

**1.00**      **GENERAL****1.01**      **GENERAL REQUIREMENTS**

- .1      Refer to Division 1, General requirements.
- .2      All contract documents form an integral part of this section.

**1.02**      **DESCRIPTION OF WORK**

- .1      This section specifies general requirements and procedures for contractors submissions of the to Consultant for review. Additional specific requirements for submissions are specified in individual sections.
  - .1      Shop Drawings.
  - .2      Product Data.
  - .3      Samples and Mock-Ups.
  - .4      Material Testing

**1.03**      **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      Allow ten working days for Consultant's review of each submission.
- .3      All submissions are to include a transmittal letter outlining the following information:
  - .1      Date of Submission
  - .2      Project name
  - .3      Contractor's name, address, telephone, email address
  - .4      Contact person's name and position
  - .5      Identification including colour, finish, material type, trade name, texture, etc. clearly marked on each sample or product.
- .4      All submissions of project components, products, samples, etc. shall be clearly marked with the following information:
  - .1      Date of Submission
  - .2      Project title and number
  - .3      Name, address telephone, email address, contact person of the;
    - .1      Subcontractor
    - .2      Supplier
    - .3      Manufacturer

In addition to the above information the Contractor shall indicate via stamp on transmittal (if submittal is a product), shop drawing or product information sheet, their corporate name, address and telephone number 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.

- .5 Shop Drawings and submittal information shall include but are not limited to the following information;
  - .1 Fabrication details
  - .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
- .6 Contractor is responsible for the distribution of submittals reviewed by the Consultant to all trades necessary to complete the work. Contractor shall maintain an up to date file of all submissions and revisions on site at all times.

#### 1.04 GENERAL REQUIREMENTS

- .1 Work adjacent to or impacted by the submittal shall not proceed until the Consultant review of the submittal is complete and has been submitted to the Contractor.
- .3 Shop drawings, product data, samples and mock-ups shall be submitted in SI Metric Units.
- .4 Where items or information are not in SI Metric units provide converted values in brackets adjacent to imperial units.
- .5 Should the Contractor feel it is necessary to deviate from the details to fully meet the intended requirements of the project they are to provide written documentation and rationale for the deviation to the Consultant at the time of submission.
- .6 Contractor to revise submissions as indicated by the Consultants written mark ups or comments and resubmit as required. Fabrication, selection, purchase of components noted in the submission prior to the review by the Consultant is at Contractors own risk.

#### 1.05 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 Consultant are not intended to change the Contract Price. If adjustments affect the value of work, state such in writing to the Consultant. Do not proceed with work until such time a change order has been issued.
- .3 Unless otherwise noted in the Contract Documents the Contractor is to submit six (6) full scale copies of each shop drawing requested. Reduced, electronically transmitted drawings either via email or fax are not acceptable.
- .4 Cross-reference shop drawing information to applicable portions of Contract Documents.

#### 1.06      SAMPLES

- .1 Samples: Samples include but are not limited to examples of materials, products, equipment, hardware, etc. that clearly illustrate the quality, finishes, workmanship indicated in the Contract Documents.
- .2 Unless otherwise noted on the Contract Documents the Contractor shall submit two (2) samples of each element.
- .3 Unless otherwise indicated in the Contract documents samples are to be delivered prepaid to the consultant's business address.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Comments made by the Consultant regarding the sample review are not intended to change the Contract Price. If adjustments affect the value of work, state such in writing to the Consultant. Do not proceed with work until such time a change order has been issued.
- .6 Reviewed samples will become standard of workmanship and material against which installed work will be compared.

#### 1.07      MOCK-UPS

- .1 Mock-ups: A Mock Up is a field-erected example of work complete with specified materials and workmanship.
- .2 Mock Ups are to be erected on site in a location where they can remain for the duration of the Contract. Coordinate location of the mock-up(s) with the Consultant.
- .3 Adjustments made to mock-ups by the Consultant are not intended to change the Contract Price. If adjustments affect the value of work, state such in writing to the Consultant. Do not proceed with work until such time a change order has been issued.
- .4 Reviewed mock-ups will become standards of workmanship and material against which installed work will be compared.

**1.08 SHOP DRAWING, MOCK-UP AND SAMPLE REVIEW**

- .1 The review of shop drawings, mock-ups and samples by the Consultant is for the sole purpose of ascertaining conformance with the general concept. This review shall not mean that the Consultant 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 sub trades

**1.09 MATERIAL TESTING AND INSPECTIONS**

- .1 The Contractor at no cost to the Owner and as part of their work shall coordinate the performance of all inspections and material testing and approvals required by this Contract. Should the test require a representative sample or repair of as constructed area as a result of testing the Contractor at no cost to the Owner will undertake the selection and delivery of samples to the testing agency and carry our repairs to constructed work as required by the Consultant. Unless otherwise noted all tests prepared by an independent testing agency will be paid for by the Owner.
- .2 Prior to the start of work the Contractor shall provide the Consultant with a schedule outlining the required tests and inspections and indicate the dates or frequency of testing or inspections to ensure that they are fully coordinated with the requirements of the Contract Documents.
- .3 The Contractor shall provide certificate of inspections and test results to the Consultant via email noting within the body of the email whether the tests or inspections conform to the requirements of the Contract Documents.
- .4 Should the Contractor cover work to be tested or inspected prior to carrying out required testing or inspections then the Consultant has the right request at no cost to the Owner to have the work in question be uncovered, tested. Following positive test results or inspection the work in question is to at no cost the Owner be reinstated as per the Contract documents.
- .5 Should the inspection or test results indicate that the work by the Contractor not meet the requirements of the Contract documents the Consultant has the right request at no cost to the Owner that the work be demolished or removed from the site, replaced or re-executed in accordance with the Contract documents and re-tested or inspected to ensure conformance with the Contract documents.

**2.00 PRODUCTS (Not Applicable)**

**3.00** EXECUTION (Not Applicable)

**END OF SECTION 01330**

**1.00 GENERAL**

**1.01 GENERAL REQUIREMENTS**

- .1 Refer to Division 1, General Requirements
- .2 All contract documents form an integral part of this section.

**1.02 DESCRIPTION**

- .1 Work Included: Furnish all labour, materials, equipment and services necessary to protect existing trees on site and on adjacent road right-of-way and sites, 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 Parks Department, including hand excavation and root pruning.

**1.03 GENERAL**

- .1 The "Tree Protection Zone"(T.P.Z.) shall be established on site under the direction of the Consultant and Parks Department Arborist. It must be demarcated on site and fenced off from all impacts of construction. The T.P.Z. is defined as **2 times the diameter** of 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.Z. on site with CNW Arborist.**
- .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 Parks Department provided that the location, materials and methods are approved and supervised by a CNW Staff Inspector/Arborist.**
- .3 **No Parks Department approvals for root pruning beyond the limits of the T.P.Z. are required. All severed or fractured roots over 2cm in diameter outside the T.P.Z. are to be neatly cut back a min of 10 cm above damage with a clean sharp saw.**

**1.04 QUALITY ASSURANCE**

- .1 Inspection: The Contractor shall give at least forty-eight (48) hours notice to the Consultant, CNW Staff Inspector and the Parks Department Arborist 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 Parks Department Arborist shall do or supervise all root pruning, branch pruning, etc. within the T.P.Z.** The Parks Department Arborist 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 arboricultural industry standards by Certified Arborists or Tree Surgeons under direct supervision of the CNW Staff Inspector/Arborist.

**2.00 PRODUCTS**

**2.01 PROTECTIVE BARRIER**

- .1 Orange plastic web snow fencing, 1.2m high "Tenax", as supplied by Ronco Sales Ltd., or pre-approved equal. **REFER TO DEMOLITION AND TREE MANAGEMENT PLAN FOR DETAIL**

**2.02 TREE PROTECTION AREA SIGNS**

- .1 Tree Protection Zone signs shall be signs at least 900mm x 450mm, on painted plywood or other acceptable weather resistant material, stating:  
**TREE PROTECTION ZONE, DO NOT REMOVE FENCE DURING CONSTRUCTION:**  
No Dumping                      No Burning  
No Storage                        No Cutting  
No Machinery                    No Toxic Substances (paint, solvents, fuel, oils)  
**TO REPORT VIOLATIONS PHONE: 604 527-4567**

**2.03 WATER, FERTILIZERS, MISCELLANEOUS - N.I.C.**

- .1 Water, fertilizers and miscellaneous materials shall be as specified in other sections of the specification and as directed by the Parks Department Arborist.

**3.00 EXECUTION**

**3.01 PROTECTIVE BARRIER FENCE ERECTION**

- .1 Before starting site work, install a clearly visible 1.2m high continuous protective barrier fence at the approved lines for the "Tree Protection Zone" (locations as directed on site by CNW Staff Inspector). **Maintain this barrier until Substantial Performance and remove from the site at that time. INSTALLATION AS PER DEMOLITION AND TREE MANAGEMENT PLAN.**

**3.02 TREE PROTECTION AREA SIGNS**

- .1 Install Tree Protection Zone signs as specified on the protective barrier fence, total of ~~four~~(4) signs, one each side of the T.P.Z. Signs shall be well secured and shall be maintained in place until Substantial Performance.
- .2 Take all measures necessary to prevent the following activities within tree protection zones except as authorized by the CNW Staff Inspector.
  - .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.

3.03 ROOT PRUNING

- .1 Before the start of any machine excavation, hand excavate along the established limit of excavation and prune all roots along the line. Cuts shall be clean, to approved arboricultural practice.
- .2 Retained Transplanted Trees shall be root pruned as directed by the Parks Department Arborist.

3.04 BRANCH PRUNING

- .1 **Do not branch prune any “top growth” of any retained tree to compensate for reduction of roots unless specifically instructed by the Parks Department Arborist.**

3.05 OTHER MEASURES

- .1 Other measures may be necessary for tree protection and ongoing survival, depending on site conditions. These may be determined during the initial planning for retention and excavation, or may be recommended by the Arborist during the course of construction. All additional measures, not clearly identified at time of bid will be considered “extra” to the work of this Contract.

**END OF SECTION 02115**



**1.00**      **GENERAL**

**1.01**      **GENERAL REQUIREMENTS**

- .1      Refer to Division 1, General Requirements.
- .2      All contract documents form an integral part of this section.

**1.02**      **DESCRIPTION**

- .1      Furnish all labour, materials, 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.

**1.03**      **RELATED WORK**

- .1      Rough-Grading / Landscape Areas                      Section 02310

**1.04**      **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.

**2.00**      **PRODUCTS** (not applicable)

**3.00**      **EXECUTION**

**3.01**      **CLEARING AND GRUBBING**

- .1      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 Consultant review prior to the start of work.

- .2 Clear all trees (except those identified for retention), existing plant growth, undergrowth, dead wood, surface rocks or boulders and all deleterious material.
- .3 Grub out stumps, roots, rubbish over 50mm (2") in size to minimum depth of 300mm (12") below indicated finish grade. Refer to requirements in geotechnical report.
- .4 Remove and dispose of off site, embedded rocks and boulder less than .15 cubic metres (5 cubic feet) encountered during clearing and grubbing operation.
- .5 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.
- .6 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 Consultant or Contractor to remain.
- .7 Where existing trees to be retained are entwined with existing fencing, carefully remove fencing by hand avoiding damages to trees. Where chain link is included into tree bark, carefully cut fencing around tree to minimize damage

3.02 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 02230**

**1.00 GENERAL**

**1.01 GENERAL REQUIREMENTS**

- .1 Refer to Division 1, General requirements.
- .2 All contract documents form an integral part of this section.

**1.02 DESCRIPTION**

- .1 Furnish all labour, materials, equipment, and services necessary to excavation and backfill of 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 sub grade
  - .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

**1.03 RELATED WORK**

- .1 Shop Drawings, Product Data and Samples Section 01330
- .2 Cast in Place Concrete Pavement Section 02750
- .3 Cast in Place Concrete Section 03300

**1.04 CODES AND STANDARDS**

- .1 Contractor is responsible for complying with all current Workers' Compensation Board (WCB) of B.C. 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.

**1.05 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 Consultant.
- .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.

1.06 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.

1.07 PROTECTION AND INTERRUPTION OF EXISTING SERVICES AND UTILITIES

- .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.

1.08 PROTECTION OF ADJACENT STRUCTURES AND SURFACES

- .1 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.
- .2 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 Consultant.

1.09 PERMITS AND 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 INSPECTIONS

- .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-excute 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 Consultant for review;
- .1 Sieve analysis of granular material and light weight fill.
  - .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.

## 2.00 PRODUCTS

### 2.01 MATERIALS

- .1 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
100	100
75	55-100
4.8	30-100
0.55	15-80
0.25	10-50
0.075	0-5

- .2 Crushed Granular Base Course: The 19 mm (3/4") crushed granular base course 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)	Sieve Size (Imperial)	Percent Passing
19	3/4"	100
12.5	1/2"	75-100
9.5	3/8"	60-90
4.75	#4	40-70
2.36	#8	27-55

1.18	#16	16-42
0.60	#30	8-30
0.30	#50	5-20
0.15	#100	5-15
0.074	#200	2-8

- .3 Filter Gravel: As supplied by Mainland Sand and Gravel. Sound, durable particles, free from clay, organic material or other deleterious matter, evenly graded, to meet the following gradation requirements.

Sieve Size (mm)	Sieve Size (Imperial)	Percent Passing
10	3/8"	98
4.75	#4	95
0.15	#100	Less than 2

- .4 Lightweight Fill: Under hard landscape finishes: Granular fill with 100% passing the 2 inch sieve and 100% retained on the 3/8" sieve, a dry unit weight of less than 10 kN/m<sup>3</sup>, and a minimum angle of internal friction of 45 degrees. Acceptable products include: Garibaldi Pumice, Lava Inc. (Red Basalt), TrueLite by Lafarge Company or Martin's Feed, or approved equivalent.

Under the water play channel mound: Granular fill, as above, and Type 2 Expandable Polystyrene (EPS) Geofoam blocks of minimum 600mm dimension, securely pinned together with 10M bar, as shown on drawings, or suitable equivalent is acceptable. Geofoam density of approx. 18-19 kilogram per cubic metre, minimum compression resistance at 1% deformation of 400kPa.

- .5 Native Material Fill: Will be considered but must be reviewed and approved by either the project Geotechnical Engineer
- .6 GeoGrid: Biaxial geogrid (BX1200MSE) or equivalent Strata Grid.  
Filter Fabric: Propex 4545 or equivalent.

### **3.00 EXECUTION**

#### **3.01 EXCAVATION**

- .1 Prior to commencing excavation the Contractor shall:
- .1 Carry out hand dug test pits or hand augers to confirm existing sub grade conditions in the following locations:
- Under landscape structures
  - Drinking fountain
  - Basketball and tennis courts
  - Water play channel
- Sub grade preparation for these elements will be consistent with methodologies used elsewhere on site and will be at the direction of the geotechnical engineer.
- .2 Confirm in writing to the Consultant that he has verified the locations of all underground services.

- .3 Obtained in writing and submitted to the Consultant 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.
- .4 Notify the Consultant for on site review of sub grade preparation work twenty-four (24) hours prior to commencement of import, placement and grading operations.
- .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 Place light weight fill in maximum 300mm (1'0") lifts to depths indicated on drawings complete with Geogrid and filter fabric as per details. Compact each lift to 952MPD as required by geotechnical engineer.
- .5 Excavation shall be performed to ensure that the placement of fill materials are minimized.
- .6 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.
- .7 All exposed excavation faces shall be protected from weather with appropriate tarps or plastic sheeting as soon as possible after being cut.
- .8 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 course material compacted to 95% Modified Proctor Density. Retain boulders for use on site.
- .9 Bottom of excavation to be level, free from loose material and debris.
- .10 Protect excavations against freezing. Frozen areas shall be thawed and protected from further frost until subsequent work has been completed.
- .11 All necessary precautions shall be taken to preserve all materials outside the required excavations in an undisturbed condition.
- .12 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.

### 3.02 PLACEMENT OF GRANULAR FILL MATERIAL AND LIGHTWEIGHT FILL

- .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 Consultant.
  - .2 All backfill materials shall have been inspected and approved by the Geotechnical Engineer.
  - .4 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 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 crushed granular base course 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 granular sub-base and crushed granular base course 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 course as required to obtain the specified compaction density.

### 3.03 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.

3.04 PLACING TYPE 2 EXPANDABLE POLYSTYRENE [EPS] GEOFOAM (water play channel mound only):

- .1 Place and pin polystyrene blocks under the directions of the geotechnical consultant

3.05 DEWATERING

- .1 Pump or otherwise continuously remove all water that has accumulated in excavation during the progress of the Work.
- .2 Do not divert water onto adjacent property.
- .3 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.

3.06 CLEAN UP

- .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 02315**

**1.00 GENERAL**

**1.01 GENERAL REQUIREMENTS**

- .1 These Specifications and Drawings shall be read in conjunction with the terms and conditions of the General Contract Documents.
- .2 This Contractor shall visit the site prior to tender and shall become thoroughly familiar with site conditions. Problems arising from a failure to do so shall not constitute a contract change.

**1.02 SCOPE OR WORK**

- .1 Supply and install complete sub surface drainage system including but not limited to, drain rock, piping, filter cloth, clean outs, sediment sumps, excavation, pipe bedding, and backfill as detailed and specified herein.

**1.03 RELATED WORK**

- .1 Shop Drawings, Product Data, Material Testing and Samples Section 01330
- .2 Growing Medium Preparation and Placement Section 02910

**1.04 STANDARDS**

- .1 All work shall be installed in accordance with but not be limited to approved editions of:
  - .1 CSA or ASTM as noted in specification
  - .2 B.C. Plumbing Code
  - .3 2006 City of New Westminster Supplemental Specifications

**1.05 PERMITS AND INSPECTIONS**

- .1 The contractor shall apply and pay for all necessary permits, fees, and inspections required by any public authority having jurisdiction. Ensure that both Federal and Provincial taxes are included if and where required.

**1.06 WORKMANSHIP**

- .1 Workmanship shall be best quality employing individuals skilled in their trades. An experienced superintendent, will be on site at all times overseeing work to be completed in this section.

**1.07 SUBMITTALS**

- .1 Submit a sieve analysis of the various aggregate components specified for use in this section.
- .2 Submit a one (1) litre sample of the various aggregate components specified for use in this section.

