

LANDSCAPE SPECIFICATIONS

FOR

**KASLO PARK PLAYGROUND
VANCOUVER, BC
Issued for Tender**

Stantec Consulting Ltd.

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SECTION	TITLE
00 00 00	List of Submittals
00 65 00	Contract Closeout
01 33 23	Shop Drawings and Product Data
01 89 13	Site Preparation and Grading
02 41 13	Selective Site Demolition
03 10 00	Concrete Forming and Accessories
03 20 00	Concrete Reinforcing
03 33 00	Cast-In-Place Concrete Non Flatwork
03 35 00	Concrete Finishing
04 43 00	Boulder Placement
11 68 13	Play Equipment
31 11 00	Clearing and Grubbing
31 23 10	Excavation and Backfill
32 01 56	Tree Protection
32 01 90	Landscape Maintenance
32 12 16	Hot Mix Asphalt Paving
32 13 13	Cast In Place Concrete Paving
32 91 13	Growing Medium
32 92 19	Mechanical Seeding
32 92 23	Sod Lawn
33 46 16	Subsurface Drainage Systems

END OF SECTION

PROJECT NAME-
SUBMITTALS
SUMMARY.

SUBMITTAL INFO				TRACKING				STATUS		
SPEC SECTION	ITEM	NAME	REQUIRED SUBMITTAL TYPE	SUBMITTAL TYPE AND DATE RECEIVED	REVISION 1	REVISION 2	REVISION 3	APPROVED		CURRENT REVIEW STATUS
								YES	NO	
03 10 00	1	Form Material	product data							
03 20 00	2	Reinforcing Material	mill certificates							
11 68 13	3	Play Equipment	shops, warranty, sched. A							
31 23 10	4	Granular Material	sieve, sample, product information							
32 13 13	5	Flatwork Concrete	mock up							
32 91 13	6	Growing Medium	analysis, soil laboratory recommendations, samples							
33 46 16	7	Drainage	record dwg, analysis, sample							
	8	Drinking fountain	product cut sheet							

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Final Review, delivery of Bonds and Guarantees, submittal of Maintenance Manual, and Project Record Documents, Delivery of Release of Liens, and Warranty.

PART 2: PRODUCTS (Not Applicable)

PART 3: EXECUTION

3.1 Final Review

- .1 Final Review will not be made until all work within this contract is completed. The Contractor shall notify Owner's Representative in writing at least five (5) days prior to date on which work will be ready for final review. Any delay in making Final Review shall not relieve the Contractor of responsibility for work, nor shall the Owner be held responsible for damages or claims for compensation due to continuing maintenance or other work occasioned by such delay. If the Owner's Representative making the final review finds the work so far from completion to make a later visit necessary, or that undue delay in making final review is incurred, Contractor shall, if determined by the Owner, be liable for expenses to Owner incurred by reason of such delay or re-review.

3.2 Delivery of Bonds, Release of Liens, and Guarantees

- .1 Bonds, Release of Liens, and Guarantees shall be provided for those portions of this work where required by specific sections or as determined in the General Conditions of the Supplementary Conditions. Submittal of releases and guarantees shall comply with conditions of the Contract.

3.3 Acceptance of Completed Work

- .1 When all work required by the Contract Documents for this project has been performed, furnished, and/or installed as specified in each specific section, acceptance of work covered by the Contract will be given by means of a Certificate of Completion and until such acceptance the Contractor will be responsible for work covered by the Contract. Contractor's responsibilities will cease, except as provided by the guarantees, when acceptance of the work is given.

3.4 Operation and Maintenance Instructions

- .1 The Contractor shall furnish one (1) digital version in current PDF file format and two (2) paper hard copies of complete sets of manuals, containing the manufacturer's instructions for maintenance and operation of each item of equipment and apparatus furnished under the Contract and any additional data specifically required under the Specifications for each division of the work. The manuals shall be arranged in the order that these items appear in the Specifications and shall be indexed, substantially bound and titled. Manuals shall be project specific and shall not include items that are not a part of this project.
- .2 Manuals shall be delivered to the Owner's Representative prior to application for final payment and as a condition of approval of final payment.

3.5 Contractor's Guarantee

- .1 The Contractor shall deliver to the Owner's Representative upon completion of all work under the Contract, a written guarantee addressed to the Owner on the Contractor's letterhead. This guarantee shall be made to cover a period of one year from date of acceptance of all work under the contract as determined by the Owner's Representative.
- .2 Guarantees from Contractor shall be supported as required in the Specification Section individual guarantees from each trade or subcontractor and manufacturer for supplier covering work. Where specific sections of the Specifications call for longer guarantees, these time periods shall so be stated. Guarantees shall be delivered to the Owner's Representative prior to application for final payment and as a condition of approval of final payment.

3.6 Project Record Documents

- .1 Throughout the progress of the work, maintain an accurate record of all changes in the Contract Documents.
- .2 Record Documents shall be protected from loss, damage, or deterioration until completion of the work and transfer of data to the final Record Documents.
- .3 All entries to the Record Documents shall be made within 48 hours of receipt of information.
- .4 Upon completion of work, and as a condition of Acceptance of Work, transfer the recorded changes to a set of Record Documents and submit to the Owner's Representative. This will include, but not be limited to, as-built drawings in digital format using current PDF, AutoCAD file formats as well as printed hard-copies.

SAMPLE WRITTEN GUARANTEE LETTER

Date: _____
Re: _____ (Title of Project)

Name and Address of Owner

[Enter VPB Project Manager's Name]:

The undersigned attest to the Owner that the Contractor will guarantee materials, equipment and workmanship under this contract, that the Contractor will remedy any defects and pay for any damage to related work and building contents resulting from said defects, which shall occur for a period of one (1) year from the date of certification of final completion by the Owner's Representative.

This guarantee shall not be construed as to shorten the life of specific guarantees/warranties/bonds as required elsewhere under this contract.

During this period, upon written notice to do so, the Contractor will proceed with due diligence, at the Contractor's expense, to properly replace any defective materials and/or equipment and to perform any labor necessary to correct any defect in the work.

In the event that the Contractor fails upon reasonable notice to remedy such defects, the Owner may furnish such materials or labor as necessary to place work in the condition required by the Contract Documents, and the Contractor agrees to reimburse the Owner fully and promptly for his expense.

Signature and Name of Contractor

ATTEST: (Signature must be notarized)

END OF SECTION 00 65 00

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read interpreted and coordinated with all other parts.

1.2 Description

- .1 This section specifies general requirements and procedures for the Contractor to make submissions of shop drawings, product samples and other submittals to Owner's Representative for review. Additional specific requirements for submissions are specified in individual sections. Submissions may include:
 - .1 Shop Drawings.
 - .2 Product Data.
 - .3 Product Samples
 - .4 Mock-Ups.

1.3 Submission Requirements

- .1 Coordinate each submission with requirements of work and Contract Documents. Individual submission will not be reviewed until all related information is available.
- .2 The Owner's Representative review of submittals made by the Contractor shall not relieve the Contractor from the responsibility for complying with contract drawings or specifications, unless the Contractor has secured the written approval of the Owner's Representative for all deviations.
- .3 Owner's Representative review for submittals shall not relieve the Contractor from responsibility for error and omissions in the submittals.
- .4 Submittals shall contain only those items specified and shall not include items which are not provided for under this contract unless they are clearly marked and/or voided as not being part of the contract.
- .5 Comply with progress schedule for a timely submission of submittals as they relate to work progress. Coordinate submittal of related items.
- .6 Allow 10 working days for Owner's Representative review of each submission.
- .7 Maintain submittal log to ensure timely and complete submittals.
- .8 Accompany submissions with transmittal letter containing:
 - .1 Date
 - .2 Project title and number
 - .3 Contractor's name, address, telephone and facsimile
 - .4 Contact person's name and position
 - .5 Identification and quantity of each shop drawing, product data, and sample (if requested or required)
 - .6 Other pertinent data
- .9 Submissions shall include:
 - .1 Date and revision dates
 - .2 Project title and number.
 - .3 Name, address telephone, facsimile, and contact person of:
 - .1 Subcontractor
 - .2 Supplier

- .3 Manufacturer
- .4 Contractor's stamp, signed by Contractors authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents. Submittals, which do not contain this information, will be returned without being examined and shall be considered rejected.
- .10 Details of appropriate portions of Work as applicable:
 - .1 Fabrication
 - .2 Layout, showing dimensions, including identified field dimensions, and Clearances
 - .3 Setting or erection details
 - .4 Capacities
 - .5 Performance characteristics
 - .6 Standards
 - .7 Operating weight
 - .8 Wiring diagrams
 - .9 Single line and schematic diagrams
 - .10 Relationship to adjacent work
 - .11 Materials
 - .12 Finishes
- .11 After Owner's Representative review and written approval distribute copies to persons necessary to complete the work. Ensure one copy of reviewed submission is kept on site.

1.4 General Requirements

- .1 Work affected by the submittal shall not proceed until review is complete.
- .2 Present shop drawings, product data, samples, and mock-ups in the same units used in the contract documents.
- .3 Where items or information is not produced in SI Metric units converted values are accepted.
- .4 Contractor's responsibility for errors and omissions in submission is not relieved by Owner's Representative review and/or approval of submissions.
- .5 Notify Owner's Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .6 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Owner's Representative review of submission, unless Owner's Representative gives written acceptance of specific deviations.
- .7 Make any changes in submission which Owner's Representative may require consistent with Contract Documents and resubmit as directed by Owner's Representative.
- .8 Notify Owner's Representative, in writing when resubmitting, any revisions other than those requested by Owner's Representative.

1.5 Shop Drawings

- .1 Shop drawings: are defined as original drawings, or modified standard drawings, catalogue information, illustrations, schedules, performance charts, brochures and other product data provided by Contractor, to illustrate details of portions of Work, which are specific to project requirements.
- .2 Adjustments made on shop drawings by the Owner's Representative are not intended to change the Contract Price. If adjustments affect the value of work, state such in writing to the Owner's Representative prior to proceeding with work.
- .3 Submission of reproductions for each requirement requested can be made by email using the current digital PDF file format.

- .4 Faxed shop drawings are not acceptable.
- .5 Include a cross-reference of shop drawing information to applicable portions of Contract Documents.
- .6 Engineered shop drawings are to be provided if requested on the drawings.

1.6 Samples

- .1 Samples: examples of materials, equipment, quality, finishes, workmanship.
- .2 Deliver samples prepaid to the Owner's Representative's business address.
- .3 Where colour, pattern or texture is criterion submit full range of samples.
- .4 Adjustments made to samples by the Owner's Representative are not intended to change the Contract Price. If adjustments affect the value of work, state such in writing to the Owner's Representative prior to proceeding with work.
- .5 Reviewed samples will become standard of workmanship and material against which installed work will be verified.

1.7 Mock-Ups

- .1 Mock-ups: field-erected example of work complete with specified materials and workmanship.
- .2 Erect mock-ups at locations acceptable to Owner's Representative.
- .3 Adjustments made to mock-ups by the Owner's Representative are not intended to change the Contract Price. If adjustments affect the value of work, state such in writing to the Owner's Representative prior to proceeding with work
- .4 Reviewed mock-ups will become standards of workmanship and material against which installed work will be verified.

1.8 Shop Drawing, Mock-Up and Sample Review

- .1 The review of shop drawings, mock-ups and samples by the Owner's Representative is for the sole purpose of ascertaining conformance with the general concept. This review shall not mean that the Owner's Representative approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for requirements of the construction and contract documents. Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all subtrades.

PART 2: PRODUCTS (Not Applicable)

PART 3: EXECUTION (Not Applicable)

END OF SECTION 01 33 23

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to prepare the site suitable for subsequent work indicated in the contract documents, including but not limited to:
 - .1 Preservation and protection of existing plants, site features and intertidal habitat.
 - .2 Draining of wet areas of the site by means of temporary ditches, pumping and other means approved by the Owner's Representative.
 - .3 Tree removal and removal of tree roots only where explicitly shown on drawings and as required to obtain satisfactory base for paving.
 - .4 Stripping and disposal of all existing materials to prepare for path and base as detailed. All other deleterious materials, including unsuitable material under areas to be filled, shall be treated as over excavation.
 - .5 Stripping and removal of all deleterious materials.
 - .6 Stripping and stockpiling topsoil (if any).
 - .7 Grading of the site, including the importation of and relocation of fill to create compacted subgrades as required for subsequent work as detailed and specified.
 - .8 Work from existing conditions and grades shown on plans. The intent is to balance structural cut and fill on site. Grades shown on drawings may be revised in conjunction with the Owner's Representative to achieve this balance.
 - .9 Placing approved fill, subbase, base and associated materials as detailed.
 - .10 Finished grading of the site for landscaping including unit concrete pavers, C.I.P. concrete paving, asphalt paving, irrigation, sodding, seeding and planting.

1.3 Related Work

- | | | |
|----|-----------------------------|------------------|
| .1 | Shrub and Tree Preservation | Section 32 01 91 |
| .2 | Subsurface Drainage | Section 33 46 16 |
| .3 | Growing Medium | Section 32 91 13 |

1.4 Quality Assurance

- .1 Codes and Standards: Perform backfilling work in compliance with applicable requirements of governing authorities having jurisdiction.
- .2 Inspection: The Owner's Representative or his representative is to inspect and approve all stages of the work. The Contractor shall give forty-eight (48) hours notice to the Owner's Representative when inspection is required.

1.5 Job Conditions

- .1 Use all means necessary to control dust, dirt and debris on and near the worksite, including Construction Access Route (C.A.R.), caused by the Contractor's operations. Thoroughly moisten all surfaces, when necessary, to prevent dust being a nuisance in adjoining areas.
- .2 Use all means to protect all materials of this Section before, during and after installation. Protect all trees designated to remain. Make good any damage. **Follow Vancouver Park Board Tree Protection Guidelines as required.** Protect existing fencing, walls, curbs, sidewalks, pavement, benchmarks, surface or underground utilities that are to remain. Notify the Owner's Representative immediately if any damage occurs. Restore to original or better condition, unless directed otherwise.
- .3 Protect adjacent construction and all surrounding properties, including municipal streets, sidewalks, above and under ground services.
- .4 Obtain approval from Owner's Representative on designated Construction Access Route (C.A.R.) Ensure C.A.R. is appropriately signed and maintained during course of construction. Remediate to original condition prior to Substantial Performance.
- .5 Maintain any existing fence barriers currently on site surrounding areas of preserved existing vegetation. Do not enter areas of preserved existing vegetation without the approval of the Owner's Representative.

1.6 Site Conditions

- .1 Start of work shall signify acceptance of site as satisfactory and no claim will be recognized for extra work nor any allowance made for defective work due to site conditions.
- .2 Investigate the site to verify information shown in Contract Documents. **Verify that existing grades are as shown on Drawings and notify Owner's Representative immediately of any discrepancies.**
- .3 Review existing site conditions with regard to subsurface conditions. Data on indicated subsurface conditions is not intended as representations or warrants of continuity of such conditions. Additional test borings and other exploratory operations may be made by Contractors at no cost to the Park Board. Notify Owner's Representative prior to carrying out any such work.

1.7 Testing and Approvals

- .1 A testing agency will be retained by the Owner or its representative to perform periodic testing of the subgrade preparation if required, to ensure the requirements of the Contract and General Conditions are being met. The Contractor at no extra cost to the contract shall provide any retesting due to non-conformance.
- .2 Cooperate and assist as required the testing agency in the execution of their work.

1.8 Materials Definitions

- .1 The terms “subgrade”, “subbase”, and “base”, wherever used in the contract documents shall mean materials that meet the requirements stated herein for each class of material.

1.9 Submittals

- .1 If required, provide representative samples for subbase, base, drain rock (clear crush), quarry tailings, rip-rap or any another aggregate materials used on site, at least fourteen (14) days before scheduled time of delivery to site.

PART 2: PRODUCTS

2.1 Subgrade

- .1 Subgrade is a dense surface that has been proof rolled as specified and which has been treated to eliminate all soft or spongy areas. Compaction and uniformity of subgrade shall be subject to approval by the Owner's Representative.
- .2 Subgrade may be existing, undisturbed material resulting from cutting or may be built up using Type 1 fill or Type 2 fill, depending on the applications.

2.2 Fill

- .1 Fill material shall be natural mineral material of a consistent quality throughout, free from foreign matter such as construction debris, plant and grass seeds, organic matter (except within limits shown for Type 1) and pests, and meeting the requirements set out for Type 1 or Type 2 fill, depending on the application.
- .2 Obtain the Owner's Representative's approval of fill material before delivering to the site if imported, or before moving on site if native. **If imported material is approved for use, supply Owner's Representative with written notification a minimum of thirty (30) days prior to beginning fill operations a complete statement of origin, compensation, suitability, environmental clearance and proposed location of all deposits that is intended for imported fill.**
- .3 Fill shall be classed as Type 1 or Type 2, depending on its application and shall meet the following requirements for each type:

TYPE	APPLICATION	REQUIREMENTS
Type 1	Under planted and grass areas	Maximum aggregate size 200mm evenly graded, containing not more than 20% fines (clay and silt) and not more than 5% organic matter, or as approved by the Owner's Representative.
Type 2	Under subbase for pathways, paved areas, structures	Maximum aggregate size 200mm evenly graded, containing not more than 15%

		<p>finer passing a No. 200 (0.075mm) sieve when tested according to ASTM designation C-136. The Owner's Representative may approve alternatives.</p>
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2.3 Subbase

- .1 Subbase shall be crushed granular aggregate composed of inert, clean, tough, durable particles capable of withstanding the effects of handling, spreading and compaction without excessive degradation or production of deleterious fines. The aggregate shall be reasonably uniform in quality and free from an excess of flat or elongated pieces.
- .2 All subbase aggregate shall have a gradation within the limits set out herein when tested according to ASTM designation C-136.

Sieve Size (mm)	Total Percent Passing
75.0	100
37.5	60 - 100
20.0	40 - 80
9.5	30 - 60
4.75	20 - 45
2.36	15 - 35
1.18	10 - 25
0.300	4 - 16
0.075	2 - 9

2.4 Drain Rock, Clear Crush

- .1 5mm to 19mm uniform clear crush.

2.5 Filter Fabric

- .1 Needle-punched, non-woven filter fabric, Nilex 4551 as manufactured by Nilex, or pre-approved equivalent.

2.6 Base

- .1 20mm diameter minus domestic or imported material below all paved surfaces. Material shall be free of organic and other deleterious material with the following particle size breakdown:

Sieve Size (mm)	Total Percent Passing
20.0	100
9.5	60 - 95
4.75	40 - 70
2.36	30 - 60

1.18 20 - 45

0.300 8 - 45

0.075 2 - 9

2.7 Construction Fencing

- .1 Metal fencing is required around the entire construction site. Fencing to be a minimum of 1.8m in height. Fencing to be "Modu-Loc" or equivalent, and is to be approved by Owner's Representative before installation. The Contractor is to ensure fencing is secure at all times, so as to prevent intrusion into the construction site by any unauthorized persons. Panels to be pinned to the ground and bolted together. Contractor is responsible for maintaining the integrity of the fencing in a vertical position at all times. Fencing is to be reviewed by the Owner's Representative before the start of any construction activities and is to remain in place until Final Acceptance.

PART 3: EXECUTION

3.1 Limits Of Work

- .1 Before starting work identify the limits of work on site by accurate survey. Prior to grading, excavating or trenching the Contractor shall locate and expose all utility lines, drain pipes and all other services which are within the areas of this work, and where the existing services are located less than 300mm below the proposed depth of trenching or excavation, such existing services shall be exposed by hand and adequately marked and protected. All separation distance requirements of the local authorities having jurisdiction over the service shall be observed.
- .2 Take all measures necessary to prevent the following activities outside the limits of work except as authorized by the Owner's Representative:
 - .1 Travel of equipment and vehicles
 - .2 Storage of materials or equipment
 - .3 Stockpiling of soil or excavated materials
 - .4 Burning
 - .5 Excavating or trenching
 - .6 Cutting of roots or branches
 - .7 Disposal or spilling of toxic matter

3.2 Tree Removal

- .1 Remove trees only as shown on the plan, or as requested by the Owner's Representative. Remove all debris from site. Remove all roots and parts that would be detrimental to the construction.

- .2 Strip topsoil, surface silts and organics, down to approved subgrade. Remove topsoil, surface silts and organics from the site, except for clean topsoil approved by the Owner's Representative for stockpiling for future use.

3.3 Unsuitable Material

- .1 Remove from the site all material unsuitable for use as fill.

3.4 Drainage

- .1 Drain and/or dewater all areas to be regraded using methods acceptable to the Owner's Representative and local environmental authorities having jurisdiction.
- .2 Slope rough grades away from any building envelopes/ structures at a minimum 2%, unless specifically shown on drawings or directed by Owner's Representative.

3.5 Excavation And Filling

- .1 Cut, fill and import material as required to create subgrades as detailed and specified herein.
- .2 Remove all deleterious material and ponded water from the site.
- .3 Compact exposed ground surface beneath all fill areas with a minimum 5 ton vibrator roller, except in "soft" landscape areas, i.e. areas to receive grass or planting.
- .4 Any soft or spongy areas shall be sub-excavated, removed and replaced with granular subbase material. Such fill shall be placed in maximum 200mm lifts and compacted to the densities required for Type 1 or Type 2 fill.
- .5 Scarify existing grades to a minimum depth of 150mm prior to placing of fill. Move excavated material intended for reuse as fill directly from the cut to the fill area, spread and compact to the required densities.
- .6 Place fill in maximum 200mm lifts and compact each lift to the following Standard Proctor Densities, to ASTM D698 using approved vibratory compaction equipment, prior to placing subsequent layers as follows:
Type 1 Fill: 95% Standard Proctor Density (S.P.D.).
Type 2 Fill: 98% Standard Proctor Density (S.P.D.).
- .7 Compact fill materials only when the moisture content is suitable for obtaining the specified density. If moisture content is too low, apply water by means of approved distribution. If moisture content is too high, dry the fill material by blading, disking, or other approved method. **DO NOT OVER COMPACT FILL TYPE 1.**
- .8 Excavated material used as Fill Type 2, shall be overlaid with a minimum of 200mm of subbase, compacted to 98% Standard Proctor Density.

3.6 Grading

- .1 **DO NOT GRADE SOIL WHEN SOIL IS WET.** Uniformly grade areas within limits of grading under this Section. Smooth finished surface within specified tolerances, compact with levels or slopes between elevations as shown, or between such points and existing grades.
- .2 Grade areas to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and to allow for specified depths of base courses and finished materials.
- .3 Remove particles larger than 100mm diameter from the surface leaving a smooth compacted surface to required subgrade.
- .4 Compact subgrade as required, to stated densities in the above section.

3.7 Subbase And Base

- .1 Ensure base materials and existing surface are at approximately the same moisture content to facilitate bonding.
- .2 Install subbase, base, and filter fabric as detailed. Place in maximum 200mm lifts and compact to minimum 98% Standard Proctor Density (S.P.D.).
- .3 Finish to subgrades as detailed, suitable for subsequent installation of path and base, structures and paving.

3.8 Tolerances

- .1 Maximum subgrade tolerance is ± 25 mm when checked with a 3 m straight edge placed in any direction, and the subgrade shall not be consistently above or below the design grades.

3.9 Maintenance

- .1 Protect newly graded areas from traffic, erosion, and standing water and free of debris. Provide temporary drainage ditches from graded areas as required.
- .2 The site surface shall always be contoured to direct precipitation and run-off to drainage ditches or slopes leading away from the work area. Surfaces shall always be left graded smooth and rolled with a smooth drum roller to minimize infiltration of water and subsequent deterioration of material due to excessive moisture content. The surface shall never be left with undrained depressions or with a rough texture.
- .3 Repair and re-establish grades in settled, eroded and rutted areas to specified tolerances.
- .4 Repair and make good and clean up any damage and/or debris to municipal roads and streets caused by work of this Contract. Obtain and pay for all permits required for use of municipal roads and streets.

3.10 Cleaning

- .1 Remove excess excavated material, trash, debris and waste materials and dispose of off site as directed by Owner's Representative at no additional cost to the Board.

END OF SECTION 01 89 13

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary for the demolition and removal of all materials as indicated in the contract documents.
- .2 Concrete shall be broken into pieces 200 mm and remain on site to be buried with fill material as shown on the drawing.
- .3 The work shall include all coordination required for the shut-off, isolation and capping of all utilities such as water, sewer, electricity, telephone and gas services.

1.3 Related Work

- | | | |
|----|------------------------------|------------------|
| .1 | Tree Protection | Section 32 01 56 |
| .2 | Clearing and Grubbing | Section 31 11 00 |
| .3 | Site preparation | Section 01 89 13 |
| .4 | Site Preparation and Grading | Section 01 89 13 |

1.4 Quality Assurance

- .1 Demolition to be carried out in accordance with Vancouver Building Bylaw, latest edition and all regulatory authorities as applicable.
- .2 Procedures and methods of demolition shall be to the approval of the Owner's Representative and Owner.
- .3 Codes and Regulations: Do all demolition work according to the requirements of the Vancouver Building By-law and WorkSafeBC Accident Prevention Regulations, and the Canadian Construction Safety Code.

1.5 Qualifications

- .1 Qualifications of Workers: Provide a Supervisor who shall be present at all times during the demolition work and who shall be thoroughly familiar with the work required and who shall direct and coordinate all work.
- .2 All areas of responsibility for demolition and cutting shall be thoroughly coordinated by the Contractor.
- .3 Provide one (1) person on site who is responsible for maintaining the safety barriers and protection of the workers and the public. Provide the name of this person to the Owner's Representative.
- .4 Any changes in personnel must be reported to the Owner's Representative.

