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**SECTION 32 13 13  
CONCRETE PAVING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- .1 Provide concrete paving and accessories for a complete installation.
- .2 Coordinate the whole of this Section with Owner's requirements for:
  - .1 Light pole base anchors.
  - .2 Flagpole base and foundation sleeve.
  - .3 Pipe bollards.

**1.2 RELATED SECTIONS**

- .1 03 30 00 Cast-in-Place Concrete.
- .2 05 50 00 Metal Fabrications.
- .3 07 92 00 Joint Sealants.
- .4 26 56 00 Lighting Exterior.
- .5 32 31 16 Welded-Wire Fences and Gates.

**1.3 REFERENCES**

- .1 ASTM D1751-04(2013)e1 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- .2 CSA A23.1-14/A23.2-14 Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete, Includes Update No. 1 (2015).

**1.4 QUALITY ASSURANCE**

- .1 Pre-Installation Conferences:
  - .1 Convene a pre-installation conference in accordance with Division 1 requirements.
  - .2 Schedule concrete site element pre-installation conference after installation of forms, placing of base, and installation of sleeves, but before placing of concrete.
- .2 Meet quality assurance / control requirements specified in Section 03 30 00 Cast-in-Place Concrete.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- .1 Concrete: As specified in Section 03 30 00 Cast-in-Place Concrete.
- .2 Expansion Joints: Meet requirements specified in Section 03 30 00 Cast-in-Place Concrete.

- .3 Granular Base: Road Base type gravel or crushed rock, graded by weight as follows:

Sieve	Percent Passing
25 mm	100
19 mm	85 - 100
5 mm	45 - 60
1.2 mm	30 - 50
0.063 mm	5 - 10 (non-plastic)

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- .1 Sub-Base: Ensure sub-base is compacted.

#### 3.2 INSTALLATION

- .1 Granular Base: 100 mm minimum of granular base, level, and compact.

#### 3.3 JOINTS

- .1 Align joints of sidewalk, curb, and gutter.
- .2 Expansion And Contraction Joints:
- .1 Install so top of expansion joint material is 6 mm below finished surface of concrete.
- .2 No expansion joint required between curbs and walks parallel to curb.
- .3 Provide expansion joint at end of walks perpendicular to and terminating at curb.
- .4 Table Two: Spacing On Center:

Sidewalks and Curbs	9,000 mm
Mow Strips	30,000 mm
Flat Drainage Structures	15,000 mm
Retaining Walls w/guardrails	10,000 mm
Retaining Walls w/chain link fencing	15,000 mm

- .3 Scored Control Joints:

- .1 Depth of control joints shall be approximately one quarter of concrete slab thickness, but not less than 25 mm.
- .2 Table Three: Spacing On Center:

Sidewalks	1,500 mm
Curbs	3,000 mm
Mow Strips	1,500 mm
Flat Drainage Structures	3,000 mm
Retaining Walls w/guardrails	1,830 mm
Retaining Walls w/chain link fencing	3,000 mm

#### 3.4 FINISHES

- .1 Curb, Gutter, Sidewalks, Mow Strips, Flat Drainage Structures, Stairs, And Miscellaneous:
- .1 Broom finish.
- .2 Round edges including edges formed by expansion joints.
- .3 Remove edger marks.

- .2 Light Pole And Flagpole Bases: Exposed portion to have rubbed finish.
- .3 Retaining Walls:
  - .1 Immediately after removing forms, remove joints, marks, bellies, projections, loose materials, and cut back metal ties from surfaces to be exposed.
  - .2 Point up voids with cement mortar, 1:2 mix, and rub exposed surface with carborundum to smooth, even surface.
- .4 Fence Piers: Chamfer edges.

### 3.5 SPECIAL REQUIREMENTS

- .1 Form vertical surfaces full depth. Do not allow concrete to flow out from under forms in any degree.
- .2 Sidewalks, Exterior Stairs, And Landings:
  - .1 Slope sidewalks with cross slope of 3 to 6 mm (1/8 to 1/4 in.) per 300 mm (12 in.) in direction of intended drainage.
  - .2 Slope sidewalks away from building 1 percent minimum.
  - .3 Do not dust with cement.
- .3 Mow Strips:
  - .1 Granular base not necessary under mow strips. Compact subgrade under mow strip to density of undisturbed earth.
  - .2 Form and cast mow strips in place.
  - .3 Set top of mow strip 38 mm (1-1/2 in.) above finish grade.
  - .4 Compact topsoil underneath mow strip to density of undisturbed earth.
- .4 Light Pole Bases: Install bond breaker consisting of three layers of 30 lb roofing felt between pole base and adjoining sidewalk.
- .5 Pipe Bollards: Install plumb and fill with concrete.

### 3.6 FIELD QUALITY CONTROL

- .1 Review: Notify Consultant three (3) days minimum before placing concrete for specified concrete site elements to allow verification of grades and elevations.

**END OF SECTION**

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**SECTION 32 14 00**  
**UNIT PAVING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- .1 BCIT does not encourage the use of unit paving for large paved areas. Unit pavers are considered suitable for pedestrian pathways but driveways, loading areas, or entrances leading to the trades shops.
- .2 Provide precast concrete unit pavers on bedding sand on base materials, on slab or on grade as indicated and specified. Including edge restraints, sealants and jointing sand.

**1.2 REFERENCES**

- .1 ASTM C936/C936M-15 Standard Specification for Solid Concrete Interlocking Paving Units.

**1.3 SUBMITTALS / MOCK-UPS**

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data: Submit product data sheets including installation and maintenance instructions.
- .3 Submit sample pavers as specified to indicate colour and shape selections for the BCIT Staff approval. Colour will be selected by Owner in conjunction with Consultant from the manufacturer's standard colour range.
- .4 Samples: provide 3 samples of each type of paver specified. See mock-up section below.
- .5 Submit sieve analysis for grading of both bedding and jointing sand.
- .6 Submit sample of pea gravel (if on slab application applies).
- .7 Submit test results for compliance of unit paver requirements to CSA (or ASTM) Standards from an independent testing laboratory if requested by Owner or Consultant.
- .8 Submit photograph of paver colour, size, and pattern in accordance with section 1.6.5 prior to mock-up. If applicable, include photograph of adjacent landscapes containing unit pavers.

**1.4 QUALITY ASSURANCE**

- .1 Installer Qualifications: Installation shall be by an installer with at least 3yrs. Min. experience in placing concrete unit pavers on projects of similar size/scope. The contractor must be prepared to advise of previous work by submission of a written list if requested by BCIT or the Landscape Architect.
- .2 Mock-ups: 3m x 3m mock-up of each paver installation to be provided for review prior to commencing full installation. Provide a 3m x 3m site mock-up of setting, cutting, and edging works to demonstrate understanding of paver pattern and finish expectations. Landscape Architect to observe mock-up prior to commencing full installation. Obtain approval of BCIT and Landscape Architect prior to proceeding with actual installation. Test panel to remain for duration of construction to serve as reference/standard of acceptable installation against which the work will be judged.

**1.5 DELIVERY STORAGE AND HANDLING**

- .1 Deliver and store pavers shall on pallets, metal strapped, or shrink wrapped PVC packaged by the paver manufacturer capable of transfer by fork lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.
- .2 Loading on slab due to equipment and material shall not exceed designed live loads.

- .3 Protect sand from rain, snow, wind and standing water by means of a temporary waterproof covering such as a plastic drop sheet or tarpaulin.
- .4 Do not install base, sand or pavers during heavy rain or snowfall.
- .5 Do not install frozen sand.

