultant prior to installation.
- .4 The Contractor shall not allow nor cause any of his work to be covered or enclosed until it has been inspected, tested, and approved by the Consultant. Should any of the work be enclosed or covered before such inspection and test, it shall be uncovered at the Contractor's expense; and after it has been inspected, tested and approved, the Contractor shall make all repairs with like materials necessary to restore all work and that of other Contractors to its original conditions.
- .5 The Contractor agrees to supply all necessary conduit, trenching, fasteners and line for the proper installation of automated systems.
- .6 Notification shall be made to the Consultant 48 hours in advance of commencing irrigation system installation.

1.4 Testing

- .1 Upon completion of the irrigation system, the entire system shall be tested and balanced. The Contractor shall notify the Consultant for a final test to allow the Consultant to be on site to consult. All components shall then be checked for proper operation; and the system shall not be accepted by the Consultant until all portions are operating as intended and until all deficiencies have been corrected. The Contractor shall provide all pumps, gauges and fittings required for testing.

1.5 Balancing & Adjustments

- .1 The Contractor shall balance and adjust the various components of the irrigation system so the overall operation is most efficient and coverage is uniform.

1.6 As-Built Plan

- .1 The as-built irrigation plan must be updated daily in the field as work progresses. The as-built drawings shall be marked to indicate any and all changes made. The Contractor shall supply the Consultant with three copies of the as-built plan showing the exact location and size of all components of the system including the exact trench location for all buried wire. Refer to Section 01300 for additional submission requirements.

1.7 Warranty Maintenance

- .1 The Contractor shall test and adjust all equipment for smooth, trouble-free operation of the irrigation system.
- .2 Defects or misalignment of any part of the work caused by settlement of bedding or backfill material within the warranty period shall be corrected by the Contractor at their expense. Depressions caused by such settlement in excess of specified depths shall be repaired by the Contractor at their expense. The Contractor shall carry out corrections to defective or deficient work within 48 hours of notification by the Consultant.
- .3 Emergency repairs may be required to protect property or permit operation of the work. The Consultant shall notify the Contractor immediately. The Contractor must make repairs within 24 hours of notification by telephone. If repairs are not made within 24 hours, the Consultant will arrange for the emergency repairs to be carried out and will invoice the Contractor. Maintenance not of an emergency nature shall be brought to the attention of the Contractor in writing and he shall take the necessary action to correct the faulty work.
- .4 The Contractor shall blow-out all irrigation water lines prior to freeze-up in the fall of the year of completion and reactivate the system in the spring of the following year.
- .5 The Contractor shall familiarize the Owner with the operation of the irrigation system and locations of control equipment.

1.8 Warranty

- .1 All irrigation system equipment and installations shall be warranted for one (1) full year following the issuance of the substantial performance certificate for the project. Equipment and installation damaged by accidental causes or vandalism

is exempt.

PART 2 - PRODUCTS

2.1 Materials

.1 Irrigation Pipe:

- .1 H.D.P.E.: Type PE3408, DR 13.5, Series 128 or better (Pipe sizes 2" and greater), high density polyethylene to ASTM F-714, - CGSB 41-GP25M and CSA B137.1-M1983. Join by thermal butt fusion in strict accordance with manufacturer's written instructions. The pipe and material must meet or exceed the requirements of paragraph 4.1 and 4.4 of the Canadian General Standards Board - Pipe, Polyethylene, for the Transport of Liquids, 41-GP-25M and requirements of ASTM 1248 for PE3408 materials and ASTM F714.

.2 Fittings:

- .1 H.D.P.E.: Manufacturer approved saddle fittings (wedge type) at head connections. Butt fusion fittings at pipe connections. Fittings to be approved by pipe manufacturer for fusion with pipe. Use pipe manufacturer's approved brass saddles and flange assemblies to connect to non-fusion materials.
- .2 Swing Joints and Risers: Unitized "O" ring type. Spears or Lasco.
- .3 Isolation valves: All manual brass ball or butterfly valves are to be lever type, brass valves of approved manufacturer's quality. Located and sized as indicated on drawings or as required to suit application.
- .4 Quick Coupling Valves: 25 mm (1") brass valves. Rainbird 5RC, Toro 475-00 or 475-01, Buckner QB5RC10, Hunter HQ-5RC are acceptable.

