List of Specifications

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: EXECUTION

2.1 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.

2.2 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.

2.3 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.

2.4 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.

2.5 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.

2.6 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.

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

PART 1: GENERAL

1.1 General Requirements

.1 Refer to Division 1, General Requirements.

.2 This section of the specification forms an integral part of the Contract Documents and is to be read interpreted and coordinated with all other parts.

1.2 Description

.1 This section specifies general requirements and procedures for the Contractor to make submissions of shop drawings, product samples and other submittals to Owner's Representative for review. Additional specific requirements for submissions are specified in individual sections. Submissions may include:

.1 Shop Drawings.

.2 Product Data.

.3 Product Samples

.4 Mock-Ups.

1.3 Submission Requirements

.1 Coordinate each submission with requirements of work and Contract Documents. Individual submission will not be reviewed until all related information is available.

.2 The Owner's Representative review of submittals made by the Contractor shall not relieve the Contractor from the responsibility for complying with contract drawings or specifications, unless the Contractor has secured the written approval of the Owner's Representative for all deviations.

.3 Owner's Representative review for submittals shall not relieve the Contractor from responsibility for error and omissions in the submittals.

.4 Submittals shall contain only those items specified and shall not include items which are not provided for under this contract unless they are clearly marked and/or voided as not being part of the contract.

.5 Comply with progress schedule for a timely submission of submittals as they relate to work progress. Coordinate submittal of related items.

.6 Allow 10 working days for Owner's Representative review of each submission.

.7 Maintain submittal log to ensure timely and complete submittals.

.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.

END OF SECTION 01 33 23

PART 1: GENERAL

1.1 General Requirements

.1 Refer to Division 1, General Requirements.

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

1.2 Description

.1 Supply all products, labour, equipment, and services necessary to prepare the site suitable for subsequent work indicated in the contract documents, including but not limited to:

.1 Preservation and protection of existing plants, site features

.2 Draining of wet areas of the site by means of temporary ditches, pumping and other means approved by the Owner's Representative.

.3 Tree removal and removal of tree roots only where explicitly shown on drawings and as required to obtain satisfactory base for paving.

.4 Stripping and disposal of all existing materials to prepare for path and base as detailed. All other deleterious materials, including unsuitable material under areas to be filled, shall be treated as over excavation.

.5 Stripping and removal of all deleterious materials.

.6 Stripping and stockpiling topsoil (if any).

.7 Grading of the site, including the importation of and relocation of fill to create compacted subgrades as required for subsequent work as detailed and specified.

.8 Work from existing conditions and grades shown on plans. The intent is to balance structural cut and fill on site. Grades shown on drawings may be revised in conjunction with the Owner's Representative to achieve this balance.

.9 Placing approved fill, subbase, base and associated materials as detailed.

.10 Finished grading of the site for landscaping including unit concrete pavers, C.I.P. concrete paving, asphalt paving, irrigation, sodding, seeding and planting.

1.3 Related Work

.1	Shrub and Tree Preservation	Section 32 01 91
.2	Subsurface Drainage	Section 33 46 16
.3	Growing Medium	Section 32 91 13
.4	Irrigation	Section 32 80 00

1.4 Quality Assurance

.1 Codes and Standards: Perform backfilling work in compliance with applicable requirements of governing authorities having jurisdiction.

.2 Inspection: The Owner's Representative or his representative is to inspect and approve all stages of the work. The Contractor shall give forty-eight (48) hours notice to the Owner's Representative when inspection is required.

1.5 Job Conditions

.1 Use all means necessary to control dust, dirt and debris on and near the worksite, including Construction Access Route (C.A.R.), caused by the Contractor's operations. Thoroughly moisten all surfaces, when necessary, to prevent dust being a nuisance in adjoining areas.

.2 Use all means to protect all materials of this Section before, during and after installation. Protect all trees designated to remain. Make good any damage. **Follow Vancouver Park Board Tree Protection Guidelines as required.** Protect existing fencing, walls, curbs, sidewalks, pavement, benchmarks, surface or underground utilities that are to remain. Notify the Owner's Representative immediately if any damage occurs. Restore to original or better condition, unless directed otherwise.

.3 Protect adjacent construction and all surrounding properties, including municipal streets, sidewalks, above and under ground services.

.4 Obtain approval from Owner's Representative on designated Construction Access Route (C.A.R.) Ensure C.A.R. is appropriately signed and maintained during course of construction. Remediate to original condition prior to Substantial Performance.

.5 Maintain any existing fence barriers currently on site surrounding areas of preserved existing vegetation. Do not enter areas of preserved existing vegetation without the approval of the Owner's Representative.

1.6 Site Conditions

.1 Start of work shall signify acceptance of site as satisfactory and no claim will be recognized for extra work nor any allowance made for defective work due to site conditions.

.2 Investigate the site to verify information shown in Contract Documents. Verify that existing grades are as shown on Drawings and notify Owner's Representative immediately of any discrepancies.

.3 Review existing site conditions with regard to subsurface conditions. Data on indicated subsurface conditions is not intended as representations or warrants of continuity of such conditions. Additional test borings and other exploratory operations may be made by Contractors at no cost to the Park Board. Notify Owner's Representative prior to carrying out any such work.

1.7 Testing and Approvals

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

.2 Cooperate and assist as required the testing agency in the execution of their work.

1.8 Materials Definitions

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

1.9 Submittals

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

PART 2: PRODUCTS

2.1 Subgrade

.1 Subgrade is a dense surface that has been proof rolled as specified and which has been treated to eliminate all soft or spongy areas. Compaction and uniformity of subgrade shall be subject to approval by the Owner’s Representative.

.2 Subgrade may be existing, undisturbed material resulting from cutting or may be built up using Type 1 fill or Type 2 fill, depending on the applications.

2.2 Fill

.1 Fill material shall be natural mineral material of a consistent quality throughout, free from foreign matter such as construction debris, plant and grass seeds, organic matter (except within limits shown for Type 1) and pests, and meeting the requirements set out for Type 1 or Type 2 fill, depending on the application.

.2 Obtain the Owner’s Representative’s approval of fill material before delivering to the site if imported, or before moving on site if native. If imported material is approved for use, supply Owner’s Representative with written notification a minimum of thirty (30) days prior to beginning fill operations a complete statement of origin, compensation, suitability, environmental clearance and proposed location of all deposits that is intended for imported fill.

.3 Fill shall be classed as Type 1 or Type 2, depending on its application and shall meet the following requirements for each type:

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

2.6 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 contact BC OneCall and obtain the locations of all underground utilities on site,ocate 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

3.3 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 $\pm$ 25mm 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 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 Contract shall ensure that all forms not treated with a form release agent are to be kept evenly moist to prevent shrinkage. Wet the surface of untreated forms just prior to placing concrete.

.8 Form release agent shall be applied in strict accordance with the manufacturers written instructions.

3.3 Removal of Formwork

.1 Forms shall not be removed until concrete has attained sufficient strength to ensure that no damage or continuity of concrete will occur when forms are removed.

.2 The structural engineer shall advise the Contractor as to the duration of cure time required prior to the removal of suspended formwork.

.3 The Contractor shall use wooden wedges when prying directly against face of concrete during form removal. Do not pry directly against concrete surface.

.4 Carefully remove form ties to avoid marking concrete. Unless otherwise indicated on the construction drawings plug and grout form tie holes to prevent rust staining. Ensure grout is finished smooth and flush to finished face of concrete.

.5 Thoroughly clean and retreat forms prior to reuse.

3.4 Architectural Concrete Formwork

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

.1 Formwork shall be constructed so that finished concrete surface will be free from any imperfections as a result of, but not limited to, misalignment or warping of forms, misalignment or warping of plywood or steel elements, inadequate tightness of forms, mortar leakage and any texture imparted by formwork.

.2 Maintain true right-angled corners for all exposed edges of concrete, unless otherwise indicated.

.3 The pattern for form ties shall be in accordance with the approved shop drawings.

.4 Back all edges of forms and brace to assure that mortar leakage is eliminated.

.5 Thoroughly inspect all forms prior to reuse. Do not reuse forms when surfaces that will come in contact with concrete have been damaged to the extent that the finished surface will not conform to the specifications.

3.5 Cleaning

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

END OF SECTION 03 10 00

PART 1: GENERAL

1.1 General Requirements

.1 Refer to Division 1, General Requirements.