## PART 2 - PRODUCTS

### 2.1 UNIT PAVER MANUFACTURERS

- .1 Manufacturers: Pavers to conforming to manufacturer's specifications, **or pre-approved equal**. Concrete pavers may have spacer bars on each unit to maintain minimum joint width.
- .2 Areas of vehicular traffic: selected unit pavers are minimum 80mm thickness and manufactured to carry vehicle loads. Unit pavers selected for vehicular loads to be integrated with patterns of pedestrian areas containing unit pavers as per Consultant drawings.
- .3 Paver gaps: Gaps between pavers to not exceed 4mm in size in areas of high pedestrian and vehicular flow. Gap sizes to be installed as per manufactures specifications.
- .4 Non-accepted paver types: Open grid concrete precast pavers **or** systems with rubber-based integration of grass or gravels between pavers for storm water management are not acceptable materials for BCIT campus. Paver gaps must be sized for universal accessibility of wheelchairs, walkers, bicycles, strollers, and heel use across BCIT campus in all applications involving unit pavers.
- .5 Colours, sizes and patterns: To be integrated and complementary with adjacent building walkways and plaza spaces containing existing pavers. Provide Owner with photo submittal of specified paver colour, size and pattern prior to mock-up. Include photographs of adjacent landscapes if they include unit pavers.
- .6 Subject to compliance with specifications the following manufacturers are acceptable:
  - .1 Abbotsford Concrete Products (supplied locally through various sources including Abbotsford Concrete)
  - .2 Barkman Paver Products (supplied locally through various suppliers including Gemstone Landscape Supply)
  - .3 Belgard Paver Products (supplied locally through various suppliers including Expocrete)
  - .4 Holland Pavers (supplied locally through most suppliers)
  - .5 Or approved alternative.

### 2.2 UNIT PAVER MATERIALS

- .1 Precast concrete pavers: Conform to ASTM C936-96, Standard Specification for Solid Concrete Interlocking Paving Units, including:
  - .1 Min. compressive strength 55Mpa (8000psi).
  - .2 Max. absorption 5% when tested in accordance with ASTM C140.
  - .3 Resistance of 50 freeze thaw cycles when tested in accordance with ASTM C67 or Can3-A231.2-95 Precast Concrete Pavers, including:
  - .4 Min compressive strength of 50Mpa (7250psi).
  - .5 Resistance of 50 freeze thaw cycles when tested in accordance with Can3-A231.2-M85.

**2.3 LAYING COURSE AND BASE MATERIALS**

- .1 Sand course clean, sharp, fresh water sand (or manufactured from crushed rock), non-plastic, free of deleterious soluble salts and other contaminants which may cause efflorescence and reduce skid and slip resistance.
- .2 Grading of samples shall be done according to ASTM C136. Conforming to the grading requirements of ASTM C33 for Concrete Aggregates.
- .3 Pea Gravel: shall consist of clean rounded gravel, 6mm to 10mm dia., free of all deleterious materials.
- .4 Granular Base Materials to be 19mm (3/4") minus crushed gravel.
- .5 Verify location, type, installation and elevations of edge restraints around the perimeter of the area to be paved.
- .6 BEDDING SAND gradation limits as follows:

BEDDING SAND - TABLE 1

Sieve Size	% Passing
9.52mm	100
4.75mm	95 - 100
2.36mm	80 - 100
1.18mm	50 - 85
600um	25 - 60
300um	10 - 30
150um	2 - 10
75um	0 - 10
#4	95 - 100
#8	80 - 100
#16	50 - 85
#50	10 - 30
#200	0 - 10

- .7 Grading of samples shall be done according to ASTM C136. Conforming to the grading requirements of ASTM C144 Aggregate for Masonry Mortar. Gradation limits as follows:

.1 JOINTING SAND - TABLE 2

<u>Sieve Size</u>	<u>Natural Sand</u>	<u>Manufactured Sand</u>
	<u>% Passing</u>	<u>% Passing</u>
#4	100	100
#8	95 – 100	95 – 100
#16	70 – 100	70 – 100
#30	40 – 75	40 – 75
#50	10 – 35	20 – 40

**PART 3 - EXECUTION**

**3.1 EXAMINATION AND PREPARATION**

- .1 Examine areas of work to receive concrete pavers and correct unsatisfactory conditions. Start of work shall indicate acceptance of conditions.
- .2 Ensure subgrade is well drained. Verify that the subgrade is dry, uniform, even and ready to support base, sand, pavers and the intended loads. Examine base course for adequate compaction and uniform surface. Ensure base course compacted to 95 mpd.
- .3 Verify gradients and elevations of subgrade and subbase are correct to allow installation as per the details and meet intended finished grades. Notify Owner and Consultant of any discrepancies prior to proceeding with installation.

**END OF SECTION**

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**SECTION 32 15 00  
AGGREGATE SURFACING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- .1 Prepare sub-grade to receive aggregate surfacing.
- .2 Provide herbicide treatment to base prior to installation of aggregate.
- .3 Provide aggregate surfacing as indicated.

**1.3 REFERENCES**

- .1 British Columbia Building Code, 2012 Edition (BCBC).
- .2 ASTM C131/C131M-14 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C136/C136M-14 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D1557-12e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
- .5 ASTM D2419-14 Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
- .6 ASTM D3665-12 Standard Practice for Random Sampling of Construction Materials.
- .7 ASTM D3744/D3744M-11a Standard Test Method for Aggregate Durability Index.
- .8 ASTM D5444-15 Standard Test Method for Mechanical Size Analysis of Extracted Aggregate.

**1.4 DEFINITIONS**

- .1 Aggregate Surfacing includes:
  - .1 Type 1: Roadways, parking lots, and areas subject to vehicular traffic.
  - .2 Type 2: Cart paths, walkways, and bike paths subject to light maintenance traffic.
  - .3 Type 3: Walking and bicycle paths, subject to pedestrian traffic only.
- .2 Coarse aggregate: Aggregate retained on the No. 8 sieve.
- .3 Dry Seed: Fine aggregates spread over cured surface for loose texture.
- .4 Leveling Course: A course of  $\frac{3}{4}$  in. minus clean crushed gravel of variable thickness used to eliminate irregularities in the contour of an existing surface prior to placing the subsequent course.
- .5 Fine aggregate: Aggregate passing the No. 8 sieve.
- .6 Sieve: An apparatus for laboratory work in which the openings of the mesh are square for separating sizes of material.
- .7 Supplemental fine aggregate: Aggregate passing the no. 30 sieve.
- .8 Wet Seed: Fine aggregates spread over recently placed materials and compacted into layer for the purpose of texturizing or modifying surface finish.



## **1.5 SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Manufacturer's published product data on pre-emergent herbicide.
  - .2 For Aggregate Surfacing, submit Material Certification and Sieve Analysis Report, indicating compliance with specifications.
- .3 Samples:
  - .1 Submit two heavy duty bags each containing one liter of proposed aggregate surfacing material.
  - .2 Submit three (3) 12" x 12" samples of each type of geotextile fabric specified.
- .4 Installer Qualifications: Submit Installer's qualifications.

## **1.6 QUALITY ASSURANCE**

- .1 Pre-Installation Conferences:
  - .1 Conduct a pre-installation conference. Attendees shall include Contractor, Owner, and Consultant.
  - .2 Schedule pre-installation conference after staking of areas that are to receive aggregate surfacing but before installation.
- .2 Installer Qualifications: Installers shall have a minimum three years' experience and have installed the products specified successfully.
- .3 Mock-ups: Mock up an area of 3m x 3m (10' x 10') complete with accessories for Consultant's review. Mock-up may form part of completed work if undisturbed at Substantial Performance.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Packaged Materials: Deliver packaged materials in clearly marked containers showing net weight, guaranteed analysis and name of manufacturer. Specified requirements for packaged materials apply to bulk shipments. Protect materials from deterioration by moisture and temperature during delivery and during storage at site. Protect liquid components from freezing.
- .2 Protect stored materials and items from weather, careless handling, and vandalism.
- .3 Repair or replace damaged items, as determined by the Consultant.
- .4 Deliver, store, handle and protect aggregate and stabilizer material with provision for drainage and intrusion of dirt, debris, or other foreign matter.
- .5 Store Stabilized Aggregate Surfacing material under cover to prevent accumulation of moisture until placed.