- .5 Each subtrade is required to coordinate its work with the work of this section as to the amount of demolition work required and as to termination conditions to be left at the junction of existing work to remain.
- .6 Each subtrade shall be responsible to ensure that all demolition and cutting does not destroy more than is required, or what is needed for future construction.
- .7 Any demolition and cutting carried beyond the necessary requirements shall be the responsibility of the Contractor, and shall be reinstated at no cost to the Owner.

1.6 Job Conditions

- .1 The Contractor shall provide for temporary connections to power and water and drainage lines as required. No outages, limitations or obstructions shall be permitted unless with the prior approval of the Owner.
- .2 The Contractor shall contact the Owner and/or Owner's Representative prior to any service interruptions and obtain permission for interruption at a specific time.
- .3 The Contractor shall take the necessary precautions to fully protect existing surfaces against damage from demolition and/or removal of existing work.

1.7 Permits

- .1 If a demolition permit is required the Contractor shall be responsible for obtaining this permit.

PART 2: PRODUCTS (Not Applicable)

PART 3: EXECUTION

3.1 Hazardous Materials

- .1 Carefully examine work to be removed. Report the presence of hazardous materials or potentially hazardous materials to the Owner immediately.
- .2 Hazardous materials are not to be disturbed if located or suspected until their presences has been reported to the Owner. Vancouver Park Board will be responsible for the removal of any hazardous materials if they were not identified and included in the base contract.

3.2 Inspection of Existing Conditions

- .1 Carefully examine areas to be demolished. Report any discrepancies with the Contract Documents to the Owner's Representative immediately.

- .2 The Contractor shall accept the site as it exists and will be responsible for all demolition work as required.
- .3 The Contractor shall visit the site at their own expense prior to the submission of tenders and take whatever time is required to ascertain existing site conditions and surrounding features related to the proposed demolition and ensure that conditions are suitable for execution of the work.
- .4 No additional sums of money will be allowed for any items resulting from lack of familiarity with the site conditions. Report any discrepancies to the Owner's Representative.
- .5 Arrange for a site visit together with Owner to examine existing site conditions adjacent to demolition. Take pictures of any existing damage and record them in writing to avoid any disputes at a later date.

3.3 Protection

- .1 The Owner shall be saved harmless by the Contractor from any loss, damage, death or injury occurring through neglect, carelessness or incompetence of the Contractor, or the handling or condition of the Contractor's equipment.
- .2 Existing trees shall be fully protected at all times during the work of this Section as required.
- .3 Immediately make all repairs and replacements to adjacent existing works caused by the Work of this Section.
- .4 Provide temporary enclosures for securing the work area and the maintenance of any services necessary to the proper and efficient operation of the project.
- .5 Protect site improvements such as sidewalks, curbs, existing landscaped and asphalt areas and all interior finishes that lie along the path of removal.
- .6 Conduct construction operations with minimum interference to existing buildings operations, adjacent buildings, adjacent public or private roadways, parking lots, sidewalks and access facilities in general. Keep such areas free of material debris and equipment at all times.
- .7 The Contractor shall provide any hoardings, barricades, warning signs and lights, as necessary, for the protection of all people and property on and adjacent to the site as specified herein or by WorkSafeBC. The Contractor shall alter, adapt, maintain, relocate and remove these additional barricades, etc. as necessary due to the work.
- .8 All barricades provided by the Contractor shall be removed from the site upon completion of the work and any damage caused repaired to the satisfaction of the Owner.
- .9 Prevent movement, settlement or damage to existing building, finishes, services, walks, paving and parts of existing building to remain. Provide shoring and bracing as required. Make good any damage and be liable for injury caused by demolition.
- .10 Provide necessary temporary weather protection with dust screens if and when required to protect existing adjacent buildings from dust penetration during demolition work.
- .11 Protect adjacent work from damage, staining, disfigurement caused by the work of this section.

- .12 Promptly as the work proceeds, and on completion, keep the premises clean and free from rubbish, debris, surplus materials and equipment.
- .13 At the end of each days work, leave the work area and surrounds in a safe condition so that no parts are in danger of toppling or falling.

3.4 Demolition

- .1 Remove materials from demolition promptly as the demolition work progresses. Materials shall not be sold, buried or burned at the site. The Contractor shall be assumed to have allowed for any credit that may be obtained for such materials.
- .2 Temporary stockpiling of demolished materials that are required to be removed from the site is not permitted. All demolition materials from excavations must be removed from site daily.
- .3 The Contractor is responsible for disposing of demolition materials in a legal manner.
- .4 Carry out all necessary temporary bracing and supporting to as required during demolitions.
- .5 Prevent debris from blocking surface drainage inlets and systems that must remain in operation.
- .6 Carry out all demolitions and making good. Patch and make good to a standard at least equal to that of adjacent surfaces when related work is completed.
- .7 Any items containing PCBs should be stockpiled in a safe location. The Owner should be notified and will arrange subsequently removal and disposal of items if not included in the base contract.
- .8 No heavy equipment causing excessive vibrations to the existing structures are permitted.
- .9 Make cut clean, true, smooth edges. Make patches inconspicuous in final assembly.
- .10 Demolish existing walls with care, do not damage adjacent surfaces noted to remain.
- .11 Remove existing millwork fixtures, services, and building components where required.
- .12 Remove existing asphalt and concrete paving, concrete curbs as required for new site development.
- .13 Remove existing site services and catch basins as noted.
- .14 Subsurface structure: remove all subsurface foundations, piles and pile caps as per the contract documents.
- .15 Refer to moving plans for equipment moving requirements.
- .16 Complete demolition work to produce clean exposed sub-grade where demolition is indicated. Remove extraneous materials.
- .17 Large boulders or rocks over two feet diameter shall remain on site unless otherwise noted by Owner's Representative.
- .18 Drilling through concrete and masonry shall be carried out using diamond drills.
- .19 Procedures and methods of drilling, coring and/or cutting shall be to the approval of the Owner.

3.5 Debris

- .1 Condemned material becomes the Contractor's property and must be removed completely from the site. Keep clean all areas in use at all times.
- .2 Contractor shall be held responsible for all costs, penalties, summonses and notices arising from the failure to comply with the keeping of the adjacent site, local roads, and thoroughfares clean and free from debris and damages caused by debris and demolition work.

3.6 Cleaning

- .1 Upon the completion of all demolition work remove all equipment, materials, and debris. Leave the area clean.

END OF SECTION 02 41 13

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to install erect, and strip all formwork and false work for cast-in-place concrete as indicated in the contract documents.

1.3 Related Work

- | | | |
|----|--------------------------------|------------------|
| .1 | Shop Drawings and Product Data | Section 01 33 23 |
| .2 | Concrete Reinforcement | Section 03 20 00 |
| .3 | Cast-In-Place Concrete | Section 03 13 13 |

1.4 Reference Standards

- .1 Concrete formwork shall conform to the requirements of the following standards unless otherwise required by this specification:
 - .1 B.C. Building Code: Current Edition.
 - .2 CAN3-A23.1-M90 Concrete Materials and Methods of Concrete Construction.
 - .3 CAN/CSA-A23.3 Code for the Design of Concrete Structures for Buildings.
 - .4 CAN/CSA S269.3 Design, Fabrication, Erection and Use of Concrete Formwork.
 - .5 ACI 347 Recommended Practice for Concrete Formwork.
 - .6 WorkSafeBC - Section 34.28
- .2 Where the standard is referred to in this specification it shall mean the documents specified in this clause and their referenced documents.

1.5 Quality Assurance

- .1 Concrete formwork fabrication and erection shall be done by experienced and competent personnel having adequate training and equipment for all phases of the work specified.

1.6 Quality Control

- .1 Where slopes illustrating 'positive drainage' on a horizontal surface either as labels or spot elevations are indicated on construction drawings the Contractor shall construct the formwork as required to ensure that when the concrete is placed the formwork does not hinder the finishing of concrete to achieve positive drainage.

1.7 Submittals

- .1 The Contractor shall submit to the Owner's Representative three (3) copies of product data for form material to be used.

PART 2: PRODUCTS

2.1 General

- .1 Products shall satisfy the requirements of the standard unless otherwise specified or indicated on the Contract drawings.

2.2 Forms for concrete:

- .1 Non-Exposed Concrete Surfaces: Plywood, shiplap or dimensional lumber, for rough-form finish in accordance with CAN/CSA A23.1-94, Section 24, Item 24.3.2.
- .2 Architectural Concrete Surface (concrete surfaces exposed to view): as per CSA A23.1-94 24.3.3
- .3 Form work for smooth, form finish concrete shall have a form facing material which will provide smooth, hard, uniform texture on the concrete.
- .4 The form material may be medium density overlay (MDO) plywood, tempered concrete – form-grade hardboard, metal, plastic, paper or other material capable of producing smooth finish.
- .5 Material with raised grain, torn surfaces, worn edges, patches, dents, or other defects that will impair the texture of the concrete surface shall not be used.
- .6 Acceptable products include but are not limited to:
 - .1 Multipour MDO Form Panel,
 - .2 B-Matte 333 MDO Form Panel
- .7 Form material thickness shall be sufficient to ensure that finished concrete work is true to lines, shapes, angles and finishes indicated on the Contract drawings. Minimum thickness of form material shall be 19 mm (3/4"). Ensure that the same type of formwork material is used throughout the entire scope of the project.
- .8 Form Release Agents: Concrete form release shall be composed of an organic chemical that reacts with the alkali content of concrete to form a release film, along with providing an inert barrier to provide double separation. Acceptable materials include but are not limited to:
 - .1 Duogard Concrete Form Release Agent by W.R. Meadows
 - .2 Eco-Coat by W R Meadows
- .9 Form ties complete with precast concrete plugs shall leave no metal within 25 mm (1") of the concrete surface. Acceptable products include but are not limited to:

- .1 Meadow Burke Snap Ties,
- .2 Dayton Superior Plastic Snap Ties with Plastic Cone
- .3 Void Form: Closed cell expanded polystyrene (EPS) voiding. Acceptable products include but are not limited to:
 - .1 Korolite Type 2, Mansonville Plastics, Surrey, BC,
 - .2 Korvoid, Mansonville Plastics, Surrey, BC (where compressive loads exceed 110 Kpa (16psi))
 - .3 Plastispan, Plasti-Fab EPS

PART 3: EXECUTION

3.1 Design Of Formwork, Falsework and Reshoring

- .1 The Contractor shall assume full responsibility for the design of form work and ensure structural adequacy of the forms to withstand all concrete and construction loads.
- .2 As a minimum, the work shall conform to CAN/CSA-A23.1, Section 24 for regular work (concrete surfaces not exposed to view) and CAN/CSA-A23.1, Section 28 for architectural concrete (concrete surfaces exposed to view).
- .3 Forms shall be so constructed that the finished concrete will conform to the shape, dimensions and tolerances as specified in the drawings. As required they shall also incorporate the cambers specified on the structural drawings.
- .4 The strength and rigidity of forms shall be such that they will not leak mortar or result in visible irregularities in the finished concrete, but in any case the deflection of facing materials between studs as well as deflection of studs and walers shall be in accordance with the CAN/CSA S269.3.
- .5 Where concrete is exposed to view, forms are to be laid out so that joints are kept to a minimum and located in an orderly and symmetrical arrangement where possible.
- .6 Unless otherwise indicated on the construction drawings the location of form ties shall be evenly spaced and in straight horizontal and vertical lines. Prior to the start of work in this section the Contractor shall provide the Owner's Representative a shop drawing illustrating the spacing and location of form tie holes.
- .7 The Contractor shall take care to ensure not to exceed the live load of the structure with any construction or shoring loads.
- .8 The Contractor is responsible for monitoring the curing time and related strength of the concrete. These shall be factored into the scheduling, staging and progress of all concrete work.

3.2 Form Work Construction

3.1 Form Work Construction

- .1 Construct formwork using appropriately sized timber or steel members, braces, walers, ties, etc. to ensure that the forms will not deflect, blow out, or deform as a result of concrete load.
- .2 Contractor shall ensure that where a positive slope is indicated on the construction

drawings that the form work is constructed to achieve this slope. This includes but is not limited to cast in place concrete stair form construction.

- .1 The Contractor shall clearly indicate, using an indelible line the entire length of the stair tread the elevation of the back of the stair tread.
- .2 Prior to the placement of concrete using the line layout noted and the finished elevation of the top of the riser formwork the Contractor shall illustrate to the Owner's Representative that the formwork has been constructed to allow for positive drainage to the lines and levels indicated on the construction drawings from the back of the tread to the nose of the tread.
- .3 Install all inserts including cant and reveal strips, anchors, ties, bolts, nailers, anchor bolts, embedded plates, indicated on the contract documents and/ or required by other trades. Ensure cant and reveal strips are true to line and grade and joints are butt tight and smooth.
- .4 Provide all voids: openings and block outs indicated on the contract documents and/ or required by other trades.
- .5 Openings that have not specifically been indicated on the structural engineer's drawings must be approved in writing by the structural engineer.
- .6 Joints and corners shall be constructed so that they will not leak as a result of pressure from freshly placed concrete. Caulk as required.
- .7 The Contractor shall ensure that all forms not treated with a form release agent are to be kept evenly moist to prevent shrinkage. Wet the surface of untreated forms just prior to placing concrete.
- .8 Form release agent shall be applied in strict accordance with the manufacturers written instructions.

3.3 Removal of Formwork

- .1 Forms shall not be removed until concrete has attained sufficient strength to ensure that no damage or continuity of concrete will occur when forms are removed.
- .2 The structural engineer shall advise the Contractor as to the duration of cure time required prior to the removal of suspended formwork.
- .3 The Contractor shall use wooden wedges when prying directly against face of concrete during form removal. Do not pry directly against concrete surface.
- .4 Carefully remove form ties to avoid marking concrete. Unless otherwise indicated on the construction drawings plug and grout form tie holes to prevent rust staining. Ensure grout is finished smooth and flush to finished face of concrete.
- .5 Thoroughly clean and retreat forms prior to reuse.

3.4 Architectural Concrete Formwork

- .1 With respect to these specifications Architectural Concrete refers to concrete surfaces that are exposed to view. In addition to requirements of this section and those outlined in Section 28 of CAN/CSA-A23.1, formwork for architectural concrete shall specifically address the following:

- .1 Formwork shall be constructed so that finished concrete surface will be free from any imperfections as a result of, but not limited to, misalignment or warping of forms, misalignment or warping of plywood or steel elements, inadequate tightness of forms, mortar leakage and any texture imparted by formwork.
- .2 Maintain true right-angled corners for all exposed edges of concrete, unless otherwise indicated.
- .3 The pattern for form ties shall be in accordance with the approved shop drawings.
- .4 Back all edges of forms and brace to assure that mortar leakage is eliminated.
- .5 Thoroughly inspect all forms prior to reuse. Do not reuse forms when surfaces that will come in contact with concrete have been damaged to the extent that the finished surface will not conform to the specifications.

3.5 Cleaning

- .1 Rubbish and debris resulting from work of this section shall be collected regularly, and removed from the project site and properly disposed.

END OF SECTION 03 10 00

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to install reinforcing steel as indicated in the contract documents.

1.3 Related Work

- .1 Concrete Formwork Section 03 10 00
- .2 Cast-in-Place Concrete Section 03 33 00

1.4 Reference Standards

- .1 Except as stated otherwise, all work shall conform to the following:
 - .1 B.C. Building Code 1998.
 - .2 City of Vancouver Building Bylaw No. 6134.
 - .3 CAN/CSA-A23.2 Methods of Tests for Concrete
 - .4 CAN/CSA-A23.3 Code for the Design of Concrete Structures for Buildings.
 - .5 CAN/CSA- A23.1 Concrete Materials and Methods of Concrete Construction
 - .6 CAN/CSA G30.5-M Welded Steel Wire Fabric for Concrete Reinforcement.
 - .7 CAN/CSA G30.12-M Billet-Steel Bars for Concrete Reinforcement.
 - .8 CAN/CSA W186-M Welding of Reinforcement Bars in Reinforced Concrete Construction.
 - .9 ACI manual of Standard Practice for Detailing
- .2 Where the standard is referred to in this specification is shall mean the documents specified in this clause and their referenced documents.

1.5 Inspection

- .1 All steel for the section shall be placed before pouring of concrete is begun.

1.6 Testing and Approvals

- .1 As per Section 03110 - Concrete/Reinforcement Testing.

1.7 Submittals

- .1 Submit mill certificates properly correlated to the materials in accordance with CAN/CSA G30.18.

PART 2: PRODUCTS

2.1 General

- .1 Products shall satisfy the requirements of the standard unless otherwise specified herein or on the drawings.

2.2 Materials

- .1 Reinforcing bars will conform to CAN/CSA G30.18, Grade 400 R, unless otherwise specified herein or on the drawings.
- .2 Reinforcing not in accordance with the above standards shall not be used.
- .3 Reinforcing bars to be welded will conform to CAN/CSA G30.18, Grade 400 W.
- .4 Welded wire fabric will conform to CAN/CSA G.30.5, size and gauges as shown on the drawings.
- .5 Welded wire fabric for slabs will be delivered in flat sheets only.
- .6 Accessories: tie wire, hangers, bolsters, bar supports and spacers adequate for strength and support of reinforcing construction conditions.
 - .1 Use non-staining supports for architectural concrete.

PART 3: EXECUTION

3.1 General

- .1 All phases of concrete reinforcement work shall be in accordance with the standard unless otherwise specified herein or on the drawings. Workers who are skilled and experienced in their trade shall do the work.
- .2 The Contractor shall notify the Owner's Representative at least 48 hours before any concrete is placed in order that an inspection may be made.
- .3 Ship bundles of bar reinforcement, clearly identified in accordance with the bar list.

3.2 Fabrication

- .1 Fabricate reinforcing to CSA-A23.1.
- .2 Reinforcing bars will be cold bent. Bars will not be straightened or rebent.
- .3 Splices in reinforcing bars at locations not shown on the Drawings must be submitted for review by the Owner's Representative. Such splices will conform to the standards.

3.3 Placing

- .1 Reinforcing of size and shapes shown on the Drawings will be accurately placed in accordance with the Drawings and the requirements of the standard.
- .2 Reinforcement shall be adequately supported by chairs, spacers, support bars, hangers, or other accessories, and secured against displacement within the tolerances permitted in the standard. Support devices contacting surfaces exposed to the exterior shall be non-corroding.
- .3 Reinforcing bars that are not part of the structural design or drawing, and whose only function is supporting other reinforcing in lieu of other support accessories, will be considered as accessories.
- .4 Clean reinforcement before concrete is placed.
- .5 Contractor to coordinate a site meeting for the Owner's Representative to review reinforcing steel and placing before concrete is placed. A minimum of 48 hours notice is required for this review meeting.

3.4 Welding

- .1 Any welding of reinforcing steel shall be in accordance with CAN/CSA W186.
- .2 Copies of the Canadian Welding Bureau approved welding procedure and certificate of current operator qualification shall be submitted to the Owner's Representative prior to commencement of welding

END OF SECTION 03 20 00

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to install architectural cast in place concrete as indicated in the contract documents.
- .2 Install all anchor bolts, embedded metal, inserts, hangers, etc. supplied by other project trades to be cast into concrete. The Contractor shall be responsible for the correct positioning, depth, exposure and installation of these elements.
- .3 Install all openings, sleeves, block outs, etc. required by other trades and indicated on the construction drawings. The Contractor shall be responsible for the correct positioning, depth and installation of these elements.

1.3 Related Work

- .1 Concrete Reinforcement Section 03 20 00
- .2 Concrete Forming and Accessories Section 03 10 00
- .3 Concrete Finishing Section 03 35 00

1.4 Reference Standards

- .1 Unless otherwise noted concrete work shall conform to the requirements of the following standards:
 - .1 B.C. Building Code Current Edition
 - .2 CSA CAN3-A23.1.
 - .3 CAN/CSA-A23.2 Methods of Tests for Concrete.
 - .4 CAN/CSA-A23.3 Code for the Design of Concrete Structures for Buildings.
- .2 A copy of the standard shall be kept by the Contractor on site for the duration of the work.

1.5 Submittals

- .1 A minimum of two (2) weeks prior to the start of work in this section the Contractor shall submit to the Owner's Representative the following information:
 - .1 Written confirmation of the mix design criteria from the concrete batch plant.
Confirmation shall also be sent to the project Testing Agency.
 - .2 Shop drawings indicating the layout of all form ties.

1.6 Quality Assurance

- .1 To ensure consistency in the mix design; colour and finished appearance the supply of concrete and aggregate to be used in the concrete mix shall be from a single source throughout the duration of work of this Contract.
- .2 Quality of Finish: The quality of finish shall be such that, when the forms are stripped, it meets the standards set out below, without further finishing work other than sandblasting as required, and clean-up.
- .3 Concrete finishes shall exhibit sharp, accurate definition at corners, arises, reglets and the like, generally free of chipped or spalled areas and within dimensional tolerances set out in CAN/CSA A23.1/A23.2-00, except in the instance of "bug holes" or "honey-combing", in which a maximum of 5 mm diameter holes will be allowed. Members shall be visually straight. Major defects will necessitate replacement. The judgement as to what constitutes major defects will be by the Owner's Representative.
- .4 Concrete finish shall be uniform in colour.
- .5 Plane surfaces without protuberances, indentations, ridges or bulges.
- .6 Abrasive blasted surfaces shall have uniform depth of cutback, distribution of aggregate and colour and texture matching the sample panel designated by the Owner's Representative
- .7 Under no circumstances shall repair to any architectural concrete be undertaken without the Owner's Representative written consent. Concrete members that are repaired without written consent may be classified as defective work at the discretion of the Owner's Representative.

1.7 Testing and Approvals

- .1 All required sampling, preparation of specimens and testing shall be performed by an independent testing agency appointed by the Owner's Representative. The testing agency shall report any procedures that are contrary to the specifications or accepted practice to the Owner's Representative.
- .2 Testing will be paid for by the Contractor. The testing agency shall submit all results directly to the Owner's Representative.
- .3 The cost of supplying the material for samples shall be borne by the Contractor. The Contractor shall provide adequate notice and coordinate the scheduling of all concrete placements with the testing agency. The Contractor shall cooperate with the testing agency during the sampling process.
- .4 The testing agency shall perform the following:
 - .1 Review mix designs to ensure conformance with the specifications. Provision of a written report to the Owner's Representative.
 - .2 Test cement and aggregate for conformance with the material requirements of the specification.

- .3 Supply cylinder moulds, sample the concrete, make and cure test cylinders and perform compressive strength tests in accordance with specification standards.
- .4 Carry out slump and air content tests for each concrete test in accordance with specification standards.
- .5 Take three (3) test cylinders for each 25 cubic Metres (33 cubic yards) or fraction thereof for each class of concrete placed in any one day. In no case shall any one class of concrete be represented by less than three (3) tests.
- .5 All cylinders shall be made from concrete taken from the forms.
- .6 The Owner's Representative at their discretion may reduce or eliminate the test cylinders to be taken for minor pours or pours not of structural significance.
- .7 The testing agency shall perform the following tests on the each set of cylinders:
 - .1 Compression test of one (1) of the cylinder specimens after seven (7) days.
 - .2 Compression test of the remaining two (2) cylinders of each group after twenty eight (28) days.
 - .3 One (1) twenty-eight (28) day strength test result shall be calculated from the average of the compressive strength tests of the two (2) companion cylinders.
- .8 The testing agency shall provide certified copies of the test result to the Owner's Representative. The test results shall meet the requirements of the mix designs indicated on the Contract documents.
- .5 Should any test indicate concrete below strength, the Owner's Representative shall have the right to stop work on the suspect area until subsequent tests are made. The Contractor shall bear the cost of such required tests. Should all tests indicate below strength concrete, the Contractor shall remove this portion of the work at the Owner's Representatives request. The removal and replacement of this work by the Contractor shall be at no expense to the Owner.

1.8 Protection

- .1 Cold and hot weather requirements to CAN/CSA A23.1.

1.9 On Site Mock-Up

- .1 Construct a 1.2m long x detailed thickness and height of cast in place concrete curb. Mock-up shall include a representative of all wall elements noted in the construction details and plans including but not limited to joints, edge treatments, etc. The Owner's Representative will review and approve the mock-up prior to the start of any work of this section. The approved mock-up shall form the basis of acceptable quality required for the remainder of the concrete work.
- .2 The approved mock-up shall be a stand-alone element and not form part of the finished project. The mock-up is to be retained on site until the project has been concluded at which point the mock-up will be disposed of by the Contractor at no additional cost to the owner.

- .2 The mock-up can remain part of the final work at the discretion of the Owner's Representative.