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

1.2 Description

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

1.3 Related Work

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

1.4 Reference Standards

.1 Except as stated otherwise, all work shall conform to the following:

- .1 B.C. Building Code 1998.
- .2 City of Vancouver Building Bylaw No. 6134.
- .3 CAN/CSA-A23.2 Methods of Tests for Concrete
- .4 CAN/CSA-A23.3 Code for the Design of Concrete Structures for Buildings.
- .5 CAN/CSA- A23.1 Concrete Materials and Methods of Concrete Construction
- .6 CAN/CSA G30.5–M Welded Steel Wire Fabric for Concrete Reinforcement.
- .7 CAN/CSA G30.12-M Billet-Steel Bars for Concrete Reinforcement.
- .8 CAN/CSA W186–M Welding of Reinforcement Bars in Reinforced Concrete Construction.
- .9 ACI manual of Standard Practice for Detailing

.2 Where the standard is referred to in this specification is shall mean the documents specified in this clause and their referenced documents.

1.5 Inspection

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

1.6 Testing and Approvals

.1 As per Section 03 10 00 - Concrete Formwork

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 finish, rough formed finish and the installation of anti graffiti coatings on cast in place concrete.

1.3 Related Work

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

1.4 Reference Standards

.1 Concrete finishes shall conform to the requirements of the following standards unless otherwise required by this specification:

.1 CSA/CAN3-A23.1, Concrete Materials and Methods of Concrete Construction

1.5 Submittals

.1 Manufacturers product information sheets for all component parts of the concrete installation

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 Concresive 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

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.

3.2 Finishing of Concrete Surfaces

.1 Architectural Concrete Finish (concrete surfaces that are exposed to view):

.1 Surface finishing shall conform to CAN 3-A23.1-M94, Section 24, Finishing of Formed Surfaces, Clause 24.3.3, Smooth Form Finish.

.2 Rough Form Finish: All concealed concrete surfaces.

.1 Surface finishing shall conform to CAN 3-A23.1-M94, Section 24, Finishing of Formed Surfaces, Clause 24.3.2, Rough Form Finish. Patching to be done in accordance with clause 24.2 Patching.

3.3 Repairs to Defects

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

.2 Should the variation in colour and texture or the appearance of defect(s) including but not limited to honeycombing, rock pockets, chips, cracks, spalls, fins and stains exceed the tolerance of the specification or CAN3 - A23.1-M94, 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.

.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 soul 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.

3.5 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 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 1and 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 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 texutre 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 (10° C).

.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° F (3° 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° F (7° 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
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
3rd and 4th 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°**	**Units @ 85°**

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 fitness equipment with required safety zones as indicated in the contract documents.

1.3 Related Work

.1	Concrete Forming and Accessories	Section 03 10 00
.3	Concrete Reinforcing	Section 03 20 00

1.4 Qualifications

.1 The Fitness Equipment installer shall have a minimum of five (5) years proven record of satisfactory performance and experience on projects of similar size and scope

1.5 Quality Assurance

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

.2 Hazardous materials such as asbestos, polychlorinated byphenyls (PCB's) and lead based paints are not permitted on site.

1.6 Protection

.1 Protect all fitness equipment and components against damage during shipping, handling, storage and installation, and until Final Acceptance.

.2 Provide protected storage of fitness equipment prior to installation off the ground and free from dampness.

.3 Provide all necessary facilities/equipment for handling and lifting site furnishings-fitness equipment into final location.

.4 Take all reasonable measures to protect surrounding or adjoining work or as requested by the Owner's Representative, including all material, plant and real property related to the Work against loss or damage from any cause.

.5 Safety: The Contractor will be responsible for all aspects of job safety at the work site as per the contract documents. All work must be carried out in a safe and responsible manner. Where applicable, Workers Compensation Board "Industrial Health and Safety Regulations" must be followed.

.6 Contractor is responsible for ensuring adequate public safety in his work area at all times. No operating equipment is to be left unattended and the work area is to be left in a safe, secure condition at the end of each workday. Ensure that any partially installed fitness equipment is adequately signed with warning signs stating "CONSTRUCTION AREA - KEEP OFF" and that the overall area is properly barricaded by fences or approved guards from public access until Final Acceptance.

1.7 Submittals

.1 Provide shop drawings of all fitness equipment, and obtain Owner's Representative's approval prior to manufacture. Shop drawings shall show overall dimensions, layout, height relationships, and footing and anchoring methods adapted as necessary to the requirements of this project. Shop drawings shall show clearances to the edge of fitness area to meet the CSA Standards. The provided installation instructions and maintenance instructions shall be "project" specific containing component information that is part of the fitness area design. A "generic" package of installation instruction and maintenance instructions is not acceptable. Shop Drawings will become part of the Maintenance Manual.

.2 Submit a copy of the supplier's warranty statement stating all exclusions. The warranty certificate shall be filled out/completed by the Contractor/Supplier acknowledging the Vancouver Park Board (with site location) as the Owner.

.3 Submit completed Schedule A - Sample Inspection Report Form to the Owner's Representative upon completion of the project. See Schedule A below.

Maintenance Manual/Kit: Prior to and as a condition of Substantial Performance the Contractor shall submit a project specific maintenance manual/kit for all Project Fitness Equipment. This manual shall:

.1 Provide information to establish the frequency of inspections.

.2 Describe preventative maintenance and repair procedures.

.3 Provide copies of project specific inspection Report Forms for each fitness component shown on the Drawings.

.4 Provide 2 sets of any special tools or wrenches necessary to adjust or replace any special vandal resistant fasteners.

.5 Provide a PVC repair kit for repair of minor PVC damage.

.6 Provide an anti-graffiti chemical cleaner for removal of paint, ink or other forms of graffiti from the various surfaces/materials used on the fitness structure.

.7 A primer and matching colour touch-up kit compatible with the original manufacturer's finishing system.

.8 The Contractor/manufacturer shall submit with their bid a list of all variances from these specifications.

.9 Provide all necessary templates for location of fixing devices prior to pouring of concrete bases.

1.8 Guarantee

.1 The fitness equipment and complete installation shall be warranted for three (3) full years from the date of Substantial Performance. Repair or replace any faulty work or parts within two (2) weeks after notification by the Park Board. Do not permit dangerous conditions in or around the fitness equipment. Refer also to inspection requirements Item 3.4.2 of this Specification.

PART 2: PRODUCTS

2.1 General

.1 All materials shall have demonstrated record of durability in similar outdoor settings.

.4 Site Specificity of Design - Equipment selection is based on specific program requirements, physical constraints within the site, and public input. Requests for Product Substitution will be subject to certain subjective criteria including (in no particular order):

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

2.2 Fitness Equipment

.1 Fitness equipment shall be CSA-approved manufactured units, consisting of the components shown in the drawings and itemized herein, and all incidental components required for a proper warranted installation. As manufactured by Landscape Structures or pre-approved equal.

.2 Colour of fitness components: posts: carbon; components: cool silver matte as per Landscape Structures.

.3 Fitness equipment shall consist of the following elements:

.1 HEALTHBEAT® PARALLEL BARS
.2 HEALTHBEAT® PULL-UP/DIP
.3 HEALTHBEAT® AB CRUNCH/LEG LIFT
.4 HEALTHBEAT® CARDIO STEPPER
.5 HEALTHBEAT® BALANCE STEPS
.6 HEALTHBEAT® ASSISTED ROW/PUSHUP
.7 HEALTHBEAT® ELLIPTICAL

.8 HEALTHBEAT® HAND CYCLER
.9 HEALTHBEAT® TAI CHI WHEELS

.4 A cash allowance is provided for fitness equipment in the attached pricing table

2.4 Resilient Fitness Area Safety Surfacing

.1 ***Rubber Surfacing:*** Poured in place rubber to meet CSA-Z614-14 standards.

.1 Colours: (see drawings for layout)

.1 50% Blue, 50% Black

.2 50% Orange, 50% Black

.2 5 year minimum warranty as a performance requirement.

PART 3: EXECUTION

3.1 Preparation and Layout

.1 Examine the areas and conditions under which work of this Section will be performed. Verify safety zones of all equipment before setting posts in concrete footings. Do not proceed until conditions detrimental to proper and timely completion of the work have been satisfactorily corrected and thus meet the manufacturer's instructions and the requirements. Beginning work constitutes acceptance of conditions as satisfactory.

.2 Before installing fitness equipment or safety surfacing, verify that the subgrades are uniform, smooth, well drained and set at correct elevations to allow for installation of specified depth of resilient safety surfacing to the correct finished grade.

.3 Lay out the fitness equipment in the designated area to ensure compliance with safety zone clearances. Stake the locations of all equipment/site furnishings and obtain the approval of the Owner's Representative prior to installation. Lay out fitness equipment locations with flags and short lengths of string as required/requested by Owner's Representative. Obtain Owner's Representative approval before proceeding. Install with the required safety clearances between fitness equipment units and to retaining curb or other objects. The layout shall be in accordance with the drawings. Alternative layouts shall be approved by the Owner's Representative.