1.08 AS BUILT DRAWINGS

- .1 Submit three (3) hard copies As Built of drawings to the consultant at the completion and acceptance of work.
  - .1 The As Built drawing shall be professionally drawn using computer aided drafting/design(CADD).
  - .2 As Built drawings shall indicate all components of the subsurface drainage system as installed with clear measurements and invert elevations provided from identifiable reference points.
- .2 The Consultant shall review the drawings and provide feedback in the form of a 'marked up' set for the Contractor to correct. Upon completion of the corrections the Contractor to provide a 'dwg' file on digital disc for the Owners records and future use.

1.09 APPROVED EQUALS

- .1 All items are to be as specified or pre approved equal. Should an equal be proposed the Contractor is to provide samples and data as per the 'Submittals' paragraph to the Consultant for review a minimum of ten (10) business days prior to the start of work in this section.

1.10 SITE CONDITIONS

- .1 Existing Conditions/Underground Services: Locate and graphically indicate on the ground plane the location and type of all on site utilities/underground services prior to start of any excavation work of this section. Notify the Consultant immediately if any utilities not previously identified are encountered during work of this Contract.
- .2 Ensure that all municipal and private utilities related to on site or off site uses are operational throughout the duration of work of this Contract.
- .3 Site Preparation: Prior to the work of this Section, carefully inspect any installed work of other trades or contractors and verify all such work is complete to the extent that this work may commence properly.
- .4 Field Measurements: Make all measurements in the field and adjust the design to meet the on site conditions to ensure precise fit of items in accordance with the original design.
- .5 Discrepancies: Notify the Consultant immediately if a major discrepancy, error or conflict between the drawings and the actual site conditions is detected.
- .6 Repair to Underground Services: At no cost to the Owner, using the appropriate trades, repair all damage to any underground service caused by the work of this Contract. Note damaged and subsequent repair on As Built drawings.

**2.00 PRODUCTS****2.01 MATERIALS**

- .1 Perforated and non-perforated rigid drain pipe:
  - .1 Schedule 40 Polyvinyl Chloride (PVC) as per ASTM D1785 or approved equal.
- .2 Clean Outs:
  - .1 Schedule 40 Polyvinyl Chloride (PVC) as per ASTM D1785 or approved equal with formed, non threaded PVC cap.
  - .2 Inspection Chamber/ Drainage Basin/ Grates; Sanderson Concrete Inc., Surrey, BC 1.800.671.8882 or approved equal.
    - .1 Precast reinforced concrete barrel to the following dimensions 450mm (18")/ 600mm (24") diameter, 600mm (24") or 1200mm (48") length to ASTM C478 unless noted otherwise on drawings,
    - .2 Grates: Cast Iron to H20 loading standards sized to suit barrel.
    - .3 Sediment Catch/ Sump; Concrete bottom, minimum of 425 mm below invert elevation or as noted on drawings. Provide turn down gooseneck fittings at all discharge pipes.
- .3 Filter Medium: Needed, non-woven polypropylene mat. Acceptable products include Nilex 4545 by Nilex Geotechnical Projects, Burnaby, B.C., or Mirafi 150N by Tencate Systems, Oakville, Ontario or approved equal.
- .4 Bedding Material; Crushed or graded gravels to conform to the following gradations;

SIEVE SIZE	PERCENT PASSING
25mm	100
19mm	90 - 100
12.5mm	65 - 85
9.5mm	50 - 75
4.75mm	25 - 50
2.36mm	10 - 35
1.18mm	6 - 26
0.600mm	3 - 17
0.300mm	
0.075mm	0 - 5

**3.00 EXECUTION****3.01 INSPECTION**

- .1 Report to the consultant improper slopes, unstable sub grade and sub grade requiring additional compaction and other satisfactory conditions.
- .2 Provide 48 hours notice to the Consultant for a review of sub grade preparation prior to the placement of work of this section.

3.02 SUB GRADE PREPARATION

- .1 Ensure sub grade is sloped at a minimum of 2% to sub surface drain line trench. Consultant to review sub grade preparation prior to the start of work in this section.

3.03 INSTALLATION PVC SUBSURFACE DRAIN LINE

- .1 The Contractor shall be responsible for establishing the lines and levels of the excavation and to undertake all laying and back filling operations to ensure no damage occurs to pipe. Trench width shall be sized to allow for a minimum of 50mm of bedding material on each side of the pipe.
- .2 Do not lay drainage lines directly over or parallel to another a service line of any other trade. Where drainage lines are near or adjacent to electrical conduit ensure minimum horizontal and vertical clearance requirements as dictated by Canadian Electrical Code for all piping installations.
- .3 Place bedding material full width of trench bottom to a uniform depth of 100mm unless otherwise noted on Contract drawings. Shape bed true to grade to provide continuous, uniform bearing surface for pipe. Don not use blocks when bedding pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Installation of piping shall be as per CSA B182.11;
  - .1 Lay pipes on prepared bed, true to line and grade noted on drawings.
    - .1 Horizontal Tolerances; plus of minus 50mm (2") from specified alignment.
    - .2 Vertical Tolerances; plus or minus 10mm (3/8") from specified grade. Reverse grade is not acceptable.
  - .2 Commence layout of pipe at the outlet end. Proceed upstream with socket ends of pipe facing upgrade.
  - .3 Ensure barrel of each pipe is in contact with shaped bed throughout its full length. Ensure all pipe has positive slope to inspection chamber.
  - .4 Cut pipe as required, as recommended by manufacturer, leave smooth end at right angles to axis of pipe.
  - .5 Unless otherwise noted on drawings or required by the pipe manufacturer all joints in PVC pipe shall be solvent welded. Gasket joints shall be installed as per manufacturers written instruction. Ensure all joints are watertight.
  - .6 Fully support pipes with hand slings or crane as required to minimize lateral load. Complete each joint before laying next length of pipe. Minimize joint deflection after joint has been made to avoid joint damage.
  - .7 Ensure that all jointing materials and installed pipe are kept free of dirt, water and other foreign materials. Whenever work is stopped, install removable water tight covering.
  - .8 For curved alignments bend pipe barrel. In no case should the radius of the curvature be less the 300 times the outside diameter of the pipe barrel. Contractor to ensure that there is no joint deflection with finished curved alignments.
  - .9 Connections to manholes and inspection chambers are to be through neat, circular holes cored into sidewall. Do not hammer or chip except as approved by consultant. Grout all line connections to manhole or clean out with non-shrink grout to ensure watertight seal.

- .6 Consultant shall review all pipe installations prior to the placement of backfill material.
- .7 Back fill the first 100mm (4") of cover with pipe bedding material. Ensure that a minimum of 50 mm (2") of bedding material is placed on each side of pipe.
- .8 Remainder of backfill material shall be placed in maximum of 150mm (6") lifts using approved native material. Back fill material shall be specified growing medium where pipe runs pass through soft landscape planting areas. Compact back fill to 95% MPD, 80% MPD in planting areas.
- .9 Ensure that all refuse is cleared from all trenches prior to backfill. Refuse in backfill material is not acceptable.
- .10 Compaction procedures shall be such that pipe is not damaged during backfill operation.

3.04 INSTALLATION OF PERFORATED DRAIN LINES

- .1 Installation as per lines and grades indicated and detailed on Contract drawings.
- .2 Ensure perforations face downward.
- .3 Install cleanouts and connections to drainage structures as indicated on Contract drawings.

3.05 INSTALLATION ON DRAINAGE STRUCTURES AND CLEAN OUTS

- .1 At locations, lines and levels indicated on Contract drawings.

3.06 CLEAN UP

- .1 Surplus material shall be removed and disposed of off site by the Contractor.

**END OF SECTION 02620**

**1.00**      **GENERAL**

**1.01**      **GENERAL REQUIREMENTS**

- .1      Refer to Division 1, General Requirements.
- .2      All contract documents form an integral part of this section.

**1.02**      **RELATED WORK**

- .1      Shop Drawings, Product Data and Samples      Section 01330
- .2      Rough Grading Landscaped Area      Section 02310
- .3      Excavation and Backfill      Section 02315

**1.03**      **DESCRIPTION**

- .1      The work shall include the supply and installation of crushed granite granular paving and play sand as indicated in the Contract documents, including:
  - .1      Crushed Granular Granite Paving
  - .2      Play Sand

**1.04**      **SAMPLES**

- .1      Submit the following samples for review by Consultant;
  - .1      Crushed Granite – 1 litre sample
  - .2      Play Sand – 1 litre sample

**1.05**      **COMPACTION TESTS**

- .1      Contractor is responsible for retaining and coordinating work carried out by testing agency. Tests on compacted sub grade and finished crushed granite granular paving shall be performed to confirm that material has been compacted to densities indicated in the Contract Documents.
- .2      Frequency of Compaction Tests;
  - .1      Sub Grade; Every 100 Square Metres of compacted subgrade
  - .2      Crushed Granite Granular; Every 100 Square Metres of compacted crushed granite granular paving.

**2.00 PRODUCTS****2.01 MATERIALS**

- .1 Crushed Granite Granular Paving; shall consist of sound, durable particles consisting of the following component parts;

- .1 9.0 mm Crushed Granite;

Sieve Size (mm)	Sieve Size (Imperial)	Percent Passing
9.0	3/8"	100 %
4.75	1/4	50 – 55%
2.36	1/8"	25 – 28%
1.18	1/16"	15 – 18%

- .2 Play Sand: Clean, washed fine sand free of clay, organic material and other deleterious matter, evenly graded to meet the following requirements.

Sieve Size (mm)	Sieve Size (Imperial)	Percent Passing
5.0	4	100
2.5	8	100
1.25	16	99.4
0.63	30	94.2
0.315	50	55.9
0.16	100	11
0.08	200	1.9

- .3 Filter Cloth: Propex 4545 or equivalent

**3.00 EXECUTION****3.01 INSPECTION**

- .1 Areas of work to receive crushed granite granular paving and base course shall be examined and unsatisfactory conditions reported to Consultant. Commencement of work shall imply acceptance of conditions.

**3.02 PREPARATION OF SUBGRADE**

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



3.03 CRUSHED GRANULAR BASE COURSE

- .1 Place granular base course over sub-grade to depths and dimensions shown on drawings in maximum 150 mm (6") lifts compacted to 95% MPD.

3.04 CRUSHED GRANULAR GRANITE PAVING

- .1 Prior to the placement of the crushed granular granite paving the Contractor shall have provided compaction test results to the Consultant for review.
- .2 Place, finish grade and compact to 95% MPD crushed granular granite paving to depths and dimensions shown on drawings. Where required crushed granular granite paving is to be placed in lifts not to exceed 150 mm (6") lifts. Each lift to be fully compacted to 95% MPD.
- .3 After final compaction, the surface shall be true to elevation and shall not vary by more than 5 mm (1/4") tested with a 3 Metre (10'-0") straight edge at any location on the surface. Unless otherwise indicated in Contract document finish surfaces shall be crowned at a minimum of 2 % and site flush with adjacent materials.

3.05 PLAY SAND

- .1 Place play sand over filter fabric over sub-grade to depths and dimensions shown on the drawings in max 150mm (6") lifts compacted to 85% MPD.

3.06 ADJUST AND CLEAN

- .1 All paved areas or adjacent surface shall be brushed clean and excess materials shall be removed from the work site and disposed of in an approved dump location.

**END OF SECTION 02731**

**1.00**      **GENERAL**

**1.01**      **GENERAL REQUIREMENTS**

- .1      Refer to Division 1, General Requirements.
- .2      All contract documents form an integral part of this section.

**1.02**      **DESCRIPTION**

- .1      Work of this section refers to scope that is unique to the construction of Portland cement concrete walks. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

**1.03**      **RELATED WORK**

- .1      Excavation and Backfill              Section 02315
- .2      Cast in Place Concrete              Section 03300
- .3      Concrete Finishing              Section 03350

**2.00**      **PRODUCTS**

**2.01**      **MATERIALS**

- .1      Concrete mixes and materials: As per Section 03300 Cast in Place Concrete with the following criteria specific to this Section:
  - .1      Hand-formed and hand-placed concrete:  
Slump: 75mm, (3"), +/- 20mm, (3/4")  
Air entrainment: 4% to 6%  
Maximum aggregate size: 20mm (3/4")  
Minimum cement content: 350kg/m<sup>3</sup>  
Minimum 28 day compressive strength: 35Mpa.  
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") Asphalt impregnated fiber board or other pre approved equal.
- .4      Expansion Joint Sealant: Self-leveling two (2) part polyurethane type, conforming to CGSB 19.24-M80, Type 1, Class B. Colour as selected by Consultant from standard range.
- .5      Form Release Agent: Eco-Coat by W R Meadows; or other pre approved equal.

- .6 Curing Compound: Vocomp – 20 water based curing and sealing compound by W R Meadows ; or other pre approved equal.
- .7 Bond Break Tape: Masking tape, width to suit joint size.

### **3.00 EXECUTION**

#### **3.01 SUBGRADE PREPARATION**

- .1 Excavate or fill to design sub grade.
- .2 Compact to minimum 95% Modified Proctor Density in compliance with ASTM D698 (all following references to density imply compliance with ASTM D698).

#### **3.02 LIGHTWEIGHT FILL, GRANULAR SUBBASE AND CRUSHED GRANULAR BASE COURSES**

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

#### **3.03 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: Maximum horizontal deviation: 6mm (1/4")  
Maximum vertical deviation: 6mm (1/4")  
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 Apply form release agent in strict accordance with manufacturers written instructions.

### 3.04 INSPECTION

- .1 Notify Consultant a minimum of twenty four hours in advance of concrete placement for review of formwork. Consultant 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.

### 3.05 CONCRETE PLACEMENT

- .1 Place concrete to Section 03300 Cast in Place Concrete and the following criteria specific to this Section.
- .2 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 consultant 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.
- .5 Moisten crushed granular base immediately prior to placing concrete.
- .6 Place concrete within 1.5 hours of batching time.
- .7 Place concrete in forms, ensuring no segregation of aggregate and consolidate with approved mechanical vibrator or power screed.
- .8 Concrete to be placed in continuous operation until entire panel or section completed. Do not place fresh concrete that has achieved partial set.
- .9 Incorporate all castings into concrete at time of placement.
- .10 Discontinue placement at expansion, construction or isolation joints only.

### 3.06 EXPANSION JOINTS

- .1 Form transverse expansion joints where shown on drawings.
- .2 Extend through full depth of concrete and terminate 12 mm (1/2") below finished surface. Only where shown on drawings, apply bond break tape before applying sealant.

### 3.07 CONTROL JOINTS

- .1 In sidewalks, construct control joints to lines and patterns indicated on drawings.
- .2 Construct to minimum 1/4 depth of concrete section at point of cut or as otherwise shown on project details.

### 3.08 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.

### 3.09 FINISHING

- .1 Pre finish surface of concrete sidewalks and utility strips to smooth surface with magnesium or wood float trowel.
- .2 Standard concrete finish is by broom or brush to form a light broom finish, perpendicular to the path of travel. Alternate finishes shall be as indicated on drawings or otherwise required to match adjacent finish.
- .3 Grooves, scoring or saw cutting used for aesthetic purposes as shown on the drawings or as directed by Consultant, 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 Round edges with steel edging tool 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 and to satisfaction of Consultant.

### 3.10 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 Consultant.

### 3.11 CURING

- .1 Apply approved curing compound to all exposed concrete surfaces at rate recommended by manufacturer or alternatively, use moist curing procedures for a minimum of 7 days.
- .2 When temperature is below 5 degrees Celsius (41 degrees F) maintain all concrete at temperatures not less than 10 degrees Celsius (50 degrees F) for at least 72 hours.
- .3 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.

### 3.12 ACCEPTANCE

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

### 3.13 CLEAN UP

- .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.

**END OF SECTION 02750**

**1.00**      **GENERAL****1.01**      **GENERAL REQUIREMENTS**

- .1 Refer to Division 1, General Requirements.
- .2 All contract documents form an integral part of this section.

**1.02**      **DESCRIPTION**

- .1 Work Included: Furnish all equipment, materials, labour and services necessary for the complete supply and installation of the automatic irrigation system including trenching excavation and backfill in accordance with the Contract Documents. The Contractor is responsible for coordination with the CNW Parks Project Manager and Plumbing Staff as well as for coordination of all sleeving under paved areas and through planter walls as required and shown on the drawings (if applicable).
- .2 This section includes contractor verification of site measurements and irrigation coverage. If any conditions are observed on site that will impair proper and intended uniform irrigation coverage, notify CNW Staff as soon as possible, before proceeding with work that would yield unsatisfactory coverage.

**1.03**      **QUALITY ASSURANCE**

- .1 All irrigation work shall be done by an experienced and competent irrigation contractor having the facilities and personnel adequate for all phases of the work specified.
- .2 The irrigation contractor shall be a member in good standing of the Irrigation Industry Association of British Columbia (IIABC) and have met the qualification standards currently applied to Contractors by that organization. The contractor must provide proof of membership if requested.
- .3 A standard manufacturer's warranty is required for all irrigation equipment outlined in this specification. Refer to the General Conditions.
- .4 Verify that all pipe, fittings, primers and cements are compatible for uniform installation.
- .5 Obtain field assistance from pipe manufacturer/supplier as necessary to ensure correct installation and joining techniques are used.
- .6 Do not cement pipe and fittings under wet or muddy conditions.

**1.04**      **SUBMITTALS AND INSTRUCTIONS**

- .1 Maintenance Data and Operation Instructions/Manual: Prior to and as a condition of Substantial Performance, submit to the CNW Project Manager three (3) copies of an operating and maintenance manual containing operational information for all operating

components, cleaning and lubrication schedules, overhaul/adjustment schedules and similar maintenance operations. Each manual shall be bound in a three ring binder or similar format.

- .2 Record Drawings: Submit with the operating and maintenance materials, a suitably scaled reproducible copy of the "as-constructed" condition of the system and an electronic format version (ACAD ver. 14). This drawing should be professionally drawn or produced with the use of computer aided drafting/design (CADD). All components of the irrigation system shall be shown as installed with clear measurements provided from an identifiable reference point. As-built sketches to be maintained on daily basis and kept readily available to show to CNW Parks representative. These daily record drawings will be reviewed by CNW Parks representative.
- .3 Maintenance Materials: Submit to CNW Staff as requested 2 sets of all special tools, keys, equipment, for proper operation and maintenance of the installed system.
- .4 Instructions: Instruct a designated representative of the CNW Parks Department in the complete operating and maintenance procedures for this system. This instruction shall include but not be limited to showing the relative timing differences between zones of different precipitation rates and a schedule of run times suggested for various weather conditions.