PART 2: PRODUCTS

2.1 Concrete Mixing Materials

- .1 Portland Cement: to CAN/CSA-A5.
- .2 Aggregates: fine and coarse to CAN/CSA-A23.1
- .3 Water: potable to CAN/CSA-A23.
- .4 Air entraining admixtures: To requirements of ASTM C260. Acceptable products include but are not limited to:
 - .1 N.V.R, Sternson Ltd.
 - .2 Darex AEA, Grace Construction Materials
 - .3 MB-VR, Master Builders
- .5 Chemical Admixtures: To CAN/CSA-A266.2. The Owner's Representative shall approve use in writing.
- .6 Calcium Chloride: As a raw material or as a constituent in other admixtures, shall not be used unless approved in writing by the Owner's Representative.
- .7 Curing Compound: To requirements of ASTM C309 spray applied liquid containing a fugitive dye to be applied in accordance with manufacturers written instructions.
 - .1 Curing compounds shall be compatible with other specified floor hardeners, covering adhesives and waterproofing compounds.
 - .2 The use of other curing methods including the use of burlap and sheet materials shall be at the discretion of the Owner's Representative.
- .8 Form Release Agents: Concrete form release shall be composed of an organic chemical that reacts with the alkali content of concrete to form a release film, along with providing an inert barrier to provide double separation. Acceptable materials include but are not limited to:
 - .1 Duogard Concrete Form Release Agent by W.R. Meadows
 - .2 Eco-Coat by W R Meadows
 - .3 No Hold Concentrate, Grace Construction Materials
- .9 Joint Fill Material: Fibre Board: 12mm (1/2") pre-moulded bituminous impregnated fibre board to ASTM D 1751. Acceptable materials include but are not limited to:
 - .1 Flexcell, Sternson
 - .2 027 Fibre Expansion Joint, W R Meadows

- .10 Backer Rod: Closed cell, polyurethane foam to ASTM C 1330, Type C. For Joint widths up to 19mm (3/4") diameter of rod shall be 3mm (1/8") larger than the joint width.
- .11 Joint Sealant: Shall be self-levelling, non sag, two (2) part polyurethane type, conforming to CGSB 19.24-M80, Type II, Class B. Acceptable products include:
 - .1 Sika; Sikaflex-2C NS Mix TG
 - .2 Iso-Flex 880 GB self leveling
 - .3 Sonneborn SL2
- .12 Colour from standard range as indicated on the Contract Drawings.
- .13 Primers and bond breakers as required to install the joint sealant system shall be in strict accordance with sealant manufacturers written recommendations.

2.2 Mix Designs

- .1 Unless otherwise noted on the Contract documents the concrete mix design shall meet the following requirements:
 - .1 Ramps, stairs, and curbs:

Minimum 28 Day Strength	32 MPa
Slump	75mm, (3"), +/- 20mm (3/4")
Maximum Aggregate Size	19mm (3/4")
Water Cement Ratio	0.45
Air Content	5 – 8%
Exposure Class	C-2

PART 3: EXECUTION

3.1 General

- .1 Concrete Supply: Concrete shall only be supplied by a ready-mix concrete plant indicated by the Contractor in the submittals provided as part of the approval for work of this section.
- .2 The transport of concrete in non-agitating equipment is not permitted without the prior written permission of the Owner's Representative.
- .3 Concrete shall be discharged to the specified on site locations no longer than one and one half (1.5) hours after the introduction of the mixing water to the cement and aggregates.

3.2 Openings and Inserts

- .1 The Contractor is responsible for the coordination with all trades in the setting of all slots, sleeves, openings, fasteners, block outs, bolts, dowels, hangers, inserts, conduits, clips, etc., that described or detailed in the Contract documents.

3.3 Preparation for Concrete Pour

- .1 Owner's Representative Review: A minimum of 48 hours prior to the placement of concrete the Owner's Representative shall review the following elements:
 - .1 Layout and construction of formwork.
 - .2 Layout and placement of reinforcing.
- .2 Inserts and Block Outs: The Contractor shall have all inserts, anchors, embed items, etc. positioned or close at hand to ensure a seamless, efficient concrete placement operation.
- .3 The Contractor is to review with the Owner's Representative procedures, reference lines, form construction and other practices that will be employed to ensure that concrete that is placed in areas where the Contract documents require a positive slope to ensure drainage will after final surface finishing achieve the specified slopes.

3.4 Addition of Water

- .1 To conform to CAN/CSA-A23.1.18.4.3.
- .2 In brief – no water from the truck system or elsewhere shall be added after the initial introduction of the mixing water at the batch plant. The only exception shall be as follows:

- .1 At the start of discharge if the measured slump of the concrete is less than that specified and no more than sixty (60) minutes have elapsed from the time the concrete was loaded at the batch plant to the start of discharge, then at the discretion of the Owner's Representative up to 12 litres per cubic metre (3 gallons per cubic yard) of water may be added to concrete in the ready mix truck. The resulting concrete must satisfy the mix design requirements of the Contract documents.

3.5 Placing of Concrete

- .1 Concrete shall be deposited in the forms as close as is practicable to its final position to avoid segregation due to re handling.
- .2 Place concrete in generally horizontal, level lifts to a maximum depth of 300 mm (12"). Ensure the free fall of concrete does not exceed 1.5 Metres (5'-0").
- .3 Consolidate each lift of concrete thoroughly and uniformly by means of vibrators or finishing machines. The resultant mix should be a dense, homogeneous structure closely bonded to the reinforcing.
- .4 Vibrators shall be internal type having a minimum frequency of 7,000 revolutions per minute. A spare vibrator shall be readily accessible during all placement operations.
- .5 Ensure that the placing of concrete and the subsequent vibration process does not disturb reinforcing, location of inserts and block outs or the position of the forms.
- .6 Concrete shall not be placed during rain or snow unless Contractor has reviewed procedures for providing adequate protection to finished surfaces with the Owner's Representative. All procedures, equipment, tarps and overhead cover to be in place prior to the start of concrete placement.

3.6 Curing and Protection

- .1 Curing: Concrete shall be cured in accordance with CAN/CSA 23.1.
- .2 Unless otherwise indicated slabs shall be cured using curing compound specified. Coverage rates and method of application shall be as per manufacturers written instructions.
- .3 Freshly placed concrete shall be protected from the effects of sunshine, drying winds, cold, heat, and flowing water including rain by the use of adequate tarpaulins or other suitable materials to cover completely or enclose freshly finished surfaces, until the end of the curing period.

3.7 Finishes

- .1 Prior to final finishing, unless otherwise indicated on drawings tie holes shall be filled, formed surfaces shall be treated in accordance with CAN/CSA-A23.1. 24.
- .2 Final concrete finishes shall be as detailed in Contract documents.

3.8 Concrete Joints

- .1 Joints are to occur at regular intervals as required by the existing conditions, no further than 9 M (30 ft) apart unless noted otherwise.
- .2 Joint locations in beams or walls shall be approved by the Owner's Representative prior to their installation. Ensure proper key and dowels or extensions of reinforcing are provided at all joints.
- .3 The Contractor shall seek the approval of the Owner's Representative for installation of joints not indicated in the Construction documents.

3.9 Joint Fill and Sealant

- .1 Provide joint fillers and sealant to all joints unless otherwise indicated in the Contract documents.
- .2 Ensure that all joints are thoroughly prepared and cleaned of all foreign material that may impair the proper function of the joint of adhesion of the sealer. Cleaning procedures shall be in accordance with the manufacturers written instructions.
- .3 Unless otherwise indicated in the Contract documents or required by the sealant manufacturer the joint fill material shall terminate 12mm (1/2") below the top of the joint. The resultant space shall be space shall be filled with joint sealer in accordance with the manufacturers written instructions.

3.10 Patching

- .1 The Owner's Representative shall review all "bug holes" or "honey-combing", prior to any remedial work performed by the Contractor. Repair of these types of defects shall be as per CAN/CSA-A23.1.24.2. Patching and remedial work shall be performed by the Contractor at no cost to the Owner.
- .2 No other patching or repair of concrete surface shall be allowed. Defective work identified by the Owner's Representative shall be completely removed and replaced at no cost to the Owner.

3.11 Flood Test

- .1 Immediately upon removal of the formwork of cast-in-place improvements or placement of precast concrete elements, a flood test shall be conducted by the Contractor in the presence of the Owner's Representative to ensure proper drainage of all concrete improvements. Improvements subject to a flood test shall include but are not limited to all stairs and ramps. The flood test shall consist of the application of a volume of water sufficient to allow the visual verification of all slopes and drainage patterns and ensure that ponding does not occur. The volume of water necessary to facilitate testing and the determination of the success or failure of the flood test shall be at the discretion of the Owner's Representative.

- .2 Should the concrete not meet the grade tolerances of the Contract documents or ponding is evident after a flood test the Contractor shall at the discretion of the Owner's Representative completely remove and replace all concrete. Grinding, partial removal and patching to resolve ponding or insufficient grade is not acceptable.

END OF SECTION 03 33 00

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to install architectural finish, rough formed finish and the installation of anti graffiti coatings on cast in place concrete.

1.3 Related Work

- | | | |
|----|--------------------------------|------------------|
| .1 | Shop Drawings and Product Data | Section 01 33 23 |
| .2 | Concrete Reinforcing | Section 03 20 00 |
| .3 | Cast-In-Place Concrete | Section 03 33 00 |

1.4 Reference Standards

- .1 Concrete finishes shall conform to the requirements of the following standards unless otherwise required by this specification:
 - .1 CSA/CAN3-A23.1, Concrete Materials and Methods of Concrete Construction

1.5 Submittals

- .1 Manufacturers product information sheets for all component parts of the concrete installation including but not limited to, coloured, or stained concrete.
- .2 Quality control procedures for coloured or stained concrete.

PART 2: PRODUCTS

2.1 Concrete Materials: In accordance with CSA/CAN3-A23.1.

2.2 Bonding Agent: Formulated for bonding new concrete to cured concrete. Acceptable materials include but are not limited to:

- .1 Daraweld C, Grace Construction Materials
- .2 Polymer Bonding Agent, Target
- .3 Concessive Liquid LPL, Master Builders

2.3 Non-shrink Grout for Patching: Acceptable materials include but are not limited to:

- .1 Embeco Mortar, Master Builder's,

- .2 Fast- Set Patching Concrete, Target

2.4 Anti Graffiti Coating: All walls exceeding a height of 0.60M shall be protected with an Anti Graffiti Coating. Acceptable suppliers and proprietary products include;

- .1 CBR 501-AG Anti Grffiti Coating by Broda Stains and Coatings, as supplied by CBR Products, 102-876 Cordova, Vancouver BC. (604) 254.3325.
- .2 Pre approved equal

PART 3: EXECUTION

3.1 Site Mock Up - Architectural Concrete

- .1 A minimum of ten (10) working days prior to the start of work of this section a mock up of the components listed shall be constructed on site. Do not proceed with work of this section until the mock up(s) have been reviewed and approved by the Owner's Representative. If the mock up(s) are not approved, construct additional mock up(s) until approval is obtained.
- .2 The mock up shall be stored on site as a standard of quality, colour, finish and anti graffiti coating for each component. At the discretion of the Owner's Representative the mock up may be constructed as part of the finished component.
- .3 The mock up shall clearly illustrate all finishes, reveals, patterns, shapes and colours indicated on construction drawings and details.
- .4 ***Construct a 2.5M (8'-0") length mock up of each of the following:***
 - .1 ***Concrete seat step***

3.2 Finishing of Concrete Surfaces

- .1 Architectural Concrete Finish (concrete surfaces that are exposed to view):
 - .1 Surface finishing shall conform to CAN 3-A23.1-M94, Section 24, Finishing of Formed Surfaces, Clause 24.3.3, Smooth Form Finish.
- .2 Rough Form Finish: All concealed concrete surfaces.
 - .1 Surface finishing shall conform to CAN 3-A23.1-M94, Section 24, Finishing of Formed Surfaces, Clause 24.3.2, Rough Form Finish. Patching to be done in accordance with clause 24.2 Patching.

3.3 Repairs to Defects

- .1 Architectural concrete shall have a pleasing appearance, free of defects, with minimal colour and texture variation when viewed at a distance of 6 metres (20'-0").

- .2 Should the variation in colour and texture or the appearance of defect(s) including but not limited to honeycombing, rock pockets, chips, cracks, spalls, fins and stains exceed the tolerance of the specification or CAN3 - A23.1-M94, whichever is more onerous the concrete work will be rejected. At the discretion of the Owner's Representative rejected concrete, at no cost to the owner will be demolished and replaced by the Contractor.
- .3 Grinding or repair of stair treads to facilitate positive drainage will not be accepted. Contractor at no expense to the Owner will completely remove and replace all stair systems that exhibit ponding of water on the stair treads.
- .4 At the discretion of the Owner's Representative the Contractor may be given the opportunity to provide in writing accompanied by product information and cut sheets, a detailed methodology of repair of defective concrete. The methodology should reference the manufacturers written instructions for each product and procedure and shall clearly outline the full process for repair of defective work.
- .5 Should the Owner's Representative approve the defect repair methodology a trial repair will be carried out on the mock up. In the event the mock up was incorporated into the finished work a discrete location will be chosen by the Owner's Representative for testing of the defect repair.
- .6 The acceptance of the repair shall be at the sole discretion of the Owner's Representative. Should the repair not be acceptable to the Owner's Representative the Contractor shall, at no cost to the owner demolish, and replace the defective work.

3.4 Application of Anti Graffiti Coating

- .1 Unless otherwise indicated in the specifications or on the contract drawings anti graffiti coating to be applied to all exposed vertical concrete surfaces.
- .2 Surface preparation and application in strict accordance with the manufacturers technical data and application instruction sheet.

3.5 Protection

- .1 Protect architectural concrete from any damage by the elements and defacement of any nature during construction operation.
- .2 All corners and surfaces subject to possible damage shall be suitably protected with boards or hoardings.
- .3 The Contractor shall make adequate provision to keep all exposed concrete free from laitance caused by spillage, leaking forms or other contaminants. In no event shall laitance be allowed to penetrate, stain or harden on surfaces that have been sandblasted.
- .4 Adequate protection shall be given to all exposed reinforcing steel in architectural concrete to prevent staining of surfaces of concrete due to rust and corrosion. If any rust or corrosion does occur it shall be removed immediately to avoid permanent staining.

3.6 Cleaning

- .1 Rubbish, debris and demolition material resulting from work of this section shall be collected regularly, removed from the project site and properly disposed.
- .2 Repair, remove and clean all drips or smears resulting from the work of this section on exposed, finished surfaces or surfaces to be subsequently finished.

END OF SECTION 03 35 00

1 GENERAL

1.1 SECTION INCLUDES

1. All materials, labour, equipment, and services to supply and install landscape boulders.

1.2 RELATED SECTIONS

1. n/a

1.3 DEFINITIONS

1. Boulder: Pre-approved imported or on-site rocks of specified size.

2 PRODUCTS

2.1 MATERIALS

1. On-site Boulders:

1. May be used if they meet the size specified and are pre-approved by the Consultant.

2. Imported Boulders:

1. Boulders to be supplied by City from Manitoba Works Yard. Boulders to be approved by the Owner's Representative at the source prior to delivery or sample boulder approved by Owner's Representative prior to site delivery of remaining boulders.

3 EXECUTION

3.1 STOCKPILE

1. Boulders delivered to site shall be stockpiled and handled in a manner that prevents breakage and scarring.

3.2 PLACEMENT

1. Boulders shall be placed in horizontal orientation where possible, with 1/3 minimum of the height of the rock below finished grade.
2. Owner's Representative shall be notified by the Contractor at least 48 hours prior to boulder placement.
3. Owner's Representative is to direct on-site boulder placement.
4. Boulders shall be machine placed by use of belts or chains. Boulders shall not be dumped or pushed in place. Boulders heavily damaged by machined delivery and installation (e.g. deep or extensive scrape marks) may be rejected by the Consultant. Rejected boulders are to be replaced with similar sized boulders by the Contractor at no cost to the Owner.

END OF SECTION 04 43 00

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to play equipment with required safety zones as indicated in the contract documents.

1.3 Related Work

- .1 Fibar System 300 Specification
- .2 Concrete Forming and Accessories Section 03 10 00
- .3 Concrete Reinforcing Section 03 20 00

1.4 Qualifications

- .1 The Playground Equipment installer shall have a minimum of five (5) years proven record of satisfactory performance and experience on projects of similar size and scope and shall maintain a qualified crew with at least one (1) Canadian Certified Playground Inspector throughout the duration of the work who shall be qualified with the CPRA.
- .2 Qualifications of Workers:
 - .1 Only competent skilled trades people holding the designation Canadian Certified Playground Inspector's who are thoroughly experienced with the material and methods specified may perform any playground installation work specified under the work of the Section.
 - .2 General labour type activities related to playground equipment installations may be performed by labourers and trades helpers who are thoroughly experienced with preparation procedures provided they work under the direct supervision of a skilled Canadian Certified Playground Inspector.
 - .3 Certification must be presented to the Owner's Representative or designated representative within 48 hours upon request, and produce written proof of such. A skilled Canadian Certified Playground Inspector shall be present at all times during the execution of the playground installation work.

1.5 Quality Assurance

- .1 All layout, materials and work must meet or exceed requirements of the latest edition of the CSA standard CAN/CSA-Z614-14 Children's Play spaces and Equipment and the IPEMA (International Play Equipment Manufacturers Association) standard.

- .2 Hazardous materials such as asbestos, polychlorinated byphenyls (PCB's) and lead based paints are not permitted on site.
- .1 A copy of the CSA standard CAN/CSA-Z614-14 Children's Play Spaces and Equipment shall be kept on site for the duration of the construction schedule.
- .2 Should modifications to the CSA Guidelines occur, and then the modifications shall govern.

1.6 Protection

- .1 Protect all play equipment and components against damage during shipping, handling, storage and installation, and until Final Acceptance.
- .2 Provide protected storage of play equipment prior to installation off the ground and free from dampness.
- .3 Provide all necessary facilities/equipment for handling and lifting site furnishings-play equipment into final location.1 Take all reasonable measures to protect surrounding or adjoining work or as requested by the Owner's Representative, including all material, plant and real property related to the Work against loss or damage from any cause.
- .4 Safety: The Contractor will be responsible for all aspects of job safety at the work site as per the contract documents. All work must be carried out in a safe and responsible manner. Where applicable, Workers Compensation Board "Industrial Health and Safety Regulations" must be followed.
- .5 Contractor is responsible for ensuring adequate public safety in his work area at all times. No operating equipment is to be left unattended and the work area is to be left in a safe, secure condition at the end of each workday. Ensure that any partially installed play equipment is adequately signed with warning signs stating "CONSTRUCTION AREA - KEEP OFF" and that the overall area is properly barricaded by fences or approved guards from public access until Final Acceptance.

1.7 Submittals

- .1 Provide shop drawings of all play equipment, and obtain Owner's Representative's approval prior to manufacture. Shop drawings shall show overall dimensions, layout, height relationships, and footing and anchoring methods adapted as necessary to the requirements of this project. Shop drawings shall show clearances to the edge of play area to meet the CSA Standards. The provided installation instructions and maintenance instructions shall be "project" specific containing component information that is part of the playground design. A "generic" package of installation instruction and maintenance instructions is not acceptable. Shop Drawings will become part of the Maintenance Manual.
- .2 Submit a copy of the supplier's warranty statement stating all exclusions. The warranty certificate shall be filled out/completed by the Contractor/Supplier acknowledging the Vancouver Park Board (with site location) as the Owner.

- .3 Submit completed Schedule A - Sample Inspection Report Form to the Owner's Representative upon completion of the project. See Schedule A below.
Maintenance Manual/Kit: Prior to and as a condition of Substantial Performance the Contractor shall submit a project specific maintenance manual/kit for all Project Play Equipment. This manual shall:
 - .1 Provide information to establish the frequency of inspections.
 - .2 Describe preventative maintenance and repair procedures.
 - .3 Provide copies of project specific inspection Report Forms for each play component shown on the Drawings.
 - .4 A reproducible copy of the as constructed Play Component System produced by the Contractor or supplier/manufacture.
 - .5 Provide 2 sets of any special tools or wrenches necessary to adjust or replace any special vandal resistant fasteners.
 - .6 Provide a PVC repair kit for repair of minor PVC damage.
 - .7 Provide an anti-graffiti chemical cleaner for removal of paint, ink or other forms of graffiti from the various surfaces/materials used on the play structure.
 - .8 A primer and matching colour touch-up kit compatible with the original manufacturer's finishing system.
- .4 The Contractor/manufacture shall submit with their bid a list of all variances from these specifications.
- .5 Provide all necessary templates for location of fixing devices prior to pouring of concrete bases.

1.8 Guarantee

- .1 The play equipment and complete installation shall be warranted for three (3) full years from the date of Substantial Performance. Repair or replace any faulty work or parts within 7 days after notification by the Park Board. Do not permit dangerous conditions in or around the play equipment. Refer also to inspection requirements Item 3.4.2 of this Specification.

PART 2: PRODUCTS

2.1 General

- .1 All materials shall have demonstrated record of durability in the playground or similar outdoor settings.
- .4 Site Specificity of Design - Equipment selection is based on specific program requirements, physical constraints within the site, and public input. Requests for Product Substitution will be subject to certain subjective criteria including (in no particular order):
 - .1 Similarity to specified play structure components

- .2 Footprint
- .3 Colour Availability
- .4 Geometry
- .5 Apparent Mass and/or Visual Density
- .6 Proven Performance Record
- .7 Variance - The Contractor/manufacturer shall submit with their bid a list of all variances from these specifications.

2.2 Play Equipment

- .1 Play equipment shall be CSA-approved manufactured units, consisting of the components shown in the drawings and itemized herein, and all incidental components required for a proper warranted installation. As manufactured by Habitat Systems or pre-approved equal.
- .2 Colour of play components: select from manufacturer's standard colour range.
- .3 Play equipment shall consist of the following elements:
 - .1 Play Booster (ages 5-12) custom play structure by Habitat Systems (1-866-422-4828) per design #1134243
 - .2 Two bay single posts swings model: 177333; (x2) Toddler seats model: 176038 and (x2) Belt seats model: 174018 all by Habitat Systems per design #1134243 (1-866-422-4828)
 - .3 Hill slide (custom per Habitat Systems design #1134243)
 - .4 Custom Pull Ropes (Custom Rope Climber per Habitat Systems design #1134243)
 - .5 Curva Spinner Habitat Systems model: 247179
 - .6 Bobble Rider Double Spring Toy Habitat Systems model: 164075

2.3 Resilient Play Area Safety Surfacing

- .1 Engineered Wood Fibre/Chip: Fibar System 300 complete w/ FibarMat, FibarFelt and FibarDrain as supplied/installed by Habitat Systems, ph. 1-866-422-4828 or pre-approved equal.
- .2 Rubber Surfacing: Vitriturf Playground System as supplied by Marathon Athletic Surfaces, Vancouver, B.C. Contact: Robert Sinclair, ph. 604-878-0625 or pre-approved equal. 5 year minimum warranty as a performance requirement.

2.4 Approved Equals

- .1 All items shall be as specified or approved equals.

PART 3: EXECUTION

3.1 Preparation and Layout

- .1 Examine the areas and conditions under which work of this Section will be performed. Verify safety zones of all equipment before setting posts in concrete footings. Do not proceed until conditions detrimental to proper and timely completion of the work have been satisfactorily corrected and thus meet the manufacturer's instructions and the requirements. Beginning work constitutes acceptance of conditions as satisfactory.
- .2 Before installing play equipment or safety surfacing, verify that the subgrades are uniform, smooth, well drained and set at correct elevations to allow for installation of specified depth of resilient safety surfacing to the correct finished grade.
- .3 Lay out the play equipment in the designated area to ensure compliance with safety zone clearances. Stake the locations of all equipment/site furnishings and obtain the approval of the Owner's Representative prior to installation. Lay out play equipment locations with flags and short lengths of string as required/requested by Owner's Representative. Obtain Owner's Representative approval before proceeding. Install with the required safety clearances between play equipment units and to retaining curb or other objects. The layout shall be in accordance with the drawings. Alternative layouts shall be approved by the Owner's Representative.

3.2 Installation of Compound Structures and Independent Activities

- .1 Install play equipment and resilient safety surfacing in strict adherence to manufacturer's instructions, level and plumb and maintaining recommended safety clearances. Adapt footing and anchoring methods as necessary to the requirements and specific site conditions of this project in accordance with approved shop drawings and in such fashion that work of other Sections is not damaged. Layout all equipment prior to construction.
- .2 Provide all concrete footings as required to properly place the equipment components. It is the Contractor's responsibility to adjust drainage pipe or other new utility locations to accommodate the equipment footings.
- .3 Place specified depths and areas of resilient safety surfacing as per detail drawings.

3.3 Protection

- .1 During construction of the play equipment structures, provide PVC web fence material in sufficient quantities and wrap the structures to prevent public access onto the equipment. Maintain the fencing wrap after completion of the play equipment and safety surfacing installation through completion of the project.

3.4 Inspections

- .1 Provide a min. 48 hours notice in order to schedule all inspections. Delay claims filed by the Contractor resulting from failure to provide adequate notice of inspection required will not be entertained. All aspects of this work shall be subject to inspection by the Owner's Representative or their designated inspector. Inspector/approval points shall be of a frequency sufficient to ensure adequate Quality Control in accordance with this specification and will occur thorough the duration of the Contract. The Contractor must supply access to the work for the Owner's Representative or their Inspector. As a minimum, inspections will occur as follows:
 - .1 Upon arrival of play equipment to the site.
 - .2 After staked layout of proposed play equipment locations.
 - .3 After play equipment anchor post installation.
 - .4 Upon Final Acceptance/Assumption by the Vancouver Park Board.
- .2 The Contractor is required to visit the site a minimum of two (2) times during the warranty period to ensure all play equipment/site furnishings are performing satisfactorily/functioning as intended and perform any maintenance services required. The first visit is to occur approximately six (6) months after the Assumption Date by the Board and the second visit is to occur approximately two (2) weeks prior to the end of the warranty period.

