

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/warrantees/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

VPART 1: GENERAL

1.1 General Requirements

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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.
- .6 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
- .7 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.
- .8 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
- .9 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

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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 | Geotechnical Report | Section 00 31 32 |
| .2 | Shrub and Tree Preservation | Section 32 01 91 |
| .3 | Subsurface Drainage | Section 33 46 16 |
| .4 | 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 specifications as required (32 01 56).** 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% fines passing a No. 200 (0.075mm) sieve when tested according to ASTM designation C-136. The Owner's Representative may approve alternatives.

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, Nillex 4551 as manufactured by Nillex, 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 Shrub and Tree Preservation Section 32 01 56

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 33 00
- .4 Concrete Finishing Section 03 35 00

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 shop drawings illustrating the form tie layout for all concrete surfaces exposed to view.
- .2 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

- .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 manufacturer's 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 Formwork 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, rises, 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 1.0m high x detailed thickness of cast in place concrete wall. Mock-up shall include a representative of all wall elements noted in the construction details and plans including but not limited skate board abatement, reveals, 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

.2 Walls and Columns:

Minimum 28 Day Strength	28 MPa
Slump	75mm, (3"), +/- 20mm (3/4")
Maximum Aggregate Size	19mm (3/4")
Water Cement Ratio	0.55
Air Content	4 – 7%
Exposure Class	F-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 |
| .4 | Abrasive Blast Finish | Section 03 35 10 |

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 Concesive 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 Integral Liquid Colour Additive:** Iron oxide pigment suitable for sandblasted concrete that will produce a uniform, consistent colour. Colour pigment shall be permanent, inert, stable in atmospheric conditions, sun fast, weather resistant, alkali resistant, lime proof and non-bleeding. Particle size shall be 95to 99% minus 325 mesh.
 - .1 Acceptable products include; SGS Color-Flo Liquid Colours, by Solomon Colors, Springfield, Illinois, sgs@solomoncolor.com or pre approved equal.
 - .2 Colour as indicated on Contract drawings.
- 2.5 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 cheek wall**
 - .2 Concrete stairs (anti graffiti coating to risers and treads)**
 - .3 Concrete seat step**
 - .4 Concrete wall**

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 Sandblast Surface Finish: On concrete surfaces noted on drawings as per Section 03351.

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, which ever 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

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 miscellaneous stone work as indicated in the contract documents. Work includes but is not limited to:
 - .1 Accessory Granite Elements, Supply and Install
 - .1 Granite Block Shoreline Markers as per landscape drawings.
 - .2 Granite Blocks @ Sports Court as per landscape drawings.
 - .3 Granite Block and Steps @ Play Mounds / lawn terrace as per landscape drawings.
 - .4 Granite Edging and Setts.
 - .5 Granite Blocks and Steps at North Mound.
 - .6 Granite Slabs under benches and picnic tables.
 - .7 Granite wall caps as per landscape details.
 - .8 Granite Shoreline.
 - .9 Granite Block Terrace @ retaining headwall.
 - .2 Accessory Basalt Elements, Supply and Install
 - .1 Basalt Stone for Basalt Walls
- .2 All stone to be quarried from Quarries in British Columbia
- .3 All stone to be finished in British Columbia.

1.3 Related Work

- .1 Cast-In-Place Concrete Section 03 33 00
- .2 Excavation and Backfill Section 31 23 10

1.4 Quality Assurance

- .1 Source Supply: All material shall be obtained from quarries having adequate capacity and facilities to meet specified requirements. Cutting and finishing shall be carried out by a firm equipped to process material promptly on order and in strict accord with specifications.
- .2 All materials delivered to the site shall be clean, in good condition free of defects, stains and markings.

1.5 Protection

- .1 Site and Adjacent Property

- .1 Protect all work from damage related to weather, other trades, and/or on site construction activities.
- .2 Protect adjacent property and construction activities from damage arising from this contract.
- .2 Finished Stone
 - .1 Properly protect all stone against damage in transit or at project site.
 - .2 Place wood timbers under stone when stored on open ground to prevent contact with grade.

1.6 Existing Utilities and Structures

- .1 Exact location of all existing utilities and structures, whether or not indicated on the drawings will be determined by the Contractor. Conduct work so as to prevent interruption of service or damage.
- .2 Ensure that all underground utilities including drainage and irrigation systems are clearly located and protected during construction. Make good all damages.

1.7 Submittals

- .1 Material Samples; Two weeks prior to the start of construction submit to the Owner's Representative three (3) representative samples to the sizes and finishes noted. Clearly label the stone name or product name, quarry location, various finishes, project name and date.
 - .1 Granite: 300mm x 300mm x 100mm samples illustrating the following finishes on at least one face of each sample; split face finish, flame finish and or tumbled. Sample finish required for each for granite block and granite edging.
 - .2 Basalt Wall Stone: Representative of size, shape colour, texture.
- .2 All materials delivered to site will conform to selected samples, subject to normal stone variations. One (1) submitted sample will be retained on site at Site Office as record of approved material.

1.8 Schedule

- 1 Provide the Owner's Representative three (3) copies of a schedule outlining the key milestone dates related to quantity and sequence as required to properly expedite installation.
 - .1 The completion of quarry extraction and dressing of stone
 - .2 Delivery to the site
 - .3 Installation and completion

1.9 Examination

- .1 Prior to the commencement of work of this section, inspect all surfaces on which work is to be laid and ascertain that surfaces are adequate in relationship to the preparation of work to be performed under this section. Commencement of work will signify acceptance.
- .2 Report any defects or perceived conflicts to the Owner's Representative.

PART 2: PRODUCTS

2.1 Approved Equals

- .1 It is the intent of the City to specify Locally Quarried and Finished Stone.
- .2 Should the Contractor be seeking permission for use of an approved equal beyond the suppliers identified in this specification the following process shall be followed for the review and approval of an alternate material. See granite types for acceptable approved equal supply locations in Section 2.01.
- .3 Within the first ten (10) business days from the date of the Tender call for work of this section the Contractor shall provide in writing either by fax or email a notification to the Owner's Representative of the intention to seek an approved equal.
- .4 Following notification and within the first fourteen (14) days from the date of the Tender call supply documentation as noted to the Owner's Representative at no cost to the Owner or the Owner's Representative. Documentation to include;
 - .1 One (1) 200 mm(width) x 150 mm(depth) x 600mm(length) sample of material proposed as 'Approved Equal'. The sample shall clearly illustrate specified finishes and be labeled with the supplier name, address and phone number, stone name or product name, quarry location, and type of stone.
- .5 Owner's Representative shall review proposal for 'Approved Equal' and notify the Contractor in writing either by fax or email that the sample proposed as an 'Approved Equal' has been either accepted or rejected within five (5) business days of receipt of sample.
- .6 Rejected proposals will not be considered during the Tender evaluation.

2.2 Materials

- .1 Granite Seating/Stepping Blocks
 - .1 All Granite to be quarried from a **Canadian Quarry** and locally supplied.
 - .2 Supply granite blocks to sizes and surface finishes as noted on the drawings.
 - .3 Split face on 4 sides with top face tolerances of 75mm – 100mm variation when placed against a plumb vertical edge. Ensure not more than 30% of drill/ wedge grooves remain on block. Tolerances on other 4 split faces to be 75mm - 100mm when placed against a plumb vertical edge. (see granite block schedule)
 - .4 Free of cracks, seams or starts that may impair structural integrity or function. Minor variations in stone characteristic will be acceptable.

- .5 All granite to be generally salt and pepper mix character look of grey, black and white fleck. Acceptable suppliers and proprietary products include;
 - .1 Hardy Island Granite as supplied by Bedrock Granite Sales – Coquitlam, BC 604.941.7783.
 - .2 Polycor – Quebec, QC 418.692.4695
 - .3 Granicor – Saint-Augustin, QC. 418.878.3530
 - .4 **Pre approved equal for other Canadian quarries only accepted.**

- .2 Granite Blocks Terrace at Retaining Head Wall
 - .1 All Granite to be quarried from a **Canadian Quarry** and locally supplied.
 - .2 Supply granite blocks to sizes and surface finishes as noted on the drawings.
 - .3 Split face on 2 sides with top and front face tolerances of 25mm – 45mm variation when placed against a plumb vertical edge. Ensure not more than 30% of drill/wedge grooves remain on block. (see granite block schedule)
 - .3 Free of cracks, seams or starts that may impair structural integrity or function. Minor variations in stone characteristic will be acceptable.
 - .4 All granite to be generally salt and pepper mix character look of grey, black and white fleck. Acceptable suppliers and proprietary products include;
 - .1 Hardy Island Granite as supplied by Bedrock Granite Sales – Coquitlam, BC 604.941.7783.
 - .2 Polycor – Quebec, QC 418.692.4695
 - .3 Granicor – Saint-Augustin, QC. 418.878.3530
 - .4 **Pre approved equal for other Canadian quarries only accepted.**

- .3 Granite Blocks at Sports Court
 - .1 All Granite to be quarried from a **Canadian Quarry** and locally supplied.
 - .2 Supply granite blocks to sizes and surface finishes as noted on the drawings.
 - .3 Saw Cut all sides and Flame Finished on 5 sides with bottom left unfinished. Patterns to etched and or patterned when sides are flamed finished. Landscape architect to provide digital and to scale patterns. Patterns noted on Granite Legend.
 - .4 Free of cracks, seams or starts that may impair structural integrity or function. Minor variations in stone characteristic will be acceptable.
 - .5 All granite to be generally salt and pepper mix character look of grey, black and white fleck. Acceptable suppliers and proprietary products include;
 - .1 Hardy Island Granite as supplied by Bedrock Granite Sales – Coquitlam, BC 604.941.7783.
 - .2 Polycor – Quebec, QC 418.692.4695
 - .3 Granicor – Saint-Augustin, QC. 418.878.3530
 - .4 **Pre approved equal for other Canadian quarries only accepted.**

- .4 Granite Block Steps at Play Mound

- .1 All Granite to be quarried from a **Canadian Quarry** and locally supplied.
- .2 Supply granite blocks to sizes and surface finishes as noted on the drawings.
- .3 Split face on 4 sides with top face tolerances of 25mm – 45mm variation when placed against a plumb vertical edge. Ensure not more than 30% of drill/ wedge grooves remain on block. Tolerances on other 3 split faces to be 25mm - 60mm when placed against a plumb vertical edge. (see granite block schedule)
- .3 Free of cracks, seams or starts that may impair structural integrity or function. Minor variations in stone characteristic will be acceptable.
- .4 All granite to be generally salt and pepper mix character look of grey, black and white fleck. Acceptable suppliers and proprietary products include;
 - .1 Hardy Island Granite as supplied by Bedrock Granite Sales – Coquitlam, BC 604.941.7783.
 - .2 Polycor – Quebec, QC 418.692.4695
 - .3 Granicor – Saint-Augustin, QC. 418.878.3530
 - .4 **Pre approved equal for other Canadian quarries only accepted.**

- .5 Granite Slab and Sett Edging
 - .1 All Granite to be quarried from a **Canadian Quarry** or pre approved as per Section 1.06.
 - .2 Supply granite edges to sizes and surface finishes as noted on the drawings.
 - .3 Split face on one side (top face) with top face tolerances of 10mm - 25mm variation when placed against a plumb vertical edge. (see granite block schedule for sizes)
 - .4 Free of cracks, seams or starts that may impair structural integrity or function. Minor variations in stone characteristic will be acceptable.
 - .5 All granite to be generally salt and pepper mix character look of grey, black and white fleck. Acceptable suppliers and proprietary products include;
 - .1 Hardy Island Granite as supplied by Bedrock Granite Sales – Coquitlam, BC 604.941.7783.
 - .2 Polycor – Quebec, QC 418.692.4695
 - .3 Granicor – Saint-Augustin, QC. 418.878.3530
 - .4 Pre approved equal as per section 1.06.

- .6 Granite Slab Steps at Path and North Mound
 - .1 All Granite to be quarried from a **Canadian Quarry** and locally supplied.
 - .2 Supply granite edges to sizes and surface finishes as noted on the drawings.
 - .3 Saw cut all faces. Flame finish 4 faces, top, front, and sides.
 - .4 Free of cracks, seams or starts that may impair structural integrity or function. Minor variations in stone characteristic will be acceptable.
 - .5 All granite to be generally salt and pepper mix character look of grey, black and white fleck. Acceptable suppliers and proprietary products include;

- .1 Hardy Island Granite as supplied by Bedrock Granite Sales – Coquitlam, BC 604.941.7783.
 - .2 Polycor – Quebec, QC 418.692.4695
 - .3 Granicor – Saint-Augustin, QC. 418.878.3530
 - .4 **Pre approved equal for other Canadian quarries only accepted.**
- .7 Granite Slabs under Benches and Picnic Tables
- .1 All Granite to be quarried from a **Canadian Quarry** and locally supplied.
 - .2 Supply granite edges to sizes and surface finishes as noted on the drawings.
 - .3 Split face on 5 sides (top face & 4 side faces) with top face tolerances of 25mm – 45mm variation when placed against a plumb vertical edge. Ensure not more than 30% of drill/ wedge grooves remain on block.
 - .4 Free of cracks, seams or starts that may impair structural integrity or function. Minor variations in stone characteristic will be acceptable.
 - .5 All granite to be generally salt and pepper mix character look of grey, black and white fleck. Acceptable suppliers and proprietary products include;
 - .1 Hardy Island Granite as supplied by Bedrock Granite Sales – Coquitlam, BC 604.941.7783.
 - .2 Polycor – Quebec, QC 418.692.4695
 - .3 Granicor – Saint-Augustin, QC. 418.878.3530
 - .4 **Pre approved equal for other Canadian quarries only accepted.**
- .8 Granite Wall Cap Stone
- .1 All Granite to be quarried from a **Canadian Quarry** and locally supplied.
 - .2 Supply cap stone to sizes and surface finishes as noted on the drawings.
 - .3 Split face on two faces (top face & front face) with top face tolerances of 25mm - 45mm variation when placed against a plumb vertical edge.
 - .4 Free of cracks, seams or starts that may impair structural integrity or function. Minor variations in stone characteristic will be acceptable.
 - .5 All granite to be generally salt and pepper mix character look of grey, black and white fleck. Acceptable suppliers and proprietary products include;
 - .1 Hardy Island Granite as supplied by Bedrock Granite Sales – Coquitlam, BC 604.941.7783.
 - .2 Polycor – Quebec, QC 418.692.4695
 - .3 Granicor – Saint-Augustin, QC. 418.878.3530
 - .4 **Pre approved equal for other Canadian quarries only accepted.**
- .9 Granite Shoreline
- .1 All Granite to be quarried from a **Canadian Quarry** and locally supplied.
 - .2 Supply stone to sizes and surface finishes as noted on the drawings.

- .3 Split face surface surfaces to have tolerances of 25mm - 45mm variation when placed against a plumb vertical edge. Flame finish surfaces to be rough flame finish.
- .4 Free of cracks, seams or starts that may impair structural integrity or function. Minor variations in stone characteristic will be acceptable.
- .5 Provide sample of engraving for approval by Owner's Representative. Owner's Representative to provide digital text to scale of text to be engraved.
- .5 All granite to be generally salt and pepper mix character look of grey, black and white fleck. Acceptable suppliers and proprietary products include;
 - .1 Hardy Island Granite as supplied by Bedrock Granite Sales – Coquitlam, BC 604.941.7783.
 - .2 Polycor – Quebec, QC 418.692.4695
 - .3 Granicor – Saint-Augustin, QC. 418.878.3530
 - .4 **Pre approved equal for other Canadian quarries only accepted.**
- .10 Accessory Basalt Elements, Supply and Install
 - .1 Free of cracks, seams or starts that may impair structural integrity or function. Minor variations in stone characteristic will be acceptable.
 - .2 All basalt to be predominantly charcoal gray with tan/brown mottling and quarried locally in the Fraser Valley Region of BC. Acceptable suppliers and proprietary products include;
 - .1 Basalt Wallstone as supplied by Northwest Landscape and Stone Supply – Burnaby, BC 604.435.4842
 - .2 Cheakamus Dry Stack Basalt as supplied by Adera Natural Stone Supply – Burnaby BC 604.436.0204
 - .3 Whistler Basalt as supplied by Bedrock Granite Sales – Coquitlam, BC 604.941.7783
 - .4 Pre approved equal as per Section 1.06 Approved Equals.
 - .3 Crushed Granular Base: The 19 mm (3/4") crushed granular base shall consist of sound, durable particle free from clay, organic material or other deleterious matter, evenly graded, to meet the following gradation requirements.