## **PART 2 - PRODUCTS**

### **2.1 BASE COURSE MATERIALS**

- .1 Base Course Material: ¾ inch minus clean crushed gravel. Thickness as indicated.

### **2.2 AGGREGATE SURFACING**

- .1 Aggregate Surfacing: Match Consultant's sample.
- .2 Geotextile Fabric: Match Consultant's sample.

## **2.3 ACCESSORIES**

- .1 Pre-emergent herbicide:
  - .1 Selective type pre-emergence control chemical containing 40% Trifluralin minimum.
  - .2 Labeled for under-pavement use.
  - .3 Acceptable Products:
    - .1 Treflan or Spike 80W by Dow AgroSciences, Indianapolis, IN [www.dowagro.com](http://www.dowagro.com).
    - .2 Trust 4EC by Agrilience LLC, St Paul, MN [www.agrilience.com](http://www.agrilience.com).
    - .3 Or approved alternative.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Examine areas to receive aggregate surfacing with installer present. Verify the conditions, elevations, and measurements affecting the work of this Section prior to installation. Starting work means acceptance of existing conditions. Correct unsatisfactory conditions.

### **3.2 PREPARATION**

- .1 Survey and stake drive aisles and surfaces to show grading required by Contract Documents.
- .2 Proof roll prepared subgrade surface to check for unstable areas and areas requiring additional compaction. Compact subgrade under aggregate surfacing systems to a minimum 95% modified Proctor density ASTM D1557.
- .3 Scarify, re-grade and re-compact surface of subgrade that is deforming to provide true levels, uniform slopes and proper total thickness of aggregate surfacing required.
- .4 Remove and dispose of unsuitable material encountered in areas to be paved.
- .5 Remove loose material from compacted sub-grade surface and shape and trim compacted sub-grade for correct drainage slopes.
- .6 Pre-emergent Herbicide:
  - .1 Apply to prepared subgrade dispersed in liquid. Concentrate shall be such that Manufacturer's full recommended rate of chemical will be applied to every 100 sq. m (1100 sq. ft) and liquid will penetrate a minimum of 50 mm (2 in.).
  - .2 Application shall be no more than one day before installation of base.
  - .3 Take necessary precautions to protect adjoining property and areas designated for planting on building site.

### **3.3 INSTALLATION**

- .1 Install aggregate surfacing so as not to generate dust. Where conditions indicate dust will be generated, provide misting during installation.
- .2 Base Course:
  - .1 Construct crushed aggregate base course to compacted thickness as shown on the Drawings at not less than 95% of maximum dry density as determined by ASTM D1557.
  - .2 Field Quality Control: Owner may engage and pay for the services of a qualified soils Testing Laboratory/Agency to perform testing and inspections of Base Course material and installations.

- .3 Aggregate Surfacing Installation:
  - .1 General: Immediately before placing materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared sub-grade is ready to receive surfacing.
  - .2 Aggregates:
    - .1 Aggregates used for construction shall be representative of material in reviewed samples. Ensure stockpiles are uniform in gradation throughout and are kept separate of other types of material.
    - .2 Avoid cross contamination from other materials and sources.
    - .3 Ensure moisture content of aggregates is uniform and does not exceed 25% of the optimum moisture content as determined by ASTM D1557. In no case shall aggregates containing visible water, be used for construction.
  - .3 Placement:
    - .1 Place each course to required grade, cross section, and thickness when compacted.
    - .2 Place surface course in single or multiple lifts. The maximum compacted lift thickness shall be 4.5 inches.
    - .3 Begin applying along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise directed by the Consultant.
    - .4 Promptly correct surface irregularities in aggregate surfacing course. Use suitable hand tools to remove excess material forming high spots.
    - .5 Fill depressions to prevent segregation of mix; use suitable hand tools to smooth surface.

### 3.4 TOLERANCES

- .1 Sub-Grade: Height as indicated. Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
- .2 Finish surface areas to grades required by Contract Documents.
- .3 Aggregate Surfacing: 150 mm (4 in.) thick minimum after compaction, except where shown thicker on Drawings. Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
- .4 Ensure aggregates slope 2% away from edges of buildings.

**END OF SECTION**

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**SECTION 32 31 16  
WELDED-WIRE FENCES AND GATES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- .1 Provide fabricated welded wire mesh panels and steel posts with accessories, as indicated for a complete installation.
- .2 Provide service enclosures for meters, locked hose bibs, and other services.
- .3 Provide galvanized steel gate frames, steel gate posts and gate hardware for each gate.

**1.2 RELATED SECTIONS**

- .1 03 30 00 Cast-in-Place Concrete.
- .2 05 50 00 Metal Fabrications.
- .3 08 71 00 Finish Hardware.

**1.3 REFERENCES**

- .1 ASTM A53/A53M-12 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- .2 ASTM A123/A123M-15 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM A153/A153M-16 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .4 ASTM A641/ASTM A641/A641M-09a(2014) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- .5 ASTM A653/A653M-15e1 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .6 ASTM A853-04(2010) Standard Specification for Steel Wire, Carbon, for General Use.
- .7 ASTM F626-14 Standard Specification for Fence Fittings.
- .8 ASTM F900-11 Standard Specification for Industrial and Commercial Swing Gates.
- .9 ASTM F1043-16 Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework.
- .10 ASTM F1083-16 Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
- .11 British Columbia Building Code, 2012 Edition (BCBC).
- .12 CLFMI (Chain Link Fence Manufacturers Institute) Product Manual.

**1.4 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data: For each product indicated.
- .3 Shop Drawings:
  - .1 Show locations of fence, posts, each gate and details of gate swing or other operation hardware.

- .2 Indicate materials, dimensions, sizes, weights, and finishes of components.
- .3 Include plans, elevations, sections, gate swing and other required installation and operational clearances, and details of post anchorage, attachment and bracing.
- .4 Include diagrams for power and control wiring.
- .4 Samples:
  - .1 Submit 300 mm (12 in.) length sample of linear wire mesh materials in specified colour.
  - .2 Submit samples of gate locking system for Owner's review prior to ordering.
- .5 Maintenance Data: Include gate operator maintenance manuals.

## 1.5 QUALITY ASSURANCE

- .1 Installer Qualifications: Experienced installer who has completed fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- .2 Source Limitations for Fences and Gates: Obtain each colour, grade, finish, type, and variety of components for fences and gates from one source with resources to provide fences and gates of consistent quality in appearance and physical properties.
- .3 Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70, Article 100, by a testing agency acceptable to Authorities Having Jurisdiction, and marked for intended use.
- .4 UL Standard: Provide gate operators that comply with UL 325.
- .5 Emergency Access Requirements: comply with requirements of Authorities Having Jurisdiction for automatic gate operators serving as a required means of access.

## 1.6 PROJECT CONDITIONS

- .1 Field Measurements: Verify layout information for fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- .1 Subject to compliance with specifications the following manufacturers are acceptable:
  - .1 Omega Fence Systems, 1-800-836-6342, [www.omegafence.com](http://www.omegafence.com).
  - .2 Or approved alternative.

### 2.2 MATERIALS

- .1 General
  - .1 Cold rolled wire: Tensile strength 515 MPa (75,000 psi) minimum.
  - .2 Resistance welded at each crossing to form rectangles 50 x 200 mm (1-15/16 x 7-7/8 in.).
  - .3 One end of the vertical wire shall extend 25 mm (1 in.) from the first or last horizontal wires creating a spiked top or bottom.
  - .4 Finish: Galvanized hot-dip process to ASTM A123/A123M, or manufactured from zinc-coated steel wire to ASTM A641. A 4 mil polyester powder coating is applied on mesh after galvanization.
- .2 Regular Duty Welded Wire Mesh Panels:
  - .1 Steel Welded Wire Panels: 2511 mm (99 in.) wide formed by one vertical wire of 4.88 mm (0.192 in.) placed between two horizontal wires of 5.72 mm (0.225 in.) to ASTM A185 and ASTM A853. Acceptable product "Elite" by Omega Fence System, or approved alternative.