#### 1.05 DELIVERY AND STORAGE

- .1 Deliver and store materials in new condition, in unopened containers and protect until installed. Deliver, handle and store pipe so as to avoid gouging, bending or cracking.

#### 1.06 SITE CONDITIONS

- .1 Existing Conditions/Underground Services: Verify the existence and location of all on site utilities/underground services by hand digging or use of an electronic toning device or M-Scope. Mark the location of all buried cables, conduits, pipes etc. prior to any trenching. Cooperate with Owner and utility companies to keep their respective utilities in operation. Notify CNW Staff immediately for directions as to the procedure should any piping utilities be encountered during excavation of any trenching.
- .2 Site Preparation: Prior to the work of this Section, carefully inspect any installed work of other trades or contractors and verify all such work is complete to the extent that this work may commence properly.
- .3 Field Measurements: Make all measurements in the field and adjust the design to meet the on site conditions to ensure precise fit of items in accordance with the original design.
- .4 Discrepancies: In the event of a major discrepancy, errors or conflicts between the drawings and the actual site conditions, immediately notify CNW Staff as to procedure before proceeding with work.



- .5 Repair to Underground Services: Repair all damage to underground services caused by the work of this Contract. Damage to services that are shown on the drawings or have been brought to the Contractor's attention in the field prior to commencement or during construction of the work shall be repaired in entirety at the Contractor's expense. Damage to services which were clearly unforeseen/unknown of existence (provided that all reasonable measures were undertaken by the Contractor to ascertain the existence of these services) shall be repaired in accordance with the Changes clause of the General Conditions. Notify CNW Staff/Owner of damage immediately.

#### 1.07 PROTECTION

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

#### 1.08 GUARANTEE & WARRANTY

- .1 Provide a written Guarantee for all workmanship and materials for a period of one year from date of Substantial Performance. Make all corrections, adjustments and maintenance operations required as a result of failure of the irrigation system to perform due to the work of this Section.
- .2 Manufactured products, including but not limited to irrigation heads, quick couplers, controllers, valve boxes and valves shall be warranted as per the manufacturer's standard guarantee period or a minimum of one year, which ever is greater.

#### 1.09 EQUALS

1. All items as specified herein or on the drawings.
2. No alternative equipment will be considered for inclusion in this project.

#### 1.10 SEQUENCE

- .1 Ensure/coordinate installation of all sleeving and irrigation piping as required under all paved surfaces and through planter walls, under stairs and through existing planting beds as noted on the drawings.

- .2 Verify the location of the water supply/municipal connection point(s) for the automatic irrigation system. Coordinate as necessary.
- .3 Verify the location of the electrical conduit for the low voltage wire from the controller location to point below grade adjacent to controller only.

### 1.11 INSPECTION

- .1 Prior to commencement of any work related to this irrigation project, the contractor is required to make contact with the designated CNW Staff properly authorized to make project decisions.
- .2 All work is to remain uncovered for inspection of workmanship and materials. Notify CNW Staff a minimum of twenty-four (24) hours prior to required inspections. Failure to provide such notice or closing in uninspected work is sufficient grounds for withholding any payments due to the Contractor. CNW will request all buried work not approved to be unearthed for proper inspection.

## 2.00 PRODUCTS

### 2.01 PIPE AND FITTINGS

- .1 Plastic Pipe: Pipe shall be Non CSA Schedule 40 polyvinyl chloride plastic (PVC) conforming to ASTM D1784-97, D1785-96B.(ASTM F441/441M-97 for CPVC). It shall be extruded, virgin, high impact pipe conforming to Cell Class 12454-B, solvent weldable with belled ends, and; continuously and permanently marked showing manufacturer's name or trademark, type of material, pipe size and pressure rating.

Size/Classes as follows:

<u>Size</u>	<u>Class</u>
3/4 - 1" dia.	Class 200 PVC
1-1/4 - 4" dia.	Class 200 PVC
Mainlines, any size	Schedule 40 PVC

- .2 Plastic Pipe Fittings:
  - .1 GSR Schedule 40 PVC conforming to ASTM D-2466-97 (and F438-97 for CPVC) standards and be of the same material as the pipe. Fittings shall be designed for solvent welding to PVC pipe except where valves, risers, etc. require threaded joints.
  - .2 Fittings for PVC pipe shall be \_ to 2/3 interference fit to ensure a fully sealed joint. Provide minimum 1"(25mm) clearance between fittings to allow for repair - strictly enforced.
  - .3 All threaded connections shall be joined with minimum 3 wraps Teflon Tape - no substitutions accepted.
  - .4 Threaded nipples shall be Schedule 80 PVC and be manufactured from the same material specified for the pipe.
  - .5 Threaded connections of PVC to metal shall have male threads on the PVC and female threads on the metal.

- .3 Primers and Pipe Solvents: CSA approved type as recommended by pipe manufacturer for the temperature and conditions under which the work is being performed. Deliver in sealed containers clearly marked with name of manufacturer and lot number. CNW do not allow use of non CSA approved specialty primers or solvents such as "Wet R Dry".
- .4 Sleeves (if applicable): in locations noted on the drawings. Sized min. 2 pipe sizes larger than any irrigation lateral line to be carried, min. 3 pipe sizes larger if carrying a mainline:
  - .1 Shall be Schedule 40 PVC under all other paving surfaces/thru walls.

## 2.02 VALVES AND VALVE BOXES

- .1 Solenoid Valves: First quality of the types indicated on drawings. Sized one pipe size smaller in diameter than the pipe they control. Integrally Regulated solenoid valves are not acceptable unless site topography deems their use necessary and specific approval by CNW Staff has been given. Integrally Regulated solenoid valves will not be considered as pre-approved equals.
- .2 Quick Coupler Valves: Brass Sized to 3/4".
- .3 Isolation Valves: Cast Bronze gate valves with non-rising stems; R&W Model 280 or pre-approved equal. (for 2" up to 2 1/2" dia.) - if shown.
- .4 Bronze Ball Valves: Jones J1949SG-2" (or sized as req'd), 90° Shut off curb stop type or pre approved equal.
- .5 Valve Boxes: Shall be green plastic irrigation boxes complete with captive lock bolt covers; sized to suit valves and other components with adequate room for operating and maintenance access. As shown on the drawings.

## 2.03 SPRINKLER HEADS

- .1 First quality of the types indicated on drawings – Rainbird OR pre-approved equal.
- .2 All pop-up sprinkler heads (sprays and rotors) to be installed on swing pipe assemblies. Unitized swing joints where flow is greater than 5gpm. Rainbird, Toro or Lasco brands are all acceptable. SWING PIPE ASSEMBLIES WILL ONLY BE ALLOWED ON INSTALLATION OF HEADS TO LATERAL LINES. NO OTHER USE OF SWING PIPES WILL BE ACCEPTABLE.

## 2.04 CONTROL AND COMMON GROUND WIRING

- .1 Insulated single strand TWU copper of a type approved by the governing electrical authority and by CSA for direct underground burial, sized to suit load, resistance and distances. Insulated cover colour for control/signal wire to be consistent. Ensure white wire only and always as the common wire.
- .2 Confirm control wire size with the manufacturer of zone control valves to ensure wire is sized to the length of its run and in compliance with the BC Electrical Code, latest Edition.

- .3 Wire, breakers, conduits and related materials that comprise the electrical supply to the controller shall be CSA approved.

#### 2.05 MISCELLANEOUS MATERIALS

- .1 Electrical Tape: All weather, black plastic 19mm wide, a minimum 0.1778mm thick.
- .2 Electrical Wire Splices shall be made watertight with CSA approved watertight connectors. No splicing of wires shall occur unless located in an accessible box and shown on the Record Drawings. See Part 3 Execution. Trace wires where required shall be insulated solid copper wire; TWU, R90 or pre-approved equivalent
- .3 Thread Lubricant: Type manufactured for plastic to metal connections such as Teflon tape or Permatex 2.

#### 2.06 AUTOMATIC CONTROLLER

- .1 CSA Approved and first quality of the type specified on the drawings, complete with approved weatherproof lockable metal cabinet to CSA Standards grounded to CEC requirements as stated on the Drawings. Capable of providing all necessary features for programming the irrigation system designed.

#### 2.07 BACK FLOW PREVENTER

- .1 Watts Series 007M1QT double check Back flow Prevention Assembly (1" dia. or sized as req'd) complete with brass unions (or gate valves) and test cocks or pre-approved equal. All back flow preventers larger than 2" shall be specified/approved by CNW Staff. All back flow prevention devices to be CSA and BCWWA approved and conform with all current CNW Plumbing Dept. cross connection control standards as applicable.
- .2 All back flow prevention devices to be located in PVC or precast concrete valve boxes as shown on the drawings. Complete with captive lock or otherwise lockable bolt down covers.

#### 2.08 PRESSURE REDUCING VALVE [if required; noted on drawings]

- .1 Watts Series 223-2" Range 25 -75 psi or pre-approved equal.

#### 2.09 BLOW OUT TEE/QUICK COUPLER VALVES

- .1 Brass, sized to 3/4" as shown on the drawings.
- .2 Ensure blow-out is located in Carson 10" dia round irrigation valve box OR WITHIN WATER ENTRY CHAMBER AS DETAILED ON DRAWINGS.
- .3 Ensure quick couplers are within 50mm of underside of valve box cover to allow for full and easy access.

- .4 No brass fittings into female pvc fittings will be allowed.

### **3.00 EXECUTION**

#### **3.01 IRRIGATION SYSTEM LAYOUT**

- .1 Coordinate exact locations of lines, valves and heads, within lawn areas and planting beds to avoid conflicts and damage to existing plants during installation. Stake locations for approval by CNW Staff. Verify grades for all components.
- .2 Layout the piping and sprinkler locations with flags or short lengths of pipe and obtain the CNW Staff Inspector's approval before proceeding. The layout shall be in accordance with the drawing. Alternative layouts shall be approved by CNW Staff and indicated on the Record Drawings. It is to be expected that minor adjustments to layout not affecting quantities may be required to accommodate on-site situations.

#### **3.02 INSTALLATION OF PIPING**

- .1 Layout the piping system in accordance with drawings. Route piping to take into account site elevation changes and to minimize possible low head drainage issues.
- .2 No irrigation line shall be directly over and parallel to another irrigation line or service line of any other trade. Ensure minimum horizontal and vertical clearance requirements as dictated by Canadian Electrical Code for all piping installations near any electrical conduit/service.
- .3 Where possible, main supply lines may occupy the same trench as sprinkler lines, provided a minimum horizontal clearance of 150mm is maintained. Multiple lateral lines may occupy the same trench provided that a min. of 50mm horizontal clearance can be maintained and the pipes are all on the same plane.
- .4 Install pipes in long 'S' curves to allow for expansion and contraction. Ensure longest mainline straight run is installed and sized to compensate for potential surges in system.
- .5 Comply with all the manufacturer's printed data and recommendations regarding pipe cutting, cleaning, beveling, deburring, fitting preparation, primer and cement application and correct joining techniques. Ensure that all joints are properly fused and bonded and that all curing times given site climatic conditions are fully observed prior to testing or charging of piping system.
- .6 Install yellow warning tape approx. 250mm above all mainline runs with low voltage wiring located below piping. Warning tape on lateral lines is not required.
- .7 Trenching:
  - .1 Open excavation shall be carried out in a safe and orderly manner and in accordance with the requirements of the Workers' Compensation Act of B.C. Approved shoring shall be used where required for safe working conditions.

- .2 All trenches are to be hand or machine excavated (if pre-approved). Pulling pipes is not acceptable. All trenches shall be dug on the alignment and to the depth required as shown on the drawings and as stated herein. In any event, the water main service pipe shall be buried to a depth of at least 750mm below ground. The irrigation main and zone lines shall be buried to a depth of at least 400mm below the surface measured to top of pipe. Trenches are to be straight with uniform slopes to the bottom of all trenches.
- .3 Where the pipes are to be laid in sub-surface material the trench shall be excavated to a depth at least 100mm below the bottom of the pipe elevation. The trench shall be backfilled with at least 100mm of sand passing a 5mm sieve and be carefully compacted by hand.
- .4 Prior to backfilling, all lines, valves and fittings shall be inspected by CNW Staff where required.
- .5 Trenches shall be at least 300mm away from paving stones or other hard paving surfaces to avoid undermining such surface or its edge retention.
- .6 Backfilling shall take place in an orderly fashion. Where the line is within an enclosed planting bed or sodded lawn area and does not penetrate below the growing medium, the growing medium shall be carefully placed over the pipe and be carefully tamped by hand to achieve compaction equivalent to the surrounding area. Where the lines penetrate the native soil or sub-surfacefill, backfilling to a depth of 100mm over the top of the pipe shall be carried out with sand passing a 5mm sieve and be carefully compacted by hand. The remainder of the backfill to finish grade shall be with growing medium free of rocks and other unsuitable materials that could damage the pipe or create unusual settling conditions.
- .7 Compact the growing medium to the same density as the native material in the trench sidewalls to prevent differential settlement.
- .8 Fill piping with water at approx. 0.172 Mpa during backfill operations.
- .9 Contractor is responsible to repair all trenches which have settled below the adjacent grade for a period of one (1) year from date of Substantial Performance.
- .10 CNW do not accept any material refuse such as pipe pieces, excess wire, rags, fittings or PVC cement canisters left as backfill in any trenches.

### 3.03      INSTALLATION OF EQUIPMENT

- .1 General: Install all equipment as shown in plans and details, using appropriate connectors, cements, lubricants, solvents for each type of joint.
- .2 Valve Boxes: Install valves in valve boxes, allowing adequate space within boxes for proper operation/servicing of each component. Keep the valve box clean and clear of all debris that may fall into it during construction/installation. Ensure minimum 150mm of 19mm drain gravel in each valve box. Additionally, ensure the following:
  - .1 The top of the valve box is to be level and flush with grade, and located in shrub areas where possible.
  - .2 Valves to be installed vertical and centered.
  - .3 Valve boxes to be blocked (with brick or concrete pavers) so that neither blocking or valve box rest on lateral or mainlines when supporting the weight of expected traffic.
  - .4 Quick coupler valves to be installed within valve boxes upstream of any solenoid valves.

- .5 Valves boxes to be fully wrapped from underneath using precut piece of non-woven drainage grade filter fabric to accommodate all pipes and/or wiring contained in the box. Filter fabric shall be large enough to fully cover any opening in the valve box so as to minimize migration of soil into the box.
- .3 Automatic Controllers: Ensure controller(s) are located to allow for substantial viewing of the system operation (as practical). Coordinate location with CNW Staff Inspector prior to starting work of this Section. Install Controller on backside of Electrical Kiosk-refer to Drawings. Ensure all required sleeving and/or conduits are coordinated with prior concrete pours. Ensure all line voltage connections made by Electrician are to CEC requirements.
- .4 Control Wiring: Protect control and common wiring by installing beside or beneath irrigation mainline. Obtain approval from CNW Staff Inspector for all wiring to be installed in separate trenching and protect with Yellow Buried Wire Warning Tape at min 76mm(3") above wires. Leave additional 600mm of each wire at each valve. Wrap in electrical tape at 900mm intervals. Make wire splices only in accessible locations such as valve boxes. Minimize the number of splices. Where possible ensure that wire runs are continuous without interruption. Run control wiring from valves and connect to automatic controller. Install control wiring in conduit from 450mm below grade to connection point at controller. Conduit to be a 50mm diameter galvanized steel pipe (or rigid Sch. 40 PVC conduit) with a sweep elbow from below grade into bottom of controller base detail/cabinet location. Ensure conduit clamped to mounting surfaces with conduit pipe clamps at 250mm o.c. spacing or otherwise affixed to Consultant approval. All control or trace wire connections to be made using 3M DBY or DBR waterproof connectors installed to manufacturer's recommendations.
- .5 Trace Wiring-14 gauge trace wire to be installed on all pipe segments which do not have traceable control wiring already running alongside. Trace wiring to be terminated in valve or junction boxes where applicable to allow full connection to locator device.
- .6 Quick Coupler Valves: Install in valve box to allow for free insertion and rotation of quick coupler keys preferably just below box lid on swing jointed piping to provide sufficient "give" should a hose or line be pulled.
- .7 Irrigation Heads and Risers: Install all heads on swing pipe assemblies. Adjust all heads to 12mm below finished grade for sodded lawn areas once sodded lawn has been approved by CNW Staff.
  - .1 All sprinkler heads to be installed a minimum 50mm away from any hard surface.
  - .2 Finished heads shall be installed in 1 roll (1m<sup>2</sup>) of sod cut square to fit around head as shown on Plans. Consultant to approve sod specification at time of install.
  - .3 Swing pipe assemblies to be long enough to allow for proper vertical Alignment of head and for future adjustment due to settling or raising of grade, during maintenance operations, such as topdressing, mulching etc.
  - .4 Maximum flow through a swing pipe assembly is 5gpm. If greater than 5gpm flow is required OR if head inlet is greater than 1" dia., then a unitized swing joint assembly must be used.
  - .5 NO HEADS TO BE INSTALLED ON END OF PIPE LATERAL RUNS.