<u>Sieve Size (mm)</u>	<u>Sieve Size (inches/#)</u>	<u>Percent Passing</u>
19	(3/4")	100
12.5	(1/2")	75 – 100
9.5	(3/8")	60 – 90
4.75	(#4)	40 – 70
2.36	(#8)	27 - 55
1.18	(#16)	16 – 42
0.60	(#30)	8 - 30
0.30	(#50)	5 – 20

0.15	(#100)	5 - 15
0.074	(#200)	2 – 8

PART 3: EXECUTION

3.1 Layout

- .1 Prior to the start of construction, stake layout of all granite elements for Owner's Representative review.
- .2 Verify all locations and dimensions and report to Owner's Representative any deviation or conflicts between drawings, specifications and site conditions.

3.2 Subgrade Preparation

- .1 Compact subgrade to 95% Modified Proctor Density.
- .2 Excavate soft and unstable areas of subgrade that cannot be compacted to standard noted, fill and compact with approved granular material.
- .3 Ensure subgrade is true to line and grade and allows for sufficient depth to ensure finish grade can be established as noted on plans.

3.3 Placement of Accessory Granite and Basalt Elements

- .1 Examine material prior to installation for visible defects or damage. Do not install cracked, chipped, stained or physically damaged pieces. Report any damages to Owner's Representative immediately.
- .2 Place crushed granular base to lines and levels noted on drawings.
- .3 Set Granite Block Shoreline Marker and other Granite Blocks to lines and levels noted on drawings.
 - .1 Set blocks to pattern and layout indicated on Contract Documents.
 - .2 Ensure blocks sit true, level, and do not rock or move under pedestrian load.
 - .3 Do not use shims or spacers to level blocks. Blocks to sit tight edge to edge to lines and grades indicated on drawings.
- .4 Dry Stack Basalt Masonry Wall
 - .1 Set blocks to pattern and layout indicated on Contract Documents.
 - .2 Ensure blocks sit true, level, and do not rock or move under pedestrian load.
 - .3 Minimize use of basalt shims or spacers to level blocks. Blocks to sit tight edge to edge to lines and grades indicated on drawings.
 - .4 Prepare 2-metre long sample wall section for review and approval by Owner's Representative

3.4 Adjust and Clean

- .1 Carefully clean all stone removing all dirt and debris from all surfaces.
- .2 Remove and dispose of off site all debris as a result of work in this section.

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 install miscellaneous metalwork items as indicated in the contract documents.
 - .1 Handrails,
 - .2 Guardrails,
 - .3 Balustrades.

1.3 Related Work

- .1 Exterior Painting and Powder Coating Section 09 96 00
- .2 Site Furnishings Section 32 37 00

1.4 Reference Standards

- .1 Conform to CAN3-S16.1-M for design of steel structures, unit stresses and workmanship.
- .2 Handrails and balustrades when installed shall conform to local municipal loading requirements. Maximum deflection 1/360 of the span.

1.4 Quality Assurance

- .1 Welding work to conform to CSA Standard W59 and shall only be performed by organizations and operators qualified under CSA Welding Qualification Code, CSA W47.
- .2 Electrodes to conform to CSA Standard W48.
- .3 Painted finishes of exterior galvanized metal to conform with requirements of Section 09 96 00. Surface preparation for painting of exterior exposed steel to conform to Steel Structural Painting Council Standards - refer also to Section 09 96 00.

1.5 Submittals

- .1 Submit shop drawings of all miscellaneous metalwork for review by Owner's Representative. Completely detail items indicating all dimensions, materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcements and fixing details and accessories. **Confirm all dimensions on site prior to fabrication.**
- .2 Submit shop drawings in accordance with General Condition GC 34 as amended under Supplementary Conditions and Section 01 33 23 (as applicable).

- .3 Do not commence fabrication of miscellaneous metal items until shop drawings are reviewed/stamped by the Owner's Representative.
- .4 Shop drawings for metal balustrades, railings and guardrails, including all connection detailing, shall be sealed by a Professional Engineer registered in the province of B.C.

1.7 Protection

- .1 Use all means necessary to protect miscellaneous metal before, during and after installation and to protect the installed work and materials of all other items until Substantial Completion.
- .2 In the event of damage immediately make all repairs and replacements necessary to the approval of the Owner's Representative at no extra cost.

1.9 Quality Assurance

- .1 Prior to commencement of any work of this Section, the contractor is required to make contact with the designated Owner's Representative properly authorized to make project decisions, and to determine schedule of inspections required and parties to be present for review/approval.
- .2 All work is to be presented at fabricator's shop for inspection of workmanship and materials prior to arrival on site and/or forwarding to paint shop for finishing work. Notify Owner's Representative a minimum of **forty-eight (48) hours** prior to all required inspections.

PART 2: PRODUCTS

- 2.1 **Steel:** shall be one of the following types as designated on the drawings or specified herein.
 - .1 Structural steel, miscellaneous steel shapes, conforming to CAN3-G40.21-98, Grade 300W, 44W for flat shapes.
 - .2 Seamless hollow structural sections, conforming to CAN3-G40.21, Grade 50W, Type H.
 - .3 Pipe, schedule 40 standard weight, conforming to ASTM Specification A53, Grade A.
Include galvanized sleeves for setting verticals, as required. Bends as detailed.
- 2.2 **Bolts, Nuts and Washers:** In accordance with material and size requirements of CAN3-S16.1-94M.(ASTM A307).
- 2.3 **Galvanizing:** Hot dipped galvanizing with zinc coating 610 grams per square meter area conforming to CSA G164-M92.
- 2.4 **Galvanized Metal Primer:** Shall conform to CGSB 1-GP-198-95 Cementitious Primer for Galvanized Surfaces.
- 2.5 **Non-Galvanized Ferrous Metal Primer:** Shall conform to CGSB 1-GP-40M or 1-GP-132M90 Zinc Chromate Primer for Low Moisture Sensitivity.

- 2.6 Grout:** For fill at pipe sleeves and other locations use a, non-shrink, non-metallic, non-corrosive, flowing, 24h, MPa.15, pullout strength 7.0 MPa grout for setting metal posts.
- 2.7 Concrete Inserts:** Threaded or wedge type galvanized ferrous castings, either malleable iron to ASTM A47, or cast steel to ASTM A27 Standards. Provide bolts, washers and shims as required hot-dip galvanized as specified.
- 2.8 Fastenings:** Supply and install all hardware as required for installation. Installation hardware shall be sized to suit the material to which railings and other miscellaneous metal items are attached and shall meet the loading requirements. Hilti sleeve/chemical anchors as noted by Engineer. Submit samples for approval.
- 2.9 Angles, Clips, Channels etc.:** Provide all angles, anchors, clips, plates, channels, etc. required to support or fix items of work installed by other sections save where specifically excepted and supply and fix any other miscellaneous ironwork required in the work.
- 2.10 Delivery**
- .1 All miscellaneous metal items delivered to the site shall be tagged and supplied with sufficient information for identification and fixing in correct location.
 - .2 Arrange delivery in such sequence and manner to permit the most efficient and economical performance of this section of work.
- 2.11 Approved Equals**
- .1 All items as specified or pre-approved equals.

PART 3: EXECUTION

3.1 Examination

- .1 Examine all details of the work as related to this section and other sections. Ensure that all conditions are suitable to provide a complete and satisfactory installation or be responsible for any additional costs involved.
- .2 Carefully inspect all surfaces and the work of other trades as it relates to the work of this Section for defects and discrepancies and report it to the Owner's Representative.

3.2 Fabrication

- .1 Verify all dimensions on site prior to proceeding with shop fabrication.
- .2 Fabricate all work in accordance with details shown on drawings and reviewed/stamped shop drawings.
- .3 Fabricate items from steel unless otherwise noted.
- .4 Where possible, fit and shop assemble work, ready for erection.
- .5 Fit and shop assemble in largest practical sections for delivery to the site.

- .6 Fabricate and assemble miscellaneous metal items true, square and free from warpage or other defects.
- .7 Items to be fixed to concrete or masonry with expansion shields, expansion bolts or self-drilling anchors. Fixing to be of correct size to suit load being imposed.
- .8 Design, fabrication and workmanship shall conform to CAN3-S16.1-M94.
- .9 Welding shall conform to CSA W59-M89.
- .10 Use self-tapping shake-proof flat-headed screws on items requiring assembly by screws or as indicated.
- .11 Grind smooth all exposed welds, sharp edges, angles and corners.
- .12 Ensure exposed welds are continuous for length of each joint.
- .13 Bolted work shall be carefully tightened with threads of bolts nicked to prevent subsequent loosening, unless work indicated is noted as removable.
- .14 Drill or punch all holes required for the attachment of work of other trades and bolted connections.
- .15 Provide smooth exposed surfaces with all fastenings and connections hidden where possible.
- .16 Curved work shall be true to radii shown.
- .17 Galvanize all steel noted on drawings after fabrication of Sections prior to delivery to site.

3.3 Shop Preparation and Priming

- .1 All metal items shall be hot-dipped galvanized, primed and painted to requirements of Section 09900 - Aliphatic Urethane except where shown otherwise.
- .2 Apply one shop coat of primer to all miscellaneous metal items, except any items specified to be factory finished and any concrete encased items.
- .3 Prepare all miscellaneous metal for priming to Steel Structural Painting Council Standards; S.S.P.C. SP-1-82 Solvent Cleaning, followed by S.S.P.C. SP-6-85 Commercial Blast Cleaning.(if applicable and recommended by Owner's Representative). Refer to SSPC Manuals, Guide to Good Painting Practices Volumes 1 and 2 for complete details.
- .4 Apply primer in accordance with manufacturer's directions.
- .5 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, and grease. Do not paint when temperature is lower than 7 degrees Celsius.
- .6 Clean surfaces to be field welded; do not paint.

3.4 Preparation for Powder Coating

- .1 Thoroughly descale all steel work after fabrication. Remove roughness and irregularities by grinding and clean wire brush. Remove oil and grease from steel surfaces.
- .2 Do not coat surfaces that are to be field welded.
- .3 Coat steel as soon as possible after cleaning.

3.5 Erection

- .1 Erect metalwork square, plumb, straight and true, accurately fitted, with tight joints and intersections.
- .2 Provide suitable means of anchorage acceptable to Owner's Representative, such as dowels, anchor chips, bar anchors, expansion bolts and shields, and toggles. Ensure that items cast into concrete or built into masonry are given to the appropriate trades together with setting templates.
- .3 Execute all metal work in a thorough and workmanlike manner according to best shop practices. Material cut from stock to be sheared or parted straight and all debarred. Where cuts are burned, grind off clean and true to line. Exposed welding or welding in fitted surfaces to be ground smooth or fileted as required. Fabricate all items accurately, true to line and dimension.
- .4 Make field connections with bolts to CAN3-S16.1-M84, or weld.
- .5 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .6 Touch up rivets, field welds, bolts and burnt or scratched surfaces after completion or erection with appropriate primer.
- .7 Touch up galvanized surfaces with zinc primer where burned by field welding - refer to Section 09900. Ensure that all welds have been ground smooth and flush prior to applying zinc primer.
- .8 Fastenings shall be concealed where possible, sizes and spacing as indicated on the drawings, and shall conform to local municipal requirements, CSA Specifications and best trade practices to give permanent stability and good appearance. Avoid staining, scratches, damage and distortion of materials.
- .9 Fix in place with epoxy grout where applicable. Remove excess epoxy grout by approved means, leaving the surface around each handrail base smooth and clean.

3.6 Installation

- .1 Install handrails in concrete by inserting over spigot as detailed, formed in concrete. Secure with stainless steel bolts, drilling concrete and installing wedge anchors, two per connection or as otherwise detailed. Support in accurate final location, plumb and level.

3.7 Powder Coating (if applicable):

- .1 Powder coating shall be carried out in shop by a pre- approved powder coating company. Minor marks in powder coating due to delivery and storage shall be promptly repaired by an approved method-confirm with Owner's Representative prior to repair. Damaged surfaces determined to be unacceptable for on-site repair shall be removed and re-coated at the plant.
- .2 Submit colour sample to the Owner's Representative, size of sample at least 100mm x 100mm. Final colour shall match approved samples.

- .3 Apply powder coating to match approved sample, leaving final surfaces uniform. Hard and dry and free from foreign matter and other flaws. Repair flawed items completely; patching will not be acceptable.

3.8 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 Erection/installation of all miscellaneous metal shall be continuous so that the amount of exposed/unprotected/incomplete work at the end of each workday is minimized. Any unsafe conditions created by work of this Section shall be barricaded and marked with high visibility marking tape to current WorkSafeBC requirements.
- .3 Any damage to paving, planting or any other structure/element due to work of this Section 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, residue and waste material from the work of this Section.

END OF SECTION 05 70 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 exterior architectural wood work as indicated in the contract documents.
 - .1 Wood Topped Benches

1.3 Related Work

- .1 Cast-in-Place Concrete Section 03 33 00
- .2 Growing Medium Preparation and Placement Section 32 91 13

1.4 Reference Standards

- .1 Exterior wood, wood sizes and surface finish shall conform to the following:
 - .1 NLGA – National Lumber Grades Authority - Latest Edition, Standard Grading Rules of B.C. Coast Dimension Lumber Grades.
 - .2 WCLIB – West Coast Lumber Inspection Bureau
 - .3 WRCLA – Western Red Cedar Lumber Association
 - .4 IWPA – International Wood Products Association
 - .5 BC Building Code – Current Edition

1.5 Submittals

- .1 Samples:
 - .1 Wood: Submit two 600mm (24") long samples of each wood member element forming a finished surface. Samples are to be clearly labeled with wood type, grade, origin and member dimension.
 - .2 Fasteners, Plates and Connectors: Product information sheet and one (1) representative sample of each element.
 - .3 Hardware: Product information sheet and one (1) representative sample of each element. Sample, if approved may be used in the final installation.
- .2 Shop drawings: Shop drawings shall illustrate details necessary for fabrication and erection of the component parts including location, type, size and detail of all fastening systems.
- .3 Mock Ups: Prior to the complete fabrication of exterior architectural elements provide a full-scale mock-up the following elements:

- .1 Countersunk and plugged fastener.
- .2 Trellis end condition
- .3 Wood treatment sample

1.6 Quality Assurance

- .1 Qualifications of Contractor and Crew:
 - .1 The Contractor performing work of this section shall have a successfully completed the Interprovincial Standards Exam and hold Interprovincial Red Seal status as a carpenter. Prior to the start of work of this section the Contractor shall; provide the Owner's Representative with written confirmation that he will maintain a crew with at least one carpenter holding Red Seal status.
- .2 Erection methods and procedures shall meet the minimum standards set out by the BC Building Code. Where this specification exceeds this standard the specification shall govern.

PART 2: PRODUCTS

2.1 Lumber

- .1 Lumber Grades
 - .1 Shall conform with the NGLA latest edition Standard Grading Rules of B.C. Coast Dimension Lumber Grades.
 - .2 All S4S unless otherwise indicated.
 - .3 Moisture content (MC) at time of installation shall be in accordance with the NLGA current standards.
 - .1 19% or less kiln dried or air seasoned for structural or appearance graded.
 - .4 All lumber shall be straight, sound, and free of splits, warps and cracks.
- .2 Western Red Cedar:
 - .1 *Standard Beams, Posts and Timbers – Western Red Cedar, S4S, 'D or better', clear, (NLGA 203b,c,d WCLIB 150-b,c,d, air dried/ seasoned.*
 - .2 *Decking - Western Red Cedar, S4S, WRCLA 'Architect' knotty or better, air dried/seasoned.*
 - .3 *Lumber - Western Red Cedar, S4S, 'A' Clear (NLGA 202b, WCLIB 102-c or kiln dried.*
- .3 Pressure Treated Lumber

NOTE: ACQ is the default pressure treated wood. CCA treated wood is not to be specified. All fasteners for ACQ treated wood must be stainless steel.