2.2 Sprinklers

Rotary Pop-up Sprinklers: Acceptable Products:

- .1 At greens and tees: At 80 psi. operating pressure must have a minimum radius of 65' and a minimum flow rate of 21 g.p.m.

Rain Bird Eagle 705E-18-80
Toro 834S-06-328

- .2 At fairways: At 80 psi. operating pressure must have a minimum radius of 84' and a minimum flow rate of 25 g.p.m.

Rain Bird Eagle 950E-24-80
Toro 854S-06-558

2.6 Control Wiring

- .1 Control wires shall be direct burial CSA approved TWU-40 #14 gauge minimum. Control wire to be a different colour than the 120-volt services to controllers.
- .2 The 24-volt common ground shall be white in colour. Colours for other 24 volt wires shall be other than white.
- .3 Control wires shall be individually identified with "Brady" markers or equivalent inside the controller housing.
- .4 Splices shall be made waterproof with the use of an outdoor waterproof wire connector such as Pentite or approved alternate. Field splices shall be looped and located in a valve or junction box.
- .5 All wiring shall be bundled together, taped every 10' (3m), and placed at the bottom of the pipe trench unless "pulled in" with vibratory plow. Some slack in the wire shall be provided to allow for contraction and expansion.
- .6 In instances where control wire does not follow the irrigation line and is beneath a cart-path, walkway or driveway, the control wire shall be installed in a separate polyethylene or PVC sleeve of applicable diameter and length.
- .7 Standards for control wire shall meet the Canadian Electrical Code Standards.

2.7 Automatic Controllers

- .1 Controllers shall be suitable for the application and for the sprinklers selected. Rain Bird Stratus II or Toro TouchNet station controllers are acceptable.
- .2 Controllers shall be housed in painted steel, weatherproof, and vandal resistant pedestal enclosure that is CSA approved and lockable. Set on 2' x 2' x 6" (600 x 600 x 150mm) thick concrete pad.
- .3 Controllers shall have electrical surge protection capacity and proper grounding to protect the controller from electrical shock and lightning.
- .4 The initial programming of the controller shall be undertaken by the irrigation Contractor (or supplier as required) prior to take-over by Owner.

2.8 Valve Boxes

- .1 Valve boxes shall be prefabricated plastic boxes complete with locking cover. Carson Industries VB 1419-12-L; for single valve locations, or variant to suit valve size or approved alternate.

2.9 Sleeves

- .1 Sleeves shall be two-dimensional sizes larger than pipe diameter to allow clear passage of all water lines. Sleeves shall extend a minimum of 12" (300 mm)

- beyond the edge of surfaces.
- .2 Sleeves in areas subject to vehicular traffic shall be schedule 40 steel or corrugated culverts.
 - .3 Sleeves in areas subject to pedestrian traffic only shall conform to the following:
 - .1 PVC: SDR-35, or SDR-28, or
 - .2 ABS: DB-2, or approved equal.
 - .3 Pipe sleeves shall be one continuous length.

PART 3 - EXECUTION

3.1 Excavation

- .1 All excavation shall be unclassified and shall include all materials encountered except materials which cannot be excavated by normal mechanical excavation means. Such exceptions shall be brought to the attention of the Consultant and an adjustment shall be agreed upon before excavation of these areas proceeds. Such price adjustments and agreement shall include responsibility for disposal of the unsuitable materials removed from the trench and the acquiring of additional backfill material.
- .2 All piping should be laid and continuously supported on undisturbed or well-compacted soil.
- .3 The minimum depth of cover over 1" (25 mm), 1-1/2" (38 mm), 2" (50 mm) and lateral pipes shall be 12" (300 mm). The minimum cover depth over 3" (75 mm) and 4" (100 mm) main lines shall be 18" (450 mm). The minimum depth of cover over 6" (150 mm) main lines shall be 24" (600 mm). Adequate clearance should be maintained between plastic lines and all other underground utilities or other sources of heat.
- .4 Where trenches are over-excavated, they shall be backfilled and tamped to provide compacted bearing for the pipe.
- .5 Backfill material shall be free from rocks, large stones, and other unsuitable substances which could damage the pipe or create unusual settling problems. Backfilling shall be done in 6" (150 mm) lifts and tamped after each lift is placed to prevent excessive settling.
- .6 Chain trenchers shall be equipped with a "crumber", or trenches shall be manually cleaned of loose material before sand bedding begins.
- .7 Excavated material shall not be left on the turf (where applicable) beside the trench for a period of more than 24 hours.
- .8 The Contractor shall repair all concrete and asphalt damaged in the course of this contract.