3.5 Site Maintenance/Clean Up

- .1 The job site shall be kept in a neat, clean and orderly condition at all times during the installation process.
- .2 Footing excavation and backfilling shall be continuous so that the amount of open excavation at the end of each workday is minimized. Any open trench or other excavations shall be barricaded and marked with high visibility marking tape to current WorkSafeBC requirements.
- .3 Any damage to paving, planting or any other structures/elements due to settlement of improperly compacted footings shall be immediately repaired at the Contractor's expense to the satisfaction of the Owner's Representative.
- .4 Remove and disposal of offsite all surplus material, excess excavated materials, trash, debris and waste material from the work of this Section. This clean up shall include removal of all delivery packaging.

Schedule A: Inspection Report Form

Park Name: _____
Inspection Date: _____
Inspector's Name: _____

Location: _____
Time: _____

Individual Equipment Components	Equipment										
	Toddler Swing	Junior Swing	Tire Swing	Spiral/ Straight Slide	Spring Toys	See-Saws	Climbing Structures	Merry Go- Rounds	Composite Structure	Composite Structure	Safety Surfacing
Chains											
S-Hooks/C-Hooks											
Seats/Tire/Belts											
Hanger Bearings											
Grease Fittings											
Stability/Tilting											
Exposed Concrete											
Entanglement Points											
End/Center Fittings											
Chain Covers											
Hand Rails											
Support Bars/Legs											
Fastening Point/Areas											
Sidewalls/Bedway											
Entrapment Point/Areas											
Sharp Edges/Points											
Stair/Steps											
Plastic Component Cracking/Damage											
Spring/Bars											
Handles											
Pivot Points											

Individual Equipment Components	Equipment									
	Toddler Swing	Junior Swing	Tire Swing	Spiral/ Straight Slide	Spring Toys	See-Saws	Climbing Structures	Merry Go- Rounds	Composite Structure	Composite Structure 2
Nuts and Bolts										
Ground Clearance										
Locking Devices										
Wood Checks/Splits (max. 19mm)										
Protrusions										
Caps/Plugs										
Protective Surfaces Borders										
Equip. Spacing/ Encroachment										
Bench Seats										
Debris/Broken Glass										
Asphalt Paths										
Fencing										
Condition: Satisfactory T										
Condition: Requires Attention X										

Other Comments:

END OF SECTION 11 68 13

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to clear and grub site in preparation for landscape or site work indicated on the contract drawings.
- .2 The work shall include but is not limited to the following areas:
 - .1 Clearing and grubbing operation.
 - .2 Disposal of material cleared and grubbed from the site.

1.3 Related Work

- .1 Site Preparation and Grading Section 01 89 13
- .2 Tree Protection Section 32 01 56

1.4 Protection

- .1 Protect existing fencing, natural features, bench marks, existing buildings, existing pavement, sub surface and surface utility lines, and water courses and miscellaneous items noted on contract drawings as to remain.
- .2 Protect all existing trees, landscape plant beds, miscellaneous plant material and their associated root areas within the area to be cleared and grubbed that have been identified to remain on the contract drawings.
- .3 Protect all existing trees, landscape plant beds, miscellaneous plant material and their associated root areas that are outside of area to be cleared and grubbed.
- .4 The Contractor, at no cost to the Owner shall make good all damages incurred during the clearing and grubbing process.

PART 2: PRODUCTS (Not Applicable)

PART 3: EXECUTION

3.1 Clearing and Grubbing

- .1 All excavation shall be undertaken in accordance with the City of Vancouver's Policy and Standard Operating Procedure- Soil and Excavation Water Contamination Management.

- .2 Clear and grubbing operations shall be limited to areas indicated on the Contract drawings. Contractor shall identify the areas to be cleared and grubbed in the field by flagging or staking for Owner's Representative review prior to the start of work.
- .3 Clear all trees, existing plant growth, undergrowth, dead wood, surface rocks or boulders and all deleterious material.
- .4 Grub out all stumps, roots, rubbish over 50mm (2") in size to minimum depth of 300mm (12") below indicated finish grade.
- .5 Grub out all parts of noxious or invasive plants including but not limited to varieties of Equisetum, Rubus, Hedera and Fallopia japonica.
- .6 Remove and dispose of off site, embedded rocks and boulder less than 0.15 cubic metres (5 cubic feet) encountered during clearing and grubbing operation.
- .7 Dispose of cleared and grubbed material in an approved off site dump location. No on site burning or burying of grubbed material will be allowed.
- .8 Do not clear or grub existing trees, landscape plant beds, miscellaneous plant material and their associated root areas that have been identified on the contract drawings or marked in the field by the Owner's Representative or Contractor to remain.

3.2 Finished Surface

- .1 Finished grade of the areas that have been cleared and grubbed shall be left generally smooth and level and suitable for immediate rough grading operations.

END OF SECTION 31 11 00

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to excavate and backfill for all landscape paved areas, footings, walls, etc. indicated on contract drawings.
- .2 The work shall include but is not limited to the following areas:
 - .1 Excavation of subgrade
 - .2 Grading operations to attain sub grade design grades
 - .3 Import and placement and compaction of granular fill materials
 - .4 Compaction testing
 - .5 Removal and disposal of excess material off site

1.3 Related Work

- .1 Cast-In-Place Concrete Section 03 33 00
- .2 Hot Mix Asphalt Paving Section 32 12 16

1.4 Reference Standards

- .1 Contractor is responsible for complying with all current Work Safe BC requirements for site safety related to the scope of work in this section. This includes but is not limited to protection of personnel and site safety procedures related to open excavation.
- .2 All work under this section shall conform to the requirements of the American Society for Testing and Materials, Standards as referenced herein.

1.5 On and Off Site Construction Maintenance

- .1 Contractor shall be responsible for implementation, maintenance, and decommissioning of vehicle wheel wash facility. Decommissioning of wheel wash facility includes but is not limited to fill and grading of affected area to the satisfaction of the Owner's Representative.
- .2 Contractor shall be responsible for cleaning of adjacent municipal streets, private streets and driveways affected by vehicle movements on site or to and from the site.
- .3 Contractor shall be responsible for implementing and maintaining dust control measures for all on site activities of this section. Dust control measures shall meet all local bylaws and regulations.

1.6 Site Access

- .1 The Contractor shall be responsible for ensuring that there is minimal disruption of vehicle and pedestrian traffic flow on adjacent existing roads during work of this section.
- .2 The Contractor shall be responsible for providing warning signs, flashing lights, flag people barricades, etc. to ensure vehicle and pedestrian movement associated with the site or adjacent to the site meets all applicable municipal, provincial or federal requirements.

1.7 Protection

- .1 Prior to commencing any excavation work the contractor shall establish the location of any existing active buried utility or service lines, including service entry points. Mark these locations clearly on site to prevent accidental disturbance during the work.
- .2 Any utility or service which is presently in use, or not established as abandoned but which must be moved or otherwise disturbed, shall be referred to the utility or service company concerned so that they may advise on, co-ordinate, inspect necessary operation for relocation.
- .3 Costs incurred by any disturbance of existing active utilities and service lines, not called for under the contract documents, shall be borne by the Contractor.
- .4 Any damage done including settlement or collapse to existing active services caused by inadequate measures taken by the Contractor to prevent such disturbances shall be rectified immediately by the Contractor at no cost to the Owner.
- .5 The Contractor shall protect all adjacent structures and surfaces including but not limited to roadways and sidewalks from damage, direct or incidental as a result of work of this section.
- .6 The Contractor shall make good all damages to adjacent structures and surfaces including but not limited to roadways and sidewalks as a result of work of this section to the satisfaction of the Owner's Representative.

1.9 Deposits

- .1 The Contractor shall at no cost to the Owner shall obtain all damage and/ or crossing deposits required by the municipal, provincial, federal or utility to carry out the work of this section.

1.10 Tests and Approvals

- .1 The Contractor shall at no cost to the Owner and as part of the work of this section perform, or cause to be performed, all tests, inspections and approvals.
- .2 Should the test, inspection or approval require a representative sample of the material or workmanship the Contractor shall at no cost to the Owner supply the labour and materials necessary to provide the sample or test.

- .3 Should the test or inspection indicate that the material or work completed does not conform to the specifications the Contractor shall at no cost to the Owner promptly remove this work, dispose of it off site and re-execute it in accordance with the Contract Documents. The remedial work shall include retesting as required to establish conformance with the Contract Documents.

1.11 Submittals

- .1 Prior to the start of work for this section the Contractor shall submit the following to the Owner's Representative for review;
 - .1 Sieve analysis of granular material
 - .2 Source for supply of all materials (source shall be used throughout duration of project). Should a change of material source be proposed during work; provide samples and sieve analysis from proposed source.
 - .3 Company name, address and contact information for material testing company.
 - .4 Confirm in writing to the Owner's Representative that he/she has verified the locations of all underground services.
 - .5 Obtained in writing and submitted to the Owner's Representative at no Cost to the Owner permission from adjacent property owners and/or municipality to carry out work beyond the property limits of this contract if required to carry out the work of this section.
 - .6 Notify the Owner's Representative for on site review of sub grade preparation work forty-eight (48) hours prior to commencement of import, placement and grading operations.

PART 2: PRODUCTS

2.1 General

- .1 Review and approvals by a Geotechnical Engineer engaged by the Contractor shall be signed and sealed and submitted to the Owner's Representative prior to use of this material.

- 2.2 **Native Material Fill:** Will be considered but must be reviewed and approved by either the project Geotechnical Engineer or should a Geotechnical Engineer not be part of the project team a Geotechnical Engineer engaged by the Contractor at no cost to the Owner.

- .3 Pit Run Gravel:** To be well graded granular material, substantially free from clay lumps, organic matter and other extraneous material, screened to remove all stones in excess of maximum diameter specified in material description, e.g. (300mm Pit Run Gravel, 200mm Pit Run Gravel and 100mm Pit Run Gravel). Recycled concrete free from contaminated and other extraneous materials conforming to the specified gradations may be used as pit run gravel.

Sieve Size (mm)	Percent Passing
(300)	100
(200)	100
(100)	100
75	100
50	70-100
25	50-100
4.75	22-100
2.36	10-85
0.075	2-8

- .4 Granular Sub Base:** Shall be 75 mm (3") minus, clean, granular material free of organic material conforming to following gradation limits:

Sieve Size (mm)	Percent Passing
80	100
75	55-100
4.8	30-100
38	60-100
19	35-80
9.5	26-60
4.75	20-40
2.36	15-30
1.18	10-20
0.6um	5-15
0.3um	3-10
0.075um	0-5

- .5 Granular Base:** The 19 mm (3/4") crushed granular base shall consist of sound, durable particles, free from clay, organic material or other deleterious matter, evenly graded, to meet the following gradation requirements.

Sieve Size (mm)	Percent Passing
19	100
12.5	75-100
9.5	60-90
4.75	40-70
2.36	27-55
1.18	16-42
0.60	8-30
0.30	5-20
0.15	5-15
0.074	2-8

- .6 River Sand:** River sand to be free of organic material, salt and foreign objects and conform to the following gradation:

Sieve Size (mm)	Percent Passing
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19	100
4.75	80-100
0.6	20-80
0.15	0-20
0.075	0-8

PART 3: EXECUTION

3.1 Excavation

- .1 All excavation and waste discharge permits shall be undertaken in accordance with the City of Vancouver's Policy and Standard Operating Procedure- Soil and Excavation Water Contamination Management.
- .2 Grade to elevations and dimensions indicated on contract documents or required by the work of this section or related sections.
- .3 Ensure that work of this section provides sufficient space to permit erection of forms, site elements and miscellaneous elements of related sections.
- .4 Excavation shall to ensure that the placement of fill materials are minimized.
- .5 Contractor shall phase his operation so that a stable slope at the edge of excavation is maintained all times. Where sloping of the sides of excavations are not possible the Contractor shall implement appropriate safety measures in accordance with current WCB of BC requirements.
- .6 During excavation, stockpile material suitable for backfill in a neat manner and sufficient distance from the trench to avoid slides and cave-ins.
- .7 All excavated materials not required or suitable for backfill shall be removed and wasted as indicated or as directed. Grade as required to prevent surface water from flowing into trenches or other excavations. Remove any accumulated water by pumping or other approved method.
- .8 All exposed excavation faces shall be protected from weather with appropriate tarps or plastic sheeting as soon as possible after being cut.
- .9 Remove all boulders, rock and stones larger than 150 mm (6") in diameter from excavated surfaces encountered during excavation. Fill cavities created with crushed granular base material compacted to 95% Modified Proctor Density.
- .10 Bottom of excavation to be level, free from loose material and debris.
- .11 Protect excavations against freezing. Frozen areas shall be thawed and protected from further frost until subsequent work has been completed.
- .12 All necessary precautions shall be taken to preserve all materials outside the required excavations in an undisturbed condition.
- .13 Costs incurred as a result of deterioration caused by activities or neglect of the Contractor or and fill required for over excavation as a result of action by the contractor are the responsibility of the contractor.

3.2 Placement of Granular Fill Material

- .1 Prior to the backfill operation of site excavation ensure the following actions have been completed:
 - .1 Concrete foundation walls and footings shall have reached specified strength unless otherwise approved by the Owner's Representative.
 - .2 All backfill materials shall have been inspected and approved by the Geotechnical Engineer.
 - .3 Each component of the backfill operation shall have been inspected and approved to by the Geotechnical Engineer at the time of placement.
 - .4 Compaction density tests shall have been completed and tests results reviewed and approved by the Geotechnical Engineer.
- .2 Place crushed granular sub-base in maximum 300 mm (1'-0") lifts to depths indicated on drawings. Compact each lift to 95% Modified Proctor Density.
- .3 Place granular base in maximum 150 mm (6") lifts to depths shown on the drawings. Compact each lift to 95% Modified Proctor Maximum Density.
- .4 Place all native material fill in uniform 300 mm (1'-0") compacted lifts to depths indicated on drawings. Compact each lift to 95% Modified Proctor Density.
- .5 Ensure that granular fill material is placed to the full width of the excavation, in uniform lifts, shaping each lift to smooth, even contours.
- .6 Ensure the placement and compaction of crushed granular sub-base and granular base does not segregate or degrade the aggregate.
- .7 Apply water as necessary during compaction to obtain specified density. If material is excessively moist aerate by scarifying with suitable equipment until moisture content is suitable for compaction.
- .8 Mechanical compaction equipment shall be used with extreme caution to prevent any undue pressure on foundation work. Do not use motorized compaction equipment directly adjacent to foundation or retaining walls.
- .9 Where backfill is required on both sides of foundation walls it shall be placed and compacted simultaneously on both sides of the wall.
- .10 All sub grade whether disturbed or undisturbed, shall be compacted to 95% Modified Proctor Density.
- .1 Soft areas or areas that do not meet specified compacted densities shall be over excavated and filled with compacted crushed granular base as required to obtain the specified compaction density.

3.3 Grading Subgrade and Granular Fill

- .1 Site sub grade shall be shaped to lines and elevations indicated on contract drawings.

- .2 Finished surface of sub grade and granular fill material shall have no irregularities exceeding 10 mm (3/8") when checked with a 3 M straight edge placed in any direction. Correct all sub grade and granular fill surface irregularities by loosening and adding or removing sub grade or granular fill material until surface is within specified tolerance. Correcting sub grade deficiencies by manipulating granular fill material is not acceptable.
- .3 Shaping of sub grade shall ensure uniform slope transitions with rounded, smooth profiles between changes in elevations
- .4 Ensure that sub grade preparation allows for depth of granular fill and finished materials as indicated on contract drawings.

3.4 Dewatering

- .1 All excavation and waste discharge permits shall be undertaken in accordance with the City of Vancouver's Policy and Standard Operating Procedure- Soil and Excavation Water Contamination Management.
- .2 Pump or otherwise continuously remove all water that has accumulated in excavation during the progress of the Work.
- .3 Do not divert water onto adjacent property.
- .4 Ensure that sediment control devices are in place as per municipal or provincial regulations prior to the start of dewatering operations. Do not divert dewatering effluent to natural water bodies.

3.5 Cleaning

- .1 Clean up and remove from the site, as the work proceeds any debris and waste material or rubbish resulting from the work of this section.
- .2 Transport all surplus excavated materials, fill materials, and debris off site to an approval disposal area.

END OF SECTION 31 23 10

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to protect existing trees on site, adjacent properties, and on adjacent road right-of-way and sites as indicated in the contract documents, including but not limited to:
 - .1 Survey and layout for locations of protective barriers.
 - .2 Installation, maintenance, adjustment during construction, and final removal of protective barriers and signs.
 - .3 Pruning as approved by the Owner's Representative including hand excavation and root pruning.
 - .4 Watering, fertilizing, and all other measures directed by the Owner's Representative as required to maximize the health and prospects for survival of the trees.

1.3 Related Work

- .1 Clearing and Grubbing Section 31 11 00
- .2 Growing Medium Preparation and Placement Section 32 91 13

1.4 Reference Standard

- .1 City of Vancouver Tree Protection By-Law. (OR CITY OF VANCOUVER TREE PROTECTION BY-LAW 7347 OVERRIDDEN BY SPECIFICATIONS STATED HEREIN).
- .2 International Society of Arboriculture standards.
- .3 ANSI A300 Tree Pruning Guidelines

1.5 Definitions

- .1 The "Tree Protection Area" (T.P.A.) shall be established on site under the direction of the Owner's Representative. It must be demarcated on site and fenced off from all impacts of construction. The T.P.A. is defined as the "dripline", which is a line drawn vertically to the ground from the furthest horizontal extent of the canopy branches as measured around the full circumference of the tree. Minor adjustments may be required to this rule to meet site species/specific conditions. Confirm T.P.A. on site with Owner's Representative. In addition to the T.P.A. definition the following shall be minimum distances for protection barrier fencing from the trunk.

Diameter at height of 140cm (cm)	Minimum distance of protection barrier fencing from trunk (cm)
10	60
20	120
30	180
40	240
50	300
80	480
100	600

- .2 Excavation, soil stabilizing measures, shoring (if necessary) and related work shall be planned and executed such that no excavation or other construction activities occur within the Tree Protection Area. A variance may be obtained from the Board provided that the location, materials and methods are approved and supervised by a Owner's Representative.
- .3 No Owner approvals for root pruning beyond the limits of the T.P.A. are required. All severed or fractured roots over 2cm in diameter outside the T.P.A. are to be neatly cut back a min of 5 cm above damage with a clean, sharp tree pruning saw.

1.6 Qualifications

- .1 All pruning operations shall carried out or under the direction of an I.S.A. Certified Arbourist using clean sharp pruning tools,

1.7 Quality Assurance

- .1 Inspection: The Contractor shall give at least forty-eight (48) hours notice to the Owner's Representative of the timing for root pruning, branch pruning, installation of protective barrier, and all other tree protection measures. The protective barrier shall be accurately located on site, prior to starting any hand excavation or root pruning. The Park Board Arbourist shall do or supervise all root pruning, branch pruning, etc. within the T.P.A.?(The Park Board Arbourist shall be present when all work is being done along the line of the protective fence).
- .2 Where requested, all root pruning and branch pruning shall be done to recognized arboriculture industry standards by an I.S.A. Certified Arbourist or Tree Surgeon under direct supervision of the Owner's Representative.

PART 2: PRODUCTS

2.1 Protective Barrier

- .1 Orange plastic web snow fencing, 1.2m high "Tenax", as supplied by Ronco Sales Ltd., or pre-approved equal. Posts, minimum 75mm dia. or square wood posts or steel "Tee-Bar" posts minimum 1.8m lengths. Posts maximum 2.4m o.c.

2.2 Tree Protection Area Signs

- .1 Tree Protection Area signs shall be signs at least 900mm x 450mm, on painted plywood or other acceptable weather resistant material, stating:

TREE PROTECTION AREA, DO NOT REMOVE OR MOVE FENCE DURING
CONSTRUCTION:

No Dumping No Burning

No Storage No Cutting

No Machinery No Toxic Substances (paint, solvents, fuel, oils)

TO REPORT VIOLATIONS PHONE: 604-257-8400

2.3 Water, Fertilizers, Miscellaneous

- .1 Water, fertilizers and miscellaneous materials shall be as specified in other sections of the specification and as directed by the Owner's Representative.

2.4 Stakes and Fasteners

- .1 Wood Stakes: 38 x 89 ACQ treated wood or No. 1 grade cedar stakes.
- .2 Metal Stakes: 50mm diameter schedule 40 galvanized steel pipe or 1.8 (6'-0") long studded or drilled T Posts.
- .4 Zip Straps: 140mm (5.5") long, black, nylon lock straps.

- .5 Drain Tile: 150mm (6") diameter Schedule 40 PVC (polyvinyl chloride) perforated pipe conforming to ASTM D 1784.
- .6 Burlap: 10 ounce, untreated, woven, natural jute based burlap.

2.5 Fill Materials

- .1 Type 1 Fill: Clean, angular, crusher run natural stone, free from shale, clay, friable materials, roots and vegetable matter, and conforms to the following gradations:

Sieve Size	Percent Passing
50mm	100
20mm	95 - 100
13mm	75 - 90
10mm	57 - 83
No. 4	37 - 61
No. 16	12 - 32
No. 32	8 - 23
No. 200	5 - 10

- .2 Type 2 Fill: Clean river pump sand and gravel material, free from silt, clay, loam, friable, or soluble materials and vegetable matter.
- .3 Type 3 Fill: Approved premixed growing medium per Section 32 91 13
- .4 Clear Stone: Shall consist of clean, round, washed stone. Acceptable material includes 10 mm (3/8") rock conforming to the following gradations.

Sieve Size	Percent Passing (10mm)
14mm	100
10mm	85 - 100
5mm	10 - 30
2.5mm	0 - 10
1.25mm	0 - 5

PART 3: EXECUTION

3.1 Protective Barrier Fence Erection

- .1 Before starting site work, install a clearly visible continuous protective barrier fence at the approved lines for the "Tree Protection Area" (T.P.A.) (locations as shown on Drawings). Maintain this barrier until Substantial Performance and remove from the site at that time. Support snow fencing on steel posts driven vertically into the ground, at 2.4m on centre, or as otherwise approved by the Owner's Representative.

3.2 Tree Protection Area Signs

- .1 Install Tree Protection Area signs as specified on the protective barrier fence. For large areas, install a minimum of four signs, one each side of the T.P.A. Signs shall be well secured by 'Zap Strap' or similar method and shall be maintained in place until Substantial Performance.
- .2 Take all measures necessary to prevent the following activities within tree protection areas except as authorized by the Owner's Representative.
 - .1 Storage of materials or equipment.
 - .2 Stockpiling of soil or excavated materials.
 - .3 Burning of any kind.
 - .4 Excavation or trenching.
 - .5 Cutting of roots or branches.
 - .6 Travel of equipment or vehicles.
 - .7 Disposal or spillage of toxic matter.

3.3 Root Pruning

- .1 Before the start of any machine excavation, hand excavate along the established limit of excavation and prune all roots along the line. Cuts shall be clean, using approved arboriculture practice using clean, sharp pruning tools.
- .2 Trees to be transplanted shall be root pruned as directed by the Owner's Representative.

3.4 Branch Pruning

- .1 Do not prune any retained tree to compensate for reduction of roots unless specifically instructed by the Owner's Representative.

3.5 Watering And Fertilizing

- .1 Retained trees shall be watered thoroughly and deeply, as necessary to supplement rainfall to maintain plant turgidity without prolonged saturation of the root zone. The method, amount and frequency of watering shall be as recommended by the Owner's Representative. **SPEC NOTE: TAILOR WATER SCHEDULE SPECIFIC TO PROJECT:** Suggested Summer Watering Schedule: The T.P.A. is to be watered via sprinkler, soaker hose, or by tank with a watering wand at least three times per week during June, July, August, and September or as directed by the Owner's Representative.
- .2 Fertilize Retained Trees to stimulate regeneration of lost roots and foliage. Fertilization program only as recommended by the Owner's Representative.

3.6 Excavation Around Trees and Shrubs

- .1 Excavation within drip line of trees shall be in strict accordance with those areas indicated on the contract documents or as directed by the Owner's Representative.
- .2 Excavation for New Construction within Drip Line of Tree(s):
 - .1 Hand excavate to minimize damage to root systems.
 - .2 Use narrow tine spading forks to probe and comb soil to expose roots.
 - .3 Relocate roots into backfill areas whenever possible. If large, main lateral roots are encountered, expose beyond excavation limits as required to bend and relocate without breaking.
- .3 Utility trenching Within the Drip Line of a Tree(s):
 - .1 Tunnel under and around roots by hand digging.
 - .2 Do not cut main lateral roots.
 - .3 Cutting of smaller roots that interfere with installation of new work shall be done with clean, sharp pruning tools.
- .4 Roots encountered immediately adjacent to the location of new construction that are not readily maneuverer to beyond the excavation area shall be cut 150mm (6") back from new construction.
- .5 Protection of Exposed Roots: Do not allow exposed roots to dry out prior to placement of permanent cover. Provide one of the following temporary remedial measures:
 - .1 Provide temporary earth cover using Type 3 fill.
 - .2 Pack with four (4) layers of wet, untreated burlap. Maintain dampness.
- .6 Temporarily support and protect exposed roots from damage until permanently relocated and covered with backfill. Water backfill around roots to eliminate voids and air pockets.
- .7 When directed by the Owner's Representative, pruning operations may be include the removal of limbs to restore natural shape or reduce the area of the crown of the tree(s) or shrub(s). No crown pruning shall be undertaken without the consent of the Owner's Representative.
- .8 Trees and shrubs to remain are to be thoroughly watered as required to maintain a healthy condition throughout the construction period. Contractor to document all watering operations and submit to the Owner's Representative one (1) copy of documentation at substantial performance.