- .3 Posts:
  - .1 Cold rolled 1008 grade steel to ASTM 500 and ASTM A787.
  - .2 Post size and gauge indicated in Table 1.
  - .3 Provide post lengths sized to suit application and meet code requirements.

**2.3 ACCESSORIES**

- .1 Universal Post Bracket Kit: Steel collar 12 gauge (2.6mm), wire retaining plate 6.3 x 25 mm (1/4 x 1 in.), wire retaining plate 6.3 x 25 mm (1/4 x 1 in.), Tamper proof zinc casted nut, washer and carriage bolt 8.0 x 32 mm (5/16 x 1-1/4 in.).
- .2 U Shape Bracket Kit: Stainless steel U rod Ø5/16" (Ø8mm), rear flange in PVC 88.7 x 37.8 x 28.4 mm (3-1/2 x 1-1/2 x 1-1/8 in.), PVC forehead support 60.4 x 15.2 x 27.5 mm (2-3/8 x 5/8 x 1-1/16 in.), cosmetic plastic caps and nuts (M8).
- .3 The Special Panel Fitting (SPF): Enables fastening of panels to any vertical or horizontal surface.
  - .1 SPF-W kit for vertical mounting: L-shaped slotted plate, which accommodates a 45 mm (1-3/4 in.) vertical adjustment and a retaining plate that holds two vertical wires when bolted together.
  - .2 The SPF-C kit for horizontal mounting: L-shaped slotted plate and two wire retaining plates.
  - .3 The SPF-P kit for connecting two panels together.
- .4 Post Caps: Aluminum alloy for 50 x 50 mm, 76 x 76 mm, and 102 x 102mm dimension posts (2 x 2 in., 3 x 3 in., and 4 x 4 in. Provide galvanized steel for larger dimensions caps.

**2.4 SWING GATES**

- .1 Gate frames: Galvanized square steel tube 16 ga (1.6 mm) to ASTM F900. Frame: Two vertical tubes of 38 x 38 mm (1-1/2 x 1-1/2 in.) and two horizontal tubes of 50 x 50 mm (2 x 2 in.) welded at intersections to create a rigid frame. If gate height or width exceeds 2134 mm (7 ft.), both vertical tubes must be 11 Ga (3.0 mm). If gate height or width exceeds 2430 mm (8 ft.) high or 2430 mm (8 ft.) wide, a supplementary vertical support of 38 x 38 mm (1-1/2 x 1-1/2 in.) is needed.
- .2 Gate Posts: Cold rolled from 1008 grade steel. Dimension corresponding Table 2. Posts are to include cap and SPF-W kit for adjacent panel mounting.

Table 2	
Single frame gate opening	Square post size
1830 mm or less (6 ft.) or less	76 X 76 mm (3 x 3 in.)
1860 mm to 4115 mm (6.1 ft. to 13.5ft.)	102 x 102 mm (4 x 4 in.)
4145 mm to 4875 mm (13.6 ft. to 16 ft.)	152 x 152 mm (6 x 6 in.)
4876 mm (16 ft.) and over	Custom by manufacturer

- .3 Panel Sizes: 4 feet and 6 feet unless indicated otherwise.
- .4 Mesh Section: Match mesh in fencing.
- .5 Gate Hardware: To ASTM F900 for hinges, latch, drop rods and sized to assure proper gate operation. Finish: hot-dip galvanized steel for moving parts, powder coated for non-moving parts.
- .6 Hinge: Designed to support gates without deformation during opening and closing.
- .7 Latch: Self-latching clamp-on gravity system.

**2.5 SLIDE GATES**

- .1 Gate Frames: Sized to suit application.
- .2 Wheels: Manufacturer's standard.

**2.6 FINISHES**

- .1 Finish: Manufacturer's standard black polyester powder coating.

**PART 3 - EXECUTION****3.1 PREPARATION**

- .1 Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- .2 Grading: Removed debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.
- .3 Provide clearance between bottom of fence and ground. Make clearance not less than 50 mm or more than 70 mm.
- .4 Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 ft. (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

**3.2 INSTALLATION**

- .1 Install posts in in-ground and or flanged applications.
- .2 Post Excavation: Excavate holes for posts to diameters and spacing indicated, in firm, undisturbed or compacted soil.
- .3 Post Setting:
  - .1 Place concrete in post holes. Embed posts into concrete to depths indicated. Extend concrete 50 mm above ground level, and slope to drain away from posts unless indicated otherwise.
  - .2 Protect portion of posts above ground from concrete splatter. Consolidation of concrete using mechanical devices to set posts is not permitted.
  - .3 Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.
  - .4 Do not install fabricated wire mesh panels until concrete has cured a minimum of five (5) days
- .4 Flange Post Installation: Bolt mounting plates attached to each post to structure as indicated, using expansion bolts.
- .5 Install end posts at end of fence and at buildings.
- .6 Install gate posts on both sides of gate openings.
- .7 Terminal Posts: Locate terminal end, corner, and gate posts at changes in horizontal or vertical alignment as indicated.
- .8 Mesh Panel Installation: Install mesh sections once concrete is set using the Universal Bracket kits. Install flush with horizontal wire of the panel (no gap). Vertical wire extensions pointing down for safety. Install fence panel a minimum of 30 mm (1-1/4 in.) and maximum of 50 mm (2 in.) above ground surface.
- .9 Step fence sections to follow slopes. Universal brackets can be slid along the post to the desired height and should be installed flush with horizontal wire (no gap). Steep slopes will require longer posts and mesh panels cut in half to keep gap under panel to a minimum.

- .10 Apply a zinc rich primer to the exposed ends after cutting or trimming and finish with the matching touch-up paint supplied by the manufacturer.

### **3.3 GATE INSTALLATION**

- .1 Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference.
- .2 Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.
- .3 Adjust gate to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

### **3.4 CLEANING AND ADJUSTING**

- .1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic-rich zinc paint to damaged areas. Pre-treat damaged surfaces according to zinc coating manufacturer's instructions.
- .2 Clean and trim areas disturbed by operations. Recycle or dispose of surplus materials.

**END OF SECTION**



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**SECTION 32 84 00**  
**PLANTING IRRIGATION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- .1 Provide materials and equipment required to provide a complete and properly operating irrigation systems.
- .2 Existing Conditions/Underground Services: Verify existing services, locate on-site utilities and locate underground services by hand digging or by use of an electronic toning device or M-Scope. Mark the location of all buried cables, conduits, pipes, and similar items, prior to trenching. Cooperate with the Owner to keep their utilities in operation. Notify Consultant immediately for directions as to the procedure should piping utilities be affected during excavation.
- .3 Repair to Underground Services: Repair or replace damage to underground services caused by the work of this Contract. Repair 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 its 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 Owner of damage immediately.
- .4 Design/Build Irrigation: Irrigation priced as design/build to be companies with CIC (Certified Irrigation Contractor) status, with irrigation field design works led by employees of CIP (Certified Irrigation Professional) designation or approved alternative education and certification.
- .5 Irrigation for LEED Projects: Water efficiency design credits to be determined at time of LEED project consultation process and design strategy to be executed by project Consultants. Project Consultants are responsible for incorporating xeriscapic, native or adaptive plants into the design for the achievement of LEED credit targets. Project Consultants are responsible for considering plants proposed in Blue Green document by BCIT. Project Consultants responsible for notifying Owner of intentions to use plants outside of Blue Green document and receive Owner approval based on justified LEED or aesthetic design rationale. Consultant to provide BCIT a written narrative on LEED credit targets and irrigation design system for understanding when reviewing plant palette choices.

**1.2 REFERENCES**

- .1 32 91 13 Soil Preparation

**1.3 SYSTEM DESCRIPTION**

- .1 Irrigation is required in all planting areas to support establishment of new installations or future planting renovations, and to support plant health during periods of extended drought or unforeseen site disturbances.
- .2 Specification of tough, drought tolerant plant species is encouraged.
- .3 Massing with sub-shrub or groundcover, as well the use of soil conservation strategies, organic soil amendments and organic mulches to facilitate soil moisture retention is encouraged.
- .4 Irrigation layout shall be designed according to recognized design principles to account for adequate overlap, efficient and sustainable water use with separate zoning for lawns, plantings, trees etc. and significant micro-climatic variations as required.