- .1 Pressure-treated members shall be cut and machined prior to application of preservative. Where precutting is not feasible then untreated surfaces exposed due to cutting or boring shall be thoroughly soaked with the same preservative used in the initial treatment.
- .2 All lumber which has been pressure-treated shall bear the inspection and classification label of the Underwriter's Laboratories of Canada as well as documentation confirming treatment meets or exceeds standards specified.
- .4 ACQ (Alkaline Copper Quat) treated Hem Fir to CSA 080-97
 - .1 Deck Boards and - CSA 080.36, Use category UC3.2, Residential Product Group B, ACQ –C.
 - .2 Railing components - CSA 080.36, Use category UC3.2, Residential Product Group B, ACQ – D.
 - .3 Deck Joists and Beams – CSA 080.2, Use category UC3.2, Residential Product Group C, ACQ – C.
 - .4 Deck Supports and Guardrails (4x and 6x members in contact with ground or water) – CSA 080.2, Use category UC4.1, Residential Product Group D, ACQ – C.
 - .5 Posts (8x members in contact with ground or water) – CSA 080.2, use category UC4.1, Residential Product Group D, ACQ – D.
- .5 Exotic Hardwood Decking This includes Ipe and other tropical hardwoods
 - .1 IWPA Premium AD S4S E4E, species as indicated on the contract drawings. Average moisture content not exceeding 12.
- .6 End Sealer: Non-toxic wax based end sealer. Acceptable products include Anchorseal 2 by the UC Coatings Corporation, Ipe Seal distributed by Goodfellow Inc. Richmond BC or pre approved equal.
- .7 Galvanizing Touch Up: zinc rich (minimum 96% zinc) paint or powder aerosol spray. Acceptable products include Zinga and Zingaspray as supplied by Zinga – USA (www.zinga-usa.com) or pre approved equal.

2.2 Fasteners

- .1 All fasteners and metals to meet the following standards:
 - .1 Fasteners - Hot Dip Galvanized to ASTM A153 (Class C or D).
 - .2 Metal Hangers and Plates – Hot dipped galvanized to ASTM A653 G185 continuously galvanized sheet metal or ASTM A123 batch galvanizing after fabrication.
 - .3 Stainless Steel - Fasteners, metal hangers and plates – Type 304.
 - .4 Organic Polymeric Coated Electroplated Fasteners, Metal Hangers and Plates – Provide product information for Owner's Representative review prior to use.
 - .5 Electroplated galvanized fasteners are not acceptable.

2.3 Miscellaneous Hardware

- .1 Hinges, hasps, door knobs, locksets and other miscellaneous elements to be suitable for exposed outdoor use and compatible with use and material indicated on contract drawings.

2.4 Adhesives

- .1 Exterior Waterproof Wood Glue (non load bearing applications): Exceed ANSI/HPVA Type I water resistant specifications, non-toxic, solvent clean, water clean up. Acceptable products include; Titebond III as manufactured by Franklin International, Columbus Ohio.
- .2 Construction Adhesive: Synthetic rubber base, non-flamable, water resistant adhesive. Acceptable products include; Lepage PL9000 Premium Construction Adhesive as manufactured by Henkel Canada, Mississauga Ontario.

2.5 Moisture Break

- .1 Moisture Break; Foamsealr foam sill gasket by Owens Corning or approved equal.

PART 3: EXECUTION

3.1 Installation

- .1 Install members to lines, levels and elevations indicated.
- .2 Space members uniformly ensuring adequate allowance for material expansion.
- .3 Unless otherwise noted on drawings or details ease all edges of wood members.
- .4 Use hot-dipped galvanized, stainless steel or approved non-corrosive fasteners. Unless otherwise noted on drawings fasteners sizes and types shall be as follows:

19mm (3/4") members or thinner	Casing Nails
38mm (1/2") members	Screw
89 mm (3 1/2") or larger	Bolt and washer, threaded rod bolt and washer assembly

- .5 Touch up all areas of galvanized steel that have been marred, scratched or compromised during installation.
- .6 Unless otherwise indicated use joist hangers and connecting plates for structural members hidden from view.
- .7 Where indicated on drawings for fastener to be countersunk the finish surface of the top of the fastener shall be set at least 6mm (1/4") below the finish surface of the wood member.
- .8 Where indicated on the drawings for fastener to be countersunk and plugged the species of wood for the plug shall match the species of wood for the constructed element. All plugs shall be glued in place, be of sufficient thickness to allow for a durable finish, finished flush with surrounding finished surface.
- .9 Where wood is in direct contact with concrete or non-porous materials provide a continuous foam gasket moisture break between the two materials.

3.2 Cleaning

- .1 Upon completion remove from the site all waste and residue from work of this section.
- .2 Pressure Treated Wood: dispose of at approved facility.
- .3 Untreated Wood: dispose of at approved wood recycling facility.

END OF SECTION 06 40 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 all exterior coating work as indicated in the contract documents.
- .2 The work of this contract includes but is not limited to:
 - .1 Surface preparation of substrates as required for acceptance of coating, including but not limited to: high-pressure washing, chemical cleaning, abrasive blast cleaning and making good surfaces and areas to the limits defined under preparation requirements.
 - .2 Removal of shop coatings, cleaning of surfaces and re-applying damaged and/or non-conforming shop coats of coating, other than minimal spot touch-up.
 - .3 Priming and coating of structural steel, miscellaneous metal, aluminium, galvanized steel, and ornamental metal.
 - .4 Provision of safe and adequate ventilation and protection of adjacent components.
 - .5 Touch-up and field coating necessary to repair damage due to installation and construction activity.

1.3 Related Work

- .1 Miscellaneous Metal Section 05 70 00

1.4 Reference Standards

- .1 Master Painters Institute (MPI) - Architectural Painting Specification Manual Identifiers, Evaluation, Systems, Preparation and Approved Product List. (hereafter referred to as the MPI Painting Manual) as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.
- .2 AAMA – American Architectural Manufacturers Association
- .3 SSPC Surface Preparation Standards – Latest Edition
- .4 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

1.5 Quality Assurance

- .1 Preparation of surfaces and application of coating systems shall be in accordance with the applicable chapters of Master Painters Institute (MPI) and Master Painters and Decorators Association (MPDA) Specification Manual (latest edition).
- .2 All work, unless otherwise specified, shall be to Master Painters and Decorators Association 'Premium Grade'.
- .3 The coating products of the coating manufacturer shall be as listed in the MPI Manual (latest edition), under Paint Product Recommendation section, sourced from a single manufacturer and form a fully compatible coating system. A copy of this manual shall be kept in the shop and on site for the full duration of the contract.

1.6 Qualifications

- .1 The Contractor shall have a minimum of five (5) years proven satisfactory performance with:
 - .1 Coating systems specified for this project ,
 - .2 Coating projects of similar size to this project.
- .2 Prior to the start of work of this section the Contractor shall:
 - .1 Provide the Owner's Representative with written confirmation that he will maintain a qualified crew of **Trade Qualified Journeymen Painters** and apprentices with experience in application of coating systems specified for this project throughout the duration of the work.
 - .2 The Trade Qualified Journeymen Painters hold a Provincial or Inter provincial Painter & Decorator or Painting & Decorating Certificate of Qualification throughout the duration of this work. Provide trade certification and apprentice registration numbers to the Owner's Representative.
- .3 Coating Shop:
 - .1 Prior to the start of work of this section Quality Control Inspector (QCI) shall review and approve the Contractors controlled environment to ensure that the finished quality and standards described in this specification are achievable.

1.7 Quality Assurance

- .1 The Contractor shall retain an independent third party Quality Control Inspector (QCI) to carry out the Quality Control for the work of this section. Acceptable third party inspectors include but are not limited to; MPDA Inspection Services Inc., Burnaby, British Columbia.
 - .1 Prior to the start of work of this section the Contractor shall provide written documentation that the Quality Control Inspector (QCI) is in good standing with the MPI Accredited Quality Assurance Association.

- .2 Prior to the start of work of this section the QCI shall submit to the Owner's Representative a 'Quality Control Plan' outlining all quality control procedures including but not limited to review test methods, test intervals, environmental requirements, processes, materials and interfaces necessary to ensure preparation surfaces, application of coating systems and field touch up conform to the specifications.
- .3 The QCI shall maintain a written record of all work undertaken during the course of work of this section.
- .4 The QCI shall provide copies of all test reports and review reports to the Owner's Representative for their review and records.
- .2 The Contractor shall provide the QCI a minimum of one (1) week notice that work of this section is to begin and provide the QCI with the following:
 - .1 A copy of the project coating specification.
 - .2 A full set of construction documents 'Issued for Construction' including specifications.
 - .3 A copy of the project construction and fabrication schedule.
 - .4 Confirmation of specific surface preparation procedures and primers used for all fabricated metal and miscellaneous metal items by the fabricator/ supplier.
- .3 Prior to the application of any primer or top coat(s) the QCI shall review all materials and surfaces for defects or improper preparation. The QCI shall under take a second review for defects after the application of the prime coat. The QCI shall notify the Owner's Representative and the Contractor in writing of any defects or improper preparation observed.
- .4 The Owner's Representative at their discretion may conduct Quality Assurance reviews to ensure that their expectations of colour and finish meet or exceed the requirements of this section.

1.8 Requirements of Regulatory Agencies

- .1 Conform to the latest edition of Industrial Health and Safety Regulations issued by applicable authorities having jurisdiction in regard to site safety (ladders, scaffolding, ventilation, etc.).
- .2 Conform to requirements of local authorities having jurisdiction in regard to the storage, mixing, application and disposal of all coating and related waste materials.

1.9 Guarantee

- .1 The Contractor shall provide the one of the following forms of guarantee for the work performed in this section:
 - .1 A local MPI Accredited Quality Assurance Association's two (2) year guarantee or,
 - .2 A two (2) year maintenance bond the value of which shall be equal to one hundred percent (100%) of the contract value for work of this section.

- .2 The guarantee shall warrant that the work of this section has been performed and tested in accordance with the standards and requirements incorporated in the MPI Specification Manual (latest edition). The cost of the guarantee shall be included in the Contractors bid price.
- .3 Should the Contractor select the Maintenance Bond he will provide the Owner's Representative with Maintenance Bond Consent from a reputable surety company licensed to do business in Canada. Cash or certified cheques are not acceptable in lieu of surety consent.
- .4 The guarantee or bond option shall both relate to the rework, repair, making good any and all defects in the work of this section due to faulty workmanship or defective material that appear during a two (2) year period following date substantial performance of the Project. The review of defective work will be undertaken by a third party inspector from MPDA Inspection Services Inc.- Burnaby, British Columbia. The cost of initial guarantee or bond inspections and all follow up inspections carried out during the guarantee period will be borne by the Contractor.

1.10 Submittals

- 1 Prior to the start of work of this section the Contractor shall provide the Owner's Representative with full the following:
 - .1 Manufacturers technical product information, preparation and application procedures for each type of priming and coating system.
 - .2 Two (2) sets of 300mm (12") square colour samples for each colour indicated on the contract drawings. Each colour sample shall have the specified sheen/ gloss, coating colour/ name, Contractors name and date indicated on the back. One (1) set of colour samples shall be retained on site.
- .2 Prior to the start of work of this section the Contractor shall prepare a mockup of coating application for each type of metal, sheen/ gloss and texture indicated on the Contract documents. The Contractor may use a portion of the fabricated metal components for the mockup. The mock up shall be of suitable size to accurately illustrate the workmanship proposed for the finished product. Following the Owner's Representatives review the mockup will become the acceptable standard of finish quality and workmanship for similar on-site work.

1.11 Site Conditions?

- .1 Unless specifically pre-approved Owner's Representative, QCI and the applied product manufacturer, perform no coating when the ambient air and substrate temperatures are below 50 F (10C).
- .2 Perform no exterior coating work unless environmental conditions are meet the requirements of the QCI and coating manufacturer.

- .3 Should field coating be required. The Contractor shall provide suitable weather-proof covering and sufficient heating facilities to maintain minimum ambient air and substrate temperatures for 24 hours before, during and after coating application.
- .4 Perform no coating work when the relative humidity is above 85% or when the dew point is less than 5 Deg F (3 Deg C) variance between the air / surface temperature.
- .5 Conduct all moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple cover patch test.
- .6 Apply coating only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.
- .7 The Contractor shall provide and maintain lighting facilities as required to ensure a minimum lighting level of 323 Lux (30 foot candles) is provided on surfaces to be coated.

1.12 Waste Management and Disposal

- .1 Coating and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Obtain information on these controls from applicable government departments having jurisdiction.
- .2 The Contractor shall separate and recycle all waste materials. Where coating recycling is available, the Contractor shall collect waste coating by type and provide for delivery to recycling or collection facility. Materials that cannot be reused the Contractor must be treat them as hazardous waste and dispose of them in an appropriate manner in accordance with all government regulations.
- .3 The Contractor shall place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .4 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the Contractor shall strictly adhere to the following procedures:
 - .1 Retain cleaning water for water based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
 - .2 Retain cleaners, thinners, solvents and excess coating and place in designated containers and ensure proper disposal.
 - .3 Return solvent and oil soaked rags used during coating operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 - .5 Empty coating cans are to be dry prior to disposal or recycling (where available).
 - .6 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

- .5 The Contractor shall set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

PART 2: PRODUCTS

2.1 Product Delivery, Storage and Handling

- .1 Deliver all coating materials in sealed, original labelled containers bearing manufacturer's name, product name, colour number, batch date, type of coating and colour designation, standard of environmental compliance, VOC content, materials content as well as mixing and/or reducing and application requirements.
- .2 Store all coating materials in original labelled containers in a secure (lockable), dry, heated and well ventilated single designated area meeting the minimum requirements of both coating manufacturer and authorities having jurisdiction and at a minimum ambient temperature of 45 Deg F (7 Deg C). Only material used on this project is to be stored on site.
- .3 Where toxic and/or volatile/explosive/flammable materials are being used provide adequate fireproof storage lockers and take all necessary precautions and post adequate warnings (e.g. no smoking) as required.
- .4 Take all necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect the environment from hazard spills. Materials that constitute a fire hazard (coating, solvents, drop clothes, etc.) shall be stored in suitable closed and rated containers and removed from the site on a daily basis.
- .5 Comply with requirements of authorities having jurisdiction, in regard to the use, handling, storage and disposal of hazardous materials.

2.2 Coatings: Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

2.3 Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

2.4 Coating system for ferrous metals, galvanized steel shall be a three coat build up sourced from a single manufacturer to MPI EXT 5.1G.

- .1 High Build Epoxy Finish: Three coat system manufacturers listed or pre approved equal

	Product/Manufacturer	Product/Manufacturer	Product/Manufacturer
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- .1 High Build Epoxy Finish: Three coat system manufacturers listed or pre approved equal

	Product/Manufacturer	Product/Manufacturer	Product/Manufacturer
1st Coat Zinc Rich Primer Dry Film Thickness: 3.0 mil	PPG Pitt – Guard 95-245 Epoxy Zinc Rich Primer	Cloverdale High Performance ClovaZinc 3	Sherwin Williams Zinc Clad IV
2nd Coat High Build Epoxy Dry Film Thickness: 6.0 mil	PPG Acupon 35	Cloverdale High Performance Clovathane	Sherwin Williams Pro Industrial High Performance Epoxy
3 rd and 4 th Coat Polyurethane Pigment Dry Film Thickness: 2.0 mil (each coat)	PPG Pithane Ultra Gloss Urethane Enamel	Cloverdale High Performance Clovaguard	Sherwin Williams Industrial and Marine Marcopoxy 646 Fast Cure Epoxy

2.5 Coating system for aluminium shall be a two coat powder coat build up sourced from a single manufacturer to AAMA 2604 standard.