- .9 Backfilling of trenches containing plastic pipe shall be done when pipe is cool to avoid excessive contraction during warm weather. Such backfilling can be done in early morning hours or the pipe may be water-cooled prior to backfilling procedures.
- .10 The Contractor shall avoid damage to any and all underground utilities and structures. The Contractor shall notify the Owner of all underground utilities including power, gas, and telephones and have the locations staked prior to commencing excavations.
- .11 Sleeves shall be installed where pipes or electrical wires pass under roads or walks.
- .12 The minimum width of trenches for main pipes shall be 4" (100mm) wider than the nominal size of the pipe in the trench (i.e. 4" (100 mm) pipe requires 8" (200mm) trench width, etc.)
- .13 Where trenches cross existing turf areas that are to be re-seeded or sodded the backfilled trench must be re-compacted and re-seeded using the seed mixture appropriate for that area, and approved by the Consultant. After the trench has been backfilled, re-compacted and topsoil placed, all trenching debris shall be removed from the grass on each side of the trench by hand raking or other suitable means. The Contractor shall be responsible for watering the trench area until the turf is established and accepted as per the specification for seeding and shall repair any settling of the trench during the warranty period.
- .14 In all cases pipe and heads shall be located a minimum of 18" (450 mm) inside the property lines or perimeter boundaries as indicated on drawings.

3.2 Installation of Pipes

- .1 Lateral lines may be installed by standard trenching techniques or by "pulling in" pipe. If the pull-in method is used, the pipe "plow" shall be a vibratory type. The "Bullet" which precedes the pipe and is used to form the opening for the pipe, shall not be less than 1" (25 mm) larger in diameter than the outside diameter of the pipe.
- .2 The ridge created by the vibratory plow shall be eliminated by mechanical tamping so that the soil over the pipe is returned to its original grade.
- .3 In situations where extensive rock is present in the trench bottom, all 3" (75 mm) and larger main water pipe shall be sand bedded to a minimum depth of 4" (100 mm) below the pipe and up to the centerline of the pipe. The pipe shall be left uncovered at this stage for inspection by the Consultant and shall not be backfilled until approval has been given.
- .4 HDPE is generally joined above grade alongside the trench or at a central location, then pulled to the ditch. It may be pressure tested prior to installation.

- .5 Pipe may be lowered or rolled into the trench and woven slightly from side to side, which is desirable from the standpoint of expansion and contraction but not absolutely necessary. At points in the system where the line must cross under existing lines, across or through inaccessible areas, the pipe shall be joined on firm ground and pushed or pulled into place.
- .6 In warm weather, sufficient time should be allowed for contraction, as the pipe reaches ground temperature before joining sections of termination points.
- .7 Changes in direction may be made with field bends, elbows and tees. Pipe may be field bent to a radius of 35 times the diameter of the pipe.
- .8 Where gasket repair couplings are used for splicing or joining, the enclosed gap in the pipe shall not exceed 1" (25 mm) for pipe sizes 4" (100 mm) and smaller.

3.3 Sprinkler Heads

- .1 All sprinkler heads shall be installed on approved unitized swing joints.
- .2 The sprinkler heads shall be installed so that the top is at the finished grade level and marked with a 24" (600 mm) coloured flag to prevent damage by equipment.
- .3 Backfill around the swing joint and sprinkler with coarse sand as shown on detailed drawings.

3.4 Quick Coupling Valves

- .1 All quick-coupling valves shall be installed on approved unitized swing joints.
- .2 The quick-coupling valve shall be installed so that the top is at finished grade level and marked with a 24" fluorescent orange stake to prevent damage by equipment.
- .3 Backfill around the swing joint and quick-coupling valves shall be free of rocks larger than 1" (25mm) in diameter or roots, debris, and other extraneous matter.

3.5 Isolation Valves

- .1 Valves shall be installed according to manufacturer's instructions. Valve locations in the line should be bell-holed to accommodate the valve so that the line can rest firmly on the ground.
- .2 The valve shall be installed in a valve box set plumb and flush with grade. The valve must rest upon compacted granular base.
- .3 The valve box shall have 6" (150mm) depth of 1/2" down crushed stone below the valve.