3.2 Installation of Compound Structures and Independent Activities

.1 Install fitness equipment and resilient safety surfacing in strict adherence to manufacturer's instructions, level and plumb and maintaining recommended safety clearances. Adapt footing and anchoring methods as necessary to the requirements and specific site conditions of this project in accordance with approved shop drawings and in such fashion that work of other Sections is not damaged. Layout all equipment prior to construction.

.2 Provide all concrete footings as required to properly place the equipment components. It is the Contractor's responsibility to adjust drainage pipe or other new utility locations to accommodate the equipment footings.

.3 Place specified depths and areas of resilient safety surfacing as per detail drawings.

3.3 Protection

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

3.4 Inspections

.1 Provide a min. 48 hours notice in order to schedule all inspections. Delay claims filed by the Contractor resulting from failure to provide adequate notice of inspection required will not be entertained. All aspects of this work shall be subject to inspection by the Owner's Representative or their designated inspector. Inspector/approval points shall be of a frequency sufficient to ensure adequate Quality Control in accordance with this specification and will occur thorough the duration of the Contract. The Contractor must supply access to the work for the Owner's Representative or their Inspector. As a minimum, inspections will occur as follows:

.1 Upon arrival of fitness equipment to the site.

.2 After staked layout of proposed fitness equipment locations.

.3 After fitness equipment anchor post installation.

.4 Upon Final Acceptance/Assumption by the Vancouver Park Board.

.2 The Contractor is required to visit the site a minimum of two (2) times during the warranty period to ensure all fitness equipment/site furnishings are performing satisfactorily/functioning as intended and perform any maintenance services required. The first visit is to occur approximately six (6) months after the Assumption Date by the Board and the second visit is to occur approximately two (2) weeks prior to the end of the warranty period.

3.5 Site Maintenance/Clean Up

.1 The job site shall be kept in a neat, clean and orderly condition at all times during the installation process.

.2 Footing excavation and backfilling shall be continuous so that the amount of open excavation at the end of each workday is minimized. Any open trench or other excavations shall be barricaded and marked with high visibility marking tape to current WorkSafeBC requirements.

.3 Any damage to paving, planting or any other structures/elements due to settlement of improperly compacted footings shall be immediately repaired at the Contractor's expense to the satisfaction of the Owner's Representative.

.4 Remove and disposal of offsite all surplus material, excess excavated materials, trash, debris and waste material from the work of this Section. This clean up shall include removal of all delivery packaging.

Schedule A: Inspection Report Form

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

Individual Equipment Components	Equipment											
	TAI CHI WHEELS	JUNIOR SWING	HAND CYCLER	ELLIPTICAL	ASSISTED ROW/PUSHUP	BALANCE STEPS	CARDIO STEPPER	AB CRUNCH/LEG LIFT	PULL-UP/DIP BARS	PARALLEL BARS	SAFETY SURFACING	GENERAL SITE
Seats												
Moving Parts												
Grease Fittings												
Stability/Tilting												
Exposed Concrete												
Entanglement Points												
End/Center Fittings												
Hand Rails												
Support Bars/Legs												
Fastening Point/Areas												
Entrapment Point/Areas												
Sharp Edges/Points												
Stair/Steps												
Plastic / Rubber Component Cracking/Damage												

Handles												
Pivot Points												

Individual Equipment Components	Equipment											
	TAI CHI WHEELS	JUNIOR SWING	HAND CYCLER	ELLIPTICAL	ASSISTED ROW/PUSHUP	BALANCE STEPS	CARDIO STEPPER	AB CRUNCH/LEG LIFT	PULL-UP/DIP BARS	PARALLEL BARS	SAFETY SURFACING	GENERAL SITE
Nuts and Bolts												
Ground Clearance												
Protrusions												
Caps/Plugs												
Protective Surfaces Borders												
Equip. Spacing/ Encroachment												
Bench Seats												
Debris/Broken Glass												
Condition: Satisfactory T												
Condition: Requires Attention X												

Other Comments:

END OF SECTION 11 68 13

PART 1: GENERAL

1.1 General Requirements

.1 Refer to Division 1, General Requirements.

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

1.2 Description

.1 Supply all products, labour, equipment, and services necessary to clear and grub site in preparation for landscape or site work indicated on the contract drawings.

.2 The work shall include but is not limited to the following areas:

.1 Clearing and grubbing operation.

.2 Disposal of material cleared and grubbed from the site.

1.3 Related Work

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

1.4 Protection

.1 Protect existing fencing, natural features, bench marks, existing buildings, existing pavement, sub surface and surface utility lines, and water courses and miscellaneous items noted on contract drawings as to remain.

.2 Protect all existing trees, landscape plant beds, miscellaneous plant material and their associated root areas within the area to be cleared and grubbed that have been identified to remain on the contract drawings.

.3 Protect all existing trees, landscape plant beds, miscellaneous plant material and their associated root areas that are outside of area to be cleared and grubbed.

.4 The Contractor, at no cost to the Owner shall make good all damages incurred during the clearing and grubbing process.

PART 2: PRODUCTS (Not Applicable)

PART 3: EXECUTION

3.1 Clearing and Grubbing

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

.2 Clear and grubbing operations shall be limited to areas indicated on the Contract drawings. Contractor shall identify the areas to be cleared and grubbed in the field by flagging or staking for Owner's Representative review prior to the start of work.

.3 Clear all trees, existing plant growth, undergrowth, dead wood, surface rocks or boulders and all deleterious material.

.4 Grub out all stumps, roots rubbish over 50mm (2") in size to minimum depth of 300mm (12") below indicated finish grade.

.5 Grub out all parts of noxious or invasive plants including but not limited to varieties of Equisetum, Rubus, Hedera and Fallopia japoinica.

.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
.3	Precast Concrete Unit Paving	Section 32 14 13

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 regarding 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

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 2" x 4" timber stakes max 1.0m o.c. with orange plastic web snow fencing, 1.2m high "Tenax", as supplied by Ronco Sales Ltd., or pre-approved equal.

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 under the supervision of an ISA certified arborist. 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. 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.**

1.12 Measurement And Payment (Unit Price Contracts Only)

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

PART 2: PRODUCTS

2.1 Hot-Mix Asphalt Concrete

.1 Refer to Master Municipal Specification Section 02512 Hot-Mix Asphalt Concrete Paving and COV Supplemental Specifications to Master Municipal Specifications, current edition (COV Engineering Standards and Detail Dwgs.) for asphalt cement, aggregates and gradations, sand equivalents, abrasion, absorption, mineral fillers and all aspects of the mix design.

.1 Reclaimed Asphalt Pavement (RAP): Crush and screen so that 100 % of reclaimed asphalt pavement material passes the 37.5mm screen prior to mixing. Max. allowable RAP in any Mix Design will be 20% by mass. Higher percentage of RAP may be accepted by Owner's Representative if Contractor demonstrates that supplier can produce mix meeting requirements of the specification.

.2 **Do not change job-mix without prior approval of Owner's Representative (Engineer). If change in material source is required, Contractor shall submit new mix formula for review/approval.**

2.2 Base

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

2.3 Subbase

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

PART 3: EXECUTION

3.1 Plant And Mixing Requirements

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

3.2 Base Inspection

.1 Prior to commencement of hot-mix asphalt concrete paving the granular base shall be inspected by Owner's Representative and the Contractor. Provide min 48 hrs. notice prior to desired paving time to allow for inspection to be scheduled. Areas of work to receive hot-mix asphalt concrete paving shall be examined and unsatisfactory conditions reported to Owner's Representative; **commencement of work shall imply acceptance of conditions**. If Owner's Representative have doubts about acceptability of the base, a Benkleman Beam Test may be ordered and work is not to proceed until such testing has been approved. The contractor shall provide a loaded single axle truck with a rear axle load of 8165 kg to be used in conducting tests.

.2 Any areas which are found to be soft or wet shall be excavated and backfilled with the granular subbase and base as specified.

.3 The subgrade shall be well drained. Verify that the subgrade is dry, uniform, even and ready to support subbase, base and asphalt concrete paving and the intended loads. Base course shall be examined for adequate compaction and uniform surface. The base course to be compacted to 95% Modified Proctor Density.

.4 Verify the gradients and elevations of the subgrade and base are correct to allow installation as per the details and meet the intended finished grades. **Notify Owner's Representative of any discrepancies prior to proceeding with installation**.

3.3 Preparation Of Subgrade And Placing Base Courses

.1 Prepare subgrade to requirements of Section 01 89 13 Site Preparation and Grading.