### 3.04 TESTING AND INSPECTION

- .1 Closing in Uninspected Work:
  - .1 Obtain approval of CNW Staff before backfilling any sections of the irrigation system.
  - .2 Any work closed in before inspection will be required to be exposed for inspection at no extra cost to the Owner. Provide 24 hours minimum notice to CNW Staff to arrange inspections and review of pressure testing.
- .2 Testing: Upon completion of the irrigation system, arrange for CNW Staff to be present to observe pressure testing. Test all plastic pipe and sprinklers as follows:
  - .1 After the pipe is in place in the bottom of the trench with risers in place, cap the risers where the sprinklers will be attached and all pipe couplings and fittings exposed.
  - .2 Apply a pressure of 0.551 MPa (80 psi) to each section, using a test pump and calibrated container. Inspect visually for leaks at couplings and fittings, cut out and replace any that leak. Maintain test pressure for one hour. After replacing any defective sections, pressure test for one hour and note any pressure loss.
  - .3 After approval by CNW Staff, backfill the pipe maintaining pressure in the line, noting any sudden drop in pressure. If there is any indication of a leak, locate the defective section and replace. Leaks shall not be repaired by patching.
  - .4 Provide written notice that pressure testing has been completed satisfactorily, including re-testing (for 1 hour) of all defective sections. Written notice shall state the date, parties present, pressures applied and duration of pressure tests.
- .3 Flushing: after testing and prior to attaching sprinklers, flush out each section to remove any dirt accumulated. Do not install heads on end of line runs OR remove these heads to allow for thorough flushing. FLUSH ALL PIPES THROUGH TO AND INCLUDING SWING PIPES PRIOR TO ANY HEADS BEING INSTALLED.
- .4 Adjustment: Adjust the irrigation heads for optimum coverage and rate of flow, including minor adjustment in actual head locations. Set the controller operation times as dictated by CNW Staff. The Contractor is required to balance and adjust the various components of the system to ensure the efficient operation of the system. This includes the adjustment of any pressure regulators, full and part circle radius heads, valves and adjustments to controllers.
- .5 Systems that are substantially complete on or after Sept. 15 shall be left in a winterized state as per Item 3.4. This contractor is responsible to return in the following Spring at a time dictated by CNW Staff and start-up the system and perform all maintenance functions necessary to provide a fully operating system. This contractor must also return the following fall for a full System Winterizing as outlined in 3.5.
- .6 Coverage Test: When the irrigation system has been completed, a coverage test will be completed in the presence of CNW Staff to determine if coverage to water and planting areas is complete and determine if any adjustments are required.
- .7 Controller Test: As part of the above, and prior to Final Acceptance/Assumption by CNW the automatic controller(s) shall be set in sequence and thoroughly tested thru each zone to determine if any adjustments are required.



- .8 Submit Certificate of Proof of Double Check Valve Assembly Test and Pass upon Date of Substantial Completion.

### 3.05 WINTERIZING

- .1 Winterize the system for the first time with the City of New Westminster's designated representative(s) observing. Winterizing shall include all operations necessary to protect the system from freezing temperatures, including manual and solenoid valve operations to isolate vulnerable parts of the system and draining components and pipes and/or blowing water out of all pipes with compressed air.

### 3.06 SPRING START-UP

- .1 Provide Spring "Start-up" at time coordinated with the City of New Westminster's Project Manager.

### 3.07 SITE MAINTENANCE/CLEAN-UP

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

**END OF SECTION 02800**

**1.00**      **GENERAL****1.01**      **GENERAL REQUIREMENTS**

- .1      Refer to Division 1, General Requirements.
- .2      All contract documents form an integral part of this section.

**1.02**      **DESCRIPTION**

- .1      Furnish all labour, materials, equipment and services necessary for the complete installation of the all weld construction galvanized chain link fence system to City of New Westminster Parks Standards as indicated in the Contract documents. The work includes but is not limited to supply and installation of;
  - .1      Fusion bonded vinyl woven metal mesh fabric.
  - .2      Field welding of post, rail connection.
  - .3      Priming and painting of all exposed, uncoated galvanized metal components.
  - .4      Excavation and placement of concrete footings for all posts

**1.03**      **RELATED WORK IN OTHER SECTIONS**

- .1      Shop Drawings, Product Data, Material Testing and Samples      Section 01330
- .2      Planting      Section 02900
- .3      Growing Medium Preparation and Placement      Section 02910
- .4      Sodding      Section 02926
- .5      Exterior Painting      Section 09910

**1.04**      **SUBMITTALS**

- .1      Provide shop drawings of all fence and gate components illustrating post spacing, footing design, gate locations, assembly details and general arrangement of all components for complete installation. Provide product data that includes gauge of metal wire and mesh, post wall thickness, conformation of fusion bonded vinyl mesh,
- .2      Samples:
  - .1      300mm x 300mm (12"x12") sample of the fusion bonded vinyl chain link fabric.
  - .2      Paint colour chip and manufacturers colour code number matching mesh colour.
  - .3      Product data sheets confirming galvanized metal specifications.

**1.05**      **REFERENCE STANDARDS**

- .1      CAN-138.1-M80 Fence, chain link, fabric, ASTM – F668 Class 2B thermally fused vinyl coated steel fabric
- .2      CAN/CGSB-138.2-M80 Fence, chain link, fabric, framework, zinc-coated, steel

- .3 CAN/ CGSB -138.3-M80 Fence, chain link, fabric - installation
- .4 CAN/ CGSB -138.4-M80 Fence, chain link, gates
- .5 CAN/ CGSB –1.181-92 Ready-mixed organic zinc-rich coating
- .6 CAN/CSA-G164-M92 Hot dipped galvanizing of irregularly shaped articles
- .7 CAN3-A23.1-M90 Cast-in-place concrete work shall be in accordance with.
- .8 CAN3-A23.2-M90 Materials and concrete testing in accordance with

#### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Store packaged material in original containers with all manufacturer's seals and labeling intact.
- .2 Prevent damage to materials during handling and storage. Keep materials under cover and free from moisture.

#### 1.07 APPROVED EQUALS

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

### **2.00 PRODUCTS**

#### 2.01 MATERIALS

- .1 All pipe, woven mesh, tie wires, tension wires and bands, connectors, fittings and hardware to be hot-dipped galvanized.
- .2 Pipe: to CAN2-138.2 M80, Table 1 Medium Duty, Schedule 40 (wall thicknesses as shown below), standard continuous weld, modulus of elasticity 30,000.

Outside Pipe Diameter	Schedule 40 Wall Thickness	
1-5/8"	0.140"	(9/64")
1-7/8"	0.145"	(19/128")
2-3/8"	0.154"	(5/32")
2-7/8"	0.203"	(13/64")
3-1/2"	0.216"	(7/32")
4-1/2"	0.237"	(15/64")

- .3 Fusion Bonded Vinyl Woven Metal Mesh Fabric;
  - .1 To CAN2-138.1.M80, 6 guage, 4.88mm (0.1920") with 45mm (1-3/4") openings. Top and bottom selvages to have knuckled finish.
  - .2 Fusion bonded vinyl coating to ASTM – F668 Class 2B, 7-10mil coating thickness. Vinyl coating shall have specific gravity of minimum 1.30, ASTM D792. Hardness of vinyl coating A-93-3, ASTM D2240
  - .3 Colour: Black

## .4 Fence Component Sizes

Note: pipe sizes shown are outside diameter.

Fence Component	Size (1.2M (4'-0") Ht)	Size (1.5M (5'-0") and Taller Ht.)
Bottom Rail	50mm (1-7/8")	63mm (2-1/2")
Mid Rails	63mm (2-1/2")	63mm (2-1/2")
Top Rail	50mm (1-7/8")	75mm (2-7/8")
Line Posts	75mm (2-7/8")	75mm (2-7/8")
End/Man Gate Posts	75mm (2-7/8")	75mm (2-7/8")
Vehicular Gate Posts	89mm (3-1/2")	89mm (3-1/2")
Mid Brace	50mm (1-7/8")	63mm (2-1/2")
Tie Wire Spacing	150mm (6") o.c	150mm (6") o.c
Hog Ring Spacing	100mm (4") o.c.	100mm (4") o.c.
Tack Welds Where Specified	All tension bands and frame members	All tension bands and frame members

.5 Tension Bar: 16 x 5mm (3/4" x 3/16"), length to match entire height of fabric section.

.6 Tie Wire: 3.55mm (9 gauge) galvanized.

.7 Bottom Tension Wire: tension wire is not acceptable, provide pipe rail as per 'Fence Component Size' chart.

.8 Concrete: to CSA CAN3-A 23. 1-M90 and A23.3.

.1 Type 10 Cement.

.2 Compressive strength 32 Mpa minimum at 28 days.

.3 Coarse aggregate nominal size 19 mm (3/4").

.4 Admixture for Air entrainment: 5% +/- 1%.

.5 Slump at time and point of discharge (19 mm to 75 mm) (3/4" to 3").

.9 Touch-up paint: zinc rich organic ready-mixed coating to CGSB-1-GP-181M.

.10 Post Caps: Cone type galvanized steel or cast aluminum alloy designed to fit snugly over posts and exclude moisture.

.11 Gates: All service and man gates to be heavy duty service construction, including heavy duty hinge pins and drop pins as required. Submit shop drawings for approval by Consultant.

### **3.00 EXECUTION**

#### **3.01 POST SPACING**

.1 Maximum post spacing 3Metres (10'-0") on centre. Unless otherwise indicated in Contract documents set end posts in straight and true alignments. Line posts spacing shall be field adjusted to ensure equal spacing between end posts. Set all end, line and gate posts vertical and plumb in concrete footings.

### 3.02 CONCRETE FOOTINGS

- .1 Unless otherwise detailed the minimum footing dimensions shall be 1200mm (4'-0") deep, footing diameter, 150mm (6") larger than outside post diameter, post depth embedment in footing, 75mm (3") from bottom of footing.
- .2 Posts shall be installed in concrete footings prior to installation and welding of top and bottom rail.

### 3.03 FENCE CONSTRUCTION

- .1 Unless otherwise noted, fence posts, top, bottom and mid rail connections shall be all welded construction. Weld all ends continuously to adjoining member. Grind all welds smooth.
- .2 Weld connections to be coped. No crimping or flattening will be permitted. Connections not meeting this specification will be rejected and replaced with specified construction at the contractor's expense.
  - .1 Cope all posts to accept top rail.
  - .2 Cope all mid rail and bottom rails to fit posts.
- .3 Mid rails shall be installed at all end sections and all sections adjacent to gates and corners, for all fences. All fences 2.4M (8'-0") high or higher shall have horizontal mid rails installed continuous in all sections.
- .4 Install tension bands where fabric terminates at all terminal, corner and gate posts. Tack weld as required.
- .5 Unless otherwise indicated place fusion bonded metal mesh fabric on the inside (active play side) of all areas to be enclosed.
  - .1 Place the fusion bonded metal mesh fabric by securing one end with stretcher bar and hog rings, applying sufficient tension to remove all slack before making end or mid post connections 100mm(4") above finished grade. Clearance to be measured at the post locations. Fusion bonded metal mesh fabric shall be tighten to provide a smooth uniform appearance free from sags.
  - .2 Insert stretcher bar, connect stretcher bar to end post with hog rings at 380mm (15") on centre, maximum spacing. Cut the fusion bonded metal mesh fabric at tension bar, finish by creating knuckled selvedge at bottom and twisted selvedge at top.
  - .3 Fasten fusion bonded metal mesh fabric to line posts at 150mm (6") on centre and mid, bottom or top rails at 100mm (4") on centre with tie wire.
  - .4 Join rolls of Fusion bonded metal mesh fabric by weaving a single picket into the ends of the rolls to form a continuous mesh.
- .6 Tack weld firmly in place all post tops.

**3.04**      FINISH

- .1      Unless otherwise indicated all posts, rails, mid posts, braces, gates and miscellaneous hardware are to be left unpainted galvanized metal.
- .2      Do not paint fusion bonded metal mesh fabric.

**3.05**      CLEAN UP

- .1      Clean up all excess and waste material and remove from the site to satisfaction of CNW Staff Inspector.

**END OF SECTION 02831**

**1.00 GENERAL**

**1.01 GENERAL REQUIREMENTS**

- .1 Refer to Division 1, General Requirements.
- .2 All contract documents form an integral part of this section.

**1.02 DESCRIPTION**

- .1 Work Included: Furnish all labour, equipment, material and services necessary for complete supply and installation of all plant material as shown on the drawings and herein after specified.
- .2 Related Work in Other Sections
  - .1 Shop Drawings, Product Data, Material Testing and Samples Section 01330
  - .2 Growing Medium Preparation and Placement Section 02910
  - .3 Sodding Section 02926
  - .4 Irrigation Section 02810

**1.03 QUALITY ASSURANCE**

- .1 All materials and work shall conform to the latest edition of the following standards or as otherwise specified:
  - .1 CNTA (Landscape Canada) Canadian Standards for Nursery Stock
  - .2 BCLNA Standard for Container Grown plants
  - .3 BCLNA British Columbia Landscape Standard
  - .4 Perennial Plant Association Standards for herbaceous perennial plants

**1.04 AREA OF SEARCH**

- .1 Area of search for specified plant material shall include the Lower Mainland of British Columbia, Vancouver Island, Washington and Oregon States, except as noted on the plant list.

**1.05 PROVENANCE AND SOURCE QUALITY CONTROL**

- .1 All plant material used on this project shall be hardy in this climate. Plant types have been selected with this as a criteria. This Contractor shall guarantee that plant material supplied has equal provenance, i.e. the plant has been developed from cuttings or seeds collected in an area of similar climatic characteristics. Submit proof of equal provenance to The Consultant upon request.
- .2 Plant material will be supplied from a Nursery certified Free of Phytophthora ramorum, (Sudden Oak Death), as determined and certified by the Canadian Food Inspection Agency (CFIA). Only Nurseries that are certified free of Phytophthora ramorum will be permitted to supply Plant Material for this project.

**1.06**      SUBMITTALS

- .1      Prior to any delivery of any plant material to site, submit to the Consultant, one (1) copy of the Phytophthora ramorum, (Sudden Oak Death) Free Certificate as issued by the Canadian Food Inspection Agency for the source nursery. If there is more than one source nursery provide Phytophthora ramorum, (Sudden Oak Death) Free Certificates as issued by the Canadian Food Inspection Agency for each additional nursery.

**1.07**      CONFIRMATION PLANT LIST

- .1      Contractor shall provide in writing to the Consultant a minimum of seven (7) days prior to review of plant material at the source nursery a plant list confirming the quantity, botanical name, common name and size of plants specified.

**1.08**      SUBSTITUTIONS

- .1      Contractor shall provide in writing to the Consultant a minimum of seven (7) days prior to review of plant material at the source nursery a list of proposed substitutions for review. Substitutions to be approved by Consultant.
- .2      Plant substitutions shall be of similar genus and species and of equal or greater size as those originally specified. The list shall contain the following information:
  - .1      Botanical name, common name of the specified plant
  - .2      Botanical name, common name of the proposed substitute plant
  - .3      Pot size and plant size in the nursery

**1.09**      PLANTING SCHEDULE

- .1      Contractor shall provide in writing to the Consultant upon award of the Contract a detailed planting schedule outlining dates and duration of planting operations.
- .2      Revisions to the Planting Schedule as a result of delays of any kind shall be submitted to the Consultant in a timely manner prior to the start of planting operations.

**1.10**      DELIVERY AND STORAGE

- .1      Dig and handle all plant material in a manner suitable for each species to prevent injury to or removal of fibrous roots. All plant material arriving on site with broken or loose root balls or containers will be rejected. Take precautions to prevent roots from frost, avoid burning of plants by sun or wind during handling and shipping.
- .2      Keep root balls and container soil moist before planting by covering with bark mulch, wet straw or soil, water as required to ensure moist root balls.
- .3      All plant material shall be acclimatized to the final location before delivery and planting. The Contractor will be held responsible for plant losses caused by inadequate acclimatization.



**1.11**      INSPECTION

- .1      Notify the Consultant, giving at least 48 hours notice when plants are assembled for inspection in one location ten (10) days prior to scheduled planting time. All plants to be inspected by CNW staff and Consultant at the nursery prior to delivery on site. CNW to tag trees for use on the site.
- .2      If inspection in more than one location becomes necessary, the contractor shall reimburse the Consultant for the additional time required at the current hourly rates of the Staff personnel.
- .3      All plants are subject to inspection and may be rejected for failure to comply with this specification at any time until Acceptance. Replace rejected material and remove from the site at no cost to the Parks Department.
- .4      Plants required for the work must be inspected and tagged at the place of growth before being dug. Inspection and tagging at the place of growth shall not affect the right to reject such plants on or after delivery thereof to the site.
- .5      Plants arriving on site must be inspected by the Consultant prior to off-loading. Provide minimum 48 hours notice to schedule such inspection.
- .6      The Contractor or his authorized representatives shall be present during all required inspections as specified or as may be required.

**1.12**      CONDITIONS FOR ACCEPTANCE

- .1      The conditions for Acceptance of landscape areas and for turning over the landscape areas to the Owner for subsequent maintenance are:
  - .1      Growing medium quality, fertility levels, depths and surface grading have been completed to the requirements of the Contract documents.
  - .2      Plant quantities, sizes, quality and locations are as shown in the Contract Documents or as otherwise approved by the Consultant.
  - .3      Substantial Performance for the complete project shall have been declared.
  - .4      All plants shall be installed at the correct elevation relative to finished grade, healthy, in a vigorous growing condition and established to the satisfaction of the Consultant. As required or directed by the Consultant plant material shall have been pruned for form and health, by a certified arbourist.
  - .5      All deficiencies with regard to landscape work shall have been rectified.
  - .6      All trees are staked where required or as directed by the Consultant.
  - .7      Landscape areas shall have been maintained for at least 55 days from the date of Substantial Performance. All planted areas are free of all visible weeds and substantially free from underground weed seeds or parts thereof as per the requirements of the Contract documents.
  - .8      Mulch has been placed as required. All areas not to receive mulch are in a cultivated, loose, friable condition where water can freely permeate the surface.

- .2 The Contractor shall provide 48 hours notice to the Consultant for the 'Acceptance' review. The Consultant shall review all areas of planting and if in their judgment the planting conforms to the 'Conditions for Acceptance' shall establish a date for Acceptance which will coincide with the date the Owner takes over maintenance of all planting areas within the scope of this Contract. Should the planting areas within the scope of this contract not, in the view of the Consultant meet the conditions of 'Acceptance' then the Contractor at no cost to the owner will continue to maintain the planting areas, replace plant material or take what ever action is necessary to meet the requirements of this specification.

### 1.13      GUARANTEE

- .1 For a period of one (1) year from the date of Substantial Performance, at no cost to Owner, replace all unsatisfactory plant material and continue to replace such plant material until the plants are acceptable to the Consultant.
- .2 This guarantee is based on adequate maintenance by the Owner from the date of Acceptance. The Contractor will not be responsible for plant loss due to extreme climatic conditions such as abnormal freezing temperatures or hail which occur after Acceptance. The Contractor shall be responsible for plant loss due to inadequate acclimatization.
- .3 Adequacy of acclimatization and existence of extreme climatic conditions shall be as determined by an independent Consultant, hired by the Owner on the basis of plant variety, location, recorded temperatures for the locale, time of planting and other factors pertinent to the situation.