- .1 **Primer:** Zinc Chromate, Dry Film Thickness, 0.75 mil minimum
- .2 **Powder Coating:** Polyester, Dry Film Thickness: ASTM D 1400: 2.0mil, minimum thickness.
 - .1 Acceptable products include but are not limited to: Envirocron Ultra-Durable Powder Coating, PPG Industries Inc., Powdura 4000, Sherwin Williams, TCI Powder Coatings.
- .3 Pencil Hardness, ASTM D 3363: H – 2H.
- .4 Salt Spray Resistance: ASTM B 117: 3,000 hours.
- .5 Humidity Resistance: ASTM D 2247: 3,000 hours.
- .5 Gloss/ Sheen Ratings: Finish coat gloss shall be in accordance with the following MPI sheen rating:

Gloss Level	Description	Units @ 60 degrees	Units @ 85 degrees

2.6 Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required per manufacturer’s specifications.

- .1 All materials including primers, coatings, coatings, etc. shall be listed in the latest edition of the **MPI** Approved Product List. All such material shall fully compatible with component parts and be from a single manufacturer for each system used.
- .2 All materials used shall be lead and mercury free and shall have low VOC content where possible.

- .3 All coating materials shall have good flowing and brushing properties and shall dry or cure free of blemishes, sags, air entrapment.

2.7 Coating Equipment: To best trade standards for type of product and application. Spray equipment shall be of ample capacity, suited to the type and consistency of coating or coating being applied and kept clean and in good working order at all times.

2.8 Maintenance Materials

- .1 At project completion the Contractor shall provide 4 litres (1 gallon) of each type and colour of coating from same production run (batch mix) used in unopened cans, properly labelled and identified for Owner's later use in maintenance.

PART 3: EXECUTION

3.1 Inspection

- .1 Examine all surfaces to receive coatings prior to commencing work. Do not apply finishes until surfaces have been properly prepared and inspected by the project QCI. Report any unsatisfactory surfaces to the appointed QCI and Owner's Representative.
- .2 The Contractor shall, in writing verify with the fabricator of steel and miscellaneous metal items the various preparation procedures and primers used by the steel fabricator for all metal items to be coated for this contract. The written confirmation shall be provided to the QCI for his records.
- .3 The commencement of work indicates acceptance of the surfaces and job conditions. Coatings applied by the Contractor to improperly prepared surfaces will be removed, surfaces treated as per MPI Maintenance Recoating specifications and recoated at no cost to the Owner.

3.2 Surface Preparation

- .1 The surface to be coated must be dimensionally stable, dry, clean and free of oil, grease, release agents, curing compound, and other foreign materials.
- .2 Prepare surfaces to receive coatings in strict accordance with manufacturers highest standard and recommendations with reference to SSPC surface preparation method. QCI shall inspect all surfaces prior to and upon completion of surface preparation.
 - .1 Galvanized Metal
 - .1 Solvent Clean per SSPC-SP1. If any oxidation (white rust) has formed, sand and remove all forms of contamination. If the galvanized has been passivated or stabilized, the surface must be abraded via Brush-Off Blast Clean per SSPCSP7.
 - .2 Aluminium

- .1 Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.
- .3 Ferrous Metal (minimum requirement)
 - .1 Commercial Blast Cleaning, SSPC-SP6
 - .2 A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discolouration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
- .3 Preparation of surfaces shall be done under adequate illumination, ventilation and temperature.
- .4 Remove and securely store all miscellaneous hardware and surface fittings / fastenings. Carefully clean and replace all such items upon completion of coating work in each area. Do not use solvent or reactive cleaning agents on items that will mar or remove finishes.

3.3 Mixing and Tinting

- .1 Unless otherwise specified all coating material shall be ready-mixed and pre-tinted. Re-mix all coating in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.
- .2 Use of thinners shall be in strict accordance with manufacturers written recommendations. QCI to approve and monitor addition of thinners.
- .3 Thinning of coatings for spray applications shall be in strict accordance with coating manufacturer's written instructions. QCI to approve and monitor addition of thinners.

3.4 Application of Coatings

- .1 Application of all coatings shall be in strict accordance with the manufacturers written instruction.
- .2 Ensure that the application of coatings over primers is carried out within manufacturer's specified time limits. Application of primer shall not begin until the QCI has reviewed and approved the surface preparation.
- .3 Apply coatings at spreading rate required to achieve the dry film thickness noted for each coating. Do not apply finishes on surfaces that are not sufficiently dry and hard. Ensure that the coated surface has been inspected by the QCI prior to the application of the next coat.
- .4 Application of finish coatings shall completely hide the previous coating, yield a uniform sheen, colour and texture with not drips, sags, runs or imperfections to the satisfaction of the QCI and the Owner's Representative.

- .5 All coatings shall be applied using manufacturer recommended spray, or electrostatic spray, rates.
- .6 The use of rollers and or brush application as part of the shop coating applied process is not acceptable.

3.5 Inspection

- .1 All stages of the work of this section will be subject to inspection by the QCI. Inspection hold points shall include but may not be limited to:
 - .1 After solvent washing, before any abrasive blast cleaning or coating application.
 - .2 After abrasive blast cleaning and before any coating application.
 - .3 After primer application.
 - .4 After each topcoat.

3.6 Protection

- .1 Field Applied Coatings For Repair: Field applied coatings shall be for repair only and are at the discretion of the Owner's Representative.
 - .1 Protect work of other trades, adjacent surfaces, buildings, etc. against damage, overspray, contamination. At no cost to the Owner make good any damage caused by failure to provide such protection.
 - .2 Protect finished coatings from damage until completion of project.
 - .3 Erect barriers or screens and post signs to warn of or limit or direct traffic away or around work area as required.

3.7 Review and Final Acceptance

- .1 Prior to the Final Acceptance of coating system the QCI shall verify that all required inspections have been completed to his satisfaction.
- .2 Coated exterior surfaces shall be considered to lack uniformity and soundness if any of the following defects are visually apparent to the QCI and the Owner's Representative:
 - .1 Brush / roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in coatings.
 - .2 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
 - .3 Damage due to touching before coating is sufficiently dry or any other contributory cause.
 - .4 Damage due to application on moist surfaces.
 - .5 Damage to field repaired surfaces caused by inadequate protection from air borne dust, debris or weather.
 - .6 Damage and/or contamination of coating due to blown contaminants dust, spray coating, etc.

- .3 Coated surfaces shall be considered unacceptable if any of the following are evident under natural lighting source for exterior surfaces:
 - .1 Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 1000 mm (39”).
 - .2 Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 1000 mm (39”).
 - .3 Visible defects are evident on overhead surfaces when viewed at normal viewing angles.
 - .4 When the final coat on any surface exhibits a lack of uniformity of colour, sheen, texture, and hiding across full surface area.
- .4 Coated surfaces rejected by the QCI or the Owner’s Representative shall be made good following the methods outlined in this section at no expense to the Owner.

3.8 Field Repair

- .1 Any damage to coatings on components that have been installed at the project site and in the opinion of the QCI and Owner’s Representative cannot be removed and repaired at the coating shop shall be repaired on site. The finish quality, texture, colour, sheen and appearance shall be to the original specification and to the satisfaction of the QCI and the Owner’s Representative.
- .2 In the event that abrasive blasting in the field is deemed impractical by the QCI, power tool clean all damaged areas to SSPC –S11T ‘Power Tool Cleaning Bare Metal” standard. Clean back to where coating is tightly adhered to the substrate. Feather the rough edge between the cleaned area and the existing sound coating by air driven disc sander or other suitable means. Roughen the remaining painted area by sanding or other suitable means to enhance the adhesion of subsequent application of coating. All spot cleaned areas shall be primer coated the same day. If any rust or rust bloom is evident before priming, these areas will require cleaning to the appropriate standard to the satisfaction of the QCI. All repairs and recoating procedures shall be inspected by the QCI at each step of the process.

3.9 Adjust and Clean

- .1 Remove all coating where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- .2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.
- .3 Remove combustible rubbish materials and empty coating cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.

- .4 Clean equipment and dispose of wash water / solvents as well as all other cleaning and protective materials (e.g. rags, drop cloths, masking papers, etc.), coatings, thinners, coating removers/strippers in accordance with the safety requirements of authorities having jurisdiction.
- .5 Removal all material and debris from the site and dispose of in approved facility.

END OF SECTION 09 96 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 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 regading 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 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
- .2 Aggregates and Granular Materials Section 02 41 14
- .3 Painted Pavement Markings Section 32 17 23.13

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.**

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 Performance Standard(s)/Surface Tolerances (Tennis And Sport Courts Only)

- .1 All finished asphalt concrete surfaces shall be dense, compact, free from faults or cracks and true to grades, elevations and cross falls shown. The surface shall be smooth, and shall have no readily apparent roll marks, divots or heavy oil build-up. Surface grading shall be such that the entire surface of the paved area shall be free of any standing water or birdbaths after a rainfall or test flooding (allowing for sufficient time as dictated by the Owner's Representative to allow for water to run off to the perimeter or site drainage system). **Any birdbaths holding water deeper than a five-cent coin shall be patched and leveled in accordance with recommendations of the colour coating/finishing system specified. Re-flood and test. All surface irregularities are to be repaired to Owner's Representative approval.**
- .2 All asphalt concrete paved surfaces shall have a uniform appearance. Special care shall be exercised to avoid all footprint indentations. Any areas that do not have a uniform appearance, with a tight aggregate spacing or have footprint indentations shall be repaired to Owner's Representative approval.
- .3 If asphalt concrete paving surface is a tennis or sport court the stringent surface tolerance requirements of the USTA will be strictly enforced. **Any surface irregularity with a depression greater than 3mm depth under a 3m straight edge shall be cause for rejection of the entire tennis court surface.** Repairs/resurfacing must be completed in a manner acceptable to the Owner's Representative . Repairs to tennis court surfaces shall be seamless with the adjacent surface and have a similar appearance and texture that will not result in a different shoe grip or ball bounce or compromise the application of any colour coat surface/line paint.

3.7 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.**

3.8 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.

3.9 Line Painting

- .1 Paint sports court game lines or colour coat surfaces traffic lines/symbols as detailed. Refer to Painted Pavement Markings Specification Section 09910.

3.10 Power washing

- .1 If asphalt concrete paving surface is a tennis court, then power wash entire surface of each court to remove any surface oils prior to final surface coating applications.

3.11 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 crushed granular paving as indicated in the contract documents.
- .2 The work shall include the supply and installation of granular paving as indicated, including:
 - .1 Granular Base
 - .2 Crushed Granular Paving
 - .3 Stabilizer
 - .4 Edge Restraint

1.3 Related Work

- .1 Excavation and Backfill Section 31 23 10

1.4 Submittals

- .1 Submit a sieve analysis and a one (1) litre sample of crushed granular paving for review.
- .2 Submit product information and sample of stabilizer.

1.5 Quality Control

- .1 Prior to the start of construction provide a stake layout of all both edges of all crushed granular paving areas for review by the Owner's Representative. Stake spacing to be such that the shapes and forms of the crushed granular paving areas can be clearly seen.

1.6 Protection

- .1 Protect all work from damage and protect all property from damage arising from this contract. Take every precaution necessary to avoid damage to drainage and irrigation systems, adjacent growing medium and planting.

1.7 Site Conditions

- .1 The Contractor shall be responsible for repair of any utilities damaged in the course of work of this section.

- .2 The Contractor shall coordinate all work that crosses crushed granular paving areas to ensure that appropriate sleeves are installed prior to the start of work of this section.

PART 2: PRODUCTS

- 2.1 Crushed Granular Paving:** shall consist of sound, durable stone particles free from clay, organic material or other deleterious matter as per ASTM C 136.

2.2 9mm minus crushed stone

Sieve Size (mm)	Percent Passing by Weight
9.0	100%
4.75	50 -55%
2.36	25 – 28%
1.18	15- 18%

- 2.3 Stabilizer:** organic base, water activated polymer that binds particles together forming a homogenous, semi porous surface conforming to ADA (American with Disabilities Act) requirements. Acceptable products include but are not limited to Stalok W/A Binder by Stabilizer Solutions, Phoenix Arizona or approved equal.
- 2.4 Edge Restraint:** Shall be manufactured from 100% recycled material, UV stable and capable of retaining curved or straight precast concrete unit paver installations. Acceptable products include; B.E.A.S.T by Brickstop as distributed by Abbotsford Concrete Products, Abbotsford, BC or approved equal.
- 2.5 Edge Restraint Spikes:** 300mm (12") long, galvanized metal spikes.

PART 3: EXECUTION

3.1 Inspection

- .1 Areas of work to receive crushed granular paving and base course shall be examined and unsatisfactory conditions reported to Owner's Representative. Commencement of work shall imply acceptance of conditions.

3.2 Preparation of Subgrade

- .1 Excavate soft and unstable areas of subgrade that cannot be compacted to standard noted, fill and compact with approved granular material.
- .2 Compact subgrade to 95% Modified Proctor Density.

- .3 Ensure subgrade is true to line and grade and allows for sufficient depth to ensure finish grade can be established as noted on plans.

3.3 Granular Base

- .1 Place granular base over sub-grade in maximum 150 mm (6") lifts compacted to 95% MPD.

3.4 Edge Restraint

- .1 Install edge restraint to the lines and grades indicated on contract documents. Ensure straight lines are consistent and true and curved lines are continuous (faceted shapes are not acceptable).

3.5 Crushed Granular Paving

- .1 Owner's Representative shall review crushed granular base prior to the placement of the crushed granular paving.
- .2 Blending Stabilizer: Prior to the placement of material, create a homogeneous mix of stabilizer and crushed granular paving material using the mix ratio recommended by the stabilizer manufacturer.
- .3 Place the homogeneous mix of stabilizer and crushed granular paving material to lines and grades indicated on the contract drawings.
- .4 Water heavily to full depth at a rate of 95 -150 litres per 900 kg (25 – 40 gallons per ton). Randomly test for water saturation during application.
- .5 Let saturated material stand for at least six (6) hours. Compact material using a 900 – 1,800kg (2-4 ton) double drum roller or 450kg (1,000lbs) single drum roller. Do not compact with any type of vibratory equipment.
- .6 Ensure surface material remains moist by applying a light mist of water as required.

3.6 Cleaning

- .1 All paved areas or adjacent surface shall be brushed clean and excess materials shall be removed from the work site and disposed of in an approved dump location.
- .2 If cracks appear in stabilized surfaces, sweep fines into crack and tamp in place.

END OF SECTION 32 15 40

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 the field applied painted pavement markings as indicated in the contract documents.
- .2 Includes painting of vehicular and pedestrian parking and walking surfaces, parking stall lines, speed bumps, pedestrian walkway demarcation, and specialty vehicular and bicycle traffic symbols, graphics, markings and sports court game lines.
- .3 Include in the work co-ordination of all inspections by the Owner's Representative as required to ascertain proper completion of the work.

1.3 Related Work

- | | | |
|----|------------------------------|------------------|
| .1 | Site Preparation and Grading | Section 01 89 13 |
| .2 | Hot Mix Asphalt Paving | Section 32 12 16 |

1.4 Reference Standards

- .1 Product delivery, environmental requirements, preparation of surfaces and application shall be in accordance with the applicable chapters of Canadian Painting Contractors Association/Master Painters Institute Architectural Painting Specification Manual: Ext. 2.1 Asphalt Surfaces or Ext. 3.2 Concrete Horizontal Surfaces and/or Maintenance Repainting Manuals Rex 2.1 Asphalt Surfaces or Rex 3.2 Concrete Horizontal Surfaces (CPCA/MPDA), latest editions.
- .2 A copy of the applicable chapters of the Canadian Painting Contractors Association/Master Painters Institute Architectural Painting Specification Manual and/or Maintenance Repainting Manual shall be kept on site during the duration of the painting work.
- .3 Should modifications to the standards occur in this specification, then the modifications shall govern.