.2 Place compacted aggregate base course (on compacted sub-base course) on subgrade to finished depths as detailed**.**

.3 The sub-base or subgrade as detailed shall be compacted to 95% Modified Proctor Density.

3.4 Placing And Compacting Asphaltic Concrete

.1 Place depth of asphalt concrete to thicknesses, grades and lines as shown on the contract documents or as directed by Owner's Representative. To be placed in compacted lifts of specified thicknesses. **Arrange for and complete paving in a continuous operation, avoid delays in laying parallel strips.**

.2 Placing Conditions:

.1 Place asphalt mixtures only when air temperature is above 5 degrees Celsius (10 degrees and rising for tennis and sport courts)

.2 When temperature of surface on which material is to be placed falls below 10 degrees Celsius, provide additional rollers as necessary to obtain required compaction before cooling.

.3 Do not place hot-mix asphalt concrete when pools of standing water exist on surface to be paved, during rain or snow or when the surface is damp. Refer to 1.9 Environmental Conditions.

.3 Lower Course: Machine place to specified compacted thickness (maximum lifts of 50mm after compaction) over compacted and graded aggregate base. Some areas may require thicker applications to fill in low spots and to ensure positive drainage.

.4 Upper Course: Machine place to minimum specified compacted thickness (maximum lift of 38mm after compaction) over compacted lower course. Hand place/tamp as required around all site fixtures.

.5 When asphalt concrete meets site fixtures, furnishings, concrete walls, walks or other (note specifically) flare the asphalt upwards around the base of fixture to ensure water drains away from the fixture and is in compliance with the overall grading and drainage plans for the Project.

.6 Commence rolling and/or manual compaction immediately after the bearing capacity is adequate to support the required compaction equipment, without undue displacement of material or surface cracking. Rolling and/or compaction shall be carried out in compliance with the Standards noted in Item 1.3. Hand tampers may be used at all inaccessible areas. Compaction in these locations shall be to the Owner's Representative 's approval.

.7 Along building walls, curbs, gutters, headwalls, manholes and similar locations not accessible to a roller, thorough compaction shall be obtained by means of hot hand or smaller mechanical tampers before the mixture has set. At all contacts of this nature, the joints between these structures and the surfacing must be effectively tack coated with an emulsified asphalt.

.8 The finished surface is to be smooth and rolling to allow for positive drainage of all areas.

.9 **Notify Owner's Representative min. 48 hrs. prior to flooding to arrange for inspection**. Flood the entire asphalt concrete surface area after placement of the Lower Course Asphalt to ensure positive drainage in accordance with the grading plans. Make all necessary repairs to ensure positive drainage prior to placing the Upper Course Asphalt.

.10 **Cutting and removal/patching type repairs are permitted in the Lower Course asphalt only. Take care to ensure that grading and drainage problems are rectified prior to placement of Upper Course asphalt. Deflecting, ponding or other surface grading problems found in the asphalt Upper Course shall be corrected by complete removal of the top lift of asphalt concrete and replacement with a new lift of Upper Course asphalt. Final repair process subject to review/approval with Owner's Representative.**

.11 All asphalt concrete pavement edges shall have a uniform, beveled, tidy and straight appearance. **Border planks or sawcut edges are not acceptable**.

.12 Both Lower and Upper Course asphalt concrete joints shall be homogeneous with the rest of the surface and carefully matched for texture and elevation. All joints which are rejected by the Owner's Representative are to be cut out and redone to Owner approval. Asphalt joints to be done in accordance with the Standards referenced in Item 1.3 of this Specification.

3.5 Existing Asphalt

.1 Repair all existing asphalt concrete that has been damaged/broken or eroded due the Work of this Contract.

.2 Where new asphalt concrete paving abuts existing asphalt concrete paving make good all cracked, damaged or eroded areas to a distance of 600mm back from the intersection to provide a uniformly graded, smooth and solid transition with the new work.

.3 Where existing asphalt is to be overlaid, prior to installing asphalt concrete mix, the surface shall be cleaned of loose or foreign material and tack coated in accordance with Section 02547 of the MMCD.

3.6 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 Portland cement concrete walks with finish as indicated in the contract documents.

.2 Work of this section includes but is not limited to the supply, testing, provision of tooled joints, and or sawcut joints curing and finishing of horizontal concrete surfaces.

.3 Scope of this section includes all formwork, the supply and installation of reinforcing, expansion joint fillers and joint sealants, aggregate required for complete installation.

1.3 Related Work

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

1.4 Reference Standards

.1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction

.2 CAN/CSA-A23.2, Methods of Test for Concrete

.3 CAN/CSA-A23.4, Architectural Concrete

.4 A23.1-09/A23.2-09, Concrete materials and methods of concrete construction/Test methods and standard practices for concrete

1.5 Testing and Approval

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

.3 Where tests or inspections reveal work not in accordance with the Contract requirements, the Contractor shall pay costs for additional inspections or tests required by the Owner's Representative to verify acceptability of current work.

.4 Testing shall be carried out for slump and air content for every truckload of concrete prior to the placement of any concrete. Cast specimens for compressive strength testing at seven (7) and twenty eight (28) days (one (1) specimen tested at seven (7) days and the average of 2 specimens at 28 days) in accordance with CAN/CSA-A23.2. Test results shall be provided to the Owner's Representative for review and records.

5 Concrete testing will be scheduled by the Contractor. Any concrete testing conducted by the Owner does not relieve the Contractor or Concrete Supplier of the responsibility to maintain their own quality assurance programs.

1.6 On Site Mock-up

.1 Provide an onsite sample panel for each type of concrete pavement finish detailed including the sensory pathway with ebony black pebbles and frost white pebbles mortared to concrete base. Sample panels to be a minimum of 2.0m x 2.0m (6.5' x 6.5') square. Sample panels are to include full joint patterns accurately constructed to match details on contract drawings.

.2 Sample panels shall be constructed a minimum of ten (10) working days prior to the start of work of this section. Do not proceed with work of this section until the sample panels have been reviewed and approved by the Owner's Representative. If mockup panels are not accepted by the Owner's Representative the Contractor shall at no cost to the Owner remove unacceptable panels from the site and cast new panels for review. Sample panels to remain in place for the duration of work of this section and will be the accepted standard for review and acceptance of work.

.3 Carry out all necessary adjustments, at no additional cost to the contract, required to provide paving to meet the specifications and/or match colour and finish of the approved sample.

1.7 Qualifications

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

PART 2: PRODUCTS

2.1 Materials

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

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

Type 1 and 2- Broom and Abrasive Blast Finish Concrete

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

.2 Non-staining type form release agent: chemically active release agents containing compounds that react with free lime to provide water soluble soap.

.3 Expansion Joint Material: 13mm (1/2") Resilient, flexible, non-extruding, expansion-contraction, polyethylene, closed-cell expansion joint filler with pre-scored removable strip.. When compressed to half of original thickness, recover to a minimum of 70 percent of original thickness. Joint filler shall conform to ASTM D1751. Acceptable suppliers include by W R Meadows ; or other pre approved equal.

.5 Joint Cleaner; xylol, methyl ethyl ketone or non-corrosive type recommended by sealant manufacturer and compatible with joint filler.

.6 Joint Primers; shall be type recommended by caulk sealant manufacturer.

.7 Joint Sealant: Non sag, Self-leveling two (2) part polyurethane type, conforming to CGSB 19.24-M80, Type 1, Class B. Colour as selected by Owner's Representative from standard range. Acceptable products include Sikaflex-2c NS Mix TG, manufactured by Sika or preapproved equal.

.9 Form Release Agent: Eco-Coat by W R Meadows; or other pre approved equal.

.10 Curing Compound: Vocomp – 20 water based curing and sealing compound by W R Meadows; or other pre approved equal.

.11 Curing Blanket: Non staining material capable of retaining sufficient moisture to ensure optimal wet cure conditions as per CAN/CSA-A23.1. Burlap and Poly will not be accepted. Acceptable products include;

.1 Ultra Cure NCF as manufactured by McTech Group Inc. (www.ultracure.net) or pre approved equal

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.12 The following materials shall not be used unless pre approved in writing by the Owner's Representative;

.1 Calcium chloride either as a raw material or constituent of another admixture.

.2 Super plasticizing admixtures

PART 3: EXECUTION

3.1 Subgrade Preparation

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

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

3.2 Granular Subbase and Crushed Granular Base Course

.1 Place sub base and crushed granular base material to design grade as shown on drawings. Material to be compacted to 95 % MPD.

.2 Where depths exceed 150 mm (6") ensure crushed granular sub base and granular sub base material are placed in 150 mm (6") lifts, compacting to 95% MPD between the placement of each lift.