### 1.14      PERMITS

- .1 The Contractor is responsible for obtaining all permits required for the work of this section, including but not limited to permits as may be required for planting and related work on municipal property, i.e. planting of street trees.

## 2.00      PRODUCTS

### 2.01      PLANT MATERIAL

- .1 Plant material shall be of the sizes and quantities as shown on the Contract documents. Plants shall be nursery grown unless specifically described as "collected". All "non-specimen" plants specified in the Contract documents are specified according to the CNTA Canadian Standards for Nursery Stock and the BCLNA Standard for Container Grown Plants.
- .2 In particular, plant material shall conform with the following CNTA Standards:
  - .1 "Nursery stock shall be true to name, type and form and representative of their species or variety. In addition they shall be of the size and grade and quality stated."
  - .2 "Quality shall be normal for the species when grown under proper cultural conditions viable, substantially free from pests and disease, and undamaged."
  - .3 "Roots shall not be subject to long exposure to drying winds, sun or frost, between digging and delivery."

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- .4 Root balls and soil in containers shall be free from pernicious perennial weeds."
  - .5 Roots shall be transplanted or root pruned at least once within the year prior to planting.
  - .6 Take precautions during digging, handling and shipping of plant material to avoid injury to plants and root systems.
  - .7 Plants for use when symmetry is required shall be matched as nearly as possible.
  - .8 Plants shall not be pruned prior to delivery.
  - .9 All plants shall be measured when the branches are in the normal position. Measurements shall be as set out in the BCLNA Standard for Container Grown Plants. Caliper of trees shall be measured 300mm (12") above the ground. The height of tree trunks need not be as specified if the required height can be obtained by pruning the lower branches without leaving unsightly scars or otherwise damaging the trunk. No pruning of the branches to achieve the required height shall be done prior to delivery of the material to the site without the Consultant's written approval.
  - .10 Trees shall have straight trunks with a single leader intact. There shall be no abrasion of the bark and no fresh cuts of limbs over 32mm (1-1/4") that have not completely calloused over.
  - .11 Where trees are to be in a formal arrangement or occur in consecutive order, they shall be carefully measured as to height and spread and tagged with a number before delivery to the site. These trees shall be correspondingly identified on plan to assure symmetry and expeditious handling.
  - .12 Plants larger in size than specified in the itemized plant list may be used if approved; but the use of larger plants shall not increase the Contract price. If the use of larger plants is approved, the ball of earth or spread of roots shall be increased in proportion to the size of the plant.
  - .13 The size specified is the size of plant required at the time of delivery to the construction site. Sizes shown are minimum sizes.
- .3 Container dimensions shall be as defined in the BCLNA Landscape Standard.

## 2.02

### RELATED MATERIALS

- .1 Tree Ties: Flat woven polypropylene material. 20 mm (3/4") wide, 544 Kg. (1200 lb), break strength. Arbor Tie by Deep Root or approved equal.
- .2 Tree Guy Anchors/ Tree Guy System: Direct burial or screw type disc guy anchor and guy system. The Arrow Anchor by Tree-Guy/ Tree Guy System, Santa Anna, California (800) 624-1116, or approved equal.
- .3 Stakes and Stake Fasteners: ACQ pressure treated Hem/Fir, 75 mm dia. (3") round, 2500 mm (8'-0") long. Stake fasteners shall be hot dipped galvanized or stainless steel.
- .4 Flagging Tape; 30mm (13/16") wide 'Red' PVC flagging tape by Identi-Tape, Boulder, CO or approved equal.
- .5 Burlap and Wire Baskets: To Requirements of BCLNA Landscape Standard.

- .6 Fertilizer: As indicated in growing medium analysis.

C/N Ratio	40:1 maximum
PH	6.5 to 7.5

- .7 Composted Mulch: Shall be brown to black in colour, free of chunks and sticks, soil, stones, roots or other extraneous matter.
- .1 Composted mulch shall be a uniform blend of organic materials, containing approximately 20% natural organic compost derived from source separated composted matter and 80% select composted wood fiber.
- .2 The mix shall be composted such that the weight of the organic matter is reduced by at least 60% of its original weight.
- .3 Provide a one (1) litre sample an analysis of the composted mulch confirming it meets the requirements of this specification to Consultant for review and approval prior to the start of work in this section.
- .4 Approved suppliers include; Vancouver Mill Fuels or pre-approved equal.

### **3.00 EXECUTION**

#### **3.01 PLANTING SEASON**

- .1 Plant only during the season or seasons that are normal for such work, as determined by weather conditions and as approved by the Consultant. Plants planted before or after any stipulated dates will be rejected. CNW do not allow tree planting between June 30<sup>th</sup> and September 30<sup>th</sup> regardless of irrigation. CNW do not allow any shrub planting between June 30<sup>th</sup> and September 30<sup>th</sup> unless the project is irrigated.
- .2 Do not plant during freezing, abnormally hot, dry or wet weather or when damaging climatic conditions can be anticipated.
- .3 The Contractor will be responsible for death or deterioration of plants caused by exposure to damaging climatic conditions, planting under conditions itemized above or inadequate acclimatization of plant material.

#### **3.02 DELIVERY**

- .1 Dig and handle all plant material in a manner suitable for each species to prevent injury to or removal of fibrous roots. All plant material delivered with broken or loose root balls or containers will be rejected by the Consultant and replaced by the Landscape Contractor at no additional cost to the Parks Department. Take precautions to avoid burning of plants by sun or wind during handling and transporting.
- .2 Keep root balls and container soil moist prior to delivery by covering with bark mulch, wet straw or soil and water as required to ensure moist root balls.
- .3 Coordinate the delivery of plant materials with work of other trades and other site activities.
- .4 Off load the plant materials at the site as designated by the Consultant.

**3.03**      PLANT LAYOUT

- .1      The Contract shall layout all plant material taking into consideration orientation and spacing according to the Planting Plan. Prior to the planting operation the Contractor shall provide 48 hours notice to the Consultant for the review of plant layout. The Consultant may make adjustments in plant locations and orientation or direct the Contractor to do so at no cost to the Owner.
- .2      The Contractor shall stake location of all major trees according to the Planting Plan. Prior to the planting operation the Contractor shall provide 48 hours notice to the Consultant for the review of stake layout. During major tree planting operations the Consultant must be present and may at no cost to the Owner make adjustments to the major tree to ensure proper orientation and location.

**3.04**      TREE PITS/GROWING MEDIUM TRENCHES

- .1      For all trees, excavate tree pits/growing medium trenches with vertical sides, depth to be of sufficient size to contain root ball, min 900mm (3'-0"). The minimum area of tree pit shall be 10 Square Metres (100 Square feet) per tree Unless otherwise directed by Consultant.
- .2      Ensure tree pits dug in heavy or compacted soils exhibit the ability to drain freely by filling each tree pit with a minimum of 20 litres (5 gallon) of water. Water should freely drain through subsoil within ten (10) minutes.
  - .1      Notify Consultant if tree pits in any soil condition do not drain freely or if tree pit fills with ground water.
  - .2      There shall be no standing water in the bottom of tree pit at time of planting.
  - .3      Acceptable remedial measures for poor drainage include auguring holes through the impervious layers and backfilling with approved clean rounded drain rock or sand, raising the planting grade, or adding dedicated drain lines connected to the subsurface drainage system.
  - .4      Prior to the implementation of remedial drainage measures review procedures with Consultant.
- .3      Scarify sides of all tree pits

**3.05**      PLANTING PROCEDURE

- .1      Install all plants at height grown in Nursery. Allow for settling of the growing medium after planting. The soil mark on the stem will be used as the indicator for correct growing medium/planting elevation.
- .2      Excavate hole in growing medium sufficient to receive root ball. Excavation of the subgrade below the root balls of trees shall be only as necessary to permit the bottom of the root ball to sit on undisturbed material or compacted fill such that the top of the root ball remains at the proper finished grade. Disturbed subgrade or fill below the root ball shall be compacted to prevent settlement of the tree after planting.

- .3 Plants shall be set plumb in the planting beds or in the center of the pits, except where the plant's character requires variation. Obtain approval from Consultant.
- .4 Backfill around root ball with prepared growing medium, tamping and watering to ensure firm support for the plant and eliminating all air pockets around the root ball. Ensure water penetration into the root balls during planting procedures.
- .5 Unless otherwise directed by the supply Nursery, remove all string, rope, burlap and other restricting elements out to the perimeter of the root ball. Cut all wire basket handles flush with the top ring or fold back down into the planting hole. Do not remove wire baskets. Ensure no wires from the basket protrude into the top 100mm of the growing medium.
- .6 Ensure a 150mm (6") deep saucer around all trees for the full width of the planting pit.

### 3.06 FERTILIZER APPLICATION

- .1 Place fertilizer as per recommendations of soil analysis.

### 3.07 STAKING AND GUYING

- .1 Guy/stake all trees immediately after planting as per details. Plant material not guyed or staked immediately shall be replaced if damaged.
- .2 Trees shall stand plumb on completion of this operation.
- .3 Guys/stakes shall be installed such that injury to bark will not occur.

### 3.08 PRUNING

- .1 Each shrub planted shall be pruned to preserve the natural character of the plant and in a manner appropriate to its particular requirements in the landscape design. Pruning in general shall be heavier on collected than on nursery grown plants. All soft wood sucker growth and all broken or badly bruised branches shall be removed with a clean cut.
- .2 All pruning shall be done with sharp tools. All pruning cuts to be made flush and clean; especially where lower branches have been removed from collected trees.

### 3.09 APPLYING MULCH

- .1 After finish grading is complete and immediately after each area requiring mulch is planted, place mulch in a uniform even layer. Moisten uniformly and spread to a consistent settled depth of 100mm in tree and shrub planting areas, 100mm in all ground cover areas.
  - .1 Ensure finish composted mulch layer is a minimum of 12mm (1/2") below adjacent hard landscape surfaces and edges.
  - .2 Ensure mulch is kept 125 mm (5") away from tree trunks and 75 mm (3") away from stems of shrubs.

3.10 MAINTENANCE

- .1 Begin maintenance at time of planting and continue until Acceptance.
- .2 Maintenance of all plants shall be to Level 2 Groomed, BCNLA Landscape Standard. Frequency of watering, weeding, cultivating, pruning and any other necessary operations shall be such that the plant material is healthy and vigorously growing.
- .3 Water all planted areas as necessary to provide optimum conditions for plant growth. Ensure irrigation system is operational and will thoroughly soak the growing medium of these areas to its full depth at least twice weekly. Should the irrigation system not be operational, at no cost to the Owner provide water to the plants via watering trucks or hoses.

3.11 FINISH GRADING

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

3.12 CLEAN UP

- .1 All excess materials and other debris resulting from planting operations shall be removed from the job site.
- .2 Flush all walks and paved areas and rake all lawn areas clean to the satisfaction of the Consultant.
- .3 Remove excavated subsoil material from site.

**END OF SECTION 02900**

**1.00**      **GENERAL****1.01**      **GENERAL REQUIREMENTS**

- .1      Refer to Division 1, General Requirements.
- .2      All contract documents form an integral part of this section.

**1.02**      **DESCRIPTION**

- .1      Work included: Supply all labour, services and material necessary to prepare, supply and install growing medium and mulch as specified herein.
- .2      Related Work in Other Sections:
  - .1      Shop Drawings, Product Data, Material Testing and Samples      Section 01330
  - .2      Excavation, Backfill and Grading      Section 02315
  - .3      Irrigation      Section 02810
  - .4      Plants and Planting      Section 02900
  - .5      On-site Growing Medium Preparation and Placement      Section 02911
  - .6      Hydroseeding      Section 02922
  - .7      Sodding      Section 02926

**1.03**      **APPLICABLE STANDARDS AND LEGISLATION**

- .1      Conform to the requirements of the latest editions of the following standards and legislation:
  - .1      BCLNA British Columbia Landscape Standard Latest Edition
  - .2      Canadian System of Soil Classification

**1.04**      **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.

**1.05**      **INSPECTION**

- .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 inspection at no cost to the Owner.
- .2      Notify Consultant when the site is prepared for growing medium placement. Do not place growing medium until subgrades have been inspected and approved.
- .3      Provide at least 48 hours notice in advance of each required inspection.



**1.06 SUBMITTALS AND QUALITY CONTROL**

- .1 Submit to the Consultant one (1) copy of the growing medium analysis and one (1) copy of organic matter analysis from a laboratory approved by the consultant. Acceptable laboratories include Pacific Soil Analysis Inc., Richmond, BC (604.273.8226). The analysis shall be of tests done on the proposed growing medium and organic matter from samples taken at the supply source within three weeks immediately prior to growing medium placement. Cost of initial analysis and subsequent tests to ensure compliance with specification shall be borne by the contractor. Test results shall be provided to the CNW and Consultant for review PRIOR TO any growing medium delivery to site.
- .2 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.
- .3 During the course of growing medium supply to the site, to ensure quality control provide an additional three (3) samples at intervals outlined by Consultant of growing medium taken from material delivered to the site. Samples shall be taken from a minimum of three (3) random locations and mixed to create a single uniform sample for testing. Results of these tests shall be presented to the Consultant for review.
- .4 Submit to the Consultant a one (1) litre material sample of each type of proposed growing medium for each different application within the project. Each sample shall be a composite of at least three samples from the proposed source. Clearly mark the type of sample, date of the sample, supplier's name, address and telephone number on each sample supplied for review.
- .5 Submit to the Consultant a one (1) litre composite sample of organic matter. The sample shall be a composite of at least three samples from the proposed source. Clearly mark the type of sample, date of the sample, supplier's name, address and telephone number on the sample supplied for review.
- .6 Upon approval of the growing medium analysis and organic matter analysis the supply of these materials for this Contract will be from the source noted on the analysis. Should the Contractor require the source to change during the construction period a new analysis shall be submitted to the Consultant for review and approval prior to delivery of any material from the new source to the site.
- .7 Carry out growing medium preparation and placement and the import of organic material 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.
- .8 Failure to satisfy these contractual requirements could result in the Contractor being required to remove unacceptable growing medium at their expense.

- .9 Submit to the Consultant a one (1) litre sample of Sand and sieve analysis. The sample shall be clearly mark the type of sample, date of the sample, supplier's name, address and telephone number on the sample supplied for review.

#### 1.07      PRODUCT HANDLING

- .1 DO NOT MOVE OR WORK GROWING MEDIUM OR ADDITIVES WHEN THEY ARE EXCESSIVELY WET, EXTREMELY DRY, OR FROZEN 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.
- .2 Protect growing medium and additives against extreme wetting by rain or other agents, and against contamination by weeds and insects.
- .3 Stockpile materials in bulk form in paved areas. Provide additional protection by storing under roof or tarpaulins for bulk forms of peat moss and compost. 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.
- .4 Deliver and store fertilizers and other chemical ingredients in the manufacturer's original containers. Protect against damage and moisture until incorporated into the work.

#### 1.08      APPROVED EQUALS

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

### 2.00      PRODUCTS

#### 2.01      ADDITIVES

- .1 Organic Matter: A uniform blend of natural source-separated organic materials, composted such that it is brown-black in colour Substantially free from subsoil, pests, roots, wood, construction debris, undesirable grasses or weeds, and seeds or parts thereof. Free from paper, fibre amended compost products, toxic materials, crabgrass, couchgrass, equisetum, weeds, and seeds or parts thereof with the following component analysis;

C/N Ratio	25:1
pH	6.0-7.0

- .2 Approved blended compost mixture is ***Soil Amender*** as supplied by: **Fraser Richmond Bio-Cycle Ltd. or approved equal.**

- .3 Sand: Approved medium river pump sand, well washed and free of contaminants, chemical and organic matter. Gradation of particles 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):

USB Sieve Sieve Size	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	0.053	0 - 3	Silt & clay

Organic content	0.5% by weight.
Water Soluble Salt content	0.5mm hos/cm
Ph of between	5.0 and 7.0
Saturated Hydraulic Conductivity	100 mm - 300 mm (4" - 12") per hour. Test conditions shall be for saturated sand, 15 blows compaction.

- .4 Peat Moss: Peat Moss is not allowed as an additive or organic source.
- .5 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.
- .6 Dolomite Lime: Approved commercial brands for horticultural purposes, coarsely ground; containing not less than 20% calcium by weight.

## 2.02 FERTILIZER

- .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 Consultant.

**2.03**      SCREENED GROWING MEDIUM

- .1 Screened Growing Medium shall consist of imported soil screened with additives and fertilizers as required to satisfy the following component parts;
  - .1 Substantially free from roots, sticks, building materials, wood chips, chemical pollutants subsoil, wood including woody plant parts, weeds, stones over 30mm, pests, undesirable grasses or weeds, and seeds or parts thereof and foreign objects. Growing medium shall be free from crabgrass, couch grass, equisetum, convolvulus or other weeds or seeds or parts thereof.
  - .2 Population of plant pathogenic nematodes: maximum 1000 per litre for any single species.
  - .3 Boron: the concentration in the saturation extract shall not exceed 1.0 ppm
  - .4 Sodium: the sodium absorption ratio(SAR) as calculated from analysis of the saturation extract shall not exceed 8.0
- .2 Growing Medium Composition
  - .1 Shrub Beds and Tree Planting: Eco-Soil Lawn and Garden Mix as supplied by Eco-Soil, Langley, BC (604) 541-7645.
  - .2 Seeded and Sod Lawn Areas: Eco-Soils Standard Turf Blend as supplied by Eco-Soil, Langley, BC (604) 541-7645.

**3.00**      EXECUTION**3.01**      SUBGRADE PREPARATION

- .1 Remove debris, roots, branches, stones in excess of 50mm (2") in diameter, and deleterious materials from subgrade. Remove any soil contaminated with calcium chloride, toxic materials or petroleum products. Remove any materials which protrude 25mm above the surface.
- .2 Verify that subgrades are at the proper elevations before placing growing medium. Obtain approval of The Consultant prior to placing any growing medium. Placement of growing medium implies acceptance of subgrade conditions.
- .3 Scarify compacted subgrade to a minimum depth of 150mm (6") immediately before placing growing medium

**3.02**      PLACEMENT OF GROWING MEDIUM

- .1 Growing medium shall be moist (25% to 75% of field capacity) but not wet when placed. It shall not be handled in anyway if it is wet or frozen.
- .2 Place all growing medium to the following minimum depths and levels (measured after initial settling of growing medium) to establish the required finished grades as shown on drawings.