1.5 Qualifications

- .1 The paint products of the paint manufacturer shall be as listed in the CPCA Manual, latest edition, under Paint Product Recommendation Section and shall be from a single source supplier/manufacturer. **Mixing of different manufacturer's products will not be allowed.**

- .2 The Painting Contractor shall have a minimum of five (5) years proven record of satisfactory performance on projects of similar size within the Painting and Decorating Trade (specifically Pavement/Concrete Marking) and shall show proof before commencement of work that he will maintain a crew of **Trades Qualified Journeymen Painters** ensuring they hold a Provincial or Interprovincial Painter & Decorator or Painting & Decorating Certificate of Qualification throughout the duration of this work.
- .3 Qualifications of Workers:
 - .1 Only competent and **Trades Qualified Journeymen Painters**, as defined by local jurisdiction, who have a Provincial or Interprovincial Painter & Decorator or Painting & Decorating Certificate of Qualification and who are thoroughly experienced with the material and methods specified, may perform Painting and Decorating (Pavement/Concrete Marking) work. Registered apprentices may be employed provided they work under the direct supervision of a Trades Qualified Journeyman Painter in accordance with trade regulations.
 - .2 General labour type activities 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 Trades Qualified Journeyman Painter.
 - .3 Individual trade certification and apprentice registration number must be presented to the Coatings and Finishes Inspector or his designated Inspector upon request. A skilled Trades Qualified Journeyman Painter shall be present at all times during the execution of the work.
 - .4 **Requests for exemption from the prescribed Qualifications of Workers noted in 1.4.3.1 thru 1.4.3.3 as they pertain to some projects must be submitted in writing to the Coatings and Finishes Inspector. Final approval on relaxation of any qualifications is at sole discretion of the Board.**
- .4 Painting inspection shall be performed by an inspector acceptable to the Owner's Representative (and MPDA inspector if applicable).

1.6 Protection:

- .1 Protect surrounding or adjoining work by adequately covering with drop sheets/localized masking or other necessary protective covering; make good any damage caused by failure to provide such protection. **Protect all painted pavement markings until dry.**
- .2 Safety: The contractor will be responsible for all aspects of job safety at the work site. All work must be carried out in a safe and workmanlike manner. All pertinent safety regulations of the Vancouver Park Board and Workers' Compensation Board of British Columbia Occupational Health and Safety Regulations shall be adhered to rigidly.
- .3 In the Field the Contractor will be responsible for ensuring adequate public safety in his work area, at all times. Post wet paint signs at newly painted areas, barrier tape, traffic cones and/or barriers around the work area to prevent public access and undue touching. No operating equipment is to be left unattended and work area is to be left in a safe, secure condition at the end of each work day.

1.7 Submittals

- .1 Submit samples/colour chips as requested from standard manufacturer 's colour range as directed by Owner's Representative.
- .2 The Owner's Representative will determine all colours and patterns and issue an instruction showing where the various colours and finishes shall be applied. On site work to match selected samples. No extra allowed for repainting surfaces which do not conform with approved samples.
- .3 Submit copies of all manufacturer's product data sheets and Workplace Hazardous Material Information System (WHMIS) Material Safety Data Sheets (MSDS) of the products being used to the VPB Inspector. These recommendations will be adhered to strictly. Copies of the MSDS for all controlled products and manufacturer 's product data sheets for each product used shall be kept on site and readily available upon request.

1.8 Environmental Requirements

- .1 Environmental requirements for painting shall be in accordance with applicable chapter of CPCA Specification Manual.
- .2 Paint shall not be applied in damp weather or over wet surfaces.
- .3 Ensure surface temperature of the surface to be painted is above 10 deg. C (50 deg .F) before applying any paint.
- .4 Paint should not be applied if the dew point is less than 3 deg. C(5 deg. F) below the ambient or surface temperature or when rain is imminent.
- .5 The minimum ambient drying temperatures shall be 10 deg. C (50 deg. F) and rising.
- .6 Relative humidity is 85 % maximum.
- .7 Painting in direct sunlight on a hot day can cause many adhesive failures leading to blistering, cracking or wrinkling of the paint film and will not be permitted.

1.9 Guarantee

- .1 VPB require a minimum 2-year standard guarantee including same on all repainted work. The contractor shall warrant unconditionally against fading, cracking, spalling, blistering, peeling and excessive wear. **This guarantee extends only to failure of the painted pavement surfacing and does not cover base or asphalt/concrete failure underneath the surface.**

PART 2: PRODUCTS

2.1 General

- .1 Handling & Storage of Materials and Equipment - Field Operations:

- .1 The location of storage areas for paint, materials and equipment shall be subject to approval by the VPB Inspector. The areas shall be kept in a neat and orderly fashion, with all waste material removed regularly and every precaution shall be taken to prevent fire. Storage areas set up by the contractor shall be designed and maintained by the contractor to safely contain any spilled materials.
 - .2 At the end of the painting contract, all materials surplus to the job shall be removed by the contractor. This includes used and unused abrasive, pallets, empty cans and other material surplus to the job requirements. The area must be cleaned to the satisfaction of the VPB Inspector.
 - .3 Throughout the progress of the contract work all waste materials must be handled and disposed of in a safe and environmentally sound manner in accordance with all applicable Municipal, Provincial and Federal regulations. Waste disposal will only be at approved and authorized disposal sites.
- .2 Product Delivery/Storage
- .1 Product delivery and storage of materials shall be in accordance with applicable chapter of CPCA Specification Manual.
 - .2 Deliver paint materials in sealed original labeled containers, bearing manufacturer's name, type of paint, brand name, colour designation and instructions for mixing and/or reducing.
 - .3 Store paint materials at a minimum ambient temperature of 10 degrees Celsius in a well ventilated area. If stored on site, obtain approval from VPB Inspector.
 - .4 All materials and paints shall be lead and mercury free and shall have low Volatile Organic Compounds (VOC) content where possible.

2.2 Approved Materials

- .1 Paint:
 - .1 Alkyd Zone/Traffic Marking Paint to CGSB 1-GP-74M (MPI Product 32) or Ministry of Highways and Transportation approved equal. **This paint is not approved for sports court game lines.**
 - .2 Latex Zone/Traffic Marking Paint (MPI Product 97)
This paint is also approved for sports court game lines.
 - .3 Hi-Hide Plexicolor Line Paint as available from Tomko Sports Systems Inc., Richmond, B.C. **This paint is approved for sports court game lines only.**
 - .4 Colour: White or as specified by the Park Board Project Manager.
 - .5 Glass Beads: Overlay Type, to CGSB 1-GP-74M.
- .2 The paint shall be suitable for use over all types of concrete and bituminous surfaces and when applied over emulsified asphalt, it shall not cause lifting, crazing, peeling or other damage to the base.

- .3 Specialty undercoats, fillers, primers and paint systems shall be of same manufacture as the final finish coat.
- .4 All materials shall bear manufacturer ' s label. Materials in unidentified containers shall be removed from the site.
- .5 Materials shall be used and applied in strict accordance to manufacturer ' s directions and **shall be a finishing system from a single source supplier to ensure compatibility of the coating system.**

2.3 Approved Equals

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

PART 3: EXECUTION

3.1 Inspection

- .1 The Painting Contractor shall inspect all surfaces prior to commencement of work. Any deficiencies shall be reported to the Inspector prior to starting work.
- .2 Commencement of work shall indicate acceptance of surfaces and job conditions.

3.2 Surface Preparation

- .1 Remove all surface contaminants such as dirt, dust, loose mortar or asphalt, loose paint, oil, grease or wax, peeling paint, water and other foreign matter from all asphalt and concrete surfaces to be painted.
- .2 Pressure wash the surface with minimum 2000 psi gas powered power washer to thoroughly clean surface.
- .3 Concrete substrates must be free of curing compounds, release agents, efflorescence and sealing compounds.
- .4 Prior to application of any coating over masonry surfaces test for alkalinity (pH test) and report results to the Park Board Coatings and Finishes Inspector.
- .5 All cracks and openings in the surface to be painted are to be chipped out as required and filled with an approved patching material. All patches shall be made flush with the adjoining surfaces and spot primed with an approved primer. All thick and sharp edges of paint build-ups shall be sanded and feathered to achieve a smooth uniform appearance to the approval of the Park Board Coatings and Finishes Inspector.
- .6 All remaining old paint shall have adequate sound adhesion.

3.3 Coating Application

- .1 Application:

- .1 Layout the pavement markings as indicated on the Drawings (and in accordance with the rules of the applicable game). All game lines shall be taped/masked both sides and shall be sealed to the surface prior to painting to ensure straight and sharp lines. Apply two coats of paint by brush or roller. Application of paint on sports court game lines by hand held spray equipment is not permitted. Requests to apply paint on sports court game lines by airless spray or conventional spray striping machines shall be submitted in writing and may or may not be granted. No residue of tape adhesives shall be left after removal.
 - .2 Painted pavement markings shall be of uniform colour and density with sharp edges.
 - .3 All symbols and letters to conform to dimensions shown on Standard Detail Drawings.
 - .4 Do not thin paint without approval of the VPB Inspector. If approved, the coating materials shall be thinned only if necessary and then with the proper thinner as supplied by the paint manufacturer and only up to the recommended amount. Thinning shall only be done in strict accordance with the manufacturer ' s directions. Dilution or misuse will not be allowed.
 - .5 Apply paint at even rate in accordance with the manufacturer ' s recommendations.
 - .6 Unless otherwise directed by the VPB Inspector, apply paint only when the air temperature is above 10 deg. Celsius and no rain is imminent.
 - .7 Apply glass beads at rate specified in Supplemental Specifications.
 - .8 Apply other specified markings as directed by the VPB Inspector.
 - .9 Close the sport court areas to public access for a period of 24 hours minimum after painting or until the paint is sufficiently cured to accept traffic.
Paint shall be applied to a minimum dry film thickness (DFT) of 8.0-10 mils (200-250 microns DFT).
- .2 All new asphalt to be painted over must be allowed to cure for a minimum of 14 days prior to painting application.
 - .3 All new concrete to be painted over must be allowed to cure for a minimum of 28 days prior to painting application.

3.4 Acceptance

.1 Finished work shall be of approved colour, uniform in appearance, texture and sheen, smooth and free from excessive flooding, brush marks, lap marks, runs, sags or any other film defects. Any and all such defects shall be removed/repared at the Contractor's expense and made good to the satisfaction of the VPB Inspector..2 VPB require a min. 24 hrs. notice in order to schedule all inspections. No delay claims filed by the Contractor resulting from failure to provide adequate notice of inspection required will be entertained. All aspects of this work shall be subject to inspection by the Owner's Representative or their designated inspector. Inspection/approval points shall be of a frequency sufficient to ensure adequate Quality Control in accordance with this specification and will occur throughout the duration of the Contract. The contractor must supply access to the work for the VPB Inspector. As a minimum, Inspections will occur as follows:

- .1 After layout of painted pavement markings.
 - .2 After any required cleaning and before any finish coating application.
 - .3 After finished coat application.
 - .4 At Substantial Performance.
- .3 Independent Inspection/ Testing agencies may be engaged by the owner (VPB) for the purpose of inspecting and testing portions of the work to ensure compliance with this specification. All costs associated with such a service shall be borne by the Contractor. .4 At the discretion of the VPB Inspector, occasional small spot tests may be made with a sharp instrument to physically gauge film thickness or determine other qualities of the coating(s). Such area(s) shall be repainted at the expense of the Contractor.
- .5 Painted/Coated surfaces will be inspected and may be rejected for defects including but not limited to: sags, runs, inadequate dry film thickness, coating continuity, evidence of poor coverage at any location or any misses.
- .6 The Contractor shall carry out repair work to identified defects, omissions and handling damage in such a manner so as to produce a coating equal to or better than the original coating. Re-inspection of corrective work and all retesting costs associated shall be entirely at the expense of the Contractor.

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 painting process.
- .2 Spilled, splashed, and spattered paint shall be cleaned promptly. Remove cotton waste, cloths and materials that may constitute a fire hazard and place in a closed metal container and remove daily from the site.
- .3 Any damage to paving, planting or any other structures/elements due to work of this Section shall be immediately repaired at the Contractor's expense to satisfaction of VPB Inspector.

- .4 Remove and dispose of off site all surplus material, excess materials, trash, debris and waste material from the work of this Section. Dispose of all hazardous wastes to Municipal, Provincial and Federal Guidelines.
- .5 At the conclusion of the work, leave the premises neat and clean to the satisfaction of the VPB Inspector.

END OF SECTION 32 17 23.13

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 chain link fence as indicated in the contract documents. This specification is applicable for 1.2m (4'-0"), 1.8m (6'-0"), 2.4m (8'-0") tall fences.

1.3 Related Work

- | | | |
|----|----------------------------------|------------------|
| .1 | Concrete Forming and Accessories | Section 03 11 00 |
| .2 | Concrete Reinforcing | Section 03 20 00 |
| .3 | Concrete Finishing | Section 03 35 00 |

1.4 Qualifications

- .1. The prime contractor shall have a minimum of five (5) years proven record of satisfactory performance of similar size projects in the welding trade and shall show proof before commencement of work that he will maintain a crew of competent and trades qualified welders. Minimum "C" level welding ticket. When requested contractor shall provide a list of three comparable jobs, including name and location, specifying authority/Project Manager, start and completion dates and cost amount of the welding work.
- .2 Contractor (applications) bidding work shall be approved by fencing materials manufacturer or his designate.
- .3 Only competent and trade qualified welders who have a provincial or interprovincial welding certificate of qualification and who are thoroughly experienced with the material and methods specified may perform welding work. Registered apprentices may be employed provided they work under the direct supervision of a skilled trades qualified welder in accordance with trade regulations.
- .4 General labour type activities may be performed by labourers and trades helpers who are thoroughly experienced with preparation procedures provided they work under the direction of a skilled trades qualified welder.
- .5 Individual trade certification and apprentice registration number must be presented to the Welding Inspector or his designated inspector upon request. A skilled trades qualified welder shall be present at all times during the execution of the work.

- .6 The contractor shall employ and keep on the job a qualified Charge Hand or Foreman who is fully experienced in all aspects of chain link fence installation to industry standards. He shall also have a provincial or interprovincial welding certificate of qualification. He shall be responsible for all work and receive instructions from the Board's representative during the absence of the contractor. This Foreman or Charge Hand shall not be changed whilst work is in progress without the written permission of the Board or unless said Foreman leaves the employ of the contractor.

PART 2: MATERIALS

2.1 Framework

- .1 All framework shall be galvanized schedule 40 structural steel pipe that meets the requirements of ASTM-A53 galvanized coating not less than 1.80 oz/s.f. (550 g/m²).

2.2 Welding rods for shielded metal arc welding (SMAW)

- .1 The electrodes used in fence construction shall be low alloy, all position type that meets CAN.CSAW/483 – M 1982 specifications.

2.3 Chain Link Fabric

- .1 Standard duty chain link fence fabric shall be minimum 9 ga. (.148") (3.76 mm) galvanized wire woven to a 2" (50 mm) diamond pattern.
- .2 Heavy duty chain link fence fabric shall be minimum 6 ga. (.192") (4.90 mm) galvanized wire woven to a 2" (50 mm) diamond pattern.
- .3 Non-climbable chain link fabric shall be minimum 9 ga (.148") (3.76 mm) galvanized wire woven to a 1" (26 mm) diamond pattern
- .4 Minimum galvanized coating on standard, heavy and non climbable fences shall be not less than 490 g/m² (1.60 oz/ft²)
- .5 All chain link fabric to have a knuckle selvage at both ends. Knuckle to be closed or nearly closed to a measurement of less than the diameter of wire. Barb finish NOT accepted even if chain link is hung with barb finish down.
- .6 All chain link fabric to be free of production oils, free of dents and bends.
- .7 Diamond count for standard, heavy and non-climbable fence

4' 0" (1220 mm) standard fence	13½ diamonds
6' 0" (1830 mm) standard fence	20½ diamonds
8' 0" (2435 mm) standard fence	27½ diamonds
4' 0" (1220 mm) heavy fence	13½ diamonds
6' 0" (1830 mm) heavy fence	20½ diamonds
8' 0" (2435 mm) heavy fence	27½ diamonds

4' 0" (1220 mm) non climbable fence	27 diamonds
6' 0" (1830 mm) non climbable fence	39 diamonds
8' 0" (2435 mm) non climbable fence	53 diamonds

2.4 Tie Wire

- .1 All chain link fabric ties shall be new 9 ga. (.148") (3.76 mm) hard aluminium wire.