.3 Owner's Representative to review compacted crushed granular base prior to placing forms for concrete flat work or control devices for extruding equipment.

3.3 Formwork

.1 Steel forms free from twists and warps following lines and shapes indicated on detail drawings.

.2 Wood forms to be of select dressed lumber, straight and free from defects and thoroughly cleaned following lines and shapes indicated on detail drawings.

.3 Flexible forms to be used for all curves less than 6.0m (20'-0"), radius, or as required to form smooth curve. Ensure transition at tangent of curve is true and smooth.

.4 Set forms to line and grade as shown on drawings, free from waves or irregularities in line or grade.

.5 Set special forms as required around catch basins, manholes, poles or other objects as shown on drawings.

.6 Tolerances:

a. Maximum horizontal deviation: 6mm (1/4")

b. Maximum vertical deviation: 6mm (1/4")

c. Maximum deflection from horizontal or vertical alignment to be 6mm in 3m (1/4" in 10'-0")

.7 Adequately brace forms to maintain specified tolerances after concrete is placed.

.8 Ensure forms are clean, free form extraneous material prior to the application of form release agent. Form release to be applied as per manufacturers written instructions.

3.4 Owner's Representative Review

.1 **Obtain Owner's Representative's approval prior to placing concrete.**

Notify Owner's Representative a minimum of forty-eight (48) hours in advance of concrete placement for review of formwork. Owner's Representative review to include but is not limited to:

.1 Forms are properly set at required horizontal and vertical alignment,
.2 Forms are sufficiently rigid,
.3 Forms are clean and ready for placement of concrete.

3.5 Concrete Placement

.1 Concrete Mix Equipment; Concrete shall be delivered to the site in transit mix trucks from a commercial batch plant that conforms to CAN/CSA-A23.1.

.2 Concrete Placing; In accordance with CAN/CSA-A23.1. Do not place concrete during rain or on wet or frozen base.

.3 Do not place concrete when air temperature appears likely to fall below 5 degrees Celsius (41 degrees F) within 24 hours, unless specified precautions are taken. Provide Owner's Representative with written construction process of concrete placement for work undertaken in these conditions.

.4 Schedule concrete placement to ensure sufficient daylight hours available to permit edging and finishing. Place concrete within 1.5 hours of batching time.

.5 Install mesh or rebar reinforcing at mid depth of concrete slab. Place concrete as per CAN/CSA -A23.1.

.6 Moisten crushed granular base immediately prior to placing concrete.

.7 Place concrete in forms, ensuring no segregation of aggregate. Vibrators shall be adequately powered and sufficiently intense to cause the concrete to compact readily into place. Systematically apply vibrators at such intervals that the zones of influence of the vibrator overlap. Insert the vibrator vertically into the concrete long enough to ensure that the concrete is properly compacted. Do not apply vibrator directly to the reinforcing steel or to the forms. Employ a sufficient number of vibrators so that the required rate of placement vibration throughout the entire volume of each layer of concrete is achieved. Keep one spare vibrator at site for emergency use.

.8 Concrete to be placed in continuous operation until entire panel (expansion joint to expansion joint) or section has been completed.

.9 The Contractor shall notify all trades sufficiently in advance to ensure that provision is made for openings, inserts and fasteners. He shall cooperate with all trades in the forming and setting of all slots, sleeves, bolts, dowels, hangers, inserts, conduits, clips, etc., whether they are in his scope of work or not. Depress concrete locally around drains to facilitate drainage.

.10 Discontinue placement at expansion, construction or isolation joints only.

3.6 Addition of Mix Water

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

3.7 Expansion Joints

.1 Unless otherwise indicated on drawings form transverse expansion joints at both ends of curb returns and at a maximum spacing of 10m for sidewalks, at each end of driveway crossings and at tangent points on circular walk.

.2 Extend through full depth of concrete and terminate 12 mm (1/2") below finished surface to allow for approved sealant.

3.8 Control Joints

.1 Tooled Control Joints:

.1 At locations indicated on contract drawings construct control joints at maximum 1.5m (5'-0") intervals.

.2 Sawn Control Joints;

.1 At locations indicated on contract drawings as soon as the concrete can be cut without raveling. Typically this occurs no later than sixteen (16) hours after placing. Contractor shall, through the mockup procedure satisfy himself that the typical cure time is sufficient and adjust as required to ensure joints can be cut without ravelling.

.3 Construct control joints whether saw cut or tooled to minimum 1/4 depth of concrete section at point of cut or as otherwise shown on project details.

3.9 Isolation Joints

.1 Form isolation joints around all poles, hydrants, manholes and all structures or fixed objects located within the concrete section by using approved expansion joint material.

.2 Form longitudinal isolation joints between sidewalk and abutting curb and gutter, abutting utility strips, abutting structures using expansion joint material.

.3 Use expansion joint material to form isolation joints between sidewalks and abutting walls and structures.

3.10 Caulking Sealant

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

.2 Ensure that all surfaces of the joint to be caulked sealed are clean and dry prior to start of caulking sealing operation.

.3 Joint faces shall be primed, expansion joint material covered with bond break tape prior to the application of caulking sealant material.

.4 Take all necessary precautions to ensure that primer does not stain concrete surface and that caulking sealant material is applied as per the manufacturers instructions within the confines of the joint. Clean all excess caulking from concrete surfaces.

3.11 Finishing

.1 Pre finish surface of concrete sidewalks and utility strips to smooth surface with magnesium or wood float trowel.

.2 The finish to concrete surfaces shall be as noted on contract drawings.

.1 Type 1 Concrete Finish: Broom to areas indicated on contract drawings shall form light broom marks as per approved mockup perpendicular to the path of travel.

.2 Alternate finishes as per approved mockup to areas indicated on contract drawings or if noted on contract drawings to match adjacent finish.

.3 Grooves, scoring or saw cutting used for aesthetic purposes as shown on the drawings or as directed by Owner's Representative, to be marked with proper tools or saw cut to depths shown on drawings.

.4 Finish driveway crossing, curb let downs and wheel chair ramps as shown on detail drawings.

.5 When contract drawings indicate broom finish round edges of joints with steel edging tool to a width of 50mm (2") around perimeter of each panel or as shown and described on drawings.

.6 Under no circumstances is concrete to be overworked by troweling, dusted with dry cement or finished with a mortar coat.

.7 Finished surface to be as specified, match the approved mockup and to satisfaction of Owner's Representative. Sections of cast in place concrete pavement that do not conform to this specification section, do not match the mockup or are not to the satisfaction of the Owner's Representative shall be removed and replaced by the Contractor at no cost to the Owner.

3.12 Curing

.1 Type 2 Concrete Finish:

.1 Moist cure and protect concrete to CAN/CSA-A23.1, Clause 7.4, and as directed by this specification. Curing compounds for are not an acceptable substitute for Type 2 concrete.

.2 Curing Blanket; completely cover concrete to be cured as soon as the concrete can bear the weight of moist burlap.

.3 Ensure curing blanket overlaps of a minimum of 150mm (6") between panels and 300mm (12") minimum overlap at edge of concrete slab and is in direct contact with concrete surface.

.4 Thoroughly wet the curing blanket a keep saturated during the curing period with water spray fine enough to avoid damage to the concrete surface.

.5 Contractor to ensure that curing blanket is kept wet at all times during the seven (7) day cure period.

.2 Type 1 Concrete Finish:

.1 Apply curing compound as per manufacturer's written instructions.

.3 When temperature is below 5 degrees Celsius (41 degrees F) take measures necessary to ensure that the ambient air temperature around the concrete is not less than 10 degrees Celsius (50 degrees F) for at least 72 hours. Protect from freezing for at least another 72 hours or such time as required to ensure proper curing of concrete. Admixtures are not be used for prevention of freezing.

3.13 Defective Concrete and Patching

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

.2 Repair of defective concrete work:

.1 Repair defective areas while concrete is still plastic, otherwise wait until curing is completed.

.2 Prior to undertaking any repairs provide the Owner's Representative with a written description of repair method complete with product data sheets.

.3 At the discretion of the Owner's Representative and at no cost to the Owner, the Contractor shall remove and replace concrete deemed 'defective' and 'unrepairable'.

.4 Defects and areas requiring repair as indicated by the Consultant

.3 Grinding to repair imperfections and incorrect slope is unacceptable.

.4 All areas deemed unacceptable by the Owner's Representative shall be removed from joint line to joint line, e.g. full panel.

3.14 Protection

.1 Protect freshly finished concrete from dust, rain or frost by using tarpaulins or other suitable protective coverings. Keep clear of finished surface.

.2 Place and maintain suitable barriers to protect finished concrete from equipment, vehicles or pedestrian traffic.