Growing medium shall be placed over prepared subgrade and shall be allowed to settle or compacted by light rolling such that it is firm against deep footprints to the approval of the Consultant. Do not compact more than is necessary to meet this requirement. Areas that have been over compacted rejected requiring the Contractor at no cost to the Owner remove and replace compacted growing.

Imported growing medium (150mm depth) for Sportsfield to be placed n top of (150mm depth) amended on-site growing medium. See specification section 02910-4.

- .3 Crown or slope for positive surface drainage as shown on the drawings.

### 3.03 APPLICATION OF FERTILIZERS

- .1 Apply fertilizers as specified and recommended by growing medium analysis.
- .2 Spread evenly over the placed growing medium surface by means of a suitable mechanical spreader.
- .3 Rake fertilizers into top 50mm minimum of the placed growing medium.
- .4 Ensure minimum 7 days separation time between the application of any lime treatment or fertilizers and plant material installation.

### 3.04 FINISH GRADING

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

### 3.05 ACCEPTANCE

- .1 Prior to acceptance the Consultant will inspect and at their discretion at no cost to the Owner have tested the growing medium depth and finish grading as placed. Contractor will not begin any planting or sodding operations until written acceptance from CNW has been provided.

### 3.06 CLEAN UP

- .1 All excess materials and other debris resulting from growing medium preparation and placement operations shall be removed from the job site.
- .2 Flush all walks and paved areas clean to the satisfaction of the Consultant.

**END OF SECTION 02910**

**1.00 GENERAL**

**1.01 GENERAL REQUIREMENTS**

- .1 Refer to Division 1, General Requirements
- .2 All contract documents form an integral part of this section.

**1.02 RELATED WORK**

- .1 Rough Grading/Landscape Areas Section 02310
- .2 Planting Trees Shrubs and Groundcover Section 02900
- .3 Growing Medium Preparation and Placement Section 02910

**1.03 DESCRIPTION**

- .1 Furnish all labour, materials, equipment, and services necessary for complete preparation, supply and installation of the following:
  - .1 On- Site growing medium. (Where do we say 6" new tilled in to top 12")

**1.04 TESTING**

- .1 Submit to the Consultant a copy of a growing medium analysis from Pacific Silts Analysis or other laboratory approved by the consultant. The analysis shall be of tests done on the proposed on-site growing medium from samples taken at the supply source and site stockpile 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 Consultant for review BEFORE any growing medium delivery to site.
- .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 consultant submit up to two additional samples at intervals outlined by consultant of 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 Consultant for review.

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

#### 1.05 SAMPLES

- .1 Each sample shall be a composite of at least three samplings from the proposed off site source and site stockpiled source. Each sample shall be at least one (1) litre in volume.

#### 1.06 QUALITY CONTROL

- .1 Carry out growing medium preparation and placement such that the final product matches the standard established by the approved which has incorporated the recommendations for amendment by the testing laboratory.

#### 1.07 PRODUCT HANDLING

- .1 Do not move or work growing medium or additives when they are excessively wet, extremely dry, frozen 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 Unless otherwise indicated on the contract drawings all planting areas will receive growing medium that has been delivered to site **premixed** from a recognized growing medium source ensuring consistency throughout the mix.

### 2.00 PRODUCTS

#### 2.01 MATERIALS

- .1 **On-Site Growing Medium:** Growing medium that has been stripped from site by contractor and has been stockpiled on the project site. Stock pile height not to exceed 1M (3-3").
- .2 On-site growing medium shall be substantially free of pests, roots, wood, construction debris, undesirable grasses including crabgrass or couch grass, noxious weeds or weeds, or other foreign objects.
- .3 Fertilizer:

- .1 Complete commercial synthetic slow release fertilizer meeting the requirements of the Canada Fertilizer Act, packed in water proof containers, clearly marked with the name of the manufacture, weight and analysis.
- .2 Formulation ratio: as per soil test recommendations.
- .4 Lime
- .1 Coarse (unless noted otherwise), ground dolomite limestone containing minimum 85% of total carbonates.
- .5 Organic Material: submit sample prior to shipping to site:
- .1 Organic Material shall be made up of well composted organic matter, free of substances and materials that non organic in nature, detrimental to healthy plant growth or biological activity, black/brown in colour. Acceptable products include Organic Compost, manufactured by Stream Organics Management, Surrey, BC or Soil Amender, manufactured by Fraser Richmond Bio-Cycle, Richmond, B.C., or pre-approved equal.
- .6 Wood Residuals: Content of wood residuals such as Fir or Hemlock sawdust present in the growing medium shall not cause the total Carbon to total Nitrogen ratio to exceed 40 to 1. Cedar or redwood sawdust shall not be present in growing medium.
- .7 Sand: Sand will be river pump sand or pit run sand satisfying the following gradation, (dry weight basis):

<u>SIEVE SIZE</u>	<u>CLASSIFICATION</u>	<u>% RETAINED</u>
No. 4 (4.76mm)	Gravel	0%
No. 10 (2.0 mm)	Fine gravel	0-5%
No.18 (1.0 mm)	Very coarse sand	5-10%
No.35 (0.50 mm)	Coarse sand	15-20%
No.60 (0.25 mm)	Medium sand	50-75%
No.140 (0.105 mm)	Fine sand	5-15%
No. 270	Very fine sand	0-2%
Passing No. 270	Silt, clay	0%

- .8 Fertility; Major growing medium nutrients present in the following ratios;
- .1 Nitrogen (N); 20 to 40 micrograms of available N per gram of growing medium.
- .2 Phosphorus (P); 10 to 20 micrograms of available phosphate per gram of growing medium.
- .3 Potassium (K); 80 to 1200 micrograms of available potash per gram of growing medium.
- .4 Calcium, magnesium, sulfur and micronutrients present in balanced ratios to support germination and or/ or establishment of intended vegetation.

2.02STANDARD FOR ON-SITE AMENDED GROWING MEDIUM

- .1 Growing Medium Particle Composition:

	% Dry Weight of Total Growing Medium
Particle Size Class and Properties	<b>Site Amended Growing Medium</b>



	Planting Areas
Coarse Gravel (larger than 25mm)	0
All Gravel (Larger than 2 mm)	0
	% Dry Weight of Growing Medium Excluding Gravel
Sand (larger than 0.05 mm and smaller than 2 mm)	50-70%
Silt (larger than 0.002mm and smaller than .05 mm)	10 - 30%
Clay (smaller than .002 mm)	0 - 20%
<b>Maximum Clay and Silt Combined</b>	<b>30%</b>
Organic Content	15 - 25%
Acidity (pH)	5 - 6

- .2 Salinity: Maximum saturation extract conductivity: 3.0 millihos/cm at 25 degrees C.
- .3 Carbon to nitrogen ratio: Maximum 40:1
- .4 Drainage: Percolation shall be such that no standing water is visible 60 minutes after at least 10 minutes of moderate to heavy rain or irrigation.

### 3.00 EXECUTION

#### 3.01 MIXING SITE AMENDED GROWING MEDIUM

- .1 Thoroughly mix stock piled on site amended growing medium with recommended additives to produce a material with the particle size class and properties that meets the specifications of this section.
- .2 Ensure all additives including organic matter are thoroughly incorporated into amended growing medium mix forming as closely as possible a homogenous amended growing medium.
- .3 Do not mix or handle the amended growing medium or organic material when wet or frozen.

#### 3.02 ADDITION OF AMENDMENTS AND FERTILIZER

- .1 Apply lime at rate determined by testing laboratory's recommendations. Spread lime with mechanical spreaders over entire area of imported growing medium and site amended growing medium at rate recommended by the testing laboratory. Mix lime thoroughly into upper 100 mm (4"). Ensure applied lime does not come in contact with the nitrogen - phosphate - potash fertilizers.

- .2 Apply fertilizer with mechanical spreaders over entire surface area of imported growing medium and site amended growing medium at rate recommended by the testing laboratory. Do not mix fertilizer into the growing medium.

- .3 Ensure proper drainage in the lawn area.

### 3.03 PLACEMENT OF GROWING MEDIUM

- .1 On-Site Growing Medium;
  - 1. Do not place on-site growing medium until Consultant has reviewed subgrade.
  - 2. Ensure that irrigation lines to be installed have been reviewed by the consultant prior to the placing of growing medium.
  - 3. Ensure sub grade has been broken up and or scarified prior to placement of all growing mediums. Ensure proper drainage in all planting locations prior to continuing with growing medium placement.
  - 4. Place imported growing medium and site amended growing medium at locations and depths noted on drawings. Ensure imported growing medium and site amended growing medium is placed with adequate moisture, in uniform layers, during dry weather, over approved, dry, unfrozen sub grade in compacted layers of 100 mm to 150 mm (4" to 6").
  - 5. For Sportsfield lawn, thoroughly mix using roto tiller or other mechanical means the on-site amended growing medium with the imported growing medium to a depth of 12".

### 3.04 FINISH GRADING

- .1 Fine grade (manually) imported growing medium and site amended growing medium to contours and elevations shown on drawings or as directed by consultant. Eliminate rough spots and low areas to ensure positive drainage.
- .2 Ensure imported growing medium, site amended growing medium and site amended growing medium mixed growing medium with composted mulch layer is held 25 mm (1") from top elevation of adjacent paving or top of curb.
- .3 Leave surface smooth, uniform, firm against deep foot printing, with a fine loose texture ready for the application of composted mulch layer.

### 3.05 WEED CONTROL

- .1 Prior to the start of weeding operation review method for elimination of weeds with consultant and as required municipal inspector.
- .2 Weeding operations should be carried out in a continuous fashion for the duration of the contract.

### 3.06 SURPLUS MATERIAL

- .1 Dispose of surplus material not required for fine grading and landscaping off site.

**END OF SECTION 02911**

**1.00 GENERAL**

**1.01 GENERAL REQUIREMENTS**

- .1 Refer to Division 1, General Requirements.
- .2 All Contract Documents form an integral part of this section.

**1.02 RELATED WORK**

- .1 Rough Grading/Landscape Areas Section 02310
- .2 Imported Growing Medium Preparation and Placement Section 02910
- .3 On-Site Growing Medium Preparation and Placement Section 02911
- .4 Irrigation Section 02800

**1.03 DESCRIPTION**

- .1 Work includes but is not limited to the supply, labour and installation of hydraulic seed slurry/mulch and miscellaneous materials required to fully cover and establish a vigorously growing seeded landscape.

**1.04 DELIVERY AND STORAGE**

- .1 Deliver grass seed in original containers showing:
  - .1 Analysis of seed mixture.
  - .2 Percentage of pure seed.
  - .3 Year of production.
  - .4 Date when tagged and location.
  - .5 Percentage germination.
  - .6 Name and address of distributor.
- .2 Deliver wood fibre mulch in moisture-proof containers indicating manufacturer, content and net air-dry mass.
- .3 Deliver erosion control agent in moisture-proof containers showing manufacturer, content and net mass.
- .4 Store all seed, hydraulic mulch, fertilizers and related materials in dry, weatherproof storage place. Protect from damage by heat, moisture, rodents or other causes until completion of work of this section. Do not deface labels or other identification.

**1.05 SITE EXAMINATION**

- .1 The Contractor shall fully examine the entire area to have hydraulic seed slurry/mulch applied prior to the commencement of work and report to the Consultant, in writing any improperly prepared sections. Work of this section placed on improperly prepared sections will be rectified by the Contractor at no extra cost to the Owner.

**2.00 PRODUCTS**

**2.01 MATERIALS**

- .1 Seeded Lawn (Including Playfield): Certified Canada No. 1 Grade to Government of Canada, Seeds Regulations and having minimum germination of 75% and minimum purity of 95%.

Four Way Ryegrass Blend.

% Weight	Species
25	Fiesta 4
25	SR4600
25	SR4220
25	Zoom

- .2 Seeded Meadow: Certified Canada No. 1 Grade to Government of Canada, Seeds Regulations and having minimum germination of 75% and minimum purity of 95%.

Four Way Ryegrass Blend + Dryland Wildflower Mix.

% Weight	Species
20	Fiesta 4
20	SR4600
20	SR4220
20	Zoom
20	Dryland Wildflower Mix

Dryland Wildflower Mix provided by Premier Pacific Seeds, or approved equal.

- .3 Hydraulic Mulch and Erosion Control Agent:
  - .1 Hydraulic Mulch and Erosion Control Agent: Thermo-mechanically defibrated softwood fibers designed for hydroseeding.
    - .1 Acceptable products include: "EcoFibre + Tac" as manufactured by Canfor, or pre-approved equivalent.
- .4 Water: potable, free of impurities that would inhibit germination.
- .5 Fertilizer: complete synthetic, slow release fertilize. Type and composition shall be as required by the growing medium analysis report.

**3.00 EXECUTION****3.01 WORKMANSHIP**

- .1 Provide for proper water management and drainage of site during construction. Include silt traps, erosion control measures, temporary water collection ditches, as well as their adequate maintenance during construction period.
- .2 The Contractor is to ensure that any hydraulic seed slurry/mulch or other debris spilled onto pavement is to be cleaned up immediately.
- .3 The Contractor shall take care to prevent over spray of hydraulic seed slurry/mulch beyond the limit of hydraulic seed slurry/mulch application areas indicated on the Contract drawings. The Contractor shall ensure that structures, signs, guardrails, fences and any other landscape elements within the areas to be receive hydraulic seed slurry/mulch are properly protected from over spray of hydraulic seed slurry/mulch. As part of the work of this section the Contractor shall clean all over spray and make good all damage.

**3.02 PREPARATION OF SURFACES**

- .1 Prior to the work of this section all areas to be receive hydraulic seed slurry/mulch shall be cultivated to a depth of 50 mm (2") and fine graded to remove all humps and hollows, stones, roots, branches, deleterious and refuse material.
- .2 Finish grade to have smooth and even surfaces, firm against footprints, loose textured.

**3.03 EQUIPMENT**

- .1 All hydraulic seed slurry/mulch equipment shall match the tank volume certified by identification plate or sticker that is affixed to the equipment by the manufacturer. The identification plate is not to be removed or altered.
- .2 Hydraulic seed slurry/mulch equipment shall be sized and capable of sufficient agitation to mix materials into homogeneous state during the entire application process.
- .3 Discharge pumps and gun nozzles shall be capable of applying materials uniformly over designated areas with minimal disturbance.

**3.04 APPLICATION OF HYDRAULIC SEED SLURRY/MULCH**

- .1 Application of hydraulic seed slurry/mulch shall be scheduled to take place in the spring (April 1st to June 15th) or fall (Sept. 1st to September 30th) when conditions are most favourable for the establishment of a healthy plant material.
- .2 Do not apply hydraulic seed slurry/mulch during freezing or abnormally hot, dry, weather or on frozen surfaces or surfaces covered with standing water.
- .3 Hydraulic seed slurry/mulch shall not be applied when winds exceed 10 km/h (6 mph).

- .4 Charge hydraulic seed slurry/mulch tank by adding materials to tank while it is being filled with water in the following sequence:
  - .1 Seed,
  - .2 Fertilizer and mulch,
  - .3 Erosion control agent.
- .5 Quantity of seed, mulch and erosion control agent used to prepare the hydraulic seed slurry/mulch mix shall be in strict accordance with the manufacturers written instructions.
- .6 Quantity of fertilizer to be added to the hydraulic seed slurry/mulch mix shall be in accordance with the recommendation of the growing medium test recommendations.
- .7 After charging process has been completed no additional water, seed mulch, or erosion control agent shall be added to the tank. Ensure materials are thoroughly mixed into a homogeneous water slurry prior to the start of application.
- .8 Do not leave hydraulic seed slurry/mulch mix in tank for more than four (4) hours. Slurry left in tank over specified time is not to be used and is to be disposed of off site.
- .9 Monitor the distribution of the hydraulic seed slurry/mulch mix during the application operation to ensure that a homogeneous solution is being applied in a consistent and even manner according to the rates and quantities recommended by the manufacturer over the entire area to be receive hydraulic seed slurry/mulch mix.

### 3.05

#### MAINTENANCE

- .1 The Contractor shall begin maintenance of hydraulic seed slurry/mulch areas immediately after the application process. Maintenance operations shall continue until the Consultant notifies the Contractor in writing of Final Acceptance of the work.
- .2 All maintenance equipment and practices are to conform to the BCNLA Landscape Standard, current edition, 'Level 2, Groomed'.
- .3 The Contractor shall ensure that the entire area that has received hydraulic seed slurry/mulch mix is kept moist during germination period and receives adequate water during the maintenance period.
- .4 All applications of water shall be sufficient to ensure that moisture penetrates 75 to 100 mm (3" to 4") into the underlying growing medium.
- .5 The Contractor shall be responsible for the repair and re application of hydraulic seed slurry/mulch to areas that have washed out, eroded, or scoured by wind.
- .6 Application of fertilizer during the grown in period shall be as per the BCNLA Landscape Standard, current edition, 'Level 2, Groomed' established maintenance program. Areas that have received hydraulic seed slurry/mulch after September 15 shall not be fertilized until after April 15 of the next year.

3.06 FINAL ACCEPTANCE

- .1 Conditions for Final Acceptance:
  - .1 Hydraulic seed slurry/mulch areas have been maintained for a minimum period of (90) days after Substantial Performance.
  - .2 Hydraulic seed slurry/mulch areas are fully established and exhibit a uniform, thick, dense stand of plant material.
  - .3 Hydraulic seed slurry/mulch areas are free of eroded or exposed growing medium, areas that are dead, brown or exhibiting poor health.
  - .4 Hydraulic seed slurry/mulch areas are substantially free of foreign plant material including all weeds that are currently listed on the provincial noxious weed list [www.agf.gov.bc.ca/cropprot/weedguide](http://www.agf.gov.bc.ca/cropprot/weedguide)
  - .5 No surface growing medium is visible either before or after cutting practices prescribed in this section have been implemented.
- .2 Areas where hydraulic seed slurry/mulch has been applied after October 1st will be not be reviewed for acceptance until April 30th of the following year.