3.7 Raising Grade Around Existing Trees

- .1 DO NOT RAISE GRADES within or adjacent to the tree protection zone unless authorized by Owner's Representative.
- .2 Drain Tile Installation: Install drain tile on existing grade as follows:

- .1 Layout drain tile in a spoke like arrangement consisting of eight (8) horizontal lines radiating out from the trunk of the tree to the limit of branch spread. Horizontal line to be approximately 150 mm (6") from base of trunk.
 - .2 Slope drain tile at a minimum of 1% away from trunk of the tree to the limit of branch spread. Connect ends of each of the spokes laterally around the perimeter of the tree to form a continuous, uninterrupted circle.
 - .3 Install vertical drain tile at each end of each spoke. Vertical drain tile to extend to proposed finished grade (vertical drain tile provides a means of aeration and watering).
 - .4 Owner's Representative to review drain tile installation prior to backfill operation.
- .3 Drain Tile Backfill:
- .1 Type 1 Fill: place a minimum of 150mm (6") cover around perimeter of drain tile.
 - .2 Type 2 Fill: place a Type 2 Fill to minimum depth of 150mm (6") over the Type 1 Fill.
 - .3 Type 3 Fill: place Type 3 Fill in 150 mm (6") lifts to raise grade specified elevations. Ensure allowance is made for depth of growing medium.
 - .4 Fill vertical drain tiles with Clear Stone. Ensure Clear Stone are flush with top of drain tile.

3.8 Lowering Grade Around Existing Trees

- .1 DO NOT LOWER GRADES within or adjacent to the tree protection zone unless authorized by Owner's Representative.
- .2 Lowering Grade:
 - .1 Carefully excavate by hand from limit of drip line of branch spread to proposed grade until the specified gradient has been achieved.
 - .2 Re bury or prune and remove roots as per the instructed by the Owner's Representative.
 - .3 Construct a growing medium dike at dripline to retain water. Dike to be constructed at each individual tree location unless instructed otherwise by Owner's Representative.
- .3 Excavation Through Root Area: If excavation through root area is required, excavate around roots by hand.

3.9 Surplus Material

- .1 Remove surplus material from site and dispose of at approved disposal area.

END OF SECTION 32 01 56

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to maintain the entire landscape area indicated in the contract documents for one (1) full year, beginning on the date of Acceptance of the entire landscape area.

1.3 Related Work

- .1 Plants and Planting Section 32 93 10

1.4 Reference Standards

- .1 Work shall meet or exceed the standards and practices outlined in the BCLNA/BCSLA Landscape Standard, Section 14 Level 2, Groomed.

1.5 Qualifications

- .1 All work of this Section shall be carried out by fully experienced and licensed maintenance contractors with current membership standing in the British Columbia Landscape & Nursery Association (BCLNA). Contractor to have at least 5 years minimum experience working on projects of similar size and scope. Written proof of experience may be requested by Owner's Representative for submission.
- .2 Pesticide/Herbicide/Fungicide and other chemical handling and application shall be done only by applicators holding current certification under the B.C. Pesticide Control Act.

1.6 Work Included

- .1 Maintaining the planted areas and the entire landscape area in a weed free condition.
- .2 Fertilizing as specified in this Section.
- .3 Disease and insect control as required to maintain plants in a disease and insect free condition.
- .4 Watering as specified in this Section.
- .5 Turf management; Lawn mowing, edging and trimming (aeration, topdressing and power raking) as specified in this Section.
- .6 Protection of the landscape area as necessary.

- .7 Litter removal from the entire landscape and paved areas.
- .8 Maintain all pedestrian paved surfaces in a clean condition.

1.7 Work Not Included

- .1 Sweeping and cleaning of roadways and parking lots **(except for leaves and landscape debris)**.

1.8 Warranty

- .1 The work of this Section is intended to provide conditions under which the Warranty requirements of Sections 02935 (Sodding) and 02950 (Plants and Planting) can be met through the proper care of grass, plants and planted areas. The requirements of the Warranty shall be the responsibility of this Contractor.

1.9 Equipment

- .1 Equipment shall be suited to the work at hand, and shall be in good working condition. All appropriate safety devices shall be in place and functioning to current WorkSafeBC requirements.
- .2 All equipment shall be kept clean to prevent spread of diseases. Cutting equipment shall be kept sharp and well adjusted.

1.10 Documentation

- .1 The contractor shall maintain a log book of all establishment maintenance operations carried out and shall make the log book available to the Owner's Representative Inspector for inspection upon request, as may be reasonably required. **Lack of information shall infer non-compliance with the Work of this Section and payment(s) will be adjusted accordingly by the VPB project Manager.**
- .2 The contractor shall submit with each monthly invoice for Work of this Section, a report stating the dates when maintenance staff were on site, the operations carried out and documentation of any conditions requiring attention beyond the Scope of this Section. A sample report is included at the end of this Section.

1.11 Protection and Preservation

- .1 Take all precautions necessary to protect all trees, shrubs and other plant material; underground and above ground site services, curbs, paving and other services including the irrigation system on and surrounding the contract site against any damage resulting from the work of this Section. Reinstate to original condition if damaged by the contractor, his employees, suppliers, sub-trades or equipment throughout the duration of the contract.

1.12 Codes and Regulations

- .1 All fertilizers shall comply to the Canadian Fertilizer Code.
- .2 All chemicals shall comply and be used as stated under the appropriate Government Code, Law or Regulation.

1.13 Inspection/Notification

- .1 The contractor or his authorized representative shall be present during all required inspections.
- .2 Inspections are required at least four times during the year, at times designated by the VPB Project Manager.
- .3 Make a written request ten (10) working days before the end of the one year establishment maintenance period for final inspection.
- .4 At the time of final inspection, all plants and planted areas shall be in the condition specified, all remedial work or replacements shall be complete and all plants shall be healthy and vigorous.
- .5 Notify the Board of any physical changes and or discrepancies which may affect the implementation of the contract as specified herein or which may endanger any employee of the Contractor, Board or any member of the general public.
- .6 Provide minimum three (3) days notification in writing prior to application of any chemical vegetation or pest controls. Ensure notices are posted for public safety in entire area of application three (3) days prior and for five (5) days after.

1.14 Scheduling

- .1 Schedule work on site in accordance with weather, soil and plant conditions and use of the site.
- .2 In general, execution involves weekly inspections at least during the growing period (May 1 to October 15) and at least monthly inspections during the remainder of the year, with maintenance operations scheduled on the basis of conditions observed at each inspection.
- .3 Do each operation continuously and complete within a reasonable time period.
- .4 Maintenance personnel shall attend the site during the morning of the first normal working day of each week during the maintenance period. Work at this time shall include litter pick up and disposal, monitoring of moisture in growing medium, and reporting of any damage, deterioration or other conditions requiring attention.

1.15 Payment

- .1 Payment shall consist of equal monthly installments over the one year maintenance period.
- .2 Labour shall be designated separately from materials. All billing for materials; mulch, fertilizer, sand or other materials shall be submitted with receipts of original purchase.

- .3 An up to date log book will be submitted of work done, indicating areas of work, materials used and dates of performance in support of the monthly billing. The log book shall document the development and condition of plant material as well as preventative and/or corrective measures required which are clearly outside the Contractor's present scope/responsibility. **Failure to submit the log book in support of the billing will result in a failure to process the payment and may result in non-payment if work cannot be substantiated by the Park Board.**

PART 2: PRODUCTS

2.1 General

- .1 Product Handling
 - .1 Delivery and storage shall be as required such that materials are protected against deterioration or damage as required and such that delivery and storage do not interfere with normal use of the site.

2.2 Plant Material

- .1 Plant material shall meet the requirements of Section 32 93 10, except that new plants supplied under this Section shall be sized to match existing plants of the same variety at the time of installation of new plants.
- .2 Sod or grass seed shall match the varieties installed under Section 02935.

2.3 Water

- .1 Water will be available at no cost to the contractor. Water source will be determined at time of construction. Contact VPB Project Manager.

2.4 Fertilizers and Limes

- .1 Shall be the following fertilizers and limes with the following guarantee of analysis and used as directed under PART 3 - EXECUTION.
 - .1 Fertilizer to meet recommendations of soil analysis provided by construction contract.
 - .2 Dolomite of lime (Agrico Spread Easy Dolomite).

2.5 Weed Control and Eradican Chemicals

- .1 **Do not use any chemical method of insect or disease control without prior written approval of the Park Board.** The type of herbicide and application methodology to be submitted in writing to the Owner's Representative for review and approval.
- .2 Use of herbicides, fungicides and insecticides shall conform to all current Park Board, Municipal, Provincial and Federal Government regulations and codes.

PART 3: EXECUTION

3.1 Plant Material

- .1 Watering:
 - .1 Water as required to keep plants and sod in vigorous healthy condition.
 - .2 Apply at least 1 to 1-1/2" of water during each application.
 - .3 If no irrigation system has been installed, water trees by hand, by soaking the root zone once a week during dry periods. Water source will be as outlined in 2.2.1
- .2 Weed Control:
 - .1 Maintain all areas in a weed free condition.
 - .2 Inspect landscape areas for weed growth once per week during the growing season and remove all weeds within one week of observing weed growth.
 - .3 Weed control procedures shall have no detrimental effect on the growth of desired plants. Mechanical methods are the preferred methodology in the COV. Confirm with Owner's Representative if chemical or other means are to be utilized. **Do not use any chemical method of weed control without prior written approval of the Board.**
 - .4 Mechanically cut out all grass from around tree pits/saucers to a minimum 600mm dia. to protect all trunks from damage by mowers or trimming equipment.
- .3 Cultivating:
 - .1 In the spring, before beginning watering, cultivate the soil surface of all planted areas including the base of all trees as shallowly as necessary to ensure penetration of water and air into the soil. Repeat as necessary for weed control and soil permeability. In addition this operation shall be carried out at least twice per month to prevent caking of surface soil or mulch. Where and when applicable mulch should be replaced annually or when required by erosion, decay, cultivation or vandalism.
 - .2 Avoid cultivating into the root zone of plants, particularly shallow-rooted groundcovers and rhododendrons.
- .4 Pruning:
 - .1 Deciduous Shrubs: Remove all dead, weak or diseased wood. Do not clip or shape shrubs - allow the shrub to develop a natural appearance.
 - .2 Trees: Remove dead branches only. All other tree pruning shall be carried out under the direction of the Owner's Representative. Trees improperly pruned and/or not pruned as directed by the Owner's Representative shall be considered as having died and shall be replaced with the same species by the contractor at no cost to the Board.
- .5 Pest & Disease Control:

- .1 **Do not use any chemical method of insect or disease control without prior written approval of the Park Board.**
 - .2 Follow a program of Integrated Pest Management using a combination of physical (hosing), cultural, biological and chemical methods chosen for the most effective, safe and economical control of pests and diseases. Minimize pesticide use except where irreversible damage would result from pest and disease infestation.
 - .3 Inspect all plants for signs of pest or disease once per week during the growing season and report any such conditions in the monthly report.
 - .4 Begin treatment for pests or diseases immediately following observation. If chemical controls are required, pesticides shall be chosen on the basis of highest effectiveness and selectivity, and least hazard to the environment.
 - .5 Pest and disease control shall be carried out by skilled operators, using methods approved under current laws and regulations.
 - .6 Use the recommended type of equipment and method of application for each chemical as recommended by the chemical manufacturer.
 - .7 All chemicals shall be mixed and applied as stated on the label of the manufacturer.
 - .8 Be extremely cautious in the mixing, handling and application of all chemicals as they may be harmful (if misused) to humans, plants, animals, etc.
 - .9 The Contractor shall be liable for any damage caused through the misuse of any plant disease and/or plant insect control method.
- .6 Fertilizing:
- .1 Two - three (2-3) months after the installation and initial fertilizing of plants (Section 02950), or when directed by Owner's Representative, apply one application of fertilizer appropriate for the time of application and specific for lawns or planting areas at the rates recommended by an approved soil testing laboratory, based on soil test results. Apply a minimum of three applications of fertilizer per annum **for all lawn areas** - April, June and August. Apply a minimum of two applications of fertilizer per annum **for all planting areas** - March and May. Follow manufacturer's recommended application rates, if soils test not taken.
 - .2 Work the fertilizer thoroughly into the top 50mm of soil.
 - .3 Soil Testing - examine the site to determine any areas where the plant material or lawn is performing poorly. If required and as directed by the Owner's Representative take soil samples from the affected area(s) to an approved soils testing laboratory for soils testing. Costs for such testing shall be borne by the Contractor. Determine the problem. Correct deficiencies to the soil such as poor texture, chemical residues or nutrient level or organic matter deficiencies by appropriate means as recommended by soils testing laboratory. Correct the situation at the appropriate time of year and as coordinated with the Owner's Representative.

- .7 Liming: In January within the first year after installation, lime all exterior planting and sod areas with application of dolomite lime at the rate of 10 lbs per 1000 square feet of soil surface, or as otherwise recommended by the soil testing laboratory.
- .8 Tree Protection: All trees shall be protected against wind and snow damage by adequate staking, guying, tying or wrapping as conditions require. Guys, wire ties and stakes shall conform with Section 02950 and shall be examined at frequent intervals with adjustments or replacements made to prevent any abrasions, cuts or other damage to the plants.

3.2 Mowing and Trimming

- .1 Mow all lawns with a sharp reel or rotary mower when the grass reaches a height of 60mm (2-1/2 inches). Mow to a height of 40mm(1-1/2 inches); the height of the lawn between cuttings shall not exceed 60mm(2 2 inches). **Mow and trim a minimum of 32 times per annum**; weekly from April -September, three times in October, twice each in March and November. Cut as required in December, January and February. VPB will advise.
- .2 Trim all edges walks, curbs, mowing strips or planting beds at each mowing with a nylon line type power trimmer to ensure a clean straight edge.
- .3 Remove all excess grass clippings from the grass and planted areas after each mowing, sweep all paving and other surfaces clear of clippings.

3.3 Lawn Remediation

- .1 Examine the site. Correct all thin areas or bare patches caused by poor maintenance practices (or other reasons), such as improper watering, lack of fertilizer, incorrect cutting height, chemical or mechanical damage. Examination shall include review for compacted or thin areas resulting from pedestrian traffic. If required and as directed by Owner's Representative, start an immediate program to rectify the problem(s). Remediation shall include but not be limited to the following: aeration, sanding/soiling, over seeding and fertilization.

3.4 Irrigation System

- .1 **Coordinate with requirements of Section 32 80 00 Irrigation System.**
- .2 Maintain the irrigation system in good operating condition. Check the system once per week during the operation season. Clean and adjust all sprinklers, valves, controllers, and other special components. Inspect the municipal connection details and backflow prevention devices annually as required by the City of Vancouver. Repair all damaged heads and/or other components resulting from the Contractors operations.

- .2 Test the irrigation system, flush all lateral lines and adjust heads as required for good coverage at the beginning of the growing season. Set and adjust the timing of zones several times during the season to ensure that all areas receive adequate water to supplement the natural rainfall without over watering or creating excess run-off. Adjust controller times as required to accommodate for seasonal changes in time, fertilizer application or other specifics as dictated by the Owner's Representative.
- .3 Winterize the system by blowing out all water in the irrigation system with an air compressor at the end of the growing season. Confirm exact date with Owner's Representative. Ensure all controls/power are shut-off and all pop-up type heads are in the down position.
- .4 Failure of irrigation components due to normal wear and tear, vandalism and damage by others shall be reported immediately to the Owner's Representative with an estimation of cost to repair or an instruction to contact the original irrigation subtrade to provide such a quote. Shut-off water system as required to prevent erosion damage from run-off. Water manually all landscape areas affected by loss of irrigation system until repairs have been completed. Coordinate repairs to the irrigation system immediately after damage or deterioration is noticed and the quote to repair has been approved by the Board.

3.5 Cleaning Of Paved Surfaces

- .1 Maintain all pedestrian paved surfaces of the project in a clean condition. Sweep or hose off all paved surfaces after completing maintenance operations.
- .2 Maintain any sports court surfaces on a weekly basis or as required and directed by Owner's Representative to ensure that leaves or other debris are removed from the court surfaces without damaging any painted or other special surfacing.
- .3 Hose or powerwash the surfaces to remove any spills/staining which have occurred on an annual basis. **Ensure that any chemicals or stripping/stain removal agents have been reviewed and approved by Owner's Representative prior to commencing with this work.**

3.6 Clean Up/Litter Removal

- .1 Remove debris, equipment, materials, and waste due to work of this Section at the end of each day of work **from all landscape and pedestrian areas.**
- .2 Keep paved surfaces clear and swept clean of debris, materials and waste from landscaping operations as required throughout the year.
- .3 Remove leaves and landscape debris from all paved vehicular roadways and parking lots.
- .4 SPRING CLEAN-UP - remove all debris from lawn areas, shrub and flower beds including vegetative debris or growing medium from all pedestrian paved surfaces. Place order for summer annuals as directed by Owner's Representative (If Applicable). Cultivate all planting beds and tree pits to requirements of 3.1.3.

- .5 FALL CLEAN-UP - Fall clean-up includes the same operations as specified for the Spring plus disposal of leaves from the entire site. Review the site weekly through the Fall and ensure operations are completed by end of November (or as dictated by Owner's Representative). Continue to inspect and clean the site as required at least once per month during December, January, and February.

3.7 Sample Landscape Maintenance Report

- .1 Following is a single page sample landscape maintenance report for use in meeting the requirements of 1.6.2.

LANDSCAPE MAINTENANCE MONTHLY REPORT (sample)

Project Name/Contract No.: _____
 Owner's Representative _____
 Date: _____ Time: _____ Weather _____
 Contractor Foreman _____
 Month: _____ Size of Crew: _____

<i>Elements</i>	<i>Work completed</i>	<i>Problems requiring attention</i>
BEDDING PLANTS -cultivation/weeding -fertilization -moisture content -seasonal change		
SHRUBS & GROUNDCOVERS -cultivation/weeding -pest and disease -fertilization -replace dead/dying material -weed control -pruning/moisture content		
TREES/ MAJOR PLANTS -pruning dead/broken branches -fertilization -replace dead/dying material -check/adjust guying/stakes -weed control -moisture content		
LAWN AREAS -mowing/edge trimming -moisture content -fertilization -weed control		
PAVED/GRAVELED/ BARE AREAS -general review -special maintenance/cleaning req'd.		
GENERAL COMMENTS/OTHER OBSERVATIONS -irrigation system component check -irrigation winterization/start-up -overly dry or too wet conditions		

END OF SECTION 32 01 90

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to install of hot-mix asphalt concrete paving on base and subbase(s) materials, on grade as indicated in the contract documents.
- .2 Restore all existing asphalt paving if damaged or deteriorated due to work of this Contract.

1.3 Related Work

- .1 Site Preparation and Grading Section 01 89 13

1.4 Reference Standards

- .1 Materials, mix designs, testing and application procedures shall comply with the requirements of the British Columbia Road Builders and Heavy Construction Association Specification for Hot-Mix Asphalt Concrete Pavement, revised June 1989.
- .2 Materials, mix designs, testing and application procedures shall comply with the requirements of the (MMCD) Master Municipal Specification Section 32 12 16 Hot Mix Asphalt Concrete Paving.
- .3 Sampling Mineral Aggregates ASTM D75
- .4 Sampling Bituminous Mixtures ASTM D79
- .5 Sieve Analysis of Aggregates ASTM D136
- .6 Specific Gravity of Aggregates ASTM C127 and ASTM C128
- .7 Determination of Bitumen Content ASTM D1097
- .8 Bulk Density of Compacted Asphalt Concrete Paving Mixtures ASTM D2726
- .9 Marshall Procedures for the Preparation and Testing of Bituminous Mixtures ASTM D1559
- .10 Quantity of Bitumen Absorbed by Aggregates - "Maximum specific Gravity of Bituminous Mixtures" ASTM D2041

1.5 Phasing

- .1 See Phasing Plan (if Applicable) and note that asphalt concrete paving will be completed in portions to suit the construction schedule.

1.6 Submittals

- .1 Submit sieve analysis for grading of both base and subbase materials.

- .2 Submit hot mix asphalt design and trial mix test results to the Owner's Representative for review at least one week (7 days) **prior to** commencement of work of this Section. See Item 1.10 also.

1.7 Site Conditions

- .1 Start of work shall signify acceptance of site as satisfactory and no claim will be recognized for extra work nor any allowance made for defective work due to site conditions.
- .2 Investigate the site to verify information shown in Contract Documents. **Verify that existing grades are as shown on Drawings and notify Owner's Representative immediately of any discrepancies.**
- .3 Review existing site conditions with regard to subsurface conditions. Data on indicated subsurface conditions is not intended as representations or warrants of continuity of such conditions. Additional test borings and other exploratory operations may be made by bidders at no cost to The Board. Notify Owner's Representative prior to carrying out any such work.

1.8 Protection

- .1 Verify locations of all underground utility and drainage lines. Take all necessary precautions to protect unit precast paving, curbs, utilities and other site elements and work of other trades. Make good any damage to the satisfaction of Owner's Representative at no additional cost.
- .2 Immediately report any damage to the site or danger to persons on/near site to all concerned parties (Owner's Representative).
- .3 Prior to commencement of work of this section, erect warning signs at all locations where the public may gain entrance to the project site. Provide all necessary construction barricades as requested by Owner's Representative to protect the public from accidents occurring during construction.

1.9 Quality Assurance

- .1 Installation shall be by an installer with at least 5yrs. min. experience in placing hot-mix asphalt concrete paving on projects of similar size/scope. The contractor must be prepared to advise of previous work by submission of a written list if requested by Owner's Representative.

1.10 Environmental Conditions

- .1 Do not install hot-mix asphalt concrete pavement, base, or subbase during heavy rain or snowfall, cool temperatures or other unsuitable conditions as determined by Owner's Representative. Place paving under favourable weather conditions; with temperatures exceeding 4 degrees Celsius. Base and subbase surface should be dry and stable. **Air temperature must be at least 5 degrees Celsius to place asphalt mixtures. (Air temperature must be 10 degrees and rising for tennis and sport courts)**
- .2 Do not install asphalt concrete paving on frozen, wet, muddy or rutted base(s).
- .3 Examine substrates and notify Owner's Representative of any deficiencies related to compaction or incorrect grades or slopes. Ensure deficiencies are corrected prior to commencement of work of this Section.
- .4 Use Oil Soak Blotters in catch basin spillways and elsewhere as directed to avoid spilling oil into site drainage system(s) or adjacent watercourses.
- .5 Allow asphalt concrete paving to completely cure prior to washing the surface to avoid spilling oil into site drainage system(s) or adjacent watercourses.

1.11 Testing and Approvals

- .1 The Contractor shall provide Owner's Representative with min. 48 hrs. notice to arrange for inspections and compaction tests.
- .2 An independent testing agency shall be appointed and paid for by the Owner to perform sieve analysis and density testing to confirm compliance with this Specification. Test results shall be submitted directly to the Owner's Representative. Items to be tested shall include but not necessarily be limited to the following:
 - .1 Density testing of subgrade, subbase(s), base and asphalt.
 - .2 Benkleman Beam Testing may be required prior to paving.
 - .3 Asphalt cores for density analysis.

Note: Additional density testing may be requested by Owner's Representative at any time after placement of base course(s)/asphalt concrete paving to confirm compliance with the contract documents. **Any additional tests will be at Owner's expense.**
- .3 Prior to commencing work of this Section, mix designs shall be submitted to Owner's Representative for approval. The contractor shall furnish sufficient evidence the proposed mix will produce satisfactory results to Owner's Representative (if requested). **Design of the Asphalt Mixes shall be supplied by the Owner's Representative where applicable.**

1.12 Measurement And Payment (Unit Price Contracts Only)

- .1 ***Asphalt concrete paving will be measured in tonnes of asphalt concrete actually incorporated into the Work.***

PART 2: PRODUCTS

2.1 Hot-Mix Asphalt Concrete

- .1 Refer to Master Municipal Specification Section 02512 Hot-Mix Asphalt Concrete Paving and COV Supplemental Specifications to Master Municipal Specifications, current edition (COV Engineering Standards and Detail Dwgs.) for asphalt cement, aggregates and gradations, sand equivalents, abrasion, absorption, mineral fillers and all aspects of the mix design.
- .1 Reclaimed Asphalt Pavement (RAP): Crush and screen so that 100 % of reclaimed asphalt pavement material passes the 37.5mm screen prior to mixing. Max. allowable RAP in any Mix Design will be 20% by mass. Higher percentage of RAP may be accepted by Owner's Representative if Contractor demonstrates that supplier can produce mix meeting requirements of the specification.
- .2 **Do not change job-mix without prior approval of Owner's Representative (Engineer). If change in material source is required, Contractor shall submit new mix formula for review/approval.**

2.2 Base

- .1 Refer to Master Municipal Specification Section 02226 Aggregates and Granular Materials and COV Supplemental Specifications to Master Municipal Specifications, current edition (COV Engineering Standards and Detail Dwgs.).

2.3 Subbase

- .1 Refer to Master Municipal Specification Section 02226 Aggregates and Granular Materials and COV Supplemental Specifications to Master Municipal Specifications, current edition (COV Engineering Standards and Detail Dwgs.).

PART 3: EXECUTION

3.1 Plant And Mixing Requirements

- .1 Refer to Master Municipal Specification Section 02512 Hot-Mix Asphalt Concrete Paving and COV Supplemental Specifications to Master Municipal Specifications, current edition.