.3 Provide personnel as required to prevent vandalism until concrete has set.

.4 Do not run vehicles or construction equipment on concrete for at least 7 days or as directed by Owner's Representative.

.5 Keep traffic that would affect and/or otherwise disturb the curing procedures off the finished surfaces for the full cure period of twenty-eight (28) days.

3.15 Flood Test

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

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

3.16 Acceptance

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

.1 Owner's Representative shall have reviewed concrete batch design and test results provided by the contractor.

.2 Concrete shall have full 28 day cure.

.3 All irregular, cracked or otherwise defective sections to be removed and replaced to satisfaction of Owner's Representative. The extent of removal will be at a minimum to the nearest joint.

.4 All stains, marks and discolouration as a result of spills or drips shall have been removed.

.5 Finish of concrete matches the accepted sample panels.

3.17 CleanIng

.1 Promptly, as the work proceeds and on completion, clean up and remove from the site any debris, waste material and rubbish resulting from work of this section.

.2 Clean spills and excess concrete from adjacent horizontal and vertical surfaces.

END OF SECTION 32 13 13

PART 1: GENERAL

1.1 General Requirements

.1 Refer to Division 1, General Requirements.

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

1.2 Description

.1 Supply all products, labour, equipment, and services necessary to install exterior stone paving as indicated in the contract documents.

.2 The work of this section shall include, but shall not necessarily be limited to the supply and installation of the following:

.1 Exterior stone pavers.

.2 All setting beds, mortar, reinforcing mesh, additives, grout, surface sealar and accessories required to complete paver installations.

.3 Joint sealant and filler at control joints in paving and at expansion joints, including perimeter joints between pavers and adjoining construction and joints around piping and other protrusions.

1.3 Related Work

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

1.4 Qualifications

.1 The Subcontractor executing the work of this section shall have at least five (5) years' experience in work of similar scope and nature to that indicated and specified.

.2 All stone paving work shall be done by an experienced Stone Paving/Tiling Subcontractor, employing skilled stone/ tile setters.

1.5 Quality Assurance

.1 Work under this section shall conform to the Terrazzo Tile and Marble Association of Canada (TTMAC Specification Guide 09 30 00) Tile Installation Manual (current edition) Specification Guide 09300 and ANSI listed standards as a basic minimum, and as specified.

.2 Should modifications to the Tile Installation Manual be contained herein, the modifications shall govern.

.3 A copy of the TTMAC Tile Installation Manual shall be made available on the site for reference.

1.6 Reference Standards

.1 The current and/or latest editions of references and standards as published by the following organizations or agencies, designated by abbreviations in this section, are all to be considered as part of this section. The work shall conform to the applicable requirements of these references and standards, unless indicated or specified otherwise, or as modified by governing codes.

.1 ANSI A108.5-2006 Ceramic Tile installed with Dry Set Portland Cement Mortar or Latex Portland Cement Mortar.
.2 ANSI A108.10-2006 Installation of Grout in Tilework.
.3 ANSI A118.4-2006 Latex Portland Cement Mortar.
.4 ASTM C1193-09 Standard Guide for Use of Joint Sealants.
.5 ASTM C1515 Standard for Surface Cleaning
.6 ASTM D 1751Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction
.7 CAN/CGSB-19.24-M90 Multicomponent, Chemical Curing Sealing Compound.
.8 CSA-A23.2-6B – Method of Test to Determine Adhesion by Tensile Load.
.9 BC Building Code – Current Edition
.10 Terrazzo, Tile and Marble Association of Canada Specification Guide 09 30 00 “Tile Installation Manual – Current Edition

1.7 Submittals

.1 Submit to the Owner’s Representative two (2) samples of each type of stone, each type of stone finish required in the work of this contract. Sample sizes shall match unit size of specified material. All samples shall be identified as to stone name, unit size, date and supplier name.
.2 Submit to the Owner’s Representative two (2) copies of physical test data for each stone type. Test data to include but is not limited to;

.1 Absorption by Weight as per ASTM C97
.2 Density as per ASTM C97
.3 Compressive Strength as per ASTM C170
.4 Modulus of Rupture as per ASTM C99

.3 Submit to the Owner’s Representative documentation of orders and delivery dates so as to indicate the correct material will be delivered to the site as per required schedule.
.4 Failure of on-site work to match approved samples will be cause for rejection of work. TheSubcontractor will be required to expedite replacement of all rejected work and make good at no additional cost to the Owner.
.5 Submit two (2) samples of grout in colour specified to the Owner’s Representative for approval. Grout samples to include two (2) copies of orignal product cut sheets, information sheets for all product specified.
.6 Fully acquaint material suppliers of the requirements contained herein.

1.8 On Site Mock-Up

.1 Construct a 4.0 sqaure Metre (43 square feet) sample mock-up of stone paving on site for review by the Owner's Representative and the appointed inspection agency. Sample mock–up shall include all joint types, finished and cured joint sealer, finishes and surface coatings as per drawings and specifications. The Owner's Representative will approve the mock-up before the balance of the work of this section proceeds. The approved mock-up shall form the basis of acceptable quality required for the remainder of the stone paving.

.2 The approved mock-up shall form part of finished work.

1.9 Maintenance Material

.1 Provide the Owner with extra stock of minimum of two percent (2%) of each different stone paver, size and colour installed.

.2 Package stone pavers to ensure they are protected from the elements and can be readily loaded and unloaded without damage. Ensure packaging is clearly marked as to size, type and finish. Deliver to the Owner's representative on site and obtain a receipt for same.

.3 Replacement stone pavers shall be undamaged. Damaged pavers shall be replaced by the Contractor at no cost to the owner.

1.10 Maintenance Data

.1 Submit four (4) copies of TTMAC recommended maintenance procedures for stone paving included in the contract at Substantial Performance of the Work for Owner's use.

1.11 Product Delivery, Storage and Handling

.1 Deliver all specified stone pavers, grout, setting bed material, additives, etc., to the job site with manufacturer's labels and seals intact.

.2 Store all materials in a dry location, away from ground contact, particularly keep cementitious materials away from dampness.

.3 Remove from the job site immediately all damaged or broken stone pavers caused by improper handling or storage.

1.12 Job Conditions

.1 Inspect all substrate surfaces to receive stone paving. Report any unsatisfactory conditions to the Contractor. Start of work shall imply acceptance.

.2 All materials shall be fresh, newly mixed, newly opened for start of work. Follow manufacturers recommended tests on site, to ensure proper, permanent bonds prior to continuing with work of this section. If proper, permanent bonds are not achieved notify the Owner's Representative immediately.

.3 Ensure that conditions of temperature, humidity, traffic and usage are as per the product requirements and or TTMAC specifications which ever is the more stringent of the two.

.4 Check all surfaces ready to receive pavers; all level, plumb, smooth, firm, free from loose particles, droppings, projections and other foreign matter and from other unsuitable conditions.

.5 Protect adjacent surfaces until work under this section has been completed.

.6 Erect temporary barricades to prevent damage to freshly paved areas.

.7 Protect work of other trades as necessary from damage resulting from work of this trade.

.8 Make good such damage, if any, at no additional cost to the Owner.

1.13 Pre-Installation Conference

.1 Arrange for pre-installation conference with the Owner's Representative and the Stone Paving Subcontractor.

.2 The purpose of the conference shall be to discuss coordination issues, access, hoisting and installation requirements.

.3 Arrange for the conference to take place a minimum of two (2) weeks prior to start of installation so that coordination issues affecting the work of this section or that of other Subcontractors can be accounted for and corrected prior to any installation of materials if necessary.

1.14 Quality Assurance

.1 The Owner shall retain a third party Field Quality inspector to review and document the installation procedures, physical and environmental conditions as they relate to day to day activities and specific requirements of the product manufacturers specifications/ installation proceedures and the project specifications. The daily records shall be summarized in weekly reports provided to the Contractor for action and the Owner's Representative and the Owner for review.

.2 Documentation will include but not limited to daily record keeping of installation observations including;

.1 Verification that installation conforms to details and specifications.

.2 Verification of specification elements including specified depths of various components, products and materials.

.3 Weather conditions including but not limited to temperature and weather of the day.

.3 The Contractor at no cost to the Owner will recitify immediately any and all improper construction practices or deviations from the project specifications or manufacturers specifications/ installation requirements reported by the Field Quality inspector or noted by the Owner's Representative.

1.15 Testing and Approval

.1 An independent inspection company will be appointed and paid by the Owner to carry out inspection of stone paving installations. The inspection company shall be present when the installation of stone paving begins and, at the descretion of the Owner's Representative or the Owner, shall make periodic inspections during application.

.2 The appointed inspection company shall carry out delamination survey of the stone paving installation.