3.07 CLEAN UP

- .1 The Contractor shall remove all excess material from the work of this section and dispose of off site in at an approved facility.

**END OF SECTION 02922**



**1.00**      **GENERAL**

**1.01**      **GENERAL REQUIREMENTS**

- .1    Refer to Division 1, General Requirements.
- .2    All contract documents form an integral part of this section.

**1.02**      **DESCRIPTION**

- .1    Furnish all labour, materials, equipment and services necessary for the supply and installation sod lawn to areas indicated on drawings.
- .2    The work of this section shall include, but shall not necessarily be limited to the supply, installation and maintenance of the following:
  - .1    Fine grade growing medium
  - .2    Placement of sod
  - .3    Maintenance of sod lawn until Final Acceptance

**1.03**      **RELATED WORK**

- .1    Shop Drawings, Product Data, Material Testing and Samples                      Section 01330
- .2    Rough - Grading/Landscape Areas    Section 02310
- .3    Irrigation    Section 02810
- .4    Growing Medium Preparation and Placement    Section 02910

**1.04**      **STANDARDS**

- .1    BC Landscape Standard, latest edition.
- .2    Western Canada Turf Grass Association Standard, latest edition.

**1.05**      **SUBMITTALS**

- .1    Submit one (1) square metre (1 square yard) of sod to Consultant for review. Ensure sample is complete with name of sod farm, base soil type, seed mix percentage.

**1.06**      **QUALITY ASSURANCE**

- .1    Consultant shall review sod sample prior to installation. The sample accepted by the review will form the standard by which the project will be supplied.
- .2    Should the Contractor require the source of sod supply to change during the construction a written request must be provided to the Consultant 48 hours in advance. The request is to be followed up by submission of proposed sod substitution sample and include the

name of sod farm, base soil type, seed mix percentage for Consultants review prior to the start of supply to the site.

- .3 Sod shall be cut by machine designed for that purpose, to the suppliers standard length, plus or minus two (2) percent in width and five (5) percent in length. Small, irregular or broken pieces of sod delivered to the site will be rejected.
- .4 Sod to be cut to a uniform soil thickness of 15mm (0.6 inches) excluding top growth or thatch.
- .5 Grass height at time of sod cutting shall be 40mm and 60mm (1 1/2" – 2").
- .6 All sod shall be completely free of invasive and/or noxious broadleaf weeds, grasses including but not limited to poa annua, disease, fungi, detrimental nematodes and detrimental insects.
- .7 Dry or discoloured sod is unacceptable and will be rejected.

#### 1.07 PROJECT SCHEDULING, DELIVERY AND STORAGE

- .1 Schedule sod deliveries such that sod installation occurs within twenty-four (24) hours of being lifted from the source sod farm.
- .2 Sod is to be neatly stacked or rolled at the source sod farm, delivered and unloaded on sturdy pallets.
- .3 Protect sod during transport to the site to prevent excessive drying. Sod to arrive at site green in colour, fresh and healthy condition.

#### 1.08 DRAINAGE CONTROL

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

#### 1.09 GUARANTEE

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

**2.00 PRODUCTS**

**2.01 MATERIALS**

- .1 Nursery sod;
  - .1 Shall be No. 1 Premium grade and contain only species of grass indicated on the suppliers certificate. Shall be non-netted.  
  
Sand Base Sod  
Elka II Perennial Ryegrass                      50%  
Kentucky Bluegrass                                50%  
Acceptable products include 'Pro Sport Turf' as supplied by Anderson Sod Farms, Dewdney, BC or approved equal.
- .2 Water: potable, free of impurities that would inhibit sod growth. Contractor to ensure adequate water is available to maintain sod in its original healthy state until Final Acceptance of work of this section.
- .3 Fertilizer: complete synthetic slow release fertilizer. Type and application shall be as required by the growing medium analysis report.
- .4 Wooden Pegs: 19mm x19mm x 150mm long (3/4"x3/4" x 6") No. 1 grade or better Hem/fir.

**3.00 EXECUTION**

**3.01 PREPARATION OF SURFACES**

- .1 Scarify existing sub grade, if applicable, to 100mm (4") depth over entire area to receive growing medium and sod.
- .2 Fine grade scarified sub grade. Fine grading process shall ensure area to receive growing medium and sod provides slopes (1.5% minimum - 33% maximum) for positive drainage, is free of humps and hollows, deleterious material, sticks and stones over 50 mm (2") in size (dimensions relates to length, width and height).
- .3 Place growing medium to a depth of 300mm (12") when compacted to 80%MPD. Compaction of growing medium to 80% MPD will not leave deep foot impressions when walked.
- .4 Fine grade growing medium to lines and levels indicated on construction documents. Ensure that all low spots, humps and irregularities are eliminated prior to review by Consultant.
- .5 Prior to the placement of sod Consultant to review fine grading of growing medium. Review includes grades, growing medium depth and condition of finished surface. Subsequent to the Consultant review and at no cost to the Owner the Contractor shall re grade/ add growing medium and make adjustments as directed by Consultant.

3.02      LAYING OF SOD

1. Placement of sod during hot dry summer periods, at freezing temperatures, or over frozen growing medium is not acceptable. Sod placed in these conditions will be rejected.
2. Allow sod to dry sufficiently during wet weather to prevent tearing during lifting and handling.
3. Handle sod carefully to minimize tearing and dropping of soil.
4. Placement of Sod;
  - .1 Lay sod in rows smooth and flush to adjoining surfaces.
  - .2 Stagger joints and ensure that sod sections are butted closely together without overlapping or leaving gaps between sections.
  - .3 Cut out irregular or thin sections with a sharp knife.
  - .4 Cut sod to fit tight around landscape elements.
  - .5 Cut sod to create clean, smooth lines along all plant beds.
5. Placement of Sod on Slopes;
  - .1 Lay sod with the length of each sod section parallel to slope taking extra care to ensure that sod sections are butt tight and each sod section is set in a staggered formation.
  - .2 On slopes exceeding 3:1 gradient ensure sod is secured with wooden pegs at intervals of not more than 450mm (18") along the center of each section. Ensure wooden pegs are driven flush with the sod.
  - .3 Prior to acceptance of sod areas that have been secured with wooden pegs either remove the wooden pegs or drive each wooden peg at least 50mm (2") below finished grade.
6. Use a light roller to ensure that there is full, close contact between sod and growing medium. Use of a heavy roller to correct irregularities in grade is not permitted.
7. Ensure all sodded areas are watered immediately after installation. Verify that water applied to has penetrated through sod into top 100 mm (4") of growing medium. Continue watering operations as needed to ensure that adequate moisture content is maintained to encourage deep root growth and healthy, vigorous leaf growth.
8. Protect newly placed sod from heavy foot traffic during installation and until acceptance by the Consultant. Protection shall include but is not limited to placement of wood planks or plywood of sufficient thickness to bear the imposed weight and prevent damage to sod or displacement and/or compaction of sod/growing medium
9. Sod that has been damaged by construction operation, construction/ site personnel or construction traffic shall be replaced at no cost to the Owners. Replacement shall include removal of growing medium, regrading of sub grade, replacing growing medium and sod as required.

**3.03**      MAINTENANCE

- .1 Maintenance of sod shall begin immediately after placement and shall continue until all deficiencies noted in the Substantial Performance review have been rectified to the satisfaction of the Consultant and conditions for Final Acceptance been achieved. The Contractor is to notify the Consultant in writing forty eight hours (48) prior to stopping maintenance operations.
- .2 All maintenance equipment and practices are to conform to the BC Landscape Standard Level 2 'Groomed'.
- .3 During grow in period ensure that sod is watered at required frequency to maintain growing medium immediately under sod continuously moist to a depth of 75 mm (3").
- .4 Cutting Sod;
  - .1 First cutting of sod lawn shall occur at 65 mm (2 1/2") height.
  - .2 Subsequent cuttings to a height of 65 mm (2 1/2").
  - .3 Ensure that sod is cut at seven (7) day intervals. Cutting operations shall be such that each cut is at right angles to the previous cut.
  - .4 Ensure clippings are removed and disposed of off site.
  - .5 Continue regular weekly cutting until Final Acceptance.
- .5 Sod areas to be kept free of invasive and/or noxious broadleaf weeds, grasses including but not limited to poa annua, disease, fungi, detrimental nematodes and detrimental insects.
- .6 Fertilizer analysis shall conform to recommendations provided with growing medium analysis. Application of fertilizer shall follow manufacturers recommendations noting that sod placed after October 1 shall not be fertilized until April 15th of the following spring.

**3.04**      FINAL ACCEPTANCE

- .1 Conditions for Final Acceptance of sod:
  - .1 Sodded areas exhibit fully established root systems.
  - .2 No seams are visible between sod sections.
  - .3 Sod areas are smooth and evenly graded. No depressions, foot marks or vehicle tracks.
  - .3 Sod is free of bare and dead spots and does not have any broadleaf weeds, noxious grasses including but not limited to poa annua.
  - .4 No surface growing medium is visible when grass has been cut to height of 65 mm (2 1/2").
  - .5 Sodded areas have been cut a minimum of two (2) times, at seven (7) day intervals.
  - .6 Sodded areas are a uniform green colour with no discoloured sections or patches.
  - .7 Sodded areas exhibit a thick, dense, uniform and healthy appearance.
- .2 Lawns sodded after November 1st will not be accepted until April 30th of the following growing season. All acceptance conditions must be fulfilled at that time.

3.05 CLEAN-UP

- .1 Immediately clean up any growing medium or debris spilled onto pavement.
- .2 All excess materials and debris shall be removed from site and disposed of at an approved disposal location.

**END OF SECTION 02926**

**1.00**      **GENERAL**

**1.01**      **GENERAL REQUIREMENTS**

- .1    These Specifications and Drawings shall be read in conjunction with the terms and conditions of the General Contract Documents.
- .2    This Contractor shall visit the site prior to tender and shall become thoroughly familiar with site conditions. Problems arising from a failure to do so shall not constitute a contract change.

**1.02**      **DESCRIPTION OF WORK INCLUDED**

- .1    Provide all labour, materials, equipment and services necessary to supply, erect, and strip all formwork and false work for cast-in-place concrete shown or indicated on the contract drawings and specifications.

**1.03**      **RELATED WORK SPECIFIED ELSEWHERE**

- .1    Shop Drawings, Product Data, Material Testing and Samples      Section 01330
- .2    Concrete Reinforcing      Section 03200
- .3    Cast-in-Place Concrete      Section 03300
- .4    Concrete Finishing      Section 03350
- .5    Sandblasting      Section 03351

**1.04**      **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.
  - .3    CAN3-A23.1-M90 Concrete Materials and Methods of Concrete Construction.
  - .4    CAN/CSA-A23.3 Code for the Design of Concrete Structures for Buildings.
  - .5    CAN/CSA S269.3 Design, Fabrication, Erection and Use of Concrete Formwork.
  - .6    ACI 347 Recommended Practice for Concrete Formwork.
  - .7    Workers' Compensation Board of B.C. (WCB) - 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.

**1.05**      **SUBMITTALS**

- .1    The Contractor shall submit to the Consultant three (3) copies of shop drawings illustrating the form tie layout for all architectural concrete (concrete surfaces exposed to

view).

- .2 The Contractor shall submit to the Consultant three (3) copies of product data for form material to be used for

#### 1.06 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.

#### 1.07 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.

### 2.00 PRODUCTS

#### 2.01 GENERAL

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

#### 2.02 MATERIALS

- .1 Forms for concrete shall be:
  - .1 Non-Exposed Concrete Surfaces: Plywood or shiplap, 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
    - .1 Form work for smooth, form finish concrete shall have a form facing material which will provide smooth, hard, uniform texture on the concrete.
    - .2 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.
    - .3 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.
    - .4 Acceptable products include but are not limited to:
      - .1 Multipour MDO Form Panel,
      - .2 B-Matte 333 MDO Form Panel
    - .5 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”).



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Ensure that the same type of formwork material is used throughout the entire scope of the project.

- .2 Form Release Agents: Concrete form release shall be composed of an organic chemical that reacts with the alkali content of concrete to form a release film, along with providing an inert barrier to provide double separation. Acceptable materials include but are not limited to:
  - .1 Duogard Concrete Form Release Agent by W.R. Meadows
  - .2 Eco-Coat by W R Meadows
- .3 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
- .4 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

### **3.00 EXECUTION**

#### **3.01 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 not exceed 0.0025 times the span.
- .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 Consultant 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.

### 3.02 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 Consultant 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 untreated forms just prior to placing concrete.

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

3.03 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.

3.04 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.

3.05 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 03100

**1.00**      **GENERAL**

**1.01**      **GENERAL REQUIREMENTS**

- .1      Refer to Division 1, General Requirements.
- .2      All contract documents form an integral part of this section.

**1.02**      **DESCRIPTION OF WORK INCLUDED**

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

**1.03**      **RELATED WORK**

- .1      Shop Drawings, Product Data, Material Testing and Samples      Section 01330
- .2      Concrete Reinforcing      Section 03200
- .3      Cast-in-Place Concrete      Section 03300
- .4      Concrete Finishing      Section 03350
- .5      Sandblasting      Section 03351

**1.04**      **REFERENCE STANDARDS**

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

1.05 SUBMITTALS

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

1.06 QAULITY CONTROL

- .1 To ensure consistency in the mix design, colour and finished appearance the supply of concrete and aggregate to be used in the concrete mix shall be from a single source throughout the duration of work of this Contract.

1.07 TESTING

- .1 All required sampling, preparation of specimens and testing shall be performed by an independent testing agency appointed by the Consultant. The testing agency shall report any procedures that are contrary to the specifications or accepted practice to the Consultant.
- .2 Testing will be paid for by the Owner. The testing agency shall submit all invoices directly to the Consultant.
- .3 The cost of supplying the material for samples shall be borne by the Contractor. The Contractor shall provide adequate notice and coordinate the scheduling of all concrete placement with the testing agency. The Contractor shall cooperate with the testing agency during the sampling process.
- .4 The testing agency shall perform the following:
  - .1 Review mix designs to ensure conformance with the specifications. Provision of a written report to the Consultant.
  - .2 Test cement and aggregate for conformance with the material requirements of the specification.
  - .3 Supply cylinder moulds, sample the concrete, make and cure test cylinders and perform compressive strength tests in accordance with specification standards.
  - .4 Carry out slump and air content tests for each concrete test in accordance with specification standards.
  - .5 Take three (3) test cylinders for each 25 cubic Metres (33 cubic yards) or fraction thereof for each class of concrete placed in any one day. In no case shall any one class of concrete be represented by less than three (3) tests.
  - .6 All cylinders shall be made from concrete taken from the forms.
  - .7 The Consultant at their discretion may reduce or eliminate the test cylinders to be taken for minor pours or pours not of structural significance.
  - .8 The testing agency shall perform the following tests on the each set of cylinders:
    - .1 Compression test of one (1) of the cylinder specimens after seven (7) days.
    - .2 Compression test of the remaining two (2) cylinders of each group after twenty eight (28) days.

- .3 One (1) twenty eight (28) day strength test result shall be calculated from the average of the compressive strength tests of the two (2) companion cylinders.
- .9 The testing agency shall provide certified copies of the test result to the Consultant. The test results shall meet the requirements of the mix designs indicated on the Contract documents.
- .5 Should any test indicate concrete below strength, the Consultant shall have the right to stop work on the suspect area until subsequent tests are made. The Contractor shall bear the cost of such required tests. Should all tests indicate below strength concrete, the Contractor shall remove this portion of the work at the Consultants request. The removal and replacement of this work by the Contractor shall be at no expense to the Owner.

## 1.08      PROTECTION

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

## 2.00      PRODUCTS

### 2.01      CONCRETE MIXING MATERIALS

- .1 Portland Cement: to CAN/CSA-A5.
- .2 Aggregates: fine and coarse to CAN/CSA-A23.1
- .3 Water: potable to CAN/CSA-A23.
- .4 Air entraining admixtures: To requirements of ASTM C260. Acceptable products include but are not limited to:
  - .1 N.V.R, Sternson Ltd.
  - .2 Darex AEA, Grace Construction Materials
  - .3 MB-VR, Master Builders
- .5 Chemical Admixtures: To CAN/CSA-A266.2. Use shall be approved in writing by the Consultant.
- .6 Calcium Chloride: As a raw material or as a constituent in other admixtures, shall not be used unless approved in writing by the Consultant.
- .7 Curing Compound: To requirements of ASTM C309 spray applied liquid containing a fugitive dye to be applied in accordance with manufacturers written instructions.
  - .1 Curing compounds shall be compatible with other specified floor hardeners, covering adhesives and waterproofing compounds.
  - .2 The use of other curing methods including the use of burlap and sheet materials shall be at the discretion of the Consultant.
- .8 Form Release Agents: Concrete form release shall be composed of an organic chemical that reacts with the alkali content of concrete to form a release film, along with providing an inert barrier to provide double separation. Acceptable materials include but are not limited to:

- .1 Duogard Concrete Form Release Agent by W.R. Meadows
  - .2 Eco-Coat by W R Meadows
  - .3 No Hold Concentrate, Grace Construction Materials
- .9 Joint Fill Material:
- .1 Fibre Board: 12mm (1/2") pre-moulded bituminous impregnated fibre board to ASTM D 1751. Acceptable materials include but are not limited to:
    - .1 Flexcell, Sternson
    - .2 027 Fibre Expansion Joint ,W R Meadows
  - .2 Backer Rod: Closed cell, polyurethane foam to ASTM C 1330, Type C. For Joint widths up to 19mm (3/4") diameter of rod shall be 3mm (1/8") larger than the joint width.
- .10 Joint Sealant: Shall be self-leveling, non sag, two (2) part polyurethane type, conforming to CGSB 19.24-M80, Type II, Class B. Acceptable products include:
- .1 Sika; Sikaflex-2C NS Mix TG
  - .2 Iso-Flex 880 GB self leveling
  - .3 Sonneborn SL2
- Colour from standard range as indicated on the Contract Drawings.  
Primers and bond breakers as required to install the joint sealant system shall be in strict accordance with sealant manufacturers written recommendations.