3.2 Base Inspection

- .1 Prior to commencement of hot-mix asphalt concrete paving the granular base shall be inspected by Owner's Representative and the Contractor. Provide min 48 hrs. notice prior to desired paving time to allow for inspection to be scheduled. Areas of work to receive hot-mix asphalt concrete paving shall be examined and unsatisfactory conditions reported to Owner's Representative; **commencement of work shall imply acceptance of conditions**. If Owner's Representative have doubts about acceptability of the base, a Benkleman Beam Test may be ordered and work is not to proceed until such testing has been approved. The contractor shall provide a loaded single axle truck with a rear axle load of 8165 kg to be used in conducting tests.
- .2 Any areas which are found to be soft or wet shall be excavated and backfilled with the granular subbase and base as specified.
- .3 The subgrade shall be well drained. Verify that the subgrade is dry, uniform, even and ready to support subbase, base and asphalt concrete paving and the intended loads. Base course shall be examined for adequate compaction and uniform surface. The base course to be compacted to 95% Modified Proctor Density.
- .4 Verify the gradients and elevations of the subgrade and base are correct to allow installation as per the details and meet the intended finished grades. **Notify Owner's Representative of any discrepancies prior to proceeding with installation.**

3.3 Preparation Of Subgrade And Placing Base Courses

- .1 Prepare subgrade to requirements of Section 01 89 13 Site Preparation and Grading.
- .2 Place compacted aggregate base course (on compacted sub-base course) on subgrade to finished depths as detailed.
- .3 The sub-base or subgrade as detailed shall be compacted to 95% Modified Proctor Density.

3.4 Placing And Compacting Asphaltic Concrete

- .1 Place depth of asphalt concrete to thicknesses, grades and lines as shown on the contract documents or as directed by Owner's Representative. To be placed in compacted lifts of specified thicknesses. **Arrange for and complete paving in a continuous operation, avoid delays in laying parallel strips.**
- .2 Placing Conditions:
 - .1 Place asphalt mixtures only when air temperature is above 5 degrees Celsius (10 degrees and rising for tennis and sport courts)
 - .2 When temperature of surface on which material is to be placed falls below 10 degrees Celsius, provide additional rollers as necessary to obtain required compaction before cooling.

- .3 Do not place hot-mix asphalt concrete when pools of standing water exist on surface to be paved, during rain or snow or when the surface is damp. Refer to 1.9 Environmental Conditions.
- .3 Lower Course: Machine place to specified compacted thickness (maximum lifts of 50mm after compaction) over compacted and graded aggregate base. Some areas may require thicker applications to fill in low spots and to ensure positive drainage.
- .4 Upper Course: Machine place to minimum specified compacted thickness (maximum lift of 38mm after compaction) over compacted lower course. Hand place/tamp as required around all site fixtures.
- .5 When asphalt concrete meets site fixtures, furnishings, concrete walls, walks or other (note specifically) flare the asphalt upwards around the base of fixture to ensure water drains away from the fixture and is in compliance with the overall grading and drainage plans for the Project.
- .6 Commence rolling and/or manual compaction immediately after the bearing capacity is adequate to support the required compaction equipment, without undue displacement of material or surface cracking. Rolling and/or compaction shall be carried out in compliance with the Standards noted in Item 1.3. Hand tampers may be used at all inaccessible areas. Compaction in these locations shall be to the Owner's Representative's approval.
- .7 Along building walls, curbs, gutters, headwalls, manholes and similar locations not accessible to a roller, thorough compaction shall be obtained by means of hot hand or smaller mechanical tampers before the mixture has set. At all contacts of this nature, the joints between these structures and the surfacing must be effectively tack coated with an emulsified asphalt.
- .8 The finished surface is to be smooth and rolling to allow for positive drainage of all areas.
- .9 **Notify Owner's Representative min. 48 hrs. prior to flooding to arrange for inspection.** Flood the entire asphalt concrete surface area after placement of the Lower Course Asphalt to ensure positive drainage in accordance with the grading plans. Make all necessary repairs to ensure positive drainage prior to placing the Upper Course Asphalt.
- .10 **Cutting and removal/patching type repairs are permitted in the Lower Course asphalt only. Take care to ensure that grading and drainage problems are rectified prior to placement of Upper Course asphalt. Deflecting, ponding or other surface grading problems found in the asphalt Upper Course shall be corrected by complete removal of the top lift of asphalt concrete and replacement with a new lift of Upper Course asphalt. Final repair process subject to review/approval with Owner's Representative.**
- .11 All asphalt concrete pavement edges shall have a uniform, beveled, tidy and straight appearance. **Border planks or sawcut edges are not acceptable.**
- .12 Both Lower and Upper Course asphalt concrete joints shall be homogeneous with the rest of the surface and carefully matched for texture and elevation. All joints which are rejected by the Owner's Representative are to be cut out and redone to Owner approval. Asphalt joints to be done in accordance with the Standards referenced in Item 1.3 of this Specification.

3.5 Existing Asphalt

- .1 Repair all existing asphalt concrete that has been damaged/broken or eroded due the Work of this Contract.
- .2 Where new asphalt concrete paving abuts existing asphalt concrete paving make good all cracked, damaged or eroded areas to a distance of 600mm back from the intersection to provide a uniformly graded, smooth and solid transition with the new work.
- .3 Where existing asphalt is to be overlaid, prior to installing asphalt concrete mix, the surface shall be cleaned of loose or foreign material and tack coated in accordance with Section 02547 of the MMCD.

3.6 Finished Tolerances

- .1 Finished asphalt paving surface shall be within 6mm of design elevation but not uniformly high or low.
- .2 Finished asphalt surface shall have no surface irregularities exceeding 6mm when checked with a 3m straight edge placed in any direction (3mm in 3m for tennis and sport courts).
- .3 The final surface elevation of asphalt pavement shall be 3-7mm above adjacent drainage inlets, grates, concrete collars, concrete curbs, walks or gutters or channels after compaction/rolling to compensate for minor settling. **Confirm with the Owner's Representative.**

3.7 Thickness Tolerance

- .1 The minimum asphalt concrete pavement thickness specified herein shall mean the average compacted thickness as determined from cores taken as dictated by the Owner's Representative from random locations around the site area being paved. The Contractor is to repair the core hole locations.
- .2 The average thickness of cores shall equal or exceed the specified pavement thickness and no individual core shall be more than 5mm less than the specified thickness detailed.
- .3 Any paved surface area failing the core thickness testing criteria shall receive a minimum 12mm lift of Upper Course Asphalt.

3.8 Site Maintenance/Adjustments And Cleaning

- .1 Correct any surface irregularities that develop or have been noted prior to completion of rolling process by first loosening the surface mix and removing or adding material as required.
- .2 If irregularities or defects remain after final compaction, remove the surface course immediately and lay new material to form a true and even surface. Compact immediately to specified density.
- .3 Surplus material shall be cleared away and removed from the work site.

- .4 Excess material remaining on the Lower Course surface shall be brushed away and removed from the work site, prior to installing the Upper Course.
- .5 After removal of excess material/debris check final elevations for conformance with the drawings.

END OF SECTION 32 12 16

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to install Portland cement concrete walks with finish as indicated in the contract documents.
- .2 Work of this section includes but is not limited to the supply, testing, provision of sawcut joints curing and finishing of horizontal concrete surfaces.
- .3 Scope of this section includes all formwork, the supply and installation of reinforcing, expansion joint fillers and joint sealants, aggregate required for complete installation.

1.3 Related Work

- | | | |
|----|--------------------------------|------------------|
| .1 | Excavation and Backfill | Section 31 23 00 |
| .2 | Cast in Place Concrete | Section 03 33 00 |
| .3 | Concrete Forms and Accessories | Section 03 10 00 |
| .4 | Concrete Reinforcing | Section 03 20 00 |
| .5 | Cast-in-Place Concrete | Section 03 33 00 |
| .6 | Concrete Finishing | Section 03 35 00 |

1.4 Reference Standards

- .1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction
- .2 CAN/CSA-A23.2, Methods of Test for Concrete
- .3 CAN/CSA-A23.4, Architectural Concrete
- .4 A23.1-09/A23.2-09, Concrete materials and methods of concrete construction/Test methods and standard practices for concrete

1.5 Testing and Approval

- .1 A qualified testing agency paid by the Contractor and approved by the Vancouver Park Board shall be appointed to prepare mix designs, perform field quality tests and test and report on concrete strength.

- .3 Where tests or inspections reveal work not in accordance with the Contract requirements, the Contractor shall pay costs for additional inspections or tests required by the Owner's Representative to verify acceptability of current work.
- .4 Testing shall be carried out for slump and air content for every truckload of concrete prior to the placement of any concrete. Cast specimens for compressive strength testing at seven (7) and twenty eight (28) days (one (1) specimen tested at seven (7) days and the average of 2 specimens at 28 days) in accordance with CAN/CSA-A23.2. Test results shall be provided to the Owner's Representative for review and records.
- 5 Concrete testing will be scheduled by the Contractor. Any concrete testing conducted by the Owner does not relieve the Contractor or Concrete Supplier of the responsibility to maintain their own quality assurance programs.

1.6 On Site Mock-up

- .1 Provide an onsite sample panel for each type of concrete pavement finish detailed. Sample panels to be a minimum of 2.0m x 2.0m (6.5' x 6.5') square. Sample panels are to include full joint patterns accurately constructed to match details on contract drawings.
- .2 Sample panels shall be constructed a minimum of ten (10) working days prior to the start of work of this section. Do not proceed with work of this section until the sample panels have been reviewed and approved by the Owner's Representative. If mockup panels are not accepted by the Owner's Representative the Contractor shall at no cost to the Owner remove unacceptable panels from the site and cast new panels for review. Sample panels to remain in place for the duration of work of this section and will be the accepted standard for review and acceptance of work.
- .3 Carry out all necessary adjustments, at no additional cost to the contract, required to provide paving to meet the specifications and/or match colour and finish of the approved sample.

1.7 Qualifications

- .1 Performance of work of this section shall only be carried out by skilled workers with a minimum of three (3) years experience in this type of work and finishing.

PART 2: PRODUCTS

2.1 Materials

- .1 Concrete mixes and materials: Shall be in accordance with CAN/CGSB A-A23.1, Table 5, Alternative 1 of CAN/CSA-A23.1 with the following criteria specific to this Section:

- .1 Submit proposed mix designs to Owner's Representative a minimum of three (3) days prior to concrete placement.

Slump	80mm, (3"), +/- 20mm, (3/4")
Air entrainment	5% to 8% (14-20mm aggregate)
Maximum aggregate size	14mm (9/16")
Water to Cement ration (W/C)	0.45 max
Minimum 28 day compressive strength	32Mpa
Exposure Class	C2

- .2 Non-staining type form release agent: chemically active release agents containing compounds that react with free lime to provide water soluble soap.
- .3 Expansion Joint Material: 13mm (1/2") Resilient, flexible, non-extruding, expansion-contraction joint filler. Cellular fibers securely bonded together, uniformly saturated with asphalt. When compressed to half of original thickness, recover to a minimum of 70 percent of original thickness. Joint filler shall conform to ASTM D1751. Acceptable suppliers include by W R Meadows ; or other pre approved equal.
- .4 Bond Break Tape: Masking tape, width to suit joint size.
- .5 Joint Cleaner; xylol, methyl ethyl ketone or non-corrosive type recommended by sealant manufacturer and compatible with joint filler.
- .6 Joint Primers; shall be type recommended by caulk sealant manufacturer.
- .7 Joint Sealant: Non sag, Self-leveling two (2) part polyurethane type, conforming to CGSB 19.24-M80, Type 1, Class B. Colour as selected by Owner's Representative from standard range. Acceptable products include Sikaflex-2c NS Mix TG, manufactured by Sika or preapproved equal.
- .8 Form Release Agent: Eco-Coat by W R Meadows; or other pre approved equal.
- .9 Curing Compound: Vocomp – 20 water based curing and sealing compound by W R Meadows; or other pre approved equal.
- .10 The following materials shall not be used unless pre approved in writing by the Owner's Representative;
 - .1 Calcium chloride either as a raw material or constituent of another admixture.
 - .2 Super plasticizing admixtures

PART 3: EXECUTION

3.1 Subgrade Preparation

- .1 Sub grade preparation to lines and levels indicated on the Contract drawings related to finished grade. Contractor to allow for sufficient excavation to include build up and thickness of specified granular materials and finish materials.

- .2 Compact to minimum 95% Modified Proctor Density in compliance with ASTM D698 (all following references to density imply compliance with ASTM D698).

3.2 Granular Subbase and Crushed Granular Base Course

- .1 Place sub base and crushed granular base material to design grade as shown on drawings. Material to be compacted to 95 % MPD.
- .2 Where depths exceed 150 mm (6") ensure crushed granular sub base and granular sub base material are placed in 150 mm (6") lifts, compacting to 95% MPD between the placement of each lift.
- .3 Owner's Representative to review compacted crushed granular base prior to placing forms for concrete flat work or control devices for extruding equipment.

3.3 Formwork

- .1 Steel forms free from twists and warps following lines and shapes indicated on detail drawings.
- .2 Wood forms to be of select dressed lumber, straight and free from defects and thoroughly cleaned following lines and shapes indicated on detail drawings.
- .3 Flexible forms to be used for all curves less than 6.0m (20'-0"), radius, or as required to form smooth curve. Ensure transition at tangent of curve is true and smooth.
- .4 Set forms to line and grade as shown on drawings, free from waves or irregularities in line or grade.
- .5 Set special forms as required around catch basins, manholes, poles or other objects as shown on drawings.
- .6 Tolerances:
 - a. Maximum horizontal deviation: 6mm (1/4")
 - b. Maximum vertical deviation: 6mm (1/4")
 - c. Maximum deflection from horizontal or vertical alignment to be 6mm in 3m (1/4" in 10'-0")
- .7 Adequately brace forms to maintain specified tolerances after concrete is placed.
- .8 Ensure forms are clean, free from extraneous material prior to the application of form release agent. Form release to be applied as per manufacturers written instructions.

3.4 Owner's Representative Review

- .1 **Obtain Owner's Representative's approval prior to placing concrete.**
Notify Owner's Representative a minimum of forty-eight (48) hours in advance of concrete placement for review of formwork. Owner's Representative review to include but is not limited to:
 - .1 Forms are properly set at required horizontal and vertical alignment,
 - .2 Forms are sufficiently rigid,

- .3 Forms are clean and ready for placement of concrete.

3.5 Concrete Placement

- .1 Concrete Mix Equipment; Concrete shall be delivered to the site in transit mix trucks from a commercial batch plant that conforms to CAN/CSA-A23.1.
- .2 Concrete Placing; In accordance with CAN/CSA-A23.1. Do not place concrete during rain or on wet or frozen base.
- .3 Do not place concrete when air temperature appears likely to fall below 5 degrees Celsius (41 degrees F) within 24 hours, unless specified precautions are taken. Provide Owner's Representative with written construction process of concrete placement for work undertaken in these conditions.
- .4 Schedule concrete placement to ensure sufficient daylight hours available to permit edging and finishing. Place concrete within 1.5 hours of batching time.
- .5 Install mesh or rebar reinforcing at mid depth of concrete slab. Place concrete as per CAN/CSA -A23.1.
- .6 Moisten crushed granular base immediately prior to placing concrete.
- .7 Place concrete in forms, ensuring no segregation of aggregate. Vibrators shall be adequately powered and sufficiently intense to cause the concrete to compact readily into place. Systematically apply vibrators at such intervals that the zones of influence of the vibrator overlap. Insert the vibrator vertically into the concrete long enough to ensure that the concrete is properly compacted. Do not apply vibrator directly to the reinforcing steel or to the forms. Employ a sufficient number of vibrators so that the required rate of placement vibration throughout the entire volume of each layer of concrete is achieved. Keep one spare vibrator at site for emergency use.
- .8 Concrete to be placed in continuous operation until entire panel (expansion joint to expansion joint) or section has been completed.
- .9 The Contractor shall notify all trades sufficiently in advance to ensure that provision is made for openings, inserts and fasteners. He shall cooperate with all trades in the forming and setting of all slots, sleeves, bolts, dowels, hangers, inserts, conduits, clips, etc., whether they are in his scope of work or not. Depress concrete locally around drains to facilitate drainage.
- .10 Discontinue placement at expansion, construction or isolation joints only.

3.6 Addition of Mix Water

- .1 Mix water addition shall be in strict accordance with CAN/CSA A-A23.1, clause 18.4.3. No water from the truck system or elsewhere shall be added after the initial introduction of the mixing water for the batch except when, at the start of discharge, the measured slump of the concrete is less than specified and no more than 60 minutes have elapsed from the time of batching to the start of the discharge. In this case water may be added by the producer up to an amount not exceeding 12 litres per cubic metre (2 gallons per cubic yard). The resulting concrete must satisfy the specified requirements.

3.7 Expansion Joints

- .1 Unless otherwise indicated on drawings form transverse expansion joints at both ends of curb returns and at a maximum spacing of 10m for sidewalks, at each end of driveway crossings and at tangent points on circular walk.
- .2 Extend through full depth of concrete and terminate 12 mm (1/2") below finished surface to allow for approved sealant. Apply bond break tape before applying sealant.

3.8 Pre-Molded Joint Filler and Expansion Joint Sealant for Exposed Aggregate Paving

- .1 Locate and install construction joints and pre-molded expansion joints as provided by pattern break indicate on design drawings and at junction with other surfaces. Care shall be taken to construct clean joints free from any foreign material that will impair the proper function or the material.
- .2 Unless shown otherwise, pre-molded joint filler shall extend for the full depth of the joint. Pre-molded joint filler shall terminate 12 mm below the top of the joint. Fill 12mm space with joint expansion joint sealer in accordance with the manufacturers instructions. Apply bond breaker tape before applying sealant if integrated fibreboard is used.

3.8 Control Joints

- .1 Sawn Control Joints;
 - .1 At locations indicated on contract drawings as soon as the concrete can be cut without raveling. Typically this occurs no later than sixteen (16) hours after placing. Contractor shall, through the mockup procedure satisfy himself that the typical cure time is sufficient and adjust as required to ensure joints can be cut without ravelling.
- .2 Construct control joints to minimum 1/4 depth of concrete section at point of cut or as otherwise shown on project details.

3.9 Isolation Joints

- .1 Form isolation joints around all poles, hydrants, manholes and all structures or fixed objects located within the concrete section by using approved expansion joint material.
- .2 Form longitudinal isolation joints between sidewalk and abutting curb and gutter, abutting utility strips, abutting structures using expansion joint material.
- .3 Use expansion joint material to form isolation joints between sidewalks and abutting walls and structures.

3.10 Caulking Sealant

- .1 Caulking to be applied no earlier than fourteen (14) days after placement of concrete unless specified by the manufacturer of caulking sealant.

- .2 Ensure that all surfaces of the joint to be caulked sealed are clean and dry prior to start of caulking sealing operation.
- .3 Joint faces shall be primed, expansion joint material covered with bond break tape prior to the application of caulking sealant material.
- .4 Take all necessary precautions to ensure that primer does not stain concrete surface and that caulking sealant material is applied as per the manufacturers instructions within the confines of the joint. Clean all excess caulking from concrete surfaces.

3.11 Finishing

- .1 Pre finish surface of concrete sidewalks and utility strips to smooth surface with magnesium or wood float trowel.
- .2 The finish to concrete surfaces shall be as noted on contract drawings.
 - .1 Broom Finish: areas indicated on contract drawings shall form light broom marks as per approved mockup perpendicular to the path of travel.
- .3 Grooves, scoring or saw cutting used for aesthetic purposes as shown on the drawings or as directed by Owner's Representative, to be marked with proper tools or saw cut to depths shown on drawings.
- .4 Finish driveway crossing, curb let downs and wheel chair ramps as shown on detail drawings.
- .5 Under no circumstances is concrete to be overworked by troweling, dusted with dry cement or finished with a mortar coat.
- .6 Finished surface to be as specified, match the approved mockup and to satisfaction of Owner's Representative. Sections of cast in place concrete pavement that do not conform to this specification section, do not match the mockup or are not to the satisfaction of the Owner's Representative shall be removed and replaced by the Contractor at no cost to the Owner.

3.12 Curing

- .1 Broom Concrete Finish:
 - .1 Apply curing compound as per manufacturer's written instructions.
- .2 When temperature is below 5 degrees Celsius (41 degrees F) take measures necessary to ensure that the ambient air temperature around the concrete is not less than 10 degrees Celsius (50 degrees F) for at least 72 hours. Protect from freezing for at least another 72 hours or such time as required to ensure proper curing of concrete. Admixtures are not be used for prevention of freezing.

3.13 Defective Concrete and Patching

- .1 Concrete surface to be free from open texturing, voids, and projections.

- .2 Repair of defective concrete work:
 - .1 Repair defective areas while concrete is still plastic, otherwise wait until curing is completed.
 - .2 Prior to undertaking any repairs provide the Owner's Representative with a written description of repair method complete with product data sheets.
 - .3 At the discretion of the Owner's Representative and at no cost to the Owner, the Contractor shall remove and replace concrete deemed 'defective' and 'unrepairable'.
 - .4 Defects and areas requiring repair as indicated by the Consultant
- .3 Grinding to repair imperfections and incorrect slope is unacceptable.
- .4 All areas deemed unacceptable by the Owner's Representative shall be removed from joint line to joint line, e.g. full panel.

3.14 Protection

- .1 Protect freshly finished concrete from dust, rain or frost by using tarpaulins or other suitable protective coverings. Keep clear of finished surface.
- .2 Place and maintain suitable barriers to protect finished concrete from equipment, vehicles or pedestrian traffic.
- .3 Provide personnel as required to prevent vandalism until concrete has set.
- .4 Do not run vehicles or construction equipment on concrete for at least 7 days or as directed by Owner's Representative.
- .5 Keep traffic that would affect and/or otherwise disturb the curing procedures off the finished surfaces for the full cure period of twenty-eight (28) days.

3.15 Flood Test

- .1 Immediately upon removal of the formwork of cast-in-place concrete, a flood test shall be conducted by the Contractor in the presence of the Owner's Representative to ensure proper drainage of all concrete flatwork. The flood test shall consist of the application of a volume of water sufficient to allow the visual verification of all slopes and drainage patterns and ensure that ponding does not occur. The volume of water necessary to facilitate testing and the determination of the success or failure of the flood test shall be at the discretion of the Owner's Representative.
- .2 Should the concrete not meet the grade tolerances of the Contract documents or ponding is evident after a flood test the Contractor shall at the discretion of the Owner's Representative completely remove and replace all concrete. Grinding, partial removal and patching to resolve ponding or insufficient grade is not acceptable.

3.16 Acceptance

- .1 Prior to acceptance of finished concrete the following conditions will be met;

- .1 Owner's Representative shall have reviewed concrete batch design and test results provided by the contractor.
- .2 Concrete shall have full 28 day cure.
- .3 All irregular, cracked or otherwise defective sections to be removed and replaced to satisfaction of Owner's Representative. The extent of removal will be at a minimum to the nearest joint.
- .4 All stains, marks and discolouration as a result of spills or drips shall have been removed.
- .5 Finish of concrete matches the accepted sample panels.

3.17 Cleaning

- .1 Promptly, as the work proceeds and on completion, clean up and remove from the site any debris, waste material and rubbish resulting from work of this section.
- .2 Clean spills and excess concrete from adjacent horizontal and vertical surfaces.

END OF SECTION 32 13 13

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to install growing medium and mulch as indicated in the contract documents. Growing medium for landscape areas including urban agriculture beds and planters.

1.3 Related Work

- | | | |
|-----|---------------------------------|------------------|
| .1 | Excavation Backfill and Grading | Section 32 23 10 |
| .2 | Sod Lawns | Section 32 92 23 |
| .2a | Mechanical Seeding | Section 32 92 19 |
| .4 | Subsurface Drainage Systems | Section 33 46 16 |

1.4 Reference Standards

- .1 Conform to the requirements of the latest editions of the following standards and legislation:
 - .1 BCSLA/BCLNA British Columbia Landscape Standard
 - .2 Canadian System of Soil Classification
 - .3 Canadian National Master Construction Specification, 32 91 19.13 Topsoil and Grading.

1.5 Materials Definitions

- .1 For the purpose of this specification the term “growing medium” shall mean a mixture of mineral particulates, micro organisms and organic matter which provides a suitable medium capable of supporting the intended plant growth.

1.6 Types And Locations of Growing Medium

- .1 Provide and install the following types of growing medium at the locations shown for each type:
- .2 Growing medium types:
 - .1 TYPE A On Site/Imported Soil
 - .2 TYPE B Growing Medium

1.7 Review

- .1 Verify the size, location and depth of all existing site services and sub-surface utilities prior to commencement of the work. Repair all damage as result of failure to perform adequate review at no cost to the Vancouver Park Board.
- .2 Notify Owner's Representative when the site is prepared for growing medium placement. Do not place growing medium until subgrades have been reviewed and approved.
- .3 Provide at least two days (48 hours) notice in advance of each required reviewed.