.3 The survey procedure shall consist of a standard chain-drag test to detect voids under the installed stone paving units.

.4 The chain-drag test will be carried out using a minimum of one (1) 1.0 Metre (3'-0") long section of 9.5mm (3/8" chain) that shall be dragged along the entire stone paving surface installation.

.5 Using this method areas where the stone paving units have debonded from the mortar bed substrate, or where the mortar bed thickness over the drainage mat is thinner than adjacent areas will be detected by a change in the tonal quality given off by the chain as it is dragged across the surface.

.6 The inspection company will prepare a scaled plan indicating the areas of apparent 'delamination' which exceed the area of one stone paving unit.

.7 Verification of delamination; The Contractor at his expense will remove one or more stone paving units in the delamination area for further inspection by the inspection company. Upon completion of the review, at no cost to the Owner, the contractor will make repairs as recommended by the inspection company or the Owner's Representative so that the finished appearance of the repair areas match the adjacent undisturbed stone paving.

.8 A further delamination survey will be conducted by the inspection company prior to the end of the project warranty period. The Contractor will make repairs as required by the inspection company report as indicated in this section.

1.16 Guarantee

.1 Submit a guarantee in writing in the name of the Owner that stone paving furnished and installed under this section shall remain free from all defects for a period of five (5) years from the date of issuance of Substantial Performance of the Work.

.2 This written guarantee shall cover the faithful performance of the stone paver installation, including immediate correction, at no expense to the Owner and at such time as the Owner may designate, of any defects due to faulty materials or workmanship appearing within five (5) years from the date of Substantial Performance of the Work.

PART 2: PRODUCTS

2.1 Portland Cement: Conform to CAN/CSA-A3000-03, Type 10; normal Portland cement; colour Grey.

2.2 Sand: Conform to CAN/CSA-A23.1-04.

2.3 Lime: Lime will not be added to mortar.

2.4 Water: Fresh, clean, potable, free from deleterious matter, acids or alkalis.

2.5 **Sand for Thin-Set Mortar:** Target Silica 30-30, or equivalent, washed clean and free from all dust and deleterious matter.

2.6 **Latex Additive for Thin-Set Mortar:** Latex liquid additive at least conforming to ANSI A118.4 Minimum Quality Performance Standards.
Approved Type: Mapei Granirapid System Additive.

2.7 **Latex Grout:** Factory prepared mixture to be used with Portland cement, and sand mortar and colouring; to produce hard, durable impervious, permanent, grouted joint. To ANSI A118.7 Standards with the following characteristics;

Minimum Compressive Strength at 28 days	> 37.9 MPa (5,500 psi)
Specific Gravity (paste)	1.9 – 2.1 g/cubic cm

Colour: As noted on drawings. Approved Type: Mapei Ultracolour.

2.8 **Waterproof Additive:** To improve waterproofness, flexibility and adhesion of grout. Approved manufacturers as specified for latex additive.

2.9 **Grout Release:** Temporary water soluble pre grout coating.
Approved Type: Aquamix Grout Release; or preapproved sealant.

2.10 **Surface Cleaner:** Stone cleaners capable of removing grease, rust, surface debris in preparation for surface sealer. Cleaners shall by type approved by TTMAC.
Approved Type: Aquamix Stone Deep Clean, Heavy Duty Tile and Grout Cleaner; or preapproved equal.

2.11 **Reinforcing Mesh:** 51 mm x 51 mm x 1.6 mm dia. (2” x 2” x 1/16”) galvanized wire mesh reinforcing.

2.12 **Joint Filler:** Backer rod composed of 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.
Approved Type: Soneborn by BASF; or other preapproved equal.

2.13 **Bond Break Tape:** 0.2mm (.008”) thick polyethelyene tape, width compatible with joint width.
Approved Type: C R Laurence Co. CLR bond break tape; or other preapproved equal.

2.14 Joint Sealant: Multi-component, premium-grade, polyurethane-based, elastomeric sealant principally a chemical cure in a non-sag consistency to CAN/CGSB-19.24-M90, Type 1, Class B. Ensure.

Minimum Shore Hardness ASTM D 2240 at 14 days	40 +/- 5
Tensile Strength at break; minimum	1.2MPa (175 psi)
Modulus of Elasticity – 100% Elongation	650%
Tear Strength ASTM D 624) at 14 days	17.5 N/mm (100 lbs/in.)
Adhesion in Peel (TT-S-00227E, ASTM C 794) at 21 days, concrete	5.3 N/mm (30 lb. min) 0% adhesion loss

Approved Type: Sikaflex-2c NS EZ Mix TG Sealant, manufactured by Sika; or other preapproved sealant.

Colour: As noted on drawings.

Primers and bond breakers as required to install the movement joint sealant system shall be provided in strict accordance with sealant manufacturer's recommendations.

2.15 Surface Sealer: Non sheen, water based penetrating sealer.

Approved Type: Aquamix Sealer's Choice Gold; or preapproved sealant.

2.16 Filter Drain Mat: Three dimensional, high impact polystyrene core and backer sheet with non woven filter cloth adhered to core.

Approved Type: L Nudrain WD/15 manufactured by Nilex Geotechnical Products Inc., Burnaby B.C., or approved equal.

2.17 Stone Paving

.1 Stone: All stone shall be of sound stock and uniform texture, and shall be free from holes, seams, shake, clay pockets, spills, stains, starts and other defects which will impair the strength durability and appearance of the work to the following standards;

.1 Standstead Grey Granite Polycor, also available as Hardy Island may have different

Absorption by Weight ASTM C97	0.15%
Density ASTM C97	2,660 Kg/cubic Metre (165.8 lbs/cu foot)
Compressive Strength ASTM C170	186 Mpa (354,943 psi)
Modulus of Rupture ASTM C99	14.1 Mpa (2,047 psi)

.2 Black Tusk Basalt Bedrock Granite

Absorption by Weight ASTM C97	0.31%
Density ASTM C97	2,953 Kg/cubic Metre (190 lbs/cu foot)
Compressive Strength ASTM C170	341 Mpa (49,373 psi)

.3 Nero Impala This granite is from Africa

Absorption by Weight ASTM C97	0.10%
Density ASTM C97	2,930 Kg/cubic Metre (182.8 lbs/cu foot)
Compressive Strength ASTM C170	240 Mpa (34,809 psi)
Flexural Strength ASTM C880	22 Mpa (3,190 psi)

Modulus of Rupture ASTM C99 26 Mpa (3,770 psi

Approved Types: Refer to Hardscape Materials Legend on Landscape drawings for the approved stone paver types, sizes, patterns, finish and supplier.

.2 Finish Types: Flamed and Thermal finish refers to application of high temperature flame to surface area. For the purpose of this specification Thermal finish shall have a higher degree of surface variation and rustication as a result of the application of high temperature flame.

PART 3: EXECUTION

3.1 Preparation

.1 Prepare all substrate surfaces to receive stone paving as required and as recommended by manufacturers of mortars, as required by job conditions to ensure good, permanent bonds.

3.2 Stone Paving Installation

.1 General: Paver installation shall be in accordance with TTMAC Tile Installation Manual (Current Edition) standards and ANSI 108.5 and as follows:

.1 Stone Paving shall be applied over clean surfaces which are free from loose materials, dust or grease.

.2 Saw cut pavers to required dimensions ensuring smooth, even edges free of chipping. Where required for radius elements, drill stone pavers for proper fitting without marring pavers edges.

.3 Layout pavers in accordance with drawings and patterns so that the perimeter and, where feasible, all cut pavers are no less than half (1/2) the full paver size size. Using pavers from different boxes, mix the different colour nuances to obtain a uniform appearance.

.4 Work areas available for cutting pavers will be defined by the General Contractor. Collection,filtration and disposal of cutting and cleaning water is the responsibility of the Trade Contractor.Confirm location of Work areas with General Contractor before submitting Bid.

.5 All finished grouted joints shall be smooth, neatly pointed, uniform in width without voids or cracks and shall be waterproof.

.6 Variations in the substrate surfaces shall be evened and minimized by the mortar bed.

.7 Stone pavers with one or more inclusions larger than the diameter of a Canadian Toonie, 28mm (1.1”) will be rejected.

.2 Install stone pavers over filter drain mat protection to lines and patterns indicated on the Contract drawings in accordance with TTMAC Exterior Decks 325ED, Detail A, excluding membrane, using the following components:

.1 Reinforced mortar bed with latex additive. Minimum bed thickness to be 38 mm (11/2"). Mortar bed to consist of 3:1 sand and latex Portland cement mix. Reinforce mortar bed with reinforcing mesh specified. Finished tolerance of mortar bed not to exceed 6 mm (1/4") in 3.0M (10'-0"), or 2 mm (1/16") in 305 mm (1'-0").