- .4 The valve box shall be marked with a 24" (600mm) fluorescent orange stake to prevent damage by equipment.
- .5 The top of the valve cross-handle shall be 4" (100mm) minimum below the bottom of the valve box lid.
- .6 Locate valves at well drained points along the pipe alignment. Do not place the valves in localized low areas subject to periodic inundation.
- .7 The bottom of the valve box shall be supported on crushed rock and compacted soil so that it can support the weight of turf maintenance machinery without sinking.

3.6 Electrical Wiring

- .1 Control wires shall be installed in a neat and orderly fashion and may be installed in the pipe trenches or plowed in. The wires shall be bundled together and taped every 10' (3m) when placed in trenches.
- .2 Splicing shall be minimized.
- .3 Splices, where required, shall be housed in valve boxes and shall be made waterproof with the use of "Pentite" waterproof connectors or approved alternate. Allow 24" (600mm) of conductor above the top of the valve box anywhere splices are required.
- .4 All electrical wiring shall be installed in accordance with existing codes. Common 24-volt wire to valves will be white. Tracer wire (where used) for main lines will be green. Zone wire to valves shall be any colour but white or green. All zone wiring shall be tagged at all termination or splice points as to which valve number they operate.
- .5 All 120-volt wiring shall be installed and connected by a qualified electrician.
- .6 Where wire is installed by plowing, standard wire plowing techniques and equipment shall be used (wire chutes and reels). Care must be taken to provide adequate "slack" in the wire as it enters the wire chute. If motorized wire reels are not in use, then an assistant shall walk behind the plow and manually unreel the wire and feed slack into the wire chute.
- .7 Connect 120-volt wiring to electrical panel in pump house, provided by Irrigation Contractor.
- .8 Connect to master controller in pump house, see drawing.

3.7 Automatic Controllers

- .1 Automatic controllers shall be installed on concrete pads according to the manufacturer's recommendations.

- .2 Automatic controller location is diagrammatic and shall be specifically located by the Contractor for approval by the Consultant.
- .3 All wiring shall be done in a neat, professional manner and shall be in compliance with local codes and the Canadian electrical codes, including grounding. All 24-volt control lines shall be run to the outside in an electrical conduit.
- .4 The Contractor shall place the two 2" (50 mm) PVC pipe sleeves from inside the controller to a point 12" (300 mm) outside the concrete base at a depth of 24" (600 mm). These sleeves will be used for the power feed to the controller and for the valve wiring. The radius of the bend will be 6 times the diameter of the conduit.

3.8 Master Controller

- .1 Master controller shall be installed according to the manufacturer's recommendations.
- .2 Master controller location is diagrammatic and shall be specifically located by the Contractor and approved by the Consultant.
- .3 All wiring shall be done in a neat, professional manner and shall be in compliance with local codes and the Canadian electrical codes, including grounding. All 24-volt control lines shall be run to the outside in an electrical conduit.

PART 4 - MEASUREMENT & PAYMENT

4.1 Method of Measurement

- .1 Irrigation system materials and installation shall be measured from the as-built plan on a lump sum price basis for work completed in accordance with this specification, and acceptable to the Consultant. Any additions or deletions from the contract will be paid or credited on a unit price basis as noted in the list of unit prices.

4.2 Basis of Payment

- .1 Irrigation system materials and installation shall be paid for at the Contract Price for the "Items of Work" listed below, in which this sum 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) Irrigation System

PART 1 - GENERAL

1.1 Related Work

- | | | |
|----|------------------|---------------|
| .1 | Tee Construction | Section 02952 |
| .2 | 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 & Finish Grading Section 02260

1.2 Delivery & Storage

- .1 Deliver and store seed in original containers showing:
- .2 Analysis of seed mixture.
- .3 Percentage of pure seed.
- .4 Year of production.
- .5 Net mass.
- .6 Date when tagged and location.
- .7 Percentage germination.
- .8 Name and address of distributor.
- .9 Deliver fertilizer, mulch and erosion control agent in bags showing manufacturer and content.

1.3 Scheduling

- .1 Schedule seeding to coincide with commissioning of the irrigation system.

PART 2 - PRODUCTS

2.1 Materials

- .1 Grass Seed: Certified Canada No. 1 Grade to Government of Canada, Seed Regulations and having minimum germination of 85% and minimum purity of 97%. Acceptable limit of weed seed is 0.5%. Manufacturers tags guaranteeing variety purity, germination and percentage of pure live seed are to be included.
 - .1 Greens:
 - Penn A1 Creeping Bentgrass
 - Seeding Rate: 1.5 lbs./1,000 sq. ft.