2.5 Tension Bands

- .1 All tension bands shall be industry standard hot dipped galvanized steel of a inside dimension to the post on to which they are clamped. Minimum 13 gauge in thickness and minimum ¾ in. (20 mm) width.

2.6 Tension bars

- .1 Tension bar shall be continuous (unwelded) through the fabric height, hot dipped galvanized minimum 1.2 oz/ft² (366 g/m²) of zinc coated surface area 3/16" (5 mm) x ¾" (20 mm) x chain link fabric height. ¼" (6 mm) galvanized round bar for non-climbable fences.

2.7 Post/Rail Caps

- .1 All post/rail caps shall be galvanized pressed steel, of identical style and with an inside diameter appropriate to the pipe O.D. which they are capping. Die cast, sand cast aluminium NOT acceptable.

2.8 Rails

- .1 All standard, heavy and non-climbable chain link fences shall have a top and bottom rail. All rails shall be hot dipped galvanized schedule 40, 1 7/8 (48 mm) O.D. with a minimum zinc coating of not less than 1.8 oz/ft² (550 g/m²). All rails to be welded continuous over top of line posts.

2.9 Line Posts

- .1 All standard, heavy and non climbable chain link fences shall have hot dipped galvanized schedule 40 pipe 2 3/8" (60 mm) O.D. with a minimum zinc coating not less than 1.8 oz/ft² (550 g/m²) posts set at maximum 10' 0" (3M) centres. All line post tops to be coped to accept top rail.

2.10 Terminal Posts

- .1 All standard heavy and non climbable chain link fence terminal (end, corner and gate) posts shall be hot dipped galvanized schedule 40 pipe, 2 7/8" (73 mm) O.D. with a minimum zinc coating of not less than 1.8 oz/ft² (550 g/m²)
 - .1 Gates up to and including 5' 0" (1525 mm) wide panels to have 2 7/8" O.D. (73 mm) gate posts.
 - .2 Gates up to and including 10'0" (3050 mm) wide panels to have 3 1/2" O.D. (89 mm) gate posts.
 - .3 Gates up to and including 15'0" (4572 mm) wide panels to have 4 1/2" O.D. (114 mm) gate posts.

2.11 Carriage Bolts and Hex Nuts

- .1 Carriage bolts for tension bands to be galvanized steel 5/16" (8 mm) x 1 1/4" (32 mm).

2.12 Tension Wire

- .1 Tension wire shall NOT be used.

2.13 Gates

- .1 All gates to be constructed from galvanized schedule 40 pipe 1 7/8" O.D. (48 mm) with a minimum zinc coating of 1.8 oz/ft² (550 g/m²).
- .2 All corners to be mitred, ground smooth and have 2 coats of approved zinc rich primer.
- .3 Gate height and chain link fabric to match perimeter fence.
- .4 Fabric to be fastened to gate frame with tension bars and tension bands (12" (305 mm) spaces). Aluminium tie wires every 5th diamond.
- .5 Gates to be installed with Industrial Metro Fence Hinges.
- .6 Single gates to have Stelco latch and catch or approved equal.
- .7 Double gates to have industrial cane bolt and pin latch.

PART 3: EXECUTION

3.1 Concrete Footings

- .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 All terminal and line posts for standard, heavy and non-climbable fences shall be set in a soil formed concrete footing. Each footing to be a minimum of 12" (305 mm) diameter by 36" (915 mm) deep. All concrete to be transit mixed with a minimum 25 MPA (3500 psi). Minimum pipe burial 36" (915 mm) into concrete footings.

3.2 Joints and Welding

- .1 No fittings, other than tension bands, tension bars and dome tops shall be permitted. All joints shall be coped to a radius appropriate to the post or other member to which they are to be welded. Crimping of pipe shall NOT be permitted. All steel dome tops to be tack welded in place.
- .2 All welded joints shall be full round with the joint attaining proper penetration and professional appearance. All splashes shall be filled, chipped or rounded off. All slag shall be removed. All welded joints shall be thoroughly cleaned with Zinga solvent or equivalent and coated with two (2) coats of an approved zinc rich primer (e.g. Zinga Cold Galvanization coating to a dry film thickness of 2 mils per coat).
- .3 All welds to be approved by the owner's inspector prior to the installation of the chainlink fabric.

3.3 Draping

- .1 All chain link fabric to be continuous vertically (i.e. no multi level draping of fabric permitted).
- .2 Fabric shall be taut, level and plumb.
- .3 Face side of fabric to be determined by owner prior to installation to suit individual site requirements and conditions.

3.4 Stretching

- .1 Every straight run of fabric shall be held in tension, by tension bar at each runs start and end. At no time shall it be permitted to stretch the fabric over a post at a change of angle in fence direction.
- .2 Stretching of the fabric during installation shall be done using a tension bar properly threaded through the chain link such that the chain link is not damaged. The fence fabric shall be taut after stretching to industry standards.
- .3 Tension bars to be fastened to terminal posts with tension bands spaced evenly at maximum 12" (305 mm) centres.

3.5 Tying

- .1 Standard, heavy and non-climbable chain link fabric shall be tied every 5th knuckle to the top and bottom rails.
- .2 All ties shall be double looped at both ends where anchored to the fabric and ends shall not constitute a safety hazard. All ties shall be made with one piece of wire. Any tie that fatigue breaks shall be removed and replaced.
- .3 Fabric shall be secured to each line post every 5th vertical diamond.

3.7 Cleaning

- .1 Upon completion of work, the site shall be left clean and free of the cut-offs, staples, excess wire, pipe or other construction debris. Any ruts caused by equipment shall be filled and levelled to specified surface tolerances to the owner's satisfaction.

END OF SECTION 32 31 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 exterior site furniture as indicated in the contract documents.

1.3 Related Work

- .1 Cast-in-Place Concrete Section 03 33 00
- .2 Precast Concrete Unit Paving Section 32 14 13

1.4 Requirements Included

- .1 Furnish all labour, materials, equipment and services necessary to supply and install tree grates, benches, bike racks and trash receptacles.

1.5 Guarantee

- .1 The Contractor hereby warrants that the Site Furnishings and their installation will remain free of defects and in good condition in accordance with the General Conditions.

PART 2: PRODUCTS

2.1 Benches: See Landscape Drawings for Benches.

- .1 Finish: Black - Electrostatic Powder Coating, to manufacturer's specifications.

2.2 Trash Receptacle: See Landscape Drawings for Trash Receptacles.

- .1 Finish: Black - Electrostatic Powder Coating, to manufacturer's specifications.
- .2 Contractor will provide two, (2), extra complete lids and one, (1), extra complete liners.

PART 3: EXECUTION

3.1 Installation

.1 Bench:

- .1 Assemble and install bench in accordance with manufacturer's instructions.
- .2 Bolt to concrete footing, and, or paving, as per manufacturer's specifications with 20 mm (3/4") Galv. bolts.
- .3 Touch-up damaged finishes to the acceptance of Owner's Representative.

.2 Trash Receptacle:

- .1 Assemble and install trash receptacle in accordance with manufacturer's instructions.
- .2 Bolt to concrete footing, and, or paving, as per manufacturer's specifications with 20 mm (3/4") Galv. bolts.
- .3 Touch-up damaged finishes to the acceptance of Owner's Representative.

END OF SECTION 32 37 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 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 Seeded Lawns Section 32 92 19
- .3 Plants and Planting Section 32 93 10
- .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 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 Number	Sieve Size (mm)	Percent Class
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 cuspated 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 form 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 plants by hydroseeding to all areas identified or disturbed by the work of this contract.

1.3 Related Work

- .1 Growing Medium Section 32 91 13
- .2 Plants and Planting Section 32 93 10

1.4 Reference Standards and Requirements of Regulatory Agencies

- .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 Submit dealer guarantee statements of composition of the mixture and the percentages of purity and germination of each variety of grass seed.
- .2 Submit the original seed containers which clearly identify the manufacturer's guarantee of seed analysis.
- .3 Submit completed Schedule A - Application Record to the Owner's Representative.
- .4 Provide all product data for seed, mulch, tackifier and fertilizer as required and as requested by the Owner's Representative.
Submission in writing if requested by Owner's Representative fourteen (14) days prior to commencing Work of this Section:
 - .1 Size of truck slurry in litres.
 - .2 Amount of material to be used per tank based on size of slurry tank.
 - .3 Number of tank loads required per hectare to achieve specified slurry mixture per hectare.

1.6 Protection

- .1 Protect all seeded areas against trespassing and from damage at all times until Acceptance. If any seeded areas are damaged, they shall be repaired as required to satisfaction of Owner's Representative.
- .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.

1.7 Testing and Approvals

- .1 Notify Owner's Representative at least forty eight (48) hours before installing seed for inspection of finished grades. Do not hydroseed until grades are approved by Owner's Representative.
- .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.

1.8 Conditions for Acceptance

- .1 The conditions for acceptance of hydroseeded lawn areas and for turning over the hydroseeded areas to the Vancouver Park Board for subsequent maintenance are:
 - .1 Substantial Performance for the entire project shall have been declared.
 - .2 Hydroseeded lawn areas shall have been maintained as specified for a min. of 55 days. Hydroseeded lawn shall be mown as specified (to a height of 38mm) no more than two days before inspection for Acceptance.
 - .3 The hydroseeded lawn shall be uniformly healthy, in a vigorous growing condition, representative of a dense stand of grass, with all deficiencies corrected to the approval of the Owner's Representative. Lawn 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. Acceptance by the Board will only be given provided Maintenance as per Item 3.4 has been carried out and other Conditions of Item 1.8 have been met.

1.10 Time of Seeding

- .1 The seeding shall be done during periods which are most favourable for the establishment of a healthy stand (of grass) and at times designated by the Board in accordance with the construction schedule and activities and coordinated with the local weather conditions.
- .2 No seeding shall be done when the soil is frozen, covered by frost or when there is standing or flowing water on the site, nor if the wind speed is greater than 5 km/h.

- .3 The seeding operations shall be completed before September 30, of the calendar year.

1.11 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 All grass seed, hydraulic mulch fertilizers and related materials shall be stored in a dry, weatherproof storage place and shall be protected from damage by heat, moisture, rodents or other causes until time of use. Care shall be taken that labels and other identification(s) are not removed or defaced in any fashion.

2.2 Fertilizer

- .1 Granular Fertilizer: Standard approved brands delivered in original containers, bearing manufacturer guaranteed analysis, dry and free-flowing, organic base, conforming to the applicable Provincial Fertilizer Laws, not less than 19% Nitrogen, 19% Phosphoric Acid and 19% Potash (19-19-19), or as otherwise required based on growing medium test results and time of application.
- .2 Slow-Release Fertilizer: Prills designed to release nutrients over a period of months. Agriform 16-7-12 plus iron or equivalent.

2.3 Grass Seed

- .1 Shall be fresh, clean, new crop certified Canada #1 or better seed, in accordance with Government of Canada "Seeds Act", with a minimum germination of 75% and a minimum purity of 97%. Supplied in standard containers with the following information provided: suppliers name and address, lot number/year of production, net weight (mass), names and percentages of individual seed species and percentage of pure seed. Composed of the following varieties in the proportions and testing the minimum percentages of purity and germination indicated:
- 10% Common Kentucky Bluegrass
 - 25% Common Creeping Red Fescue
 - 25% Common Chewings Fescue
 - 40% Turf Type Perennial Ryegrass
- As supplied and mixed by: a recognized, pre-approved seed distributor acceptable to the Owner.

- .2 Areas into which any other varieties of seed have been introduced will not be accepted. The Owner reserves right to test seed for purity and germination rate.

2.4 Mulch

- .1 Hydroseeding Mulch: Hydroseeding solution shall contain a mulch of dry virgin wood cellulose fibre specifically designed for hydraulic seeding, containing no growth or germination inhibiting factors, and dyed green with a water activated non-toxic dye for visual metering during application; "Ecofibre" as manufactured by Canfor or pre-approved equivalent. In addition:
 - .1 The Owner does not accept any mulches made from recycled materials such as paper, saw dust, cardboard or pulp residue.
 - .2 Mulch shall be capable of dispersing in water to form a homogeneous slurry and remaining in such a state when agitated or mixed with other specified materials. In addition it shall be capable of forming an absorptive mat ground cover allowing water percolation into underlying growing medium.
 - .3 It shall be free of weeds and other foreign material and shall be supplied in packages bearing the manufacturer's label clearly indicating weight and product name.

2.5 Tackifier

- .1 M-Binder (Mesh Organic Soil & Mulch Binder)

2.6 Water

- .1 Clean potable water (as supplied by Municipality) free of any impurities which would inhibit germination or otherwise adversely affect growth or be harmful to the environment.

2.7 Weed Control

- .1 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. Do not use herbicides containing sodium chlorate unless specifically authorized by the Owner's Representative. Do not use herbicides containing 2, 4, 5,-T in public areas or where there is a possibility of contaminating ditches draining to irrigation or potable water and only as permitted by the COV.

2.8 Approved Equals

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

PART 3: EXECUTION

3.1 Soil Preparation

- .1 Grades:
 - .1 Areas to be seeded shall be at grades shown at the time of seeding, free of “humps and hollows”. Crown or slope for surface drainage and eliminate all low spots or depressions. 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 Restore all areas to be seeded that are misshapen or eroded to specified condition, grade, slope as directed just prior to seeding. Minor adjustment and refinement of finish grade to be made as directed by Owner's Representative.
 - .3 Obtain Owner's Representative's approval of finish grading prior to proceeding.
 - .4 Ensure smooth finish on all surfaces and finished grades as shown on the drawings and as specified herein.
- .2 Clearing: Remove all weeds, briars, debris and other refuse and deleterious materials which may be detrimental to the growth of the grass.
- .3 Cultivation: as required to minimum depth of 100mm.
- .4 Moisture: ensure areas to be seeded are moist to minimum depth of 150mm before seeding.

3.2 Application

- .1 Apply with equipment designed for hydraulic seeding, a uniform solution in water of:
 - Seed as specified 24.4kg/1000 square meters
 - Fertilizer Type and Rate as required by soil testing analysis.
 - Fibre Mulch 250kg/1000 square meters
 - Tackifier Not required on flat areas or slopes up to 25%
6 kg/1000 sq. meters on slopes from 26%-35%.
(increase to 8 kg/1000 sq. meters on slopes greater than 35%)
- .2 Ensure uniform distribution of the solution over the entire area, with adequate discharge pumps, hoses and gun nozzles.
- .3 Take precautions to protect planting beds, walks, roads, buildings and other site features such as signs, guardrails, fences, and utilities against spraying with the solution. Thoroughly clean any surface which is sprayed with the solution where not intended to the satisfaction of the Owner's Representative.

- .4 Do not perform work under adverse field conditions such as wind speeds over 5 km/h, frozen ground or ground covered with snow, ice or standing water
- .5 Apply seed in a uniform workmanlike and continuous fashion until completed. Seed which has been in the hydraulic seeder more than 2 hours shall be considered dead and must be replaced.
- .6 Submit completed Schedule A - Application Record to the Owner's Representative on a daily basis.
- .7 No vehicular traffic will be permitted on areas to be seeded. All unreachable work or work under difficult control conditions shall be completed with use of hoses.
- .8 Ensure a minimum overlap of 450mm between applications to form uniform surfaces.

3.3 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.