1.8 Testing

- .1 Submit to the Owner's Representative a copy of growing medium analysis from a laboratory approved by the Owner's Representative. The analysis shall be of tests done on the proposed growing medium from samples taken at the supply source within three weeks immediately prior to soil placement. Cost of initial analysis and subsequent tests to ensure compliance with specification shall be borne by the contractor. **Results of these tests shall be presented to the Owner's Representative for review BEFORE any growing medium delivery to site.** Pond/In-stream growing medium placed prior to the review of test results by the Owner's Representative will result in rejection of pond/In-stream growing medium and subsequent removal of material by the contractor at no cost to the owner.
- .2 The analysis will include measurement of percent sand, fines, (silt and clay), and organic matter to total 100%, pH, lime required to achieve pH 6.5, water soluble salts, total carbon to total nitrogen ratio, total nitrogen and available levels of phosphorus, potassium, calcium and magnesium
- .3 The analysis shall outline the testing laboratory's recommendations for amendments, fertilizer and other required modifications to make the proposed growing medium meet the requirements of this specification.
- .4 At the discretion of the Owner's Representative submit up to two additional samples at intervals outlined by the Owner's Representative of pond/in-stream growing medium taken from material delivered to site. Samples shall be taken from a minimum of three random locations and mixed to create a single uniform sample for testing. Results of these tests shall be presented to the Owner's Representative for review.
- .5 Test reports for landscaping soils containing biosolids shall be submitted to demonstrate the finished product meets the BC Organic Matter Recycling Regulation's (OMRR) "Biosolids Growing Medium" standards; and, be supported by a documented review by a Qualified Professional as defined by OMRR

Organic Matter Recycling Regulation

http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/18_2002

- .6 Failure to satisfy these contractual requirements could result in the contractor being required to remove unacceptable growing medium at their expense.

1.9 Submittals

- .1 Submit to the Owner's Representative a copy of an analysis by an approved independent soil-testing laboratory. Acceptable laboratories include; Benchmark Laboratories Nanaimo, Ltd. Nanaimo, BC (250-585-2555), Pacific Soil Analysis Inc., Richmond, BC (604.273.8226) or pre-approved equal. The analysis shall be of tests done on the proposed growing medium and additives proposed for the work from samples taken at the supply source, within three weeks immediately prior to growing medium placement. Costs of the initial analysis, and subsequent tests to ensure compliance with the specification shall be borne by the Contractor. Failure to submit soils analysis is cause for immediate rejection and possible removal of any placed growing medium.
- .2 The analysis shall include a breakdown of the following components: total nitrogen by weight, available levels of phosphorous, potassium, calcium, magnesium, soluble salt content, organic matter by weight, % sand, % fines (silt and clay) and pH value. In addition, the analysis shall clearly indicate the Project Name, Date Tested and Contractor's Name.
- .3 Submit with the above analysis, the testing laboratory's recommendations for amendments, fertilizers and other modifications to make the proposed growing medium meet the requirements of this specification.

1.10 Samples

- .1 Submit to the Owner's Representative one composite sample of each type of proposed growing medium for each different application within the project (e.g. lawns, shrubs, urban agriculture planter). Each sample shall be a composite of at least three samples from the proposed source and shall be at least one (1) litre in volume.
- .2 Urban Agriculture Growing Medium: Submit to the Owner's Representative confirmation that the organic material component of the Urban Agriculture Growing medium is derived from an organic source free of heavy metals, contaminants, animal or plant chemical additives or supplements. The confirmation shall be in the form of a letter on company letterhead or written confirmation from provincial or regulatory agency.
- .3 At the discretion of the Owner's Representative, submit up to two additional samples, including samples of proposed additives to the growing medium from material delivered to the site as required to ascertain compliance with this specification. Results of these tests shall be submitted to the Owner's Representative for approval.
- .4 After the completion of the soils analysis, a one litre sample of the completed/mixed growing medium, including all amendments shall be submitted at least twenty-one (21) days before placement of growing medium to allow for evaluation of samples and testing for noxious weed content by Owner. Owner's Representative will advise of test results.
- .5 Samples of each growing medium type shall be submitted to the Owner's Representative in zip lock plastic bags clearly marked with the date, project name, sample name and supplier name and telephone number.

- .6 Organic Material: One composite sample or each organic material type. Sample shall be a composite of at least three samplings from the proposed source, and shall be at least one (1) litre in volume.

1.11 Quality Assurance

- .1 Advise Owner's Representative of sources of growing medium to be utilized on this Project a minimum of thirty days (30) prior to starting work of this Section.
- .2 Carry out growing medium preparation and placement such that the final product matches the standard set by the samples submitted, within a range of variation that may reasonably be expected with good quality control while incorporating the recommendations for amendment by the testing laboratory.
- .3 The Vancouver Park Board may appoint an independent testing laboratory to ascertain compliance with this specification and to recommend modifications to make the growing medium meet the requirements of this specification.

PART 2: PRODUCTS

2.1 General

- .1 Product Handling
 - .1 Do not move or work growing medium or additives when they are excessively wet, extremely dry, frozen, mixed with ice and/or snow, or in any manner which will adversely affect growing medium structure. Growing medium whose structure has been destroyed by handling under these conditions will be rejected and shall be replaced by the contractor at no cost to the owner.
 - .2 Protect growing medium and additives against extreme wetting by rain or other agents, and against contamination by weeds and insects.
 - .3 Deliver fertilizer and other chemicals in manufacturer's original containers. Protect against damage and moisture until incorporated into the work.
 - .4 Stockpile materials in bulk form in paved areas and provide protection by storing under roof or tarpaulins. Take all necessary precautions to prevent contamination of component materials from wind blown soils, weed seeds and insects. Contamination of individual components may result in rejection, if used.
 - .5 All growing medium will be delivered to site **premixed** from a recognized growing medium source ensuring consistency throughout the mix.
- 2 Approved Equals
 - .1 All items as specified or pre-approved equals.

2.2 On Site /Imported Soil (Type A)

- .1 On site-imported soil shall be friable "A Horizon" topsoil to the requirements of the B.C. Landscape Standard, stripped and stockpiled on site in an approved location. Stripping and stockpiling work shall be such that the soil is not damaged or contaminated. (Refer to Product Handling).
- .2 Mineral particle sizes shall be within the following ranges by weight:
100% shall pass a 10 mm (3/8") sieve.
Maximum of 10% shall pass a #200 sieve. (Silt and clay)
Soil shall be of a sandy loam or loamy sand texture containing between 3% and 15% organic matter (dry weight basis). Soil shall be virtually free from subsoil, wood including woody plant parts, weeds, stones over 30mm, pests, undesirable grasses or weeds, and seeds or parts thereof and foreign objects. Soil shall be free from crabgrass, couch grass, *Equisetum*, convolvulus or other weeds or seeds or parts thereof.
- .3 Soil shall be suitable for modification by screening and additives to meet the requirements for Screened Growing Medium (Type B as specified) except where specified and approved for use as unscreened On Site Soil (Type A).

2.3 Additives

- .1 Manure: Well rotted farm animal manure or compost, to the requirements of the BCSLA/BCLNA B.C. Landscape Standard. Animal manures and compost often have excessive levels of water-soluble salts. The growing medium shall be leached via fresh water from the irrigation system or through natural rainfall until an electrical conductivity of 3.0mmho/cm or less is achieved.
- .2 Compost: A uniform blend of natural source-separated organic materials, composted such that it is brown-black in colour and has carbon to nitrogen ratio of 25 to 1 or lower. pH 6 to 7. Substantially free from subsoil, pests, roots, wood, construction debris, undesirable grasses or weeds, and seeds or parts thereof. Free from toxic materials, crabgrass, couch grass, *Equisetum*, weeds, and seeds or parts thereof. The Owner does not allow use of any paper fibre amended compost products. Approved Suppliers include Fraser Richmond Biocycle and Stream Organics.
- .3 Sand: Approved medium river pump sand, well washed and free of contaminants, chemical and organic matter. Gradation of particle sizes shall fall within the following range ("Percent" to be reported as the mass of the particles whose size is less than the designated sieve opening but greater than the next designated sieve opening):

USBS Sieve Sieve Size

<u>Number</u>	<u>(mm)</u>	<u>Percent Class</u>
4	4.76	0 - 3 Fine gravel
10	2.00	0 - 20 Very coarse sand
18	1.00	0 - 20 Coarse sand
35	0.50	60 - 80 Medium sand
60	0.25	0 - 40 Fine sand
140	0.105	0 - 4 Very fine sand

- 270 0.063 0 - 2 Silt & clay
- .4 Sand shall have a saturated hydraulic conductivity between 100 mm. and 300 mm. per hour. Test conditions shall be for saturated sand, 15 blows compaction.
- .5 Sand shall have:
- Organic content < 0.5% by weight.
- Water Soluble Salt content < 0.5mmhos/cm
- Ph of between 5.0 and 7.0
- .6 Available copper, zinc and manganese following acid digest test in 0.1N HC1 and shaken for ½ hour shall be less than 25 PPM when analysed by atomic absorption spectroscopy.
- .7 Peat moss: Is not to be used.
- .8 Wood Residuals: Content of wood residuals such as fir or hemlock sawdust shall not cause a Carbon to Nitrogen ratio higher than 25:1. Cedar or redwood sawdust shall not be present in the growing medium mix.
- .9 Dolomite Lime: Approved commercial brands for horticultural purposes, coarsely ground; containing not less than 20% calcium by weight.

2.4 Fertilizers

- .1 Standard commercial brands, meeting the requirements of the Canada Fertilizer Act, packed in waterproof containers, clearly marked with the name of the manufacturer, weight and analysis.
- .2 Generally Fertilizers must be those fertilizers specified in the soils analysis report/ recommendations. Contractor shall not make any substitutions without prior written approval from Owner's Representative.

2.5 Growing Medium (Type B)

- .1 Growing Medium shall be predominantly sand based and screened with additives and fertilizers as required to make it meet the following specifications:
- .1 Substantially free from roots, sticks, building materials, wood chips, chemical pollutants and other extraneous materials.
- .2 Population of plant pathogenic nematodes: maximum 1000 per litre for any single species.
- .3 Maximum requirement of dolomite lime to required pH: 50kg/100M2.
- .4 Salinity: maximum saturation extract conductivity of 3.0 mmho/cm @25 deg. C
- .5 Fertility:
- Total Nitrogen 0.4-0.8% by weight
- Available Phosphorous 70-80 ppm
- Available Potassium 150-250ppm
- .6 Cation Exchange Capacity: 30-50 meq.
- .7 Carbon to Nitrogen Ratio: max. 40:1
- .8 pH:

- | | | |
|--|----------------|------------|
| | Lawns | 6.0 to 7.0 |
| | Planting Areas | 5.5 to 6.0 |
- .9 Boron: the concentration in the saturation extract shall not exceed 1.0 ppm
- .10 Sodium: the sodium absorption ratio (SAR) as calculated from analysis of the saturation extract shall not exceed 8.0
- .11 Total Nitrogen shall be 0.2% to 0.6% by weight.
- .12 Available phosphorous shall be 20-100 ppm
- .13 Available potassium shall be 50-250 ppm.
- .14 Tolerances: Samples of growing medium taken just before planting shall have the specified properties to within the tolerances of plus or minus 20% of the stated values, except for salinity, which shall be less than the stated limit.
- .15 The textural properties and organic content shall be have the following composition AFTER MIXING (BY DRY WEIGHT):
- .2 For PLANTING BEDS growing medium shall consist of the following AFTER MIXING (% BY DRY WEIGHT):
- 80- 88% round sand (>0.05mm-<2mm)
 - 3 % max silt (>0.0002mm - <0.05mm)
 - 2 % max clay (<0.002mm)
 - Total fines max 5%
 - 12-15% organic matter
 - pH 5 .0 to 6.0
- Nutrient Content:
- Nitrogen 0.2 - 0.6%
 - Phosphorus: 50 -150ppm
 - Potassium 50 - 300 ppm
 - C/N ratio max 25 : 1
- .3 For LAWN AREAS growing medium shall consist of the following AFTER MIXING (% BY DRY WEIGHT):
- 85- 92% round sand (>0.05mm-<2mm)
 - 3 % max silt (>0.0002mm - <0.05mm)
 - 2 % max clay (<0.002mm)
 - Total fines max 5%
 - 8- 10% organic matter
 - pH 6 .0 to 6.5
- Nutrient Content:
- Nitrogen 0.2 - 0.6%
 - Phosphorus: 50 -150ppm
 - Potassium 50 - 300 ppm
 - C/N ratio max 25 : 1

2.6 Organic Material

- .1 Organic Material (non urban agriculture):
 - .1 Shall be, fully composted material that does not contain cedar or redwood bark or wood, black/brown in colour.
 - .2 Organic component shall not contain mushroom manure compost or mushroom starter.
 - .3 Acceptable suppliers include
 - Veratec Group, Chilliwack, BC (Formerly Yardworks)
 - Harvest Power Canada Ltd., Richmond, BC (Soil Amender), (Formerly Fraser Richmond Soil and Fibre Ltd.)
 - Eco-Soil Recycling, Surrey, BC
- .2 Organic Material (urban agriculture):
 - .1 Shall be derived from an organic source free of sewage biowaste, heavy metals, contaminants, animal or plant chemical additives or supplements.
 - .2 The material shall be fully composted material that does not contain cedar or redwood bark or wood, black/brown in colour.
 - .3 Organic component shall not contain mushroom manure compost or mushroom starter.
 - .4 Acceptable suppliers include
 - Veratec Group, Chilliwack, BC (Formerly Yardworks)
 - Harvest Power Canada Ltd., Richmond, BC (Soil Amender), (Formerly Fraser Richmond Soil and Fibre Ltd.)
 - Eco-Soil Recycling, Surrey, BC
- .3 Organic Material (biosolids):
 - .1 Landscaping soils containing biosolids shall meet the BC Organic Matter Recycling Regulation's (OMRR) "Biosolids Growing Medium" standards; and, be supported by a documented review by a Qualified Professional as defined by OMRR
 - .2 Acceptable suppliers include Veratec, Chilliwack, BC (Formerly Yardworks Supply, Ltd), Harvest Power Canada Ltd. – British Columbia (Formerly Fraser Richmond Soil and Fibre Ltd.) (Soil Amender), Richmond, B.C., Eco-Soil , Langley BC, or pre-approved equal.

2.7 Construction Adhesive

- .1 PL 200 Construction Adhesive by OSI Sealants Inc. or approved equal.

2.8 Drainage Medium

- .1 Drain Rock or Torpedo Gravel: Shall consist of clean round stone or crushed rock. Acceptable material includes 19 mm (3/4") drain rock or torpedo gravel conforming to the following gradations.

SIEVE SIZE	PERCENT PASSING (19MM)	PERCENT PASSING (TORPEDO)
25mm	100	
19mm	0-100	
9.5mm	0-5	100
4.75mm	0	50-100
2.36mm		10-35
1.18mm		5-15
0.60mm		0-8
0.30mm		0-5
0.15mm		0-2

- .2 Drain Mat: Light duty, UV stable, impermeable cusped core bonded to a layer of non-woven filter fabric with the following minimum properties
- .1 Compressive Strength -718 kN/m² as per ASTM D-1621
 - .2 Flow Rate – 188 l/min/Metre as per ASTM D-4716
 - .3 Approximate profile thickness of 10mm (3/8").
- Acceptable products include J-DRain 200 manufactured by JDR Enterprises (1.800.843.7569), Nudrain WD/15 manufactured by Nilex Geotechnical Products Inc., Burnaby B.C., or approved equal.

2.9 Filter Fabric

- .1 Needled, non-woven polypropylene mat. Nilex 4545 by Nilex Geotechnical Projects, Burnaby, B.C.

PART 3: EXECUTION

3.1 Subgrade Preparation

- .1 All excavation shall be undertaken in accordance with the City of Vancouver's Policy and Standard Operating Procedure- Soil and Excavation Water Contamination Management.
- .2 Request a review of the subgrade conditions and obtain approval of the Owner's Representative to placing any growing medium.
- .3 On Grade Planting Area:
 - .1 Scarify compacted subgrade to a minimum depth of 200mm (8") immediately before placing growing medium.
 - .2 Verify that subgrades are at the proper elevations before placing growing medium.
 - .4 Placement of growing medium implies acceptance of subgrade conditions.

- .5 Remove debris, roots, branches stones in excess of 50mm dia. and other deleterious materials as directed by Owner's Representative.
- .6 Remove any soil contaminated with calcium chloride, toxic materials or petroleum products.
- .7 Remove any materials that protrude 25mm above the surface.
- .8 Dispose of removed material off site.
- .9 Review sub grade conditions to ensure that there is proper drainage in all planting areas and tree pits. Perform a percolation test as needed to confirm proper drainage.
- .4 Structural Slab Planting Area:
 - .1 Verify planter drains and or slab drains have been installed.

3.2 Placement of Drainage Medium – Drain Rock

- .1 Verify that architectural slab membrane, protection board, insulation, etc. has been approved by the Owner's Representative prior to the placement of drainage medium.
- .2 Place drainage medium over entire planter bottom ensuring consistent depth as per construction details.
- .3 Place filter fabric over the entire finished surface of drainage medium. Ensure seams are overlapped as per manufacturers recommendations.
- .4 Ensure filter fabric fits tight to face of planter wall. Take care during loading of growing medium to ensure filter fabric is not dislodged.

3.3 Placement of Drainage Medium – Drain Mat

- .1 Verify that architectural slab membrane, protection board, insulation, etc. has been approved by the Owner's Representative prior to the placement of drainage medium.
- .2 Place drainage medium – drain mat over entire planter bottom cut outs for slab drains. Ensure that overlap of filter cloth portion of drain mat is provided as per manufacturers recommendations. Ensure there are no gaps between drainage medium panels.

3.4 Importing Procedures for Prepared Growing Medium

- .1 **Imported Growing Medium:** Growing medium shall be imported and stockpiled on site in a location approved by the Owner's Representative.
 - .1 Carry out stock piling operation such that the growing medium structure is not compromised through compaction, vibration or other actions.
 - .2 Stock piled growing medium shall be protected from rain, drying and contaminants.

- .3 Growing medium shall be free of subsoil, pests, roots, wood, construction debris, undesirable grasses including crabgrass or couch grass, noxious or weeds and weed seeds or parts thereof foreign objects and toxic materials. Presence of these contaminants shall be grounds for rejection of growing medium and replacement at no cost to the Owner.

3.5 Preparation For Placement Of Growing Medium On Slab

- .1 Ensure protection board is in place and verify that previous work (waterproofing, etc.) is approved prior to starting work of this Section.
- .2 Place slab drainage layer and filter fabric separator as detailed to depths shown on drawings. Lap filter fabric 150mm (6") at all seams/joints. Ensure fabric extends 150mm (6") upward inside all planter sidewalls.
Ensure that filter fabric, slab drainage protection board, etc. are not damaged or displaced during installation of growing medium.

3.6 Preparation of Growing Medium

- .1 Mixing/screening of growing medium on site is not allowed. All growing medium is to arrive pre-mixed with the exception of addition of the following components that are to be applied at rates indicated in the growing medium analysis recommendations:
- .2 Thoroughly mix using mechanical mixing/screening equipment the constituent growing medium components and recommended additives. Resulting mixture will have a particle size class and properties that match the requirements of this specification.
- .3 No hand mixing will be accepted unless specifically approved by the Owner's Representative.

3.7 Placing Growing Medium

- .1 Do not place growing medium until Owner's Representative has reviewed drainage medium installation.
- .2 Ensure that irrigation lines to be installed have been reviewed by the Owner's Representative prior to the placing of growing medium.
- .3 Growing medium shall be moist but not wet when placed (25% of field capacity). It shall not be handled in anyway if it is wet or frozen.
- .4 Place all growing medium to the required finished grades with adequate moisture in uniform lifts of 100mm to 150mm compacted to 80MPD during dry weather, over drainage medium where planting is indicated.
- .5 Except where drawings or details show otherwise, place to the following minimum and/or maximum depths and levels (measured after initial settling of growing medium):
 - .1 Tree Planting Areas on grade maximum 900mm (36") and shall conform to the following additional parameters:

- .1 Planting hole shall be minimum 300mm (12") wider than rootball on all sides.
- .2 Planting hole shall be minimum depth of root ball. Undisturbed soil below rootball to be compacted to 100MPD.
- .3 Each tree shall have access to minimum 30m³ growing medium volume and minimum 15m³ growing medium volume per tree within connected volumes.
- .4 The required growing medium volume may be accommodated with varying soil depths between 900mm (36") and 250mm (10") outside the area defined by the planting hole. The growing medium volume must have a direct relationship to the mature drip line with outward adjustment for columnar species.
- .2 Shrub and Groundcover Areas on grade 450mm (18") minimum depth.
- .3 Low or High Traffic Lawn Areas on grade 250mm (10") minimum depth.
- .4 Urban Agriculture 450mm (18") or to within 25mm or 1" of the top of the planter.
- .6 If subgrade/subsoil drains rapidly increase soil depths as directed by Owner's Representative to ensure adequate moisture retention.
- .7 On slab depth of growing medium to achieve finished grades in all cases. Growing medium depths are not to exceed maximum allowed for by the structural engineer. Voiding, sand fill or additional growing medium may be used where required build-up over the drainage layer exceeds the required minimum depths stated above.
 - .1 For Lawn Areas Flush with adjacent surfaces after initial settlement.
 - .2 For Planting Areas As detailed on drawings. Crown all planting beds.
 - .3 Refer to drawings for top of slab and finished elevations, as applicable.
- .5 Crown or slope for positive surface drainage as shown on the drawings.

3.8 On Site Application of Amendments

- .1 Ensure minimum 7 days separation time between the application of any lime treatment or fertilizers and plant material installation.
- .2 Addition of amendment components shall be at the rates indicated in the growing medium analysis recommendations via the following methods:
- .3 Fertilizers
 - .1 This material shall be applied with mechanical spreaders over the entire planting area
 - .2 Rake fertilizers into top 50mm minimum of the placed growing medium.
- .4 Lime
 - .1 This material shall be applied with mechanical spreaders over the entire planting area and mixed thoroughly into the top 100mm (4") of the growing medium prior to fine grading.
 - .2 Do not apply by hand.
 - .2 Ensure line does not come in contact with the nitrogen - phosphate - potash fertilizers during amending process.
- .5 Organic Matter

- .1 Organic matter shall be top-dressed and cultivated into the top 150 -200mm (6"-8") of the growing medium prior to fine grading.

3.9 Finish Grading

- .1 Manually fine grade growing medium installation to contours and elevations shown on drawings or as directed by Owner's Representative. Tolerance for finish grading to be 5mm.
- .2 Eliminate rough spots and low areas to ensure positive drainage.
- .3 Finish Grade of growing medium shall be 25 mm (1") from finished elevation of adjacent curb or planter wall unless otherwise noted on drawings
- .4 Leave surface smooth, uniform, firm against deep foot printing, with a fine loose texture.

3.10 Weed Control

- .1 Ensure all weeds and weed roots that have germinated during the course of work of this section have been eliminated from growing medium.
- .2 Provide the Owner's Representative with a written methodology outlining of weed removal seven (7) days prior to starting weed removal operations.

3.11 Mulching

- .1 Place mulch over all growing medium except grass areas. Moisten uniformly and spread to a consistent settled depth of 50mm in tree and shrub planting areas, 25mm in ground cover areas.

3.12 Acceptance

- .1 Owner's Representative will inspect and test growing medium and determine acceptance of material as placed, depth and finish grading prior to any planting or sodding operations commencing.
- .2 Approval of placed growing medium subject to additional soil test analysis if requested. Costs for additional testing of placed growing medium shall be at the Contractor's expense.

3.13 Cleaning

- .1 All excess materials and other debris resulting from growing medium preparation and placement operations shall be disposed of off site.
- .2 Ensure all discolouration of adjacent surfaces caused by growing medium placement have been removed. Ensure all paved areas, tops of planters, and adjacent surfaces have been thoroughly cleaned to the satisfaction of the Owner's Representative.

END OF SECTION 32 91 13

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to install seeded lawn as indicated in the contract documents.
- .2 The work of this section shall include, but shall not necessarily be limited to the supply, installation and maintenance of the following:
 - .1 Fine grade growing medium
 - .2 Seeded lawn
 - .3 Maintenance of seeded areas until Final Acceptance

1.3 Related Work

- .1 Growing Medium Section 32 91 13

1.4 Reference Standards

- .1 BC Landscape Standard, latest edition.

1.5 Quality Assurance

- .1 Contractor to provide seed analysis that will include but is not limited to;
 - .1 Analysis of seed mixture
 - .2 Percentage of pure seed
 - .3 Year of production
 - .4 Date when tagged and location
 - .5 Percentage germination
 - .6 Name and address of distributor.

The sample accepted by the review will form the standard by which the project will be supplied.
- .2 Should the Contractor require the source of seed supply to change during the construction a written request must be provided to the Owner's Representative 48 hours in advance. The request is to be followed up by submission of proposed seed supplier and substitution seed analyses for Owner's Representatives review prior to the start of supply to the site.
- .3 All seed shall be delivered and stored in original containers in enclosed storage facility protected from the damage, weather, insects and rodents.

1.6 Drainage Control

- .1 Provide for proper water management and drainage of site during work of this section. Water management shall include silt traps, erosion control measures, temporary water collection ditches, as well as their adequate maintenance to ensure that storm water which may become laden with soil or growing medium is detained and cleaned prior to discharge from site.

1.7 Site Conditions

- .1 Examine site prior to the commencement of work to verify surface preparation is complete and has been accepted by the Owner's Representative.

1.8 Guarantee

- .1 The Contractor hereby guarantees that the sod will remain free of defects in accordance the General Conditions for a period of one (1) year from the date of Substantial Performance. The contractor shall make all corrections, adjustments and replacements required as a result of failure of all products in this section.
- .2 The Owner reserves the right to extend Contractor's guarantee period and responsibilities for one (1) additional year if, at end of the initial guarantee period the leaf development and growth of the seeded areas is not sufficient to ensure future survival.