PART 3 - EXECUTION

3.1 Workmanship

- .1 Keep site well drained.
- .2 Clean up immediately, soil, mulch or debris spilled onto cart paths, dispose of

deleterious materials.

3.2 Preparation of Surfaces

- .1 Fine grade approved topsoil areas to be seeded free of humps and hollows and free of deleterious and refuse material.
- .2 Obtain Consultant's approval of prepared seed bed grade and depth before starting seeding.

3.3 Seeding

- .1 Seed grass as soon as practicable after commissioning of part or all the irrigation system. Seeding to be completed by September 15, 2020.
- .2 Sow during calm weather (winds less than 6 km/hr) using "Brillion" type seeder or other equipment suitable for area involved to the approval of the Consultant. Sow half of required amount of seed in one direction and remainder diagonally, at 45° to the original line. Incorporate seed into soil to a minimum depth of 3/8" (10 mm) simultaneously or within one hour after seeding operation. Mix carefully with light chain harrow or wire rakes and roll area immediately afterward with water ballast type lawn or agricultural type roller.
- .3 Water with fine spray, avoiding washing out of seed. Apply enough water to ensure minimum penetration of 2" (50 mm).
- .4 Hydro-mulch tops of mounds and slopes greater than 1:4 immediately after seeding. Complete slurry to be applied per unit area:
 - .1 Mulch - 1700 lbs./ Ac, 1900 kg/Ha.
 - .2 Water - as required to completely suspend all materials
 - .3 Erosion Control Agent - 60 lbs/ Ac, 67 kg/Ha
 - .4 Use erosion control agent on slopes and swale bottoms. Double mulch quantity on all slopes greater than 1:3 and in ditch bottom.
- .5 Apply mulch in light winds (less than 10 km/hr) using equipment suitable for the area and satisfactory to the Consultant.
- .6 Immediately clean mulch from surfaces not designated to be treated.
- .7 Insure seeded areas are protected against damage until accepted by the Consultant.
- .8 In the case of dormant seeding (late fall) protect seeded areas from pedestrian and vehicular damage.
- .9 Reseed at two (2) week intervals where germination has failed. Reseed only under favourable conditions as directed by the Consultant.

3.4 Maintenance

- .1 Refer to Section 02498. (N/A)

3.5 Acceptance of Grass Seeding

- .1 Seeding will be accepted as complete by the Consultant providing:
 - .1 Seeded areas are completely established.
 - .2 Turf is free of eroded, bare or dead spots and 98% free of weeds.
 - .3 No surface soil is visible when grass has been cut to a height of 1 3/4" (45 mm).
 - .4 All seeded areas are fully established and have been cut at least twice, the last cut being carried out within 24 hours of acceptance.
- .2 Any areas seeded in fall will be accepted in the following spring, one month after start of growing season provided the acceptance conditions are fulfilled.

PART 4 - MEASUREMENT & PAYMENT

4.1 Method of Measurement

- .1 Seeding and hydro-mulching shall be paid for on a Lump Sum basis for work completed in accordance with this specification, acceptable to the Consultant. No measurement will be made for this work.

4.2 Basis of Payment

- .1 Seeding and hydro-mulching shall be paid for at the Contract Lump Sum 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.
 - i) Seeding and Hydro-mulching

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 | Subgrade Drainage | Section 02710 |
| .2 | Tee Construction | Section 02952 |
| .3 | Bunker Construction | Section 02954 |

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.
- .2 Protect approved materials from contamination.

1.4 Inspections

- .1 The Consultant will review and approve stages of work as follows;
- .1) Location and initial layout staking of green
 - .2) Subgrade excavation and shaping
 - .3) Trenching and placement of drainage pipe
 - .4) Placement of root zone mix

PART 2 - PRODUCTS

2.1 Materials

- .1 Fill: Selected material from excavation, grading, or other sources, approved by the Consultant for use intended, unfrozen and free from rocks larger than 3" (75 mm), cinders, ashes, sods, refuse or other deleterious materials.
- .2 Use approved fill to create green surround contouring to elevations indicated on drawings and approved by the Consultant. Refer to Sections 02210 and 02260.
- .3 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.