3.4 Maintenance

- .1 Perform maintenance of the hydroseeded areas from time of seeding (date of installation) to date of Acceptance by the Board. Work to include: watering, cultivation, fertilizing, cutting, weeding, and all other measures necessary to ensure germination and development of a uniform, dense, healthy stand of grass.
- .2 Begin maintenance immediately after installation and continue until Acceptance by the Board of all hydroseeded lawn areas. Maintenance shall consist of all measures necessary to keep lawn healthy, in a vigorous growing condition and all other measures necessary to ensure germination and development of a uniform, dense, healthy stand of grass. 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 lawn 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 maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.
 - .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 seeded areas showing deterioration or bare spots shall be repaired immediately. All areas shall be top dressed and over seeded with a seed mix matching the original seed mix.
- .7 All seeded areas shall be adequately protected with warning signs, temporary wire, twine or mesh fences as dictated 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/Assumption by the Owner.

3.5 Cleaning

- .1 Remove from the site all surplus materials and other debris resulting from seeding operations.
- .2 Flush all walks, pavement and any area surface sprayed with solution clean to the satisfaction of the Owner's Representative.

SCHEDULE A - HYDROSEED APPLICATION RECORD (SAMPLE)

Project Name/Owner's Contract No.: _____

Owner's Representative _____ Weather Conditions _____

Date: _____

Contractor Foreman: _____ Size of Crew: _____

Month: _____

<i>Time</i>	<i>Load No.</i>	<i>Seed Mix/ Flower Mix</i>	<i>Fertilizer</i>	<i>Mulch</i>	<i>Tackifier</i>

END OF SECTION 32 92 21

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 Growing Medium Section 32 91 13
- .2 Plants and Planting Section 32 93 10

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 **(AS APPLICABLE)** 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 plant material as indicated in the contract documents.

1.3 Related Work

- .1 Growing Medium Section 32 91 13
- .2 Sod Lawn Section 32 92 23

1.4 Quality Assurance

- .1 All materials and work shall conform to the latest edition of the following standards or as otherwise specified:
 - .1 CNTA (Landscape Canada) Canadian Standards for Nursery Stock – Current Edition
 - .2 BCLNA Standard for Container Grown plants – Current Edition
 - .3 BCSLA/BCLNA British Columbia Landscape Standard – Current Edition
 - .4 Perennial Plant Association Standards for herbaceous perennial plants
 - .5 ANSI A-300 Tree Pruning Guidelines
 - .6 Urban Tree Foundation/ISA Guideline Specifications For Nursery Tree Quality, current version

1.5 Source Quality Control

- .1 Seven (7) days prior to the Owner's Representative review of plant material at source the Contractor shall confirm in writing availability of plant material noted on Plant List.
- .2 Plant material will be supplied from nurseries who are certified by the Clean Plants program, Canadian Nursery Certification Institute (CNCI), current certification standard <http://cleanplants.ca/>. The certification shall include but is not limited to the requirements of the current active module(s), e.g. P. Ramorum module. The certification must extend to all fields and allied nursery operations where plant material is sourced. Only nurseries, fields and allied nursery operations that are certified will be permitted to supply plant material for this project.
- .3 Plant Material Review at the source nursery

- .1 Contractor request for review of the plant material at source nursery to be a minimum of seven (7) days prior to scheduled review.
 - .2 Owner's Representative shall make one (1) visit to source nursery for review of plant material for entire project.
 - .3 If review in more than one location becomes necessary, the Contractor shall reimburse the Owner's Representative for the additional time required at the current hourly rates of the Staff personnel.
 - .4 Shipping of plant material to project site shall not proceed until Owner's Representative has reviewed the plant material at the source nursery.
 - .5 All plants are subject to review and may be rejected for failure to comply with this specification at any time until Acceptance. Immediately replace rejected material and remove from the site at no cost to the Owner.
 - .6 Trees required for the work **must be reviewed and tagged by the Owner's Representative at (the place of growth) before being dug.** Inspection and tagging at the place of growth shall not affect the right to reject such trees on or after delivery thereof to the site.
 - .7 Plants required for the work **must be reviewed by the Contractor before being prepared for delivery.** Inspection shall not affect the right to reject such plants on or after delivery thereof to the site.
 - .8 **Plants arriving on site must be reviewed by the Owner's Representative prior to off-loading.** Provide minimum 48 hours notice to schedule review.
 - .9 The Contractor or his authorized representatives shall be present during all required reviews as specified or as may be required.
- .4 Plant Material Review at Project Site
- .1 All plant material shall be reviewed at the project site by the Owner's Representative prior to planting.
 - .2 Plant material that is rejected by the Owner's Representative shall be immediately removed from the site and replaced at the Contractors expense.
- .5 Imported Plant Material
- .1 Plant material imported from out of province and out of country shall be accompanied with necessary federal and provincial permits and import licenses.
 - .2 The Contractor shall conform to all federal and provincial laws and regulations with regard to horticultural inspection of domestic and imported plant material.
- .6 Condition of Plant Material
- .1 Plant rootballs and containers shall be completely free of noxious weeds and volunteer plants including, but not limited to, Horsetail and Morning Glory.
- .7 Plant material grown or supplied in Fabric Containers are not acceptable.

1.6 Submittals

- .1 Confirmation Plant List

- .1 Contractor shall provide in writing to the Owner's Representative a minimum of seven (7) days prior to review of plant material at the source nursery a plant list confirming the quantity, botanical name, common name and size of plants specified.
- .2 Prior to the review of plant material by the Owner's Representative the Contractor shall submit written documentation with CNCI certification stamp stating that the nursery has undergone all components of a certification program and has been audited to verify that all components are properly implemented. The documentation submitted shall include but is not limited to the nurseries CNCI Clean Plants certification number.
- .3 Substitutions
 - .1 Contractor shall provide in writing to the Owner's Representative a minimum of seven (7) days prior to review of plant material at the source nursery a list of proposed substitutions for review.
 - .1 Substitutions in plant material will not be considered unless written proof is submitted thirty (30) days prior to scheduled installation stating a specified plant cannot be obtained within the specified area of search.
 - .2 Plant substitutions shall be of similar genus and species and of equal or greater size as those originally specified. The list shall contain the following information:
 - .1 Botanical name, common name of the specified plant
 - .2 Botanical name, common name of the proposed substitute plant
 - .3 Pot size, plant size and calliper of trees to be substituted
 - .3 Upon submission of such proof, a proposal will be considered for using the nearest equivalent size or variety with an equitable adjustment of the Contract price.
- .4 Planting Schedule
 - .1 Contractor shall provide in writing to the Owner's Representative upon award of the Contract a detailed planting schedule outlining dates and duration of planting operations.
 - .2 Revisions to the Planting Schedule as a result of delays of any kind shall be submitted to the Owner's Representative in a timely manner prior to the start of planting operations.
- .5 Composted Mulch: Contractor to submit a one (1) litre sample of Composted Mulch to the Owner's Representative for review prior to shipment to the site.
- .6 Prepared Growing Medium: Contractor to submit a one (1) litre sample of the Prepared Growing Medium to the Owner's Representative for review prior to shipment to the site.
- .7 Antidesicant: Contractor to submit three (3) copies of manufacturer product data and specification for Owner's Representative review.

1.7 Acceptance

- .1 The conditions for Acceptance of landscape areas and for turning over the landscape areas to the Owner for subsequent maintenance are:

- .1 Growing medium quality, fertility levels, depths and surface grading have been completed to the requirements of Section 32.91.13.
- .2 Plant quantities, sizes, quality and locations are as shown in the Contract Documents or as otherwise approved by the Owner's Representative.
- .3 Substantial Performance for the complete project shall have been declared.
- .4 All plants shall be installed at the correct elevation relative to finished grade, healthy, in a vigorous growing condition and established to the satisfaction of the Owner's Representative.
- .5 Trees will be assessed for acceptance only when in leaf, and not when in a dormant state.
- .6 All deficiencies with regard to landscape work shall have been rectified.
- .7 All trees are staked where required.
- .8 **Landscape areas shall have been maintained for at least 55 days.** All planted areas are free of all visible weeds and substantially free from underground weed seeds or parts thereof, to the requirements of Section 32 01 90 Landscape Maintenance (as Applicable).
- .9 Mulch has been placed as required. All areas not to receive mulch are in a cultivated, loose, friable condition where water can freely permeate the surface.
- .2 The date of Acceptance shall be as determined by the Owner's Representative base upon the Inspection for Acceptance. Contractor shall request inspection for Acceptance, giving at least 48 hours notice.

1.8 Warranty

- .1 Replace for a period of one (1) year after Substantial Performance of the project, all unsatisfactory plant material **and continue to replace such plant material until the replacement is acceptable to the OWNER'S REPRESENTATIVE**, at no cost to the Owner. This warranty will apply to all plant material, whether supplied by Contractor or Owner.
- .2 This guarantee is based on adequate maintenance by the Owner after Acceptance. The Contractor will not be responsible for plant loss due to extreme climatic conditions such as abnormal freezing temperatures or hail which occur after Acceptance. The Contractor shall be responsible for plant loss due to inadequate acclimatization of plants for their planted location.
- .3 Adequacy of acclimatization and existence of extreme climatic conditions shall be as determined by an **independent Owner's Representative** on the basis of plant variety, location, recorded temperatures for the locale, time of planting and other factors pertinent to the situation.

1.9 Plant Material Replacements

- .1 The Contractor shall remove from the site and immediately replace any plant material that has been determined by the Owner's Representative to have died or failed to grow in a satisfactory manner during the warranty or maintenance period.
- .2 The Contractor shall extend the warranty on this replacement plant material for one (1) year from the date of replanting.
- .3 The Contractor shall continue such replacement and warranty of plant material until the Owner's Representative has determined that the 'Conditions for Final Acceptance' have been met.

1.10 Permits

- .1 Obtain and pay for all permits required for the work, including such permits as may be required for planting and related work on municipal property (e.g. street trees).

PART 2: PRODUCTS

2.1 General

- .1 Area of Search: Area of search for specified plant material shall include the Lower Mainland of British Columbia, Vancouver Island, Washington and Oregon States, except as noted on the plant list.
- .2 Provenance: All plant material used on this project shall be hardy in this climate. Plant types have been selected with this as a criteria. This Contractor shall guarantee that plant material supplied has equal provenance, i.e.: it is developed from cuttings or seeds collected in an area of similar climatic characteristics. Submit proof of equal provenance to Owner's Representative upon request.
- .3 Plants or seeds purchased for Park Board projects are to be free of neonicotinoid ("neonics") or other nicotinic Acetylcholine receptor agonists. Pesticides covered by this specification include but are not limited to clothianidin, dinotefuran, flupyradifurone, imidacloprid, thiamethoxam, sulfoxaflor, thiacloprid, and acetamiprid."

2.2 Plant Material

- .1 Plant material shall be of the sizes and quantities as shown in plant lists on Landscape Drawings and shall be nursery grown unless specifically described as "collected". **All "non-specimen" plantings specified in the Plant List(s) are specified according to the Canadian Nursery Trades Association Canadian Standards for Nursery Stock and the BCLNA Standard for Container Grown Plants.**
- .2 In particular, plant material shall conform to the following CNTA Standards:

- .1 "Nursery stock shall be true to name, type and form and representative of their species or variety. In addition they shall be of the size and grade and quality stated".
 - .2 "Quality shall be normal for the species when grown under proper cultural conditions viable, substantially free from pests and disease, and undamaged".
 - .3 "Roots shall not be subject to long exposure to drying winds, sun or frost, between digging and delivery".
 - .4 Root balls and soil in containers shall be free from pernicious perennial weeds."
 - .5 Roots shall be transplanted or root pruned at least once within the year prior to planting.
 - .6 Take precautions during digging, handling and shipping of plant material to avoid injury to plants and root systems.
 - .7 Plants for use when symmetry is required shall be matched as nearly as possible.
 - .8 Plants shall not be pruned prior to delivery.
 - .9 All plants shall be measured when the branches are in the normal position. Measurements shall be as set out in the BCLNA Standard for Container Grown Plants. Calliper of trees shall be measured 12 inches above the ground.
 - .10 Trees shall have straight trunks with a single leader intact. There shall be no abrasion of the bark and no fresh cuts of limbs over 1-1/4" that have not completely calloused over.
 - .11 Where trees are to be in a formal arrangement or occur in consecutive order, they shall be carefully measured as to height and spread and tagged with a number before delivery to the site. These trees shall be correspondingly identified on plan to assure symmetry and expeditious handling.
 - .12 Plants larger in size than specified in the itemized plant list may be used if approved; but the use of larger plants shall not increase the Contract price. If the use of larger plants is approved, the ball of earth or spread of roots shall be increased in proportion to the size of the plant.
 - .13 The size specified is the size of plant required at the time of delivery to the construction site. Sizes shown are minimum sizes.
- .3 Container dimensions shall be as defined in the B.C. Landscape Standard 1997 Edition.

2.3 Tree Ties

- .1 Flat woven polypropylene material. 20 mm (3/4") wide, 544 Kg. (1200lb), break strength. Arbor Tie by Deep Root, or approved equal. Submit sample for approval to protect bark or other types approved by the Owner. Generally they shall be of a material that will not damage the bark. Tree tie material shall be at least 25mm(1") in width and shall remain pliable in all weather conditions. They shall permit a reasonable degree of movement by the tree under normal loading conditions/forces such as wind without detrimental effects. Rubber tree buckles, or galvanized wire with rubber hose will not be accepted.

2.4 Burlap

- .1 Shall be untreated, free from toxic contaminants and of sufficient strength to hold the rootball in a compact, stable mass that does not move relative to the main stem(s) of the tree or shrub.

2.5 Wire Baskets

- .1 Non-galvanized metal basket designed and manufactured for the purpose of tree moving. Basket shall be shaped to ensure that the root ball will allow a stable planting condition in accordance with standards noted.

2.6 Water

- .1 potable and free of minerals that are detrimental to plant growth.

2.7 Composted Mulch

- .1 9mm (3/8") Composted Mulch, black/brown in colour with no cedar or redwood bark or wood material manufactured by Yard Works, Richmond, BC, Eco-Soil ,Langley BC Fraser Richmond Bio-Cycle, Richmond, B.C. or pre-approved equal.

2.8 Anti-desiccant

- .1 Wax-like emulsion that will provide a transpiration reducing film over the plant surface. Moisturin by GSI Horticultural, Bend, Oregon, (541) 383-0222 or approved equal.

2.9 Tree Trunk Protection

- .1 Extrusion mold process, polyethylene with UV protectors: "Arborgard" manufactured by DeepRoot products Canada, Inc., Vancouver, B.C., or pre-approved equal.

2.10 Tree Guy Anchors/ Tree Guy System

- .1 Direct burial or screw type disc guy anchor and guy system. The Arrow Anchor by Tree-Guy/ Tree Guy System, Santa Anna, California (800) 624-1116, or approved equal.

2.10 Stakes and Stake Fasteners

- .1 **Fir, standard or better, 75mm x 75mm x 3000mm long.** Stake fasteners shall be hot dipped galvanized or stainless steel.

2.11 Flagging Tape

- .1 30mm (13/16") wide 'Red' PVC flagging tape by Identi-Tape, Boulder, CO or approved

PART 3: EXECUTION

3.1 Planting Season

- .1 Plant only during the season or seasons that are normal for such work, as determined by weather conditions and as approved by the Owner's Representative. Plants planted before or after any stipulated dates will be rejected. **Tree planting is not permitted between June 30th and September 30th regardless of irrigation. Shrub, ground cover planting or sodded or seeded lawn installation between June 30th and September 30th is not accepted unless the project is irrigated.**
- .2 Do not plant during freezing, abnormally hot, dry or wet weather or when damaging climatic conditions can be anticipated.
- .3 The Contractor will be responsible for death or deterioration of plants caused by exposure to damaging climatic conditions, planting under conditions itemized above or inadequate acclimatization of plant material.

3.2 Planting Schedule

- .1 All planting operations shall be done in a timely manner in accordance to the 'Planting Schedule'.
- .2 'Planting Schedule' shall be updated as required by the Contractor to coincide with status of site and coordination with other trades. Provide the Owner's Representative with up dates to the schedule as required throughout the planting process.