#### **1.4 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data: Submit all product data sheets for heads, controllers, and system parts for approval for any design-build irrigation work to the Landscape Architect and BCIT Operations Manager for review and approval prior to purchase.
- .3 Shop Drawings: Submit drawings, including water calculations and zoning strategies for approval for any design-build irrigation work to the Landscape Architect and BCIT Operations Manager for review and approval prior to purchase.
- .4 Letters of Assurance: Provide a written Guarantee for all workmanship and materials for one year from date of Substantial Performance.
- .5 Demonstration: Coordinate site meeting(s) as required so as to adequately instruct Owner in the complete operating and maintenance procedures for that system.

#### **1.5 QUALITY ASSURANCE**

- .1 A standard manufacturer's warranty is required for all irrigation equipment outlined in this specification. Refer to the General Conditions.
- .2 Verify that pipe, fittings, primers and cements are compatible for proper installation.
- .3 Obtain field assistance from pipe manufacturer/supplier as necessary to ensure correct installation and adhesive techniques are used on joints.
- .4 Ensure irrigation layout is designed according to recognized design principles to account for adequate overlap, efficient and sustainable water use with separate zoning for lawns, plantings, trees etc. and significant micro-climatic variations as required.
- .5 Preconstruction meeting: Conduct a preconstruction meeting prior to installation. Attendees shall include Owner, contractor, Consultant, Owner's representative.
- .6 Fabricator Qualifications: The fabrication shall be a RainBird irrigation system, or approved alternative.
- .7 Installer Qualifications: Irrigation work shall be done by an experienced and competent installer having the capabilities and personnel necessary for the work specified.
- .8 Installer Qualifications: Installer shall be a certified irrigation manufacturer to install products specified.
- .9 Installer Qualifications: Installer shall be a member in good standing of the Irrigation Industry Association of British Columbia (IIABC).

#### **1.6 DELIVERY STORAGE AND HANDLING**

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

#### **1.7 SUBMITTALS**

- .1 Product Data: Submit installation instructions and wiring diagrams
- .2 Shop Drawings: Submit layout of system showing extent of pipe, drain covers, sprinkler heads.
- .3 Samples: Submit samples of proposed sprinkler devices.

#### **1.8 GUARENTEE**

- .1 Provide a written Guarantee for workmanship and materials for one year from date of Substantial Performance.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- .1 Subject to compliance with specifications the following manufacturers are acceptable:
  - .1 RainBird
  - .2 Toro
  - .3 Or approved alternative. See notes below.
  - .4 Proposed substitutions shall equal or exceed specified equipment. It shall be of commercial quality, robust and durable construction, and shall have a proven record of reliability and low maintenance wherever it has been used in projects that have the same site conditions.
  - .5 The proposed equipment shall have a comparable warranty and a local, well stocked distributor.

### **2.2 MATERIALS**

- .1 Pipe: Schedule 40 polyvinyl chloride (PVC) conforming to ASTM D1784-97, D1785-96B and/or CSA B137.3-93 standards.(ASTM F441/441M-97 or CSA B137.6-96 for CPVC). It shall be extruded, virgin, high impact pipe conforming to Cell Class 12454-B, solvent weldable with belled ends, and continually and permanently marked showing manufacturer's name or trademark, type of material, pipe size and pressure rating.
- .2 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. Use of non- CSA approved specialty primers or solvents such as "Wet R Dry" is not acceptable
- .3 Sleeves: Schedule 80 PVC pipe under hard surfaces.
- .4 Solenoid Valves: Rainbird PEB valves or approved alternate.
- .5 Valve Boxes: Shall be green plastic irrigation boxes complete with captive lock bolt cove complete with S.S. bolts, sized to suit valves and other components with adequate room for operating and maintenance access:
- .6 Sprinkler Heads: New pristine quality heads preferred Rainbird 1800 Series Spray and 5000 Series Rotors or approved alternate.
- .7 Control and common ground wiring: Insulated multi-strand AWG 18, Colour white common. Wiring from the controller to the landscape minimum #18 solid wire run in conduit.
- .8 Make electrical connections with CSA watertight connectors.
- .9 Automatic controllers and cabinet: Use preferred Rainbird ESP Modular Controller or approved alternate.
- .10 Backflow preventer at service vault: Install Backflow/Cross Connection Control in accordance with BC Plumbing Code requirements.
- .11 Water supply: The irrigation branch supply from Utilities service main to the demarcation point ductile iron or copper piping.
- .12 Irrigation chambers: Manufacturer's standard irrigation chamber equipment.
- .13 Co-ordinate exact locations of lines, valves and heads, with planting locations to avoid conflicts and damage to plants during installation. Stake locations and check grades of all components.

### **2.3 OPERATION**

- .1 Provide Record Drawings of the irrigation system with revisions noted, complete with PSI call outs and writing ties. Show zones or zoning edits accurately on record drawings.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- .1 Preparation: Prior to the work of this Section, carefully inspect any installed work of other trades or contractors and verify work is complete to the extent that this work may properly begin.
- .2 Field Measurements: Make measurements in the field to confirm the design meets the on-site conditions to ensure precise fit of items in accordance with original design and performance criteria.
- .3 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 BCIT.
- .4 Do not park vehicles on the site in areas where the work will be undertaken without express written consent of the Consultant. Use only such equipment/vehicles essential for construction of the system. Repair damage caused by performance of the installation of the irrigation system.
- .5 Ensure trenching and other excavations for vaults, valve boxes, and similar items are not open during non work hours of operation unless they are protected to current Worker's Compensation Board Standards. Cover, mark, and protect open excavations to ensure worker and public safety.
- .6 Retain existing irrigation components, valves and lines which serve an adjacent site. Protect and repair if damaged due to construction activity.
- .7 Coordinate and ensure the installation of sleeves and irrigation piping as required under paved surfaces and through planter walls as noted on the Drawings.
- .8 Verify location of water supply connection point for automatic irrigation system. Coordinate as necessary.
- .9 Verify the location of the electrical conduit for the low voltage wire from irrigation controller to landscape areas.

#### **3.2 FIELD QUALITY CONTROL**

- .1 Ensure work remains uncovered for inspection of workmanship and materials. Notify Consultant a minimum of forty-eight (48) hours prior to required inspections. Failure to provide such notice and closing in of un-inspected work is sufficient grounds for withholding payments. Uncover buried work that has not been inspected and approved at no additional cost to Owner.

**END OF SECTION**

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## SECTION 32 91 13 SOIL PREPARATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- .1 Provide materials, and equipment necessary for the supply, placement, and amendment of the growing medium.
- .2 For proposed amended soils: The Contractor who is responsible for supply of growing medium and/or conservation of on-site topsoil should be responsible for the testing of the growing medium. Testing shall be carried out by Pacific Soil Analysis Inc., at #5 - 11720 Voyageur Way, Richmond, B.C. (Ph. 604 - 273-8226)
- .3 For imported growing medium: Refer to BC Landscape Standards, current edition, chapter 6

#### 1.2 REFERENCES

- .1 BC Landscape Standard, Current Edition; Section 6 Growing Media.
- .2 BC Landscape Standard, Current Edition; Section 11 Landscape Over Structures.
- .3 32 93 00; Plants and Planting.

#### 1.3 DEFINITIONS

- .1 "Growing Medium": Means a mixture of mineral particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth. Commercially available landscape soils or native site soils, if proposed for use, are subject to landscape soil assessment analysis.
- .2 "On-Site Topsoil" refers to topsoils (native or commercially processed) on location at project site, or reallocated, stockpiled and transported from elsewhere on BCIT Campus lands. On-Site Topsoil may be excavated, stockpiled, protected and amended in-situ as required by the project. If proposed for project use, On-Site Topsoil will also be subject to landscape soil assessment analysis and amendment.
- .3 "Soil Consultant" refers to the professional Agrologist with training in landscape soil analysis and interpretation, who is responsible for laboratory services and recommendations.
- .4 "Contractor" refers to the Contractor responsible for the Landscape Works on a project, whether this is the General Contractor, a Landscape Contractor, or a Landscape Sub-Contractor, or a combination of Contractors and Sub-Contractors.