PART 2: PRODUCTS

- 2.1 **Grass seed:** Certified Canada No. 1 Grade to Government of Canada, Seeds Regulations and having minimum germination of 75% and minimum purity of 95%. See drawings for seed mix specification.
- 2.2 **Water:** potable, free of impurities that would inhibit sod growth. Contractor to ensure adequate water is available to maintain seeded areas during germination and in a vigorously growing, healthy state until Final Acceptance of work of this section.
- 2.3 **Fertilizer:** complete synthetic, slow release fertilizer. Type and application shall be as required by the growing medium analysis report.
- 2.4 **Wood Posts:** 38mm (1/12") x 38mm (1/12") x 1.5m (5'-0") No. 1 Grade or better Hem/Fir, untreated wood.
- 2.5 **Binder Twine:** Hemp based multiple strand string.

- 2.6 Flagging Tape:** 30mm wide (1.875"), biodegradable ribbon tape made of non woven cellulosic material, colour; red, as distributed by Freedom Supply Company www.dag-ny.com, 1.800.263.0635 or approved equal.

PART 3: EXECUTION

3.1 Preparation of Surfaces

- .1 Scarify existing sub grade to 100mm (4") depth over entire area to receive growing medium and seed.
- .2 Fine grade scarified sub grade. Fine grading process shall ensure area to receive growing medium and seed provides slopes (2% minimum - 33% maximum) for positive drainage, is free of humps and hollows, deleterious material, sticks and stones over 50 mm (2") in size (dimensions relates to length, width and height).
- .3 Place growing medium to a depth of 300mm (12") when compacted to 80%MPD. Compaction of growing medium to 80% MPD will not leave deep foot impressions when walked.
- .4 Fine grade growing medium to lines and levels indicated on construction documents. Ensure that all low spots, humps and irregularities are eliminated prior to review by Owner's Representative.
- .5 Prior to the broadcast of seed Owner's Representative to review fine grading of growing medium. Review includes grades, growing medium depth and condition of finished surface. Subsequent to the Owner's Representative review and at no cost to the Owner the Contractor shall re grade/ add growing medium and make adjustments as directed by Owner's Representative.

3.2 Seeding

- .1 Seeding operations shall be carried out in the following calendar seasons;
 - .1 Spring (April 1st to June 15th)
 - .2 Fall (August 15th to September 30th).
 - .3 Seeding shall not take place during periods of rain, freezing and/or abnormally hot and dry weather.
- .2 Seed Application: Seed rates as per seed manufacturers recommendations.
 - .1 Sow seed during calm weather with wind speeds less than 8 kph (5 mph), using wheeled or hand held rotary broadcaster.
 - .2 Sow half of required amount of seed in one direction and remainder at right angles.
 - .3 Carefully incorporate seed into top of growing medium with light chain harrow or wire rakes to a minimum depth of 6mm (1/4") as seeding operation progresses or within one (1) hour after seeding

- .4 Immediately after seed application roll seeded area with 90kg (200 lb.) water ballast type lawn or agricultural roller. If seeded area becomes wet due to rain suspend rolling operations until area has dried to the point where growing medium will not adhere to the surface of the roller.
- .3 Watering Operation: Apply water with fine spray to avoid seed wash out. Watering procedure shall ensure penetration of minimum 50mm (2") into growing medium and be at sufficient duration and intervals to keep growing medium evenly moist during germination and grow in period.
- .4 The Contractor is to carry out at no cost to the Owner, reseed operations at two (2) week intervals where germination has failed or wash outs have occurred.
- .5 Perimeter Protection: All seeded areas shall be surrounded by a 900 mm high barrier made up of the following components:
 - .1 Wood posts placed at 1.8Metres (6'-0") on centre.
 - .2 Wood Posts to be driven to a depth of 300mm (12").
 - .3 String two (2) strands of hemp based binder twine (or equal product) between posts. Insure one full wrap of twine around each post.
 - .4 Tie 300 mm (12") strands of 'red' flagging tape at 450 mm (18") intervals along the entire length of both strands of twine.
 - .5 Maintain perimeter protection until Final Acceptance of seeded area by Owner's Representative. Upon acceptance remove perimeter fence and dispose of off site.
- .6 Seeded areas that have been damaged by construction operation, construction/ site personnel or construction traffic shall be replaced at no cost to the Owners. Replacement shall include removal of growing medium, regarding of sub grade, replacing growing medium and reseeding as required.

3.3 Maintenance

- .1 Maintenance of seeded areas shall begin immediately after seeding operation and shall continue until all deficiencies noted in the Substantial Performance review have been rectified to the satisfaction of the Owner's Representative and conditions for Final Acceptance been achieved. The Contractor is to notify the Owner's Representative in writing forty eight hours (48) prior to stopping maintenance operations.
- .2 Maintenance shall follow the BC Landscape Standard, current edition, Level 2 'Groomed'. Over and above this maintenance protocol the Contractor shall monitor the application of water to the seeded areas and ensure that watering procedures are continuous.
 - .1 Apply water with fine spray to avoid seed wash out. Watering procedure shall ensure penetration of minimum 50mm (2") into growing medium and be at sufficient duration and intervals to keep growing medium evenly moist during germination and grow in period.

- .2 Monitor watering on a regular interval to ensure that watering operations are not causing wash out of seeded area. Should wash outs occur as a result of watering or rain fall re and re wash out, reseed and continue maintenance and watering procedures.
- .3 Grass Cutting: After the 'first' cut of seeded areas grass cutting operations shall be carried out on a weekly (seven day) basis until Final Acceptance by Owner's Representative.
 - .1 First cut of seeded areas shall occur when a uniform grass height of 75mm (3") has been attained. First cut shall be to a height of 64 mm (2.5").
 - .2 Continue regular weekly cutting at a height of 50mm (2") until Final Acceptance.
 - .3 Cutting operations shall be such that each cut is at right angles to the previous cut.
 - .4 Contractor to remove grass clippings after each cut and dispose of off site.
- .4 Fertilizer analysis shall conform to recommendations provided with growing medium analysis. Application of fertilizer shall follow manufacturers recommendations noting that after October 1 lawn areas shall not be fertilized until April 15th of the following spring.
- .5 Seeded lawn areas to be kept free of invasive and/or noxious broadleaf weeds, grasses including but not limited to poa annua, disease, fungi, detrimental nematodes and detrimental insects.

3.4 Acceptance

- .1 Conditions for Final Acceptance of Seeded areas:
 - .1 Seeded areas are vigorously growing, well established with a thick, dense and healthy green appearance.
 - .2 Seeded areas are do not have any eroded or wash out areas, bare or dead spots and are free of invasive and/or noxious broadleaf weeds and grasses.
 - .3 No surface growing medium is visible when established seeded areas have been cut to height of 50mm (2")
 - .4 Seeded areas have been cut at least two (2) times a minimum of (7) days apart.
- .2 Areas seeded after September 30 will be not be reviewed for Final Acceptance until April 30th the next year.

END OF SECTION 32 92 19

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to install sod lawn as indicated in the contract documents.

1.3 Related Work

- .1 Landscape Maintenance Section 32 01 90
- .2 Growing Medium Section 32 91 13

1.4 Reference Standards

- .1 Conform to the requirements of the latest editions of the following standards and legislation:
 - .1 BCSLA/BCLNA British Columbia Landscape Standard
 - .2 British Columbia Standard for Turfgrass Sod
 - .3 British Columbia Weed Control Act
 - .4 Canada Seed and Fertilizer Act
 - .5 Canada Pest Control Products Act

1.5 Submittals

- .1 Guaranteed analysis of the grass mixture and purity of sod. Submit sample of sod prior to installation. Submit soil analysis of sod growing medium with sod sample.

1.6 Testing and Approvals

- .1 Notify Owner's Representative at least forty-eight (48) hours before installing sod for review of finished grades and sod
- .2 Obtain approval in writing from the Owner's Representative for application of any chemical vegetation controls. Comply with applicable federal, provincial and municipal legislation and regulations.

1.7 Acceptance

- .1 The conditions for acceptance of sodded areas and for turning over the sodded areas to the Vancouver Park Board for subsequent maintenance are:

- .1 Total Performance of the Work (per CCDC2, Supplementary Conditions) for the entire project has been declared.
- .2 Sod shall be mown as specified no more than two days before inspection for Acceptance.
- .3 Sod shall be uniformly healthy, dense, in a vigorous growing condition, rooted into the underlying soil and shall show no signs of yellowing. There shall be no gaps showing between adjacent rolls of sod.
Sod shall have no evidence of noxious weeds.
- .2 Inspection and Acceptance by the Board: Notify the Owner's Representative at least 48 hours in advance to schedule inspection of the entire landscape ready for Acceptance.

1.8 Protection

- .1 Protect all sodded areas against trespassing and from damage at all times until Acceptance. If any sodded areas are damaged, they shall be repaired as required by the Contractor.
- .2 Comply with COV pesticide/herbicide control regulations regarding application of herbicides to control noxious weeds. Ensure all manufacturer's recommendations regarding application are strictly adhered to.

1.9 Guarantee

- .1 All workmanship and materials covered under Work of this Section shall be guaranteed for a period of ONE (1) full year from the date of Substantial Performance.

PART 2: PRODUCTS

2.1 General

- .1 Product Handling
 - .1 During shipping, storage and installation, protect sod against drying, to the requirements of the B.C. Standard for Turfgrass Sod.

2.2 Fertilizer

- .1 Fertilizer shall be **as recommended for season of application** (as per industry standards).

2.3 Lime

- .1 Dolomite Lime: Shall be finely and uniformly ground containing not less than 90% calcium carbonate.

2.4 Sod

- .1 Sod:
 - .1 Suitability: All turfgrass sod shall be suited to the locality, site conditions and intended function of each project or area.
 - .2 Sod shall be nursery grown turfgrass sod, true to type, conforming to the B.C. Standard for Turfgrass Sod. **"Non-Netted" Sod, only will be accepted by the Owner.**
 - .3 The quality grade of sod (based on B.C. Standard for Turfgrass Sod) shall be **No. 1 Premium Grade grown on a screened alluvial sand base, cultivated on a sterilized soil base to ensure a weed free product.** The maximum fines (silt and clay) in the alluvial sand base to be no more than 1% by weight.

Approved turf products includes:
Anderson Sod Farms "Pro Sport"
Submit sieve analysis for turf farm sand if requested by Owner's Representative.
- .2 The grass mixture in sod shall be suited to the location and intended use and shall be as described in the B.C. Standard for Turfgrass Sod unless otherwise specified. Standard grass mixture requirements for **general purpose areas shall be** in the following approximate proportions:

Kentucky Bluegrass	50%
Perennial Turf Type Ryegrass	50%
- .3 Weed Control: **Manual weed control is the preferred method in COV and may be the only permitted methodology.** Confirm with Owner's Representative. If chemical vegetation control is permitted, use herbicides of type and at an application rate as required to achieve the desired control. Use only standard commercial herbicide products registered for sale and use in Canada under the Pest Control Products Act.

2.5 Approved Equals

- .1 All items as specified or pre-approved equals.

PART 3: EXECUTION

3.1 Fertilizer

- .1 Apply fertilizer at manufacturers' recommended rates. Ensure equal distribution. Mix into top 50 mm. (2") of growing medium by discing, raking or harrowing. **Application of fertilizer shall be within 48 hours of laying sod.**

3.2 Liming

- .1 Add limestone as required to ensure pH 6.0 to 6.5. Mix into full depth of growing medium. Coordinate with soils analysis.

3.3 Subgrade Preparation and Finishing

- .1 **Obtain approval of Owner's Representative of subgrade and growing medium prior to laying any sod.** Ensure that growing medium is placed to required depths and tolerances as specified and detailed in the Contract Documents and spread evenly over the approved subgrade. Ensure the growing medium is firm against footprints, loose in texture and free of all stones, roots branches etc as required under Section 02920 Growing Medium Preparation and Placement.
- .2 Ensure smooth finish on all surfaces and finished grades as shown on the drawings and as specified herein.
- .3 Grades:
 - .1 Areas to be sodded shall be at grades as shown at the time of sodding, less an allowance for the thickness of the sod.
 - .2 Restore all areas to be sodded which are misshapen or eroded to original specified condition, grade and slope as directed just prior to sodding. Minor adjustment and refinement of finish grade to be made as directed by the Owner's Representative.
 - .3 Crown or slope for surface drainage and eliminate all low spots or depressions.
 - .4 Obtain approval of finish grading from the Owner's Representative prior to proceeding.
 - .5 The Owner does not allow sod laying on any slopes steeper than 4:1.
- .4 If the surface of the growing medium is dry, lightly moisten the growing medium immediately prior to laying sod.

3.4 Sod Laying

- .1 Use full rolls where possible. No bits or sod remnants are allowed.
- .2 Lay sod in rows with ends staggered. Butt all sections closely. Do not overlap or allow gaps wider than 2mm between sections. Top of sod to be flush with adjacent walking surfaces.
- .3 Protect new sod from heavy foot traffic during laying. Place planks or plywood if necessary to prevent damage. **Lay within 24 hours after delivery to prevent deterioration. Any sod laid after the 24 hour period will be rejected.**
- .4 Lay sections on slopes at right angles to the direction of the slope. Stake sod into place with wood stakes driven flush with the surface in any locations having slopes steeper than 3:1. Interval spacing on stakes shall not exceed 500mm. Prior to pedestrian traffic being allowed onto the sod, and only after the sod is well rooted into the growing medium, pegs or stakes shall be removed or driven to an elevation 50mm below the finished surface.
- .5 Cut sod where necessary only with sharp tools.
- .6 Water thoroughly to penetrate the full depth of the growing medium as specified.

- .7 When sod has dried sufficiently, roll with 113kg. (250lb.) roller to obtain smooth uniform surface and ensure a good bond between soil and sod.
- .8 Erosion control netting shall be installed in sodded areas where required, erosion control mesh or netting shall be placed and secured with stakes or staples set firmly into the ground to a minimum depth of 150mm. Spacing of stakes or staples shall be adequate to ensure complete anchorage of the sod to the ground.

3.5 Maintenance

- .1 Begin maintenance immediately after installation and continue until Acceptance of sodded areas. Maintenance shall consist of all measures necessary to keep grass healthy, in a vigorous growing condition and well rooted into the underlying soil. Maintenance shall include, but shall not be limited to the following:
 - .1 Mowing shall be carried out at regular intervals as required to maintain grass at a maximum height of 60mm. (2-1/2"). Not more than 1/3 of the blade shall be cut at any one mowing. Edges of sodded areas shall be neatly trimmed. Heavy clippings shall be removed immediately after mowing and trimming.
 - .2 Watering shall be carried out when required and with sufficient quantities to prevent grass and underlying growing medium from drying out.
 - .3 Rolling shall be carried out when required to remove any minor depressions or irregularities.
 - .4 Weed control shall be carried out when the density of weeds reaches 10 broadleaf weeds or 50 annual weedy grasses per 37 sq. M. (400 square feet).
 - .5 Weed control, whether manual or chemical, shall reduce the density of weeds to zero. **If chemical apply in strict accordance with the manufacturer's recommendations and to the standards specified herein.**
 - .6 Any sodded areas showing deterioration or bare spots shall be repaired immediately. All areas showing shrinkage due to lack of watering shall be top dressed and seeded with a seed mix matching the original seed mix.
 - .7 All sodded areas shall be adequately protected with warning signs and fencing as directed by Owner's Representative. Fencing shall be maintained in good condition to provide a continuous barrier until Acceptance. Except as otherwise required by the work of this Contract, the fencing shall be removed from the site upon Acceptance.

3.6 Supplementary Fertilizer Application

- .1 Prior to Acceptance, at a time approved by the Owner's Representative, apply fertilizer formulation **as recommended for the season** at manufacturer's recommended rates evenly to all sodded areas. Water thoroughly.

3.7 Cleaning

- .1 All excess materials and other debris resulting from sodding operations shall be removed from the job site.
- .2 Sweep and flush all walks and paved areas clean to the satisfaction of the Owner's Representative.

END OF SECTION 32 92 23

PART 1: GENERAL

1.1 General Requirements

- .1 Refer to Division 1, General Requirements.
- .2 This section of the specification forms an integral part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 Description

- .1 Supply all products, labour, equipment, and services necessary to install a completely operating drainage system as indicated in the contract documents.

1.3 Related Work

- .1 Site Preparation and Grading Section 01 89 13
- .2 Excavation and Backfill Section 31 23 10
- .3 Growing Medium Section 32 91 13

1.4 Submittals

- .1 Record Drawings: Submit a suitably scaled reproducible copy of the "as-constructed" condition of the system. This drawing should be professionally drawn or produced with the use of computer-aided drafting/design (CADD) where possible. All components of the subsurface drainage system shall be shown as installed with clear measurements provided from an identifiable reference point.
- .2 Submit one graphic sieve analysis of the proposed bedding material and a one litre sample of the proposed drain rock.
- .3 If an alternative is proposed to any specified drainage components, submit samples and or manufacturer's data sheets for approval by Owner's Representative.

1.5 Protection

- .1 Protect existing buildings, equipment, sidewalks, landscape reference points, monuments, markers and other completed work. Make good any damage resulting from work of this Contract at no expense to the Board.
- .2 Do not park vehicles on the site in areas where the work will be undertaken without express written consent of the Board. Utilize only such equipment/vehicles essential for construction of the system.
- .3 Trenching and other excavations for vaults, valve boxes etc. are not to be left open during non-work hours of operation unless they are protected to current WorkSafeBC Standards. Cover/mark/protect, as necessary, all open excavations to ensure public safety.

1.6 Site Conditions

- .1 Existing Conditions/Underground Services: Verify the existence and location of all on site utilities/underground services by hand digging or use of an electronic toning device or M-Scope. Mark the location of all buried cables, conduits, pipes etc. **prior to any trenching.** Cooperate with the Board and utility companies to keep their respective utilities in operation. Notify Owner's Representative immediately for directions as to the procedure should any piping utilities be encountered during excavation.
- .2 Site Preparation: Prior to the work of this Section, carefully inspect any installed work of other trades or contractors and verify all such work is complete to the extent that this work may commence properly.
- 3 Field Measurements: Make all measurements in the field and adjust the design to meet the on site conditions to ensure precise fit of items in accordance with the original design.
- .4 Discrepancies: In the event of a major discrepancy, errors or conflicts between the drawings and the actual site conditions, immediately notify Owner's Representative as to procedure before proceeding with work.
- .5 Repair to Underground Services: Repair all damage to underground services caused by the work of this Contract. Damage to services that are shown on the drawings or have been brought to the Contractor's attention in the field prior to commencement or during construction of the work shall be repaired in entirety at the Contractor's expense. Damage to services that were clearly unforeseen/unknown of existence (provided that all reasonable measures were undertaken by the Contractor to ascertain the existence of these services) shall be repaired in accordance with the Changes clause of the General Conditions. Notify Owner's Representative of damage immediately.

PART 2: PRODUCTS

2.1 Drain Pipe

- .1 Perforated Pipe: 100mm dia . **CSA** SDR-35 Rigid Perforated Drain Pipe.
- .2 Solid Pipe: 250 mm dia. SDR 35 Rigid Non Perforated Drain Pipe.
- .3 All pipes and fittings that are polyvinyl chloride (PVC) must conform to CSA B182.1-96M.

2.2 Drainage Structures

- .1 Area Drains: **The Park Board does not accept any plastic (PVC) drains or drainage structures.** Area drains should be designed for outdoor use, complete with square bolt-down cast iron or bronze grate and sediment bucket. Product to be heavy-duty grade and by Zurn, or pre-approved equivalent. All area drains shall be sized for area and to be a minimum of 8 inches square.

- .2 Lawn Basins/Catch Basins: Precast concrete barrels, lids and riser rings to ASTM C478 complete with galvanized steel rungs (where specified), sized to suit application and a minimum diameter of 600 mm. As supplied by Ocean Construction Supplies **or pre-approved equivalent**. Cast Iron grate and frame by Dobney Foundry (typical, No. B26 B grate and frame for 600 dia. precast concrete barrels, or equivalent).
- .3 Drain Rock: 19 to 25 mm (3/4"-1") diameter clear gravel drain rock (uniform clear crush or round free) and free of silt, sand and clay with the following gradations:
- | Sieve size | % Passing (by weight) |
|-----------------|-----------------------|
| 25 mm (1 in) | 100 |
| 19 mm (3/4 in) | 0 - 100 |
| 12.5 mm (No. 8) | 0 - 30 |
| 9.5 mm (No. 16) | 0 - 3 |
- .4 Filter Gravel: Shall be bird's-eye clean gravel with 98% passing the 7.5mm (5/16") sieve, 95% retained by the 4.76 sieve and less than 1% passing the 2.36mm sieve. The material will be clean free of organic, oil, grease or toxic materials.

2.3 Filter Fabric

- .1 The Owner does not incorporate filter fabric in its subsurface drainage systems.

2.4 Clean-Outs

- .1 Clean-outs are required all drain lines.

2.5 Approved Equals

- .1 All items as specified or pre-approved equivalents.

PART 3: EXECUTION

3.1 Inspection and Layout

- .1 Provide Owner's Representative 48 hours advance notice for inspection and approval of all subgrade prior to placing drain lines. Report any unsatisfactory conditions to Owner's Representative.
- .2 Layout the piping and drainage structure locations with flags or stakes and obtain the Owner's Representative's approval before proceeding. The layout shall be in accordance with the drawing(s). Route piping to take into account site elevation changes and locate drainage structures to maximize run-off collection. Alternative layouts shall be approved by Owner's Representative and indicated on the Record Drawings.

- .3 Coordinate exact locations of lines, clean-outs and structures, with planting locations to avoid conflicts and damage to plants during installation. Stake locations for approval by Owner's Representative. Verify grades for all drainage components.
- .4 Closing in Uninspected Work:
 - .1 Obtain approval of Owner's Representative before backfilling any sections of the subsurface drainage system.
 - .2 Any work closed in before inspection will be required to be exposed for inspection at no extra cost to the Owner.

3.2 Installation Specification

- .1 All excavation shall be undertaken in accordance with the City of Vancouver's Policy and Standard Operating Procedure- Soil and Excavation Water Contamination Management.
- .2 Area Drains: Excavate as required and perform all inlet and outlet connections as per drawings and or manufacturer's recommended installation methods. Backfill with drain rock and install as per details.
- .3 Lawn Basins: Excavate as required and perform all inlet and outlet connections as per drawings and or manufacturer's recommended installation methods. Backfill with drain rock and install as per details.
- .4 Clean-Outs: Excavate as required and perform all inlet and outlet connections as per drawings and or manufacturer's recommended installation methods. Backfill with drain rock and install as per details.
- .5 Trenching and Drain Pipe Installation:
 - .1 Open excavation shall be carried out in a safe and orderly manner and in accordance with the requirements of the Workers' Compensation Act of B.C. Approved shoring shall be used where required for safe working conditions.
 - .2 All trenches are to be hand or machine excavated. All trenches shall be dug on the alignment and to the depth required as shown on the drawings and as stated herein. Trenches are to be straight with uniform slopes to the bottom of all trenches.
 - .3 Where the pipes are to be laid in sub-surface material the trench shall be excavated to a depth at least 100 mm below the bottom of the pipe elevation or as detailed.
The tops of pipes are to be a minimum of 500 mm (20 in) below the final grades.
 - .4 Prior to backfilling, all lines, connections and fittings shall be inspected by Owner's Representative where required.
 - .6 Trenches shall be at least 600mm away from paving stones or other hard surfaces to avoid undermining such surface or its edge retention.

- .7 Backfilling shall take place in an orderly fashion. Place drain rock material to the full width of the trench bottom, with minimum bedding depth to be 100 mm. Shape bed true to grade to provide continuous, uniform bearing surface for pipe. After pipe is in place, backfill to allow for a minimum of 200 mm of drain rock over the surface of the pipe. Place a uniform 75 mm of bird's eye gravel on top of drain rock. The remainder of the backfill to finish grade shall be with growing medium free of rocks and other unsuitable materials that could damage the pipe or create unusual settling conditions.
- .8 Compact the growing medium to the same density as the native material in the trench sidewalls to prevent differential settlement.
- .9 Contractor is responsible to repair all trenches which have settled below the adjacent grade for a period of one (1) year from date of Substantial Performance.
- .10 **The Owner does not accept any material refuse such as pipe pieces, rags, fittings or other waste left as backfill in any trenches.**
- .11 No drainage line shall be directly over and parallel to another drainage line or service line of any other trade. Ensure minimum horizontal and vertical clearance requirements as dictated by Canadian Electrical Code for all piping installations near any electrical conduit/service.
- .12 **Perforated and Solid SDR Pipe:** Place bedding and/or drain rock material and install pipe in locations shown as per details and plans. Comply with all the manufacturer's printed data and recommendations regarding pipe installation, cleaning, fitting preparation and correct joining techniques.
- .13 All pipe inverts shall be installed within 15mm of design grades and bedded to provide uniform falls to drain structures.

3.3 Site Maintenance/Clean-Up

- .1 The job site shall be kept in a neat, clean and orderly condition at all times during the installation process.
- .2 Trenching, laying pipe and backfilling shall be continuous so that the amount of open trenching at the end of each workday is minimized. Any open trench or other excavations shall be barricaded and marked with high visibility marking tape to current WorkSafeBC requirements.
- .3 Any damage to paving, planting or any other structures/elements due to settlement of improperly compacted trenches shall be immediately repaired at the Contractor's expense to satisfaction of Owner's Representative.
- .4 Remove and dispose of off site all surplus material, excess excavated materials, trash, debris and waste material from the work of this Section.

END OF SECTION 33 46 16