- .4 Medium sand for root zone mix (greens mix): non-calcareous, sub-rounded to rounded shape. Particle size distribution:

<u>Particle Size</u>	<u>% Allowable</u>
> 3.4 mm	0%
2 to 3.4 mm (Gravel)	0% preferable (maximum 10% allowable)
1 to 2 mm (Very coarse sand)	0-10% (including all larger sizes)
0.50 to 1.0 mm (Coarse sand)	82% min. in range w/ 50-70% med. sand
0.25 to 0.50 mm (Medium sand)	82% min. in range w/ 50-70% med. sand
0.15 to 0.25 mm (Fine sand)	82% min. in range w/ 50-70% med. sand
0.05 to 0.15 mm (Very fine sand)	0-8% total in this range
Silt 0.002 to 0.05mm	0-8% total in this range
Clay < 0.002 mm	0-8% total in this range

- .5 Corrugated Drain Pipe: 4" (100 mm) diameter polyethylene pipe, 1/16" x 1-1/2" slotted and solid types including only manufacturer specified insert type couplers and fittings required to complete the installation as shown on the drawings.
- .6 Creeping Bentgrass: Certified Penn A1, or approved alternate. Deliver and store grass seed in original containers showing:
- .1 Analysis of seed mixture
 - .2 Percentage of pure seed
 - .3 Year of production and name of producer
 - .4 Net Mass
 - .5 Date when tagged and location
 - .6 Percentage germination
 - .7 Name and address of distributor
- .7 Fertilizer: C.I.L. Turf Starter 16-32-6 or approved alternate, and trace mineral amendments as identified by soil testing.

2.2 Materials Testing

- .1 Provide the Owner with two (2) samples, each weighing one (1) pound (454 gm) of proposed greens mix, consisting of 60% sand, 30% soil and 10% peat. Sealed, airtight containers must be used to maintain optimal moisture during transportation to facilitate proper testing.
- .2 Provide samples a minimum of four (4) weeks prior to the start of work or as directed by the Owner.
- .3 The Owner will determine acceptability of materials and conduct frequent on site

testing during construction to confirm the conformity of mixing.

PART 3 - EXECUTION

3.1 Layout

- .1 The Consultant will install reference hubs and will undertake initial green layout staking as indicated on drawings and will mark proposed finish grade elevations. The Contractor will be responsible for subsequent staking at the direction of the Consultant.

3.2 Strip & Stockpile Native Topsoil

- .1 Strip, stockpile and screen topsoil from area designated for green surrounds and adjacent mounding. Obtain approval from Consultant for all stockpile locations.

3.3 Excavation & Subgrade Shaping

- .1 Excavate green area to a depth of 8" (200 mm) below proposed finish grades. The slope of the subgrade should conform to the general slope of the finished grade. Thoroughly compact subgrade (i.e. 95% standard proctor density) to prevent future settlement.
- .2 Fine grade subgrade, eliminating uneven areas and all low spots where water will collect. Remove all loose fill, debris, building materials, roots, branches, stones in excess of 2" (50 mm) diameter. Remove subsoil that has been contaminated.
- .3 Grades must be verified and the sub-grade contours must be approved by the Consultant prior to cutting drain trenches and placing drainage materials.

3.4 Excavation for Drainage Pipe

- .1 Locate main trench line(s) along the line of maximum slope. Locate lateral lines at an angle of 30 to 45° to the subgrade slope with a continuous fall to the main line(s).
- .2 Unless directed otherwise by the Consultant, lateral lines are to be spaced a maximum of 15' (4.6 m) apart. All lateral lines shall extend to the perimeter of the green and run parallel to each other while sloping toward the main line(s).
- .3 At the low end of each green or green section(s), place a drain line at the perimeter of the green extending from the end of the first set of lateral lines to the main lines exit from the green. This is to ensure that water does not accumulate in the low end of the drainage area.
- .4 Excavate drainage trenches a minimum of 8" (200 mm) wide and a minimum of 8" (200 mm) deep into a thoroughly compacted subgrade and ensure all drainage

lines slope uniformly. Spoil from the trenches must be removed from the subgrade cavity, and the floor of each trench left smooth and clean.

- .5 Offset junctions of lateral lines with main line by 18" (450 mm) to facilitate use of insert fittings for each lateral line.