#### 1.4 SYSTEM DESCRIPTION

- .1 Growing medium specified as 'import' on design drawings require a BC Landscape Standard, Level 2 growing medium submittal to be provided to Landscape Architect for approval prior to purchase and installation. All installation and preparation to comply with BC Landscape Standard, Current Edition, section 3 Site Preparation, and Section 6 Growing medium. Comply with Section 11, Landscape Over Structures when over podium areas.
- .2 On-site topsoil designated to remain undisturbed in-situ, must be assessed, tested, amended, protected from compaction and weed infestation, and otherwise managed for the duration of the project as required and/or directed according to project drawings, specifications, soil test results or as directed by the Consultant in consultation with Owner.
- .3 On-site topsoil infested with pernicious perennial weeds such as horsetail, vetch or morning glory or any other plants identified through the Invasive Species Council of British Columbia shall be excavated to depth necessary to prohibit future recurrence and removed from BCIT

Campus. Alternative remedial strategies must be presented in writing and reviewed and approved by the Consultant in consultation with Owner.

- .4 Protect on-site topsoil intended for use as growing medium, or as component of growing medium, from contamination by invasive or pernicious weeds, insect pests, plant pathogenic organisms and other extraneous and non-organic materials and environmental toxins or contaminants.
- .5 Do not use onsite subsoil as a component of growing medium unless endorsed by Soil Consultant and where it can be amended to meet requirements of growing medium.
- .6 Following rough grading, examine existing sub-grade conditions and signify acceptance in writing to the Consultant.
- .7 Ascertain the size and location of all existing services and sub-grades prior to the work.
- .8 Repair damage resulting from failure to exercise such precautions immediately at no cost to Owner.

### **1.5 DELIVERY STORAGE AND HANDLING**

- .1 Handle and protect growing medium adequately protected to prevent damage or contamination.
- .2 Stockpile materials in bulk form in paved area(s) approved by Consultant and Owner. Prevent contamination of basic materials from wind-blown soil particles, weed seeds and insects. Contamination of ingredients may result in their rejection. Where paved surfaces are not available prevent contamination of on-site soil or sub-soil or construction materials.
- .3 Store fertilizer and chemical ingredients in the manufacturer's original containers.
- .4 Store growing medium and/or excavated topsoil in a dry area or covered and protected from weed infestation, contamination, damage, water saturation, compaction or erosion.
- .5 Keep stockpiled growing medium, excavated topsoil and all related amendments free of weed infestation prior to installation and throughout the duration of the project.
- .6 Notify the Consultant prior to soil placement to allow for inspection of growing medium.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS AND SUBMITTALS**

- .1 Manufacturer to be Landscape Industry Certified in conjunction with BCLNA (BC Landscape and Nursery Association) programming or approved equal.
- .2 Manufacturer's to provide contractor with soil report showing compliance to BC Landscape Standard, Current Edition, for complying with Level 2 Growing Medium. Contractor to submit soil report to Landscape Architect for approval prior to purchase and installation of growing medium.
- .3 Submittals samples should be submitted for any amendments proposed to be used:
  - a) Submit sample size 2 litres volume. Samples shall be representative of the stockpile (properly sampled).
  - b) Submit samples that have been tested, and approved by the Consultant in writing before the growing medium is amended. Failure to do so may result in the rejection of the growing medium, removal of the growing medium from the site at no cost to Owner.

### **2.2 TESTING**

- .1 Ensure testing shows compliance with section 6 of the BC Landscape Standard, Table 6.3.5.3 Properties of Growing Medium or Level 2 Groomed Areas, and additional requirements shown in section 6 for nutrients and texture.
- .2 Ensure test shall determines the characteristics and quantity of amendments to be used to bring the growing media and/or on-site topsoil to a satisfactory chemical and physical condition.

- .3 Ensure sand shall be tested for sieve size analysis.
- .4 Before adjusting the growing medium and/or on-site topsoil as required by the soils testing, submit soils analysis to the Consultant and Owner. The Consultant shall confirm in writing the growing media and/or on-site topsoil amendments and fertilizer to be applied. Make amendment to the growing medium and/or on-site topsoil as per the Consultants written recommendations.
- .5 Ensure soil testing must be is completed and recommendations approved by Consultant prior to installation of plant material. Failure to do so may result in the rejection of the growing medium and/or retained topsoil, removal of growing medium or retained topsoil from the site at no cost to BCIT, and replacement with approved growing media as required.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION ON EXISTING GRADE**

- .1 Verify that grades are correct with installer present. Correct unsatisfactory conditions. Eliminate uneven areas and low spots, ensuring positive and free drainage. Ensure Consultant reviews sub-base material prior to installation of growing medium.

#### **3.2 PLACEMENT**

- .1 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products. Remove debris which protrudes more than 25 mm above surface. Dispose of removed material off site, at no expense to Owner.
- .2 Scarify entire area which is to receive growing medium to depth of 150 mm. Scarify those areas where equipment used for hauling and spreading has compacted soil
- .3 Growing medium shall not be loaded, transported or spread when it is so wet that its structure is likely to be altered, or risk of compaction exists.
- .4 Spread growing medium with adequate moisture in uniform layers over approved, unfrozen subgrade, where sodding and planting is indicated.
- .5 Manually spread growing medium to achieve final grades around trees, shrubs and obstacles.
- .6 Installed growing medium to 25 mm above design grades to allow for settlement.
- .7 Place growing medium to the following dimensions (Refer to BC Landscape Standard Chapter 6 Table, Current Edition): Trees: Minimum 600mm deep and twice the diameter of the root ball around the tree. Shrubs: Minimum 450mm depth. Groundcover: Minimum 300mm depth. Low and High traffic lawn areas: 150mm depth.

#### **3.3 FINISH GRADING**

- .1 Leave surfaces smooth, uniform and firm against deep foot printing.
- .2 Fine grade growing medium to 25 mm above finished grades shown on drawings. Eliminate rough spots and low areas to ensure positive drainage. Prepare loose, friable beds by means of cultivation and subsequent raking. Ensure final grades to are accepted by Consultant prior to further work proceeding.
- .3 After planting, spread 75 mm layer of specified approved mulch evenly over exposed growing medium finished grades. Refer to BC Landscape Standard, Current Edition for reference on mulch installation.

#### **3.4 ACCEPTANCE**

- .1 Consultant will review growing medium in place and determine acceptance of material, depth of growing medium and finish grading, prior to plant installation.
- .2 Approval of growing medium may be subject to soil testing and analysis if any doubt exists concerning its conformity to the requirements as per BC Landscape Standard, Table 6-3: Properties of Growing Medium for Level 2 "Groomed" Area.

- .3 Dispose of materials not required off site, at no cost to Owner.

**END OF SECTION**



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## SECTION 32 92 19 SEEDING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- .1 Materials necessary for seeding operations to all areas identified or disturbed by this Contractor. Provide control of noxious weeds within sodded lawn areas until substantial performance. The Class of Seeding will be as dictated by the Owner in accordance with the BC Landscape Standard.
- .2 Materials necessary for re-establishing or creating new lawn spaces. The Class of Seeding will be as dictated by the Owner in accordance with the BC Landscape Standard.
- .3 Establishment of seeding including establishment maintenance and cutting in accordance with the BC Landscape Standard, Current Edition.