2.02MIX DESIGNS

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

Minimum 28 Day Strength	35 MPa
Slump	75mm, (3"), +/- 20mm (3/4")
Maximum Aggregate Size	19mm (3/4")
Water Cement Ratio	0.45
Air Content	5 – 8%
Exposure Class	C-2

- .2 Walls and Columns:

Minimum 28 Day Strength	30 MPa
Slump	75mm, (3"), +/- 20mm (3/4")
Maximum Aggregate Size	19mm (3/4")
Water Cement Ratio	0.55
Air Content	4 – 7%
Exposure Class	F-2



**3.00 EXECUTION**

**3.01 GENERAL**

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

**3.02 OPENINGS AND INSERTS**

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

**3.03 PREPARATION FOR CONCRETE POUR**

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

**3.04 ADDITION OF WATER**

- .1 To conform to CAN/CSA-A23.1.18.4.3.
  - .1 In brief – no water from the truck system or elsewhere shall be added after the initial introduction of the mixing water at the batch plant. The only exception shall be as follows:
    - .1 At the start of discharge if the measured slump of the concrete is less than that specified and no more than sixty (60) minutes have elapsed from the time the concrete was loaded at the batch plant to the start of discharge, then at the discretion of the Consultant up to 12 litres per cubic metre (3 gallons per cubic yard) of water may be added to concrete in the ready mix truck. The resulting concrete must satisfy the mix design requirements of the Contract documents.

3.05 PLACING OF CONCRETE

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

3.06 CURING AND PROTECTION

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

3.07 FINISHES

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

3.08 CONSTRUCTION JOINTS

- .1 Construction joint locations in beams or walls shall be approved by the Consultant prior to their installation. Ensure proper key and dowels or extensions of reinforcing are provided at all construction joints.

- .2 The Contractor shall seek the approval of the Consultant for installation of construction joints not indicated in the Construction documents.

3.09 JOINT FILL AND SEALANT

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

3.10 PATCHING

- .1 The Consultant shall review all honeycombing prior to any remedial work performed by the Contractor. Repair of honeycombing shall be as per CAN/CSA-A23.1.24.2. Patching and remedial work shall performed by the Contractor shall be at no cost to the Owner.
- .2 No other patching or repair of concrete surface shall be allowed. Defective work identified by the Consultant shall be completely removed and replaced at no cost to the Owner.

3.11 TOLERANCES

- .1 Should the cured concrete not meet the grade tolerances of the Contract documents and ponding is evident after a flood test the Contractor shall at the discretion of the Consultant completely remove and replace all concrete. Grinding, partial removal and patching to resolve ponding is not acceptable.

**END OF SECTION 03300**

**1.00**      **GENERAL**

**1.01**      **GENERAL REQUIREMENTS**

- .1      Refer to Division 1, General Requirements.
- .2      All contract documents form an integral part of this section.

**1.02**      **REQUIREMENTS INCLUDED**

- .1      This section describes the tolerance and finish requirements for architectural concrete surfaces and rough formed finish concrete. It is intended to supplement and to be read in conjunction with other sections of the Contract Documents governing concrete work. In the case of conflicts between this section and other sections, the most stringent requirement will govern.

**1.03**      **RELATED WORK**

- .1      Shop Drawings, Product Data, Material Testing and Samples      Section 01330
- .2      Concrete Reinforcing      Section 03200
- .3      Cast-in-Place Concrete      Section 03300
- .4      Concrete Finishing      Section 03350
- .5      Sandblasting      Section 03351

**1.04**      **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

**1.05**      **SUBMITTALS**

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

**2.00**      **PRODUCTS**

**2.01**      **MATERIALS**

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

- .2 Bonding Agent: Formulated for bonding new concrete to cured concrete. Acceptable materials include but are not limited to:
  - .1 Daraweld C, Grace Construction Materials
  - .2 Polymer Bonding Agent, Target
  - .3 Concessive Liquid LPL, Master Builders
- .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

### **3.00 EXECUTION**

#### **3.01 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 Consultant. 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 and finish for each component. At the discretion of the Consultant the mock up may be constructed as part of the finished component.
- .3 The mock up shall clearly illustrate all finishes, reveals, patterns, shapes and colours indicated on construction drawings and details.
- .4 Construct a 2.5M (8'-0") length mock up of each of the following:
  - .1 Concrete water play channel

#### **3.02 FINISHING OF CONCRETE SURFACES**

- .1 Architectural Concrete Finish (concrete surfaces that are exposed to view):
  - .1 Surface finishing shall conform to CAN 3-A23.1-M94, Section 24, Finishing of Formed Surfaces, Clause 24.3.3, Smooth Form Finish.
- .2 Rough Form Finish: All concealed concrete surfaces.
  - .1 Surface finishing shall conform to CAN 3-A23.1-M94, Section 24, Finishing of Formed Surfaces, Clause 24.3.2, Rough Form Finish. Patching to be done in accordance with clause 24.2 Patching.
- .3 Sandblast Surface Finish: On concrete surfaces noted on drawings as per Section 03351.

**3.03**      **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 Consultant rejected concrete, at no cost to the owner will be demolished and replaced by the Contractor.
- .3 At the discretion of the Consultant 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.
- .4 Should the Consultant 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 Consultant for testing of the defect repair.
- .5 The acceptance of the repair shall be at the sole discretion of the Consultant. Should the repair not be acceptable to the Consultant the Contractor shall, at no cost to the owner demolish, and replace the defective work.

**3.04**      **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.

**3.05**      **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 03350**

**1.00 GENERAL**

**1.01 GENERAL REQUIREMENTS**

- .1 Refer to Division 1, General Requirements.
- .2 All Contract Documents form an integral part of this section.

**1.02 REQUIREMENTS INCLUDED**

- .1 Furnish labour, material, equipment and services necessary for sandblasting of surfaces indicated on the construction drawings.
- .2 The work shall include but is not limited to the following components:
  - .1 Concrete Plinth Bench
  - .2 Concrete Water Play Channel
  - .3 Concrete Weir Walls
  - .4 Concrete Banding
  - .5 Concrete Water Play Channel Terminus Basin Pattern

**1.03 RELATED WORK**

- .1 Shop Drawings, Product Data, Material Testing and Samples Section 01330
- .2 Concrete Reinforcing Section 03200
- .3 Cast-in-Place Concrete Section 03300
- .4 Concrete Finishing Section 03350
- .5 Sandblasting Section 03351

**1.04 QUALITY ASSURANCE**

- .1 All work and material shall conform to Chapter 9 of CPCA/MPDA Specification Manual (latest edition) and as herein specified.
- .2 This Contractor shall have a record of satisfactory performance in the trade and shall maintain a qualified crew of sandblasters throughout the duration of the work.

**1.05 REQUIREMENTS OF REGULATORY AGENCIES**

- .1 Applicable Provincial, municipal regulations and environmental requirements shall be fully maintained during sandblasting operations.



- .2 WCB safety regulations shall be strictly adhered to in all respects. Specific emphasis shall be placed on monitoring and adhering to permissible noise levels and air borne particulate levels.

1.06 SITE MOCK UP – SANDBLASTING

- .1 A minimum of ten (10) working days prior to the start of work of this section mock up(s) of the sandblast finishes shall be prepared by the Contractor. Do not proceed with work of this section until the mock up(s) have been reviewed and approved by the Consultant. If the mock up(s) are not approved, construct additional mock up(s) until approval is obtained.
- .2 Construct two (2) 1.8M x 1.8M (6'-0" x 6'-0") mock up panels. Each panel shall be divided into three (3) equal zones, one for each intensity of sandblast finish, i.e. light, medium and heavy or as indicated on construction drawings and details. One mock up panel shall be of a vertical section of wall, the second shall a horizontal concrete surface.
- .3 Sample panels shall be sandblasted after the specified curing time has elapsed. Finish sandblast work will follow the curing procedure and timing.
- .4 The mock up shall be stored on site as a standard of quality, and finish for each component.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to the site in unopened, weather tight packaging that is clearly marked with the manufacturers name and product information.
- .2 All materials shall be protected from the rain and excessive moisture, sit on pallets and stored in a location that will not impact other trades working on the site.

1.08 JOB CONDITIONS

- .1 Equipment used in sandblasting operations shall be properly muffled. All dust shall be completely controlled during the operation.
- .2 Protect surrounding and adjoining work by adequately covering with tarpaulins or other necessary protective covering. At no cost to the Owner, make good any damage caused by failure to provide suitable protection.

**2.00** **PRODUCTS**

**2.01** **MATERIALS**

- .1 Abrasives shall conform to CGSB Specification 31-GP-421M.
- .2 Sand gradation will be selected by the Sandblasting Subcontractor to achieve finishes described in the construction drawings and details, implemented on the mock up panels and approved by the Consultant.

**3.00** **EXECUTION**

**3.01** **INSPECTION**

- .1 The Contractor shall inspect all surfaces to be sandblasted and report to the Consultant in writing any defects or elements that will hinder the completion of sandblast operations. Commencement of work indicates acceptance for the above condition.
- .2 Prior to start of work of this section the Contract shall ensure that the Consultant has reviewed and accepted all surfaces to be sandblasted.

**3.02** **FINISH**

- .1 Sandblasting finishes shall be light, medium and heavy sandblast finishes as called up on details and drawings. The exact finish of sandblast will be governed by matching samples reviewed by the Consultant.
- .2 Refer to drawing for location, type and extent of sandblast finishes.

**3.03** **SANDBLAST OPERATION**

- .1 All sandblasting required on this project shall be carried out by the air-blasting method.
- .2 Concrete shall have cured for a minimum of twenty one (21) days prior to sandblasting.
- .3 Schedule sandblasting operations to ensure cure times match those of the approved mock up panels.
- .4 Sandblasting operation shall yield uniform texture and colour to all surfaces. The texture and colour shall match the approved mock up panels.

3.04 CLEAN UP

- .1 During the progress of the work keep the premises free from any unnecessary accumulation of tools, equipment, surplus materials and debris.
- .2 Upon completion of the work remove all excess materials and clean all surfaces.

**END OF SECTION 03351**

**1.00**      **GENERAL**

**1.01**      **GENERAL REQUIREMENTS**

- .1    Refer to Division 1, General Requirements
- .2    All contract documents form an integral part of this section.

**1.02**      **DESCRIPTION**

- .1    Furnish all labour, materials, equipment and services necessary for the supply and installation of miscellaneous metal work as specified.
- .2    The work of this section shall include, but shall not necessarily be limited to:
  - .1    Metal custom entry structure and custom picnic structure.
  - .3    Metal fasteners, hangers, plates, screens
  - .4    Decorative custom metal elements, pipes, members, shapes and forms
  - .5    Galvanized metal

**1.03**      **RELATED WORK**

- .1    Shop Drawings, Product Data and Samples                      Section 01330
- .2    Cast In Place Concrete    Section 03300
- .3    Exterior Painting    Section 09910

**1.04**      **QUALITY ASSURANCE**

- .1    All work in this section is to be performed by a contractor experienced in metal fabrication and erection, including cutting, bending, forming, welding and finishing.
- .2    Fabricators of welded construction shall be certified by the Canadian Welding Bureau in accordance with CSA W47.1.
- .3    Workmanship for exposed work to be of the highest quality for metalwork.

**1.05**      **STANDARDS**

- .1    Welding: CAN/CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures and W59 Welded Steel Construction (Metal Arc Welding)
- .2    Steel Sections and Plates: CAN3-G40.21-M92. Grade 300W
- .3    CAN/CSA – G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4    CAN/CSA – G40.2/G40.21, General Requirements for Rolled Welded Structural Quality

Steel

- .5 Canadian Institute of Steel Construction (CISC)
- .6 BC Building Code, latest edition

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING PROTECTION

- .1 The Contractor shall be responsible for the protection of all steel work during fabrication, shipping storage and erection.
- .2 Work of this section that has been damaged shall be repaired or at the discretion of the Consultant replaced at no cost to the Owner.

1.07 SUBMITTALS

- .1 Shop Drawings: The Contractor is responsible for the ensuring that all shop drawings are prepared by a professional engineer licensed to practice in the province of British Columbia. The Contractor's professional engineer shall sign and seal all shop drawings prior to submission to the Consultant for review.
- .2 Verify all dimensions with on site conditions prior to proceeding with shop drawing preparation.
- .3 Shop drawings shall complete details necessary for fabrication and erection of the component parts of the structure, including location, type, size and extent of all welds. Splices not shown on the shop drawings will not be accepted.
- .4 The review of the shop drawings parts by the Consultant constitutes a general review of the methods only and will not include approval of dimensions, figures or quantities. The Contractor is responsible for structural design, correct fabrication and proper alignment of all items.
- .5 At the completion of the work provide a letter of compliance signed by a professional engineer registered to practice in the province of British Columbia confirming that the handrails and guardrails have been designed and installed to meet the design loads required by the BC Building Code.
- .6 Submit two (2) samples of each finish of metal to the Consultant for review. The approved samples will be used as the standard for the project.
- .7 Submit a Schedule of Shop Fabrication to the Consultant prior to the start of work of this section.

1.08      CO-ORDINATION WITH OTHER TRADES

- .1      Supply all necessary instructions and drawings to other trades for related work that includes but is not limited to setting bearing plates, anchor bolts and members that are to be built in the work of other trades.

1.09      DELIVERY

- .1      All metal items delivered to the site shall have identification tags that provide sufficient information for identification and fixing.
- .2      The Contractor shall ensure that all deliveries of metal components to the site are done in a manner that permits the most efficient and economical performance of the work of this section.

2.00      PRODUCTS

2.01      MATERIALS

- .1      All metal components shall be new unless otherwise indicated and be of sizes and shapes listed in the current CISC handbook or as indicated on contract drawings.
- .2      Structural steel plates and bars: CAN3 - G40.21 - Grade 300W.
- .3      Galvanizing: Hot Dipped Galvanizing with Zinc Coating, CSA G164-M1981.
- .4      Galvanized Metal Primer: GGSB 1-GP-198M.
- .5      Stainless Steel:
  - .1      Plate: ASTM A 167, Type 304.
  - .2      Bars Stock: ASTM A 276, Type 304.
  - .3      Tubing: ASTM A554, Grade MT 304.
  - .4      Pipe: ASTM A312, Grade TP 304.
- .6      Miscellaneous Framing Clips, Brackets, Plates, Backing, Trim, Channel: to CSA - G40.21 Grade 300W, as detailed or sized to suit and engineered to meet load requirements.
- .7      Bolts, Nuts and Washers: to ASTM A307.
- .8      Grout: Non-shrink, non-metallic, flowable, sand/cement/expanding grout, pre mixed, suitable for installation of steel into drilled or cored pockets, normal grey colour.
  - .1      Acceptable products include; Quick-Rok, BASF Master Flow 928 or approved equal.
- .9      Primer: shop prime meeting CGSB 1 - GP - 40.

**3.00**      **EXECUTION**

**3.01**      **INSPECTION**

- .1      Examine all surfaces and details to which the work of this section is to be applied and ensure that all conditions are suitable to provide a complete installation conforming to industry standards.
- .2      Examine surfaces and conditions prior to installation of any items. Report any defects or discrepancies to the Consultant prior to the start of work. Commencement of work implies acceptance of surfaces and conditions.

**3.02**      **FABRICATION**

- .1      Fabricate all work in strict accordance with standards indicated, true to lines and forms indicated on Contract document and reviewed shop drawings.
  - .1      Fabrication to CSA S16.1
  - .2      Welding SCA W59, by welders qualified in accordance with CSA W47.1.
- .2      Shaped members shall be fabricated with sharp lines, angles and rises. Members shall be true, straight, square and free from warping or other defects.
- .3      Curved or brake formed work shall be evenly sprung.
- .4      Exposed surfaces shall be smooth with all fastenings and connections hidden where possible.
- .5      Shearing and punching shall leave clean, true lines and surfaces.
- .6      Drill or punch all holes required for the attachment of work of this section or by other trades.
- .7      All joints in any members shall be closely fitted and machined. Where possible fit and shop assemble work. Fit and shop assemble in largest practical sections for delivery to the site.
- .8      Weld all permanent connections. Grind smooth all exposed welds, sharp edges, angles and corners. Ensure all welds are continuous for each joint and free from pits and holes.
- .9      Unless otherwise indicated on drawings grind smooth sharp edges, angles and corners.
- .10     Where screws are indicated use shake-proof, flat head screws countersunk flush with finish surface unless otherwise noted.
- .11     Unless otherwise indicated on drawings bolted work shall be carefully tightened with threads or bolts nicked to prevent subsequent loosening.

- .12 Contractor to ensure full assembly of welded elements prior to application of powder coating. Field welding of powder coat finished elements is not acceptable.

### 3.03 SHOP PREPARATION AND PRIMING

- .1 Clean and shop prime metal requiring painting or powder coating in accordance with Section 09900.
- .2 Clean surfaces to be field welded; do not paint.

### 3.04 INSTALLATION

- .1 Erect metal work square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .2 Anchor all items securely to supporting members. Anchoring methods shall be as indicated on shop drawings.
- .3 Execute all metal work in a thorough and workman like manner according to best shop practices to the standards indicated.
- .4 Material cut from stock shall be sheared or parted straight and deburred. Where cuts are burned, grind off clean and true to line.
- .5 Surfaces to be welded shall be free of loose scale, rust, paint or other foreign matter. Where weld material is deposited in two or more layers each layer is to be cleaned before the next layer is deposited. Care shall be taken to minimize stresses due to heat expansion, contraction and distortion by using approved methods and proper sequence in welding. Carry out field welding in such a manner as to prevent damage to adjacent surfaces.
- .6 Exposed welding or welding to fitted surfaces to be ground smooth and finished to the best possible visible appearance.
- .7 Where screws are indicated use shake-proof, flat head screws countersunk flush with finish surface unless otherwise noted.
- .8 Install or provide to allied trade angles, brackets and/ or anchoring elements as indicated on approved shop drawings.
- .9 Where indicated on Contract drawings core and set in grout anchors, posts and supports. Ensure all embed items are true to line, grade and plumb as required.

### 3.05 METAL FINISH

- .1 All exposed metal work noted to be galvanized in accordance with section\_\_\_\_\_. For painted surfaces in accordance with section 09900 to match approved colour chip.



- .2 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with approved primer prior to paint application.

**3.06** CLEAN UP

- .1 As a requirement for Substantial Performance all work of this section shall be thoroughly cleaned of foreign material including but not limited to grime, oil, grease and dust.
- .2 Remove all debris as a result of work from this section and dispose of off site in approved dumpsite.

**END OF SECTION 05500**