3.5 Installation of Drain Pipe

- .1 Place a minimum 1" (25 mm) depth of pea gravel into trench, to level trench bottom and insure continuous positive slope (minimum 0.5%) along the entire run of the drain pipe.
- .2 Place slotted pipe into centre of trenches and hand back fill with pea gravel to fill trench flush with green subgrade. (DO NOT OVERFILL TRENCHES). Ensure that the pipe is not displaced laterally or vertically during back filling. If movement occurs excavate and repeat levelling and back filling operation.
- .3 At the time of installation, all pipe ends and joints are to be capped and/or coupled with manufacturer approved fittings to prevent soil or stone entering pipes prior to completion of back filling.

3.6 Greens Mix Preparation and Delivery

- .1 Mix Preparation

If metered blending equipment is to be used, blend slow release fertilizer (0-20-10) into greens mix at a rate of 0.5 lbs. per cubic yard. Additional amendment of trace elements as determined by testing may be added during this process. (Optional)
- .2 Following the Consultant's approval of off-site mixture, deliver to site as required.
- .3 Protect mixed soil from segregating or contamination during preparation, storage or transport. Do not stockpile in unprotected conditions. Deliver directly to each installation location.
- .4 The Consultant will undertake random testing of delivered greens mix to ensure conformity to specification.

3.7 Placing Greens Mix

- .1 Do not place greens mix until the Consultant has approved subgrade.
- .2 Place greens mix by depositing material into edge of green cavity and pushing gently out onto subgrade, insuring subgrade is not disturbed.
- .3 Ensure that the mix is moist when being spread to assist in firming.
- .4 Place material to approximate finish grades as directed by the Consultant. The

greens mix should form a uniform compacted depth of 12" (300 mm). Attain initial compaction using spreading machinery, traveling in a circular or oval pattern.

3.8 Finish Grading and Compaction

- .1 Fine grade entire green area to contours and elevations as indicated on drawings and as confirmed by the Consultant. Eliminate rough spots and low areas to ensure positive drainage.
- .2 Compact mix to prevent settlement and retain surface contours using equipment and methods approved by the Consultant.
- .3 Level ridges left by compaction equipment.
- .4 Leave surface smooth, uniform and firm against foot printing in excess of 1/4" (6 mm).
- .5 Following the Consultant's approval of finish contours, thoroughly soak entire green profile to enhance compaction.
- .6 Allow top 2" to 3" (75 mm) to dry. Rake or float green surface in a circular pattern to eliminate all low spots or undulations.
- .7 Repeat as necessary to produce a firm, gently contoured surface suitable for seeding.

3.9 Application of Fertilizer

- .1 Spread C.I.L. Turf starter fertilizer (or approved alternate) over entire green surface at a rate of 3 lbs. per 1,000 square feet. Application is to be completed within 48 hours prior to seeding.

3.10 Seeding

- .1 Do not seed until surface contours have been approved by the Consultant.
- .2 Lightly rake green surface to prepare seed bed.
- .3 Using a drop seeder, apply Bentgrass seed at a rate of 1.5 lbs. (0.68 kg) per 1,000 sq. ft. (92.9 sq. m.).
- .4 Spread seed in two (2) directions at 45° to each other.
- .5 Bury seed to a depth of 1/8" (3 mm) by lightly raking by hand or with a small turf tractor.
- .6 Roll green surface to firm seed bed and insure good soil/seed contact.
- .7 Begin watering program using a fine spray immediately following completion of

seed bed firming.

- .8 Continue watering at intervals required to maintain a constantly moist seed bed. (Three to five times per day during daylight hours depending on drying conditions present).

3.11 Maintenance (N/A)

- .1 Maintain seeded area from the start of work until the recognized completion date and acceptance by the Consultant.
- .2 Ensure maintenance equipment is appropriate for the intended use and suitable to Consultant.
- .3 Cut grass only after substantial germination and the majority of grass is 1/2" (12 mm) to 3/4" (19 mm), or reached the three leaf stage.
- .4 Gradually reduce mowing height from 1/2" (12 mm) by 1/16" (1.5 mm) each week to reach desired height of 3/16" (4.5 mm).

PART 4 - MEASUREMENT AND PAYMENT

4.1 Method of Measurement

- .1 Green construction shall be measured on a lump sum basis for work completed in accordance with this specification, acceptable to the Consultant.

4.2 Basis of Payment

- .1 Greens shall be paid for at the Contract Lump Sum Price per green, including greenside bunkers 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) Green Construction

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