#### 1.2 REFERENCES

- .1 BC Landscape Standard, Chapter 7, Lawns and Grass
- .2 BC Landscape Standard, Chapter 6, Growing Medium
- .3 British Columbia Weed Control Act
- .4 Canada Seed and Fertilizer Act

#### 1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data: Submit the original seed containers which clearly identify the manufacturer's guarantee of seed analysis. Provide all product data for seed and fertilizer as required and requested by the Consultant.
- .3 Letters of Assurance: Submit dealer guarantee statements of composition of the mixture and the percentages of purity and germination of each variety of grass seed.

#### 1.4 QUALITY ASSURANCE

- .1 Notify Consultant and Owner at least twenty four (24) hours before seeding for inspection of finished grades and seed. Do not seed until grades are approved by Consultant.
- .2 Ensure the Owner representative is present during all fertilizer applications.
- .3 Obtain approval in writing from the Owner for application of chemical vegetation controls. Comply with applicable federal, provincial and municipal legislation and regulations.
- .4 Protect seeded areas against trespassing and from damage at all times until Substantial Performance. Repair damaged seeded areas at no additional cost to Owner.
- .5 Provided that all the conditions for Substantial Performance have been met, Substantial Performance will be declared when the seed and organic additive has been applied as specified. **Maintenance and germination are not conditions for Substantial Performance.**
- .6 All workmanship and materials covered under Work of this Section shall be guaranteed for a period of ONE (1) full year from the date of Substantial Performance.
- .7 Perform seeding during periods most favorable for the establishment of a healthy stand (of grass) and at times in accordance with the construction schedule and activities and coordinated with the local weather conditions. Seeding to not occur before March 15<sup>th</sup> or after October 1<sup>st</sup>.

- .8 Do not perform seeding when soil is frozen, covered by frost or when there is standing or flowing water on the site.

### **1.5 DELIVERY STORAGE AND HANDLING**

- .1 Store grass seed, fertilizers and related materials in a dry, weatherproof storage place and protect from damage by heat, moisture, rodents or other causes until time of use. Ensure labels and other identification(s) are not removed or defaced in any fashion.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- .1 Subject to compliance with specifications the following manufacturers are acceptable:
  - .1 Premier Pacific Seeds or approved equal
  - .2 Or approved alternative.

### **2.2 MATERIALS**

- .1 Product Description: All items as specified or pre-approved equals.
  - .1 Make: Premier Pacific Seeds All Purpose Sun and Shade Mix
  - .2 Model: No Model #
  - .3 Feature 1: For new campus lawn areas or areas requiring re-establishment. Install as per manufacturers specifications.
- .2 Product Description: Specifics and standards to which product complies.

### **2.3 ACCESSORIES**

- .1 Water: Clean potable water (as supplied by Owner) free of any impurities which would inhibit germination or otherwise adversely affect growth or be harmful to the environment.
- .2 Weed Control: Manual weed control is the preferred method and may be the only permitted methodology. Confirm with Owner.

## **PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

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**SECTION 32 93 00  
PLANTS AND PLANTING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- .1 Provide plants and plant installation as indicated and specified.
- .2 Plants specified by Consultant to be coordinated with BCIT Blue+Green document, November 2012 edition. If variation in species is needed for LEED related, CPTED related, or aesthetic reasons, then Owner is to be notified by Consultant of intended variances and species suggestions for approval.

**1.2 REFERENCES**

- .1 BC Landscape Standard, Current Edition
- .2 CLNA Standards for Nursery Stock, Current Edition
- .3 ISA / ANSI, ANSI-A300, Standards for Tree Care Operations.
- .4 BCIT Blue/Green Document by Kevin Connery, November 2012. Inquire with Owner to obtain a copy.

**1.3 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data: Photo submittals of plant stock or a nursery visit is to be coordinated with the Consultant prior to purchase and delivery of plant materials. See quality assurance section below.

**1.4 QUALITY ASSURANCE**

- .1 Make trees and plant material available for inspection at one location well in advance of scheduled planting time. Notify the Project Landscape Architect when plants are available for inspection.
- .2 Plants are subject to inspection and may be rejected for failure to comply with contract specifications at any time until Substantial Performance. Replace rejected material and remove from the site at no cost to Owner.
- .3 Materials and work shall conform to the latest edition of the following standards or as otherwise specified:
  - .1 BC Landscape Standard, Current Edition
  - .2 CLNA, Canadian Standards for Nursery Stock, current edition.
  - .3 ISA / ANSI, ANSI-A300, Standards for Tree Care Operations.
- .4 Before substitutions of plant material are considered, documented due diligence that the specified material is not available at nurseries throughout Pacific Northwest (Canada and United States) must be provided. Area of supply shall include but shall not be limited to the area as mentioned herein
- .5 Plant material used on this project shall be hardy in this climate. Plant types have been selected with this as a criteria. This Contractor shall guarantee that plant material supplied has equal provenance, i.e.: it is developed from cuttings or seeds collected in an area of similar climatic characteristics. Submit proof of equal provenance to Staff upon request.

- .6 The Consultant may waive one or more inspections. This shall not impair the right of the Consultant to inspect work or materials which have been damaged or in any way do not conform to the contract specifications.
- .7 Be present during all required inspections as specified or as may be required by the Consultant.
- .8 The cost of replacements resulting from theft, accidental damage, vandalism, carelessness on the part of others shall not be borne by the Contractor.
- .9 Substitutions: where it is impossible to obtain the particular plant material listed on the Landscape Drawing, request substitutions with types and variations possessing the same characteristics. Request substitutions of trees in writing at least three (3) months and shrubs and groundcover at least two (2) months prior to planting. Substitutions must be approved by the Consultant and Owner.

#### **1.5 SUBSTANTIAL COMPLETEION AND WARRENTY**

- .1 Notify the Owner and Consultant at the completion of work for an Inspection for Substantial Performance.
- .2 Final inspection of planting will be made one month before the end of the specified warranty period. For release from the Contract, all plant materials supplied or transplanted must be alive and in a healthy, satisfactory growing condition at the time of inspection.
- .3 Warranty stipulates that plant material will remain free of defects as per contract plant lists and landscape specifications, for one (1) full year from the date of certified Substantial Performance of the Work.
- .4 End-of-warranty inspection will be conducted by the Consultant and Owner representatives including a representative(s) from project management and a representative from operations.
- .5 Replace all plant material found dead, or not in a healthy, satisfactory growing condition or which, in any other way, do not meet the requirements of the project or contract specifications, at Contractor's expense, during and up to end of the warranty period.
- .6 All required replacements shall be plants of the same size and species as specified on the plant list and shall be supplied and planted in accordance with the drawings, specifications and change orders.
- .7 Replace defective or dead plants, trees, lawns or plantings as required during the 1 year maintenance and warrantee period to the satisfaction of the Consultant and Owner.

#### **1.6 DELIVERY STORAGE AND HANDLING**

- .1 Deliver, unload, and handle to avoid dropping and sudden impacts to roots and root balls.
- .2 Ensure plant material is free of damages, defects, noxious perennial weeds and is true to type as specified on plant list. Do not accept or install sub-standard plant material or weed infested plant material.
- .3 Ensure appropriate storage, protection and installation of plant material.
- .4 Immediately store and protect plant material which will not be installed within 1 hour after arrival at site in storage location approved by the Consultant.
- .5 Protect stored plant material from frost, wind, sun, drought and physical damage as follows:
- .6 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in hem/fir mulch or topsoil and watering to full depth of root zone.
- .7 For pots and containers, maintain moisture level in containers. Heel-in fibre pots and all other containers as required for increasingly adverse weather conditions.
- .8 For balled and burlapped and wire basket root balls, keep moist before planting by heeling-in with mulch or soil.

- .9 Place plants stored on site in such a way as to protect branches, rootballs and roots from damage.
- .10 Verify existence and location of on-site utilities. Contact the Consultant immediately for directions as to procedure should piping or utilities be encountered during excavation.
- .11 Protect existing equipment, sidewalks, landscaping reference points, monuments and markers. Make good all damage incurred during this work.
- .12 Make every effort to protect plants in storage adjacent to any construction work.
- .13 Erect temporary continuous barriers, and/or tree protection fencing where necessary to ensure safety of existing plants and trees.
- .14 Replace, at no additional cost to the Owner, any plant material damaged as a result of the work of this section.
- .15 Protect fertilizers from moisture.
- .16 Notify the Consultant a minimum of forty-eight (48) hours prior to each delivery.