.2 Remove dust and contaminants from back of each paver with a cleandamp cloth before back buttering.

.3 Back butter pavers with thin set mortar using a notched trowel to achieve a minimum of 95% coverage of the back of the pavers. Contact shall be evenly distributed to give full support of the paver.

.4 Beat pavers into fresh thin set mortar bed to ensure finished surfaces are evenly pitched to drains at slopes indicated on Contract drawings. Areas that exhibit pooling, ponding or water retention will be rejected and remedied at the Contractors expense.

.5 Take care to monitor and minimize lippage during installation.

.6 Clean excess thin set mortar from paver prior to final set.

.7 Finished tolerance in the true plane of the flat surface of stone shall be be determined using a 1.2M (4'-0") long straight edge. Surface variation shall not exceed 1/3 the specified joint width.

3.3 Joints

.1 Provide control joints in grid pattern indicated on Contract Drawings to the following standards unless otherwise noted on the contract drawings:

.1 Joints between pavers shall be 6 mm (1/4") wide maximum, with a tolerance of +/- 2 mm (1/16") unless otherwise indicated in Contract drawings.

.2 Control joints and expansion joints shall be 12 mm (1/2") wide maximum, with a tolerance of +/- 2 mm (1/16") unless otherwise indicated in Contract drawings.

.3 Ensure control and isolation joints are installed as part of the paver layout. Saw cutting the control joints after paver is in place is not permitted.

.4 Remove all thin set mortar from the control joints as the work progresses. Do not allow the thin set to harden the control, expansion or isolation joints.

.5 Cure and protect freshly installed pavers as specified by the manufacturer of the thin set mortar.

3.4 Grouting

.1 Allow seventy-two (72) hours after installation of pavers prior to grouting. Grout shall be applied in accordance with ANSI A108.10 'Installation of Grout Tile" and the manufacturers written instructions.

.2 Protect caulked joints during grouting to prevent grout entering joint. Do not allow the grout to harden in the control, expansion or isolation joints prior to removal. Freshlygrouted pavers shall be cured and protected in accordance with the grout manufacturer's writtenspecifications.

.3 Clean paver surface after grout has cured. Within twenty-four (24) hours of cleaning grout from paver surface Owner's Representative to review paver installation noting deficiencies. Upon rectifing deficiencies the Contractor shall reclean the full surface area. Owner's Representative to review and indicate that the finished section of work is in general conformance with the specifications and that surface sealer can be applied. Note: cleaning and maintenance of all paver areas shall be the responsibility of the Contractor until an area is signed off by the Owner's Representative.

3.5 Surface Sealer Application

.1 Clean surface as per manufacturers instructions ensuring all areas are clean, dry and free of existing sealers, coatings or deletrious materials.

.2 Apply first coat surface sealer prior the grouting procedure.

.3 Apply the second coat of sealer in accordance with the manufacturers written instruction after stone paver grouting has been completed, the finish surface has been thoroughly cleaned and Owner's Representative has reviewed the grouted surface. Ensure strict adherance to cure time, moisture content of stone pavers and ambient air temperature for all applications.

.4 Protect all surfaces from rain, dust and dirt until sealer has fully cured.

3.6 Joint Sealer Application

.1 Make good joints to be sealed, clean, dry, free of dust, loose mortar, as recommended by the manufacturer. Remove oils and grease using solvent-based materials such as xylol, loluol or methyl ethyl ketone for cleaning metals. Use no water base cleaners or soap detergents.

.2 Apply joint sealant only after tests have been carried out showing there will be no staining of adjacent paver surfaces.

.3 Joint sealant shall maintain a width to depth ration of 2:1 provided proper rubber joint filler is used.

.4 Prime sides of joints as required by specified manufacturer's printed specifications and recommendations.

.5 Mask adjoining work as necessary to ensure no smearing, over sealing or marking of adjacent stone paving or surfaces.

.6 Install joint filler in accordance with manufacturer's printed directions. Ensure joint filler installation provides a void space that matches the depth of the joint indicated on drawings. Where joint depth is too shallow to accommodate joint filler ensure bond break tape is applied to bottom of joint prior to application of joint sealant.

.7 Joint sealant materials shall be used in strict accordance with ASTM C1193 and sealant manufacturer's written instructions and shall be applied only by specially trained applicators.

.8 All joints shall be tooled, and exposed sealed joints both taped and tooled. All joints to be sealed shall be thoroughly pretreated to ensure the full bond capabilities of the sealant. Tapes shall be removed as soon as possible after tooling.

.9 Joint sealants, tapes, gaskets, separators, joint fillers, back-up and packing materials shall be physically and chemically compatible with each other and with adjacent materials. Items shall be installed so that they will not become dislodged during or after installation.

.10 Protect all joint sealant from dust, dirt and debris until fully cured. Grout sealant that has been contaminated resulting in colour change or finish irregularity shall be removed and replaced by the Contractor at no expense to the Owner.

3.7 Adjust and Clean

.1 On completion, check work and replace defective, upset or misaligned pavers.

.2 Make good skips, voids or excess grouting. Remove all debris and excess materials from the premises, leaving it in a clean condition to the satisfaction of the Owner's Representative.

.3 Remove all stains, dirt, excess mortar, and defacements as on all stone and glass pavers and joints.

.4 The products to be used for cleaning the pavers shall be as recommended by the paver manufacturer and approved by the Terrazzo Tile and Marble Association of Canada.

3.8 Cleaning

.1 At completion, remove all debris, tools and equipment as directed from the premises.

END OF SECTION 32 14 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 exterior site furniture as indicated in the contract documents.

1.3 Related Work

.1 Cast-in-Place Concrete Section 03 33 00

1.4 Requirements Included

.1 Furnish all labour, materials, equipment and services necessary to supply and install benches.

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

2.3 Benches: Refer to manufacturers installation specifications.

PART 3: EXECUTION

3.1 Installation

.1 Benches: Maglin Ogden – Range 5,

- Ipe,
- back support,
- arm rest: OGM1900-CA1 – powder coat: Silver 14,
- square leg: OGM1900-MS1 – powder coat: Silver 14

.2 Assemble and install bench in accordance with manufacturer's instructions.

.3 Bolt to concrete footing, and, or paving, as per manufacturer's specifications with vandal proof 20 mm (3/4”) Galv. bolts.

.4 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

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.

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 contaminates 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 $30m^3$ growing medium volume and minimum $15m^3$ 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.

3.12 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 sod lawn as indicated in the contract documents.

1.3 Related Work

.1 Growing Medium Section 32 91 13

1.4 Reference Standards

.1 Conform to the requirements of the latest editions of the following standards and legislation:

.1 BCSLA/BCLNA British Columbia Landscape Standard
.2 British Columbia Standard for Turfgrass Sod
.3 British Columbia Weed Control Act
.4 Canada Seed and Fertilizer Act
.5 Canada Pest Control Products Act

1.5 Submittals

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

1.6 Testing and Approvals

.1 Notify Owner's Representative at least forty-eight (48) hours before installing sod for review of finished grades and sod

.2 Obtain approval in writing from the Owner's Representative for application of any chemical vegetation controls. Comply with applicable federal, provincial and municipal legislation and regulations.

1.7 Acceptance

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

.1 Total Performance of the Work (per CCDC2, Supplementary Conditions) for the entire project has been declared.

.2 Sod shall be mown as specified no more than two days before inspection for Acceptance.

.3 Sod shall be uniformly healthy, dense, in a vigorous growing condition, rooted into the underlying soil and shall show no signs of yellowing. There shall be no gaps showing between adjacent rolls of sod.

Sod shall have no evidence of noxious weeds.

.2 Inspection and Acceptance by the Board: Notify the Owner's Representative at least 48 hours in advance to schedule inspection of the entire landscape ready for Acceptance.

1.8 Protection

.1 Protect all sodded areas against trespassing and from damage at all times until Acceptance. If any sodded areas are damaged, they shall be repaired as required by the Contractor.

.2 Comply with COV pesticide/herbicide control regulations regarding application of herbicides to control noxious weeds. Ensure all manufacturer's recommendations regarding application are strictly adhered to.

1.9 Guarantee

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

PART 2: PRODUCTS

2.1 General

.1 Product Handling

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

2.2 Fertilizer

.1 Fertilizer shall be as recommended for season of application

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 32 91 13 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 Where new sod meets existing grass, the newly laid sod to match with the grade of the existing grass with a clean straight edge.

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 Contractor is responsible for irrigation of sodded areas from the time of installation until acceptance. 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 removed and replaced with sod matching the original.

.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