3.3 Delivery

- .1 Dig and handle all plant material in a manner suitable for each species to prevent injury to or removal of fibrous roots. All plant material delivered with broken or loose root balls or containers will be rejected by the Owner's Representative and replaced by the Landscape Contractor at no additional cost to the Owner.
- .2 Take precautions to avoid burning of plants by sun or wind during handling and transporting.
- .3 Keep root balls and container soil moist prior to delivery by covering with bark mulch, wet straw or soil and water as required to ensure moist root balls.
- .4 Coordinate the delivery of plant materials with work of other trades and other site activities.
- .5 Off load the plant materials at the site as designated by the Owner's Representative.
- .6 All plant material shall be acclimatized to the final location before delivery and planting. The Contractor will be held responsible for plant losses caused by inadequate acclimatization.

3.4 Plant Layout

- .1 Locate plants according to the Planting Plan for approval of plant location and orientation. Notify the Owner's Representative, giving 48 hours notice, when plant layout will be ready for review. At this time the Owner's Representative may make adjustments in plant locations and orientation prior to planting.
- .2 Stake location of all major trees for approval to positioning. Notify the Owner's Representative at least 48 hours before planting of major trees. **The Owner's Representative must be present** during planting of major trees to ensure proper orientation and location.
- .3 Anti-desiccant shall be applied only as directed by the Owner's Representative. Application of anti-desiccant shall be in accordance with manufacturer's instructions.
- .4 Coordinate planting operations with other trades and project schedule.

3.5 Excavation

- .1 Existing Utilities; The Contractor is responsible for confirming the location and extent of existing utilities prior to the start of all planting operations. All attempts should be made to ensure that utility services are maintained to all on and off site parties through out the entire planting operation.
- .2 For all trees, excavate tree pits with vertical sides, depth to be of sufficient size to contain root ball, min 600mm x 10m² surface area of growing medium or as detailed, directed by Owner's Representative.
- .3 Scarify the sides of tree pits.
- .4 **Test all tree pits for poor drainage as directed by Owner's Representative.** Fill each tree pit with a minimum of 20 litres (5 gallon) of water. Water should freely drain through subsoil within ten (10) minutes. If poor drainage or percolation is encountered report this condition immediately to the Owner's Representative for acceptable remedial measures. Measures such as auguring holes through the impervious layers and backfilling with approved clean rounded drain rock or sand, raising the planting grade, or adding dedicated drain lines connected to the subsurface drainage system will be considered.
 - .1 Notify Owner's Representative if tree pits in any soil condition do not drain freely or if tree pit fills with ground water.
 - .2 There shall be no standing water in the bottom of tree pit at time of planting.
- .5 Protect bottom of tree pit(s) against freezing.
- .6 Ensure tree pits and plant beds are kept well drained and free of contaminants and construction debris.
- .7 Excavate hole in growing medium sufficient to receive root ball. Excavation of the subgrade below the root balls of trees shall be only as necessary to permit the bottom of the root ball to sit on undisturbed material or compacted fill such that the top of the root ball remains at the proper finished grade. Disturbed subgrade or fill below the root ball shall be compacted to prevent settlement of the tree after planting. Remove excess material from the site.

- .8 Remove excavated subsoil material from site, or use on site in an approved manner. Obtain prior approval from Owner's Representative.

3.6 Planting Procedure

- .1 Planting operations shall be carried out under conditions that are conducive to healthy, vigorous growth of plant material.
- .2 Planting operations shall not be carried out when the growing medium is frozen, mixed with ice and/or snow, saturated or compacted to levels that exceed this specification.
- .3 Plant material shall be planted vertical, straight and plumb at locations staked in field and or noted on landscape plans.
- .4 Ensure orientation of plant material will give best appearance in relation to views from adjacent buildings, roads, walks or use areas.
- .2 Install all plants at height grown in Nursery. Allow for settling of the growing medium after planting. The grade that the plant was grown in the nursery shall be used as the indicator for proper growing medium and plant elevation relationship. Top of root ball elevation shall match the elevation of adjacent growing medium elevation.
- .3 Plants shall be set plumb in the planting beds or in the center of the pits, except where the plant's character requires variation. Obtain approval from Owner's Representative.
- .4 Backfill around root ball with prepared growing medium, tamping and watering to ensure firm support for the plant and eliminating all air pockets around the root ball. Ensure water penetration into the root balls during planting procedures.
- .5 Remove all string, rope, burlap and other restricting elements out to the perimeter of the root ball. Cut all wire basket handles flush with the top ring or fold back down into the planting hole. Do not remove wire baskets. Ensure no wires from the basket protrude into the top 100mm of the growing medium.
- .7 Ensure a 150mm (6") deep saucer around all trees for the full width of the planting pit.

3.7 Fertilizer Application

- .1 Place fertilizer as per recommendations of soil analysis and to requirements of Section 32 91 13.

3.8 Tree Stabilization

- .1 Stake and Tie trees immediately after planting if specified and only as directed by the Owner's Representative. Trees damaged as a result of delayed staking shall be replaced.
- .2 Trees shall stand plumb on completion of this operation.
- .3 Stakes and ties shall be installed such that injury to bark will not occur.
- .4 Ensure guy pins and stakes are placed out beyond the root ball. Trees that have had root balls penetrated by guy pins and stakes will be rejected.
- .5 Tie one (1) to two (2) flagging tape flags to all guy wires at a height that is clearly visible.

3.9 Tree Trunk Protection

- .1 Trees in lawn areas shall have trunk protection.
- .2 Place tree trunk protection around base of tree trunk as per manufacturer instructions.
- .3 Trees 100mm (4") calliper or less shall have one protector. Do not interlock ends of tree protector.
- .4 Trees greater than 100 mm (4") calliper shall have a minimum of two interlocked protectors. Do not interlock outside ends.

3.10 Tree Rings

- .1 Trees in lawn areas shall have 750mm (30") tree rings cut around the base of each tree. The tree rings shall be true circles centered on the trunk of the tree.
- .2 Have sod removed and area mulched as per specifications.
- .3 Trees in seeded areas shall have 750mm (30") tree rings cut around the base of each tree once seeded areas have been accepted by the Owner's Representative. The tree rings shall:
 - .1 Be true circles centered on the trunk of the tree.
 - .2 Have grass removed and area mulched as per specifications.

3.11 Pruning

- .1 Prune trees and shrubs after planting operation only as directed by Owner's Representative.
- .2 Prune only as directed by Owner's Representative.
- .3 Tree pruning is to be performed in accordance with the best practices published on the International Society of Arboriculture's (ISA) website (www.treesaregood.org).
- .4 Branch removal should be limited to necessary clearance pruning for public and electrical safety and the removal of dead, diseased, and/or defective wood to improve tree health and/or structure.
- .5 Street trees are to be pruned and maintained in accordance with Illuminating Engineering Society of North America (IES) standards for Roadway Lighting.
- .6 Each shrub planted shall be pruned to preserve the natural character of the plant and in a manner appropriate to its particular requirements in the landscape design.
- .7 All soft wood sucker growth and all broken or badly bruised branches shall be removed with a clean cut.
- .8 All pruning shall be done with proper, sharp pruning tools. All pruning cuts to be made protecting the branch collar.
- .9 All pruning cuts shall be made with pruning saws or hook and blade pruning tools designed and manufactured for pruning operations. Anvil-type pruning tools shall not be used in any pruning operations.
- .10 Do not damage the branch collar.

- .11 Do not damage the leader or lead branches. Plants which have had the main leader or lead branches damaged or removed will be rejected and replaced by the Contractor at no cost to the Owner.
- .12 Do not remove minor twig branches along the main structural branches.

3.12 Applying Mulch

- .1 Prior to the application of composted mulch;
 - .1 Reset all plants that have settled so that relationship of nursery grade of root ball to finish grade of growing medium is as per specification
 - .2 Manually remove all weeds and weed roots from root balls and adjacent growing medium.
 - .3 Remove all deleterious material and debris from planting areas.
 - .4 All fine grading is complete, the growing medium is loose and friable
 - .5 The Owner's Representative has reviewed of all planting areas.
- .2 Spread composted mulch to minimum depth of 50 mm (2").
 - .1 Ensure finish composted mulch layer is a minimum of 12mm (1/2") below adjacent hard landscape surfaces and edges.
 - .2 Ensure mulch is kept 125 mm (5") away from tree trunks and 75 mm (3") away from stems of shrubs.

3.13 Maintenance

- .1 Begin maintenance at time of planting and continue for a minimum of fifty-five (55) days or until Acceptance which ever is greater, at which time the Owner will take over maintenance.
- .2 If for any reason the Contractor elects, on his own without the written consent of the Owner's Representative to suspend maintenance operations he is to provide the Owner's Representative written notice of such action. Any damages or requirement for the replacement of plant material that as a result of the suspension of maintenance operations shall be the borne by the Contractor at no cost to the Owner.
- .3 Maintenance of plant material includes but is not limited to watering at intervals sufficient to maintain healthy, vigorous growth, weeding of plant beds and tree pits, cultivating of growing medium, pruning, only if requested, treatment of insects, moulds, fungi or disease to the Level 2 "Groomed" as per the BCNLA Landscape Standard, Current Edition or as directed by Owner's Representative.
- .4 Plant material shall be deep watered at least once per day when temperatures exceed 25 degrees Celsius (77 degrees F).
- .5 Contractor to ensure adequate moisture in plant root zone prior to winter freeze-up.
- .6 Ensure tree guards, stakes, flagging tape on tree guy wire and tree ties are kept secure, taught and in proper repair.

3.14 Finish Grading

- .1 All planted areas and all growing medium shall be fine graded after placing to the finished elevations and contours as detailed and specified herein. Surfaces shall be true to intended grades, smooth, uniform, and firm against deep foot printing, with a fine loose surface texture. Ensure all rough spots and low areas are eliminated to ensure positive surface drainage. Adjust grades to accommodate for mulch as specified/detailed.

3.15 Cleaning

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

END OF SECTION 32 93 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 temporarily relocate, maintain, return and replant existing trees and shrubs as indicated in the contract documents.

1.3 Related Work

- .1 Clearing and Grubbing Section 31 11 00
- .2 Growing Medium Section 32 91 13
- .3 Plants and Planting Section 32 93 10

1.4 Guarantee

- .1 Guarantee shall apply only to labour, workmanship, and materials. Tree and shrub survival shall not be included in this guarantee.

1.5 Reference Standard

- .1 ANSI A300 Tree Pruning Guidelines
- .2 City of Vancouver Tree Protection By-Law

PART 2: PRODUCTS

2.1 Wire Baskets

- .1 Baskets shall be eight (8) gauge or better weld wire, cone shaped in diameters to match dug root ball sizes 1200 mm (4'-0") and greater.

2.2 Burlap:

- .1 Burlap for containing roots and soil shall be heavy weight Hessian burlap.

2.3 Heavy Rope/Twine:

2.4 Tree Ties:

- .1 Arbour Tie by Deep Root, or pre-approved equal. Flat woven polypropylene material 20 mm wide, 544 Kg (1200 lb.) break strength tree tie.

2.5 Tree Guy Anchors:

- .1 Anchors shall be buried, 100 mm (3") diameter steel disc, screw-in type.

2.6 Stakes

- .1 Fir, standard or better, 75mm x 75mm x 3000mm, long.

2.7 Mechanical tree digger:

- .1 Mechanized-digging equipment to be hydraulic spade type.
- .2 Digger shall be suitable size to produce an earth ball, which complies with the current B.C.N.T.A. and C.N.T.A. standards.

PART 3: EXECUTION

3.1 Pre-Digging And Planting Holes

- .1 Pre-dig holes to receive trees with the mechanical tree digger at locations noted on the Landscape Drawings or as marked by Owner's Representative in field. Ensure Owner's Representative has reviewed proposed tree locations prior to digging.
- .2 Insure that the top elevation of the relocated root ball is 50 mm (2") above the existing surrounding grade for pre dug holes. Confirm that the existing grade is the final finished grade.

3.2 Tree Digging Procedure

- .1 Lift root balls from hole with tree digger. Place wire baskets, lined with burlap, in hole.
- .2 Replace root ball into wire basket lined hole and tie basket to ball with heavy rope/twine.
- .3 Ensure tree trunk and branches are not injured by wire basket ties or rope.

3.3 Shrub Digging Procedure

- .1 Root ball shall be a minimum of 450 mm (18") in diameter for shrubs up to 1.2 metres (4'-0") height and spread. Shrubs greater than 1.2 metres (4'-0") increase diameter of root ball 50 mm (2") for every 200 mm (8") of height and spread.

- .2 Use a clean, sharp spade to dig around the perimeter of the shrub to form a rootball with a diameter as noted in 3.03.1 to a minimum depth of 350 mm (14”).
- .3 Shrubs that cannot be moved to new location on site will have their root balls contained with burlap and located in the temporary on site nursery.

3.4 Delivery To Site

- .1 Protect trunk, branches and root ball from abrasion and damage during loading, unloading and transplanting operations.
- .2 Cover trees and root balls with tarpaulins to minimize drying during transportation operations.
- .3 Coordinate location for unloading and temporary stockpile on site.

3.5 Watering

- .1 Construct saucer around each tree with a berm of growing medium approximately 150 mm (6”) higher than the top of the root ball, 1200 mm (4'-0”) from the base of trunk of the tree to facilitate watering.
- .2 Water each relocated tree and shrub to ensure deep and thorough saturation of root ball.

3.6 Temporary Storage of Plant Material On Site

- .1 Coordinate shipping and relocation of plant material on site or from nursery with excavation of planting pits to ensure minimum time lapse between nursery digging and on site planting.
- .2 Ensure branches of trees and shrubs are bound securely into a confined mass during handling and transport.
- .3 Do not bind of planting stock with rope or wire which would damage bark, break or damage branches or damage the natural shape of the plant
- .4 Protect plant material against abrasion, and exposure to extreme temperature change during transit.
- .5 Cover plant foliage and branches with tarpaulin to prevent loss of moisture during transit.
- .6 Fully support root ball of large trees during all lifting operations.
- .7 Do not lift trees or shrubs by the trunk or branches. Plant material only to be moved by lifting the rootball or container.
- .8 Remove broken and damaged roots with clean cuts using sharp pruning shears.
- .9 Temporary Storage of Plant Material on Site:
 - .1 Heel-in all trees, shrubs and miscellaneous plant material that cannot be planted immediately.
 - .2 Insure temporary heel - in area is shaded and protected from the wind.
 - .3 Provide sufficient water at regular intervals to ensure health of plant material.

- .4 Plant material to be spaced to insure branches do not touch and sufficient air movement can be maintained around trees and shrubs.
- .5 Material to heel-in relocated trees and shrubs.

3.7 Pruning

- .1 Prune only as directed by Owner's Representative.
- .2 All Pruning to be completed by an I.S.A. Certified Arborist using proper sharp Arborist's tools.

3.8 Guying Relocated Trees

- .1 Use wood stakes only if requested by Owner's Representative.
- .2 Staking system to incorporate buried anchors or stakes and Arborknot as per manufacturers instructions to achieve a straight, secure tree. Coordinate type of staking system with Owner's Representative.

3.9 Maintenance

- .1 Maintenance of plants shall begin immediately after planting operation and shall continue until all deficiencies noted in the Substantial Performance review have been rectified to the satisfaction of the Owner's Representative. **The Owner's Representative is to notify the Owner's Representative in writing forty-eight hours (48) prior to stopping maintenance operations.**
- .2 Maintain tree ties until completion of contract or until directed by the Owner's Representative or owners representative to be removed.

3.10 Cleaning

- .1 Clean up immediately any growing medium or debris spilled onto pavement.
- .2 Remove all materials and other debris resulting from tree relocation operations from job site.
- .3 Backfill and re-grade tire ruts and other disruptions to existing surfaces as a result of tree moving operations.

END OF SECTION 32 96 43

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 Plumbing Section 22 00 00
- .2 Site Preparation and Grading Section 01 89 13
- .3 Excavation and Backfill Section 31 23 10
- .4 Growing Medium Section 32 91 13
- .5 Plants and Planting Section 32 93 10

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