## **PART 2 - PRODUCTS**

### **2.1 PLANT MATERIAL**

- .1 The plant material must be selected from the BCIT Landscape document titled Blue+Green and be from the approved plant list provided therein.
- .2 Trees, shrubs, groundcovers, perennials: Nursery grown of sizes and quantities shown in plant lists on landscape drawings and specification.
- .3 Conform to the BC Landscape Standard and Canadian Standards for Nursery Stock.
- .4 Ensure transplanted or root-prune materials have been pruned at the nursery at least once within the year prior to planting.
- .5 Take precautions during digging, handling and shipping of plant material to avoid injury to plant parts, branches and root systems.
- .6 Trees designated B&B shall be properly dug with firm, natural balls of soil retaining as many fibrous roots as possible, in sizes and shapes as specified in the Canadian Standards for Nursery Stock. Ensure balls are firmly wrapped with non-synthetic, biodegradable burlap and secured with nails and/or heavy, non-synthetic rottable twine. Ensure the root collar is apparent at surface of ball. Trees with loose, broken, processed or manufactured root balls shall not be accepted.
- .7 Trees and plants designated as transplants, bareroot or collected plants, shall not be dug or installed before dormancy or after bud break.
- .8 Plants, typical of their species or variety, shall have a normal habit of growth and shall be of premium quality, sound, healthy, vigorous, well branched, and densely foliated, free of disease, insect pests, eggs or larvae, have a healthy well-furnished root systems, and be free of binding or girdling roots.
- .9 Ensure plants conform to measurements specified in the plant list. Measurements specified are minimum size acceptable for each variety. Plants that meet the requirements specified in the plant list, but that do not possess a normal balance between height and spread will not be accepted. Plants for use when symmetry is required, or when planted in formal rows, shall be matched in form and size as nearly as possible. Do not prune prior to delivery.
- .10 Measure plants and tree trunks when branches are in the normal position. Dimensions for height and spread as specified refer to the main body of the plant and not from branch-tip to branch-top. 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. Do not prune branches to obtain the required height, before the plants are delivered to the site unless so approved in writing by the Project Landscape Architect.

- .11 As per Canadian Standards for Nursery Stock: Tree caliper shall be the determining measurement when caliper exceeds 40 mm (1.5 in.).
  - .1 For trees with a caliper up to 100 mm (4"): Measure caliper no less than 150 mm (6") above the ground level.
  - .2 For trees 100 mm (4in.) and larger caliper: Measure caliper at 300 mm (12 in.) above ground level.
- .12 Ensure trees have straight trunks with a single leader intact. Trees with multiple leaders, unless specified, shall be rejected. Trees with a damaged or crooked leader, bark abrasions, sunscald, disfiguring knots, insect or disease damage, girdling roots or cuts on limbs over 20mm (3/4") in diameter that are not completely closed should be rejected by Project Landscape Architect.
- .13 Take precautions during digging, handling and shipping of plant material to avoid injury to plants and root systems.

## **2.2 ACCESSORIES**

- .1 Tree stakes: Dressed 50mm (2") diameter treated fir stakes, lengths as detailed. Number per tree as required to keep tree plumb and true during one (1) year warranty period.
- .2 Guywires: Trees up to 65mm (2.5") caliper - 14 gauge galvanized, multi-strand, twisted wire. Trees 65mm (2.5") to 75mm (3") caliper – 12 gauge wire, covered with new black garden hose, 2-ply, reinforced and of at least 13 mm (1/2") diameter, around leader at branch crotch.
- .3 Deadmen: 100x150 mm (4"x6") pressure preservative treated construction grade lumber or approved equivalent. Lengths to be determined on site.
- .4 Plastic Strapping: DeepRoot, Arbortie or approved equivalent. Strapping to be to be 19mm (2") wide, flat, woven polypropylene or nylon; 900 lb. break strength.
- .5 Mulch: Composted bark mulch with 50mm and minus Douglas Fir / Hemlock bark chips, dark brown in colour and free of cedar chips, soil, wood, stones, roots, plastic and other deleterious matter or pre-approved equal.
- .6 Fasteners: Hot dipped galvanized.
- .7 Fertilizers: Agricultural fertilizer of a formula indicted by soil test results of site soils and/or planting media specified for the project. Fertilizers shall be organic, slow-release compositions incorporated into the planting media wherever applicable.
- .8 Anti-Desiccants: if specified, are to be applied to plants in full leaf immediately before digging or as required by the Project Landscape Architect. Anti-Desiccants are to be sprayed so that all leaves and branches are covered with a continuous protective film.
- .9 Biostimulants: shall contain soil conditioners, VAM, and ectomycorrhizal fungi spores and soil bacteria appropriate for existing soil conditions. Submit manufacturer's literature for approval.

## **PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

*This document contains standards that are the minimum requirements for BCIT construction projects. The information in the document is organized using the MasterFormat® and SectionFormat® systems. It is not a specification; it is intended to supplement the Consultant's own documents. Do not use this information as a standalone specification.*

**SECTION 32 94 00  
PLANTING ACCESSORIES (EDGERS)**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- .1 Materials and installation of standard manufactured catalogue items such as planting bed edger products.
- .2 Provide necessary compaction tests and other tests as required to ensure underlying base gravels or materials for edger preparation are compliant with Drawings and Specifications compaction requirements.
- .3 Provide site base preparation of gravels and aggregates in accordance with other references provided. Install edging materials in accordance with manufacturers finish. Fine grade and provide finishes against edger products in accordance with design drawing details.

**1.2 REFERENCES**

- .1 Manufacturer's specifications for any products specified on in these specifications or drawings.
- .2 BC Landscape Standard, Current Edition.

**1.3 DEFINITIONS**

- .1 Edger: Means any constraint applied to a walkway or planting bed to retain soft permeable materials such as soils, crushed granite fines, or gravel.

**1.4 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data: Submit confirmation of product model # and order prior to purchase and installation of the name product. Include colour and finish specification of product if options are available for approval.
- .3 Install product as per manufacturer's specifications.

**1.5 QUALITY ASSURANCE**

- .1 Ensure edge restraints meet flush with all surrounding surfaces unless specified otherwise in design drawings.
- .2 Provide a 1.5 lineal meter long sample of edging installation and fine grading and finished against edging product for approval by Landscape Architect and BCIT project manager prior to full installation of remaining product.
- .3 Assemble furnishings in accordance with manufacturer's instructions.

**1.6 DELIVERY STORAGE AND HANDLING**

- .1 Keep products stored in a dry and safe area until the time of installation.
- .2 Ensure that packaging or protection materials remain intact until time of installation. Remove in accordance with manufactures specifications.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- .1 Subject to compliance with specifications the following manufacturers are acceptable:

- .1 Manufacturer 1. Northwest Landscape Supply.
- .2 Manufacturer 2. Brickstop Stone Edging.
- .3 Or approved alternative.

## **2.2 MATERIALS**

- .1 Granite edger:
  - .1 Locations: At planting bed edges to retain small amount of soils.
  - .2 Make: Dundarave Granite Border Stone, or approved equal.
  - .3 Model: GGBS7393DUN.
  - .4 Feature 1: 7" height x 3" width x 39" length.
  - .5 Feature 2: Salt and pepper granite.
  - .6 Base preparation for edger: In accordance with manufacturer's recommendations.
- .2 Aluminum edger:
  - .1 Locations: At lawn edges to separate stone from lawn and at flush transitions between unit paving and lawn or planting spaces where a flush finish is desired.
  - .2 Make: Brickstop Stone Edger, or approval equal
  - .3 Model: Original L – shaped paver edging
  - .4 Feature 2.5m lengths, 1.5" height and flange

## **PART 3 - EXECUTION – NOT USED**

**END OF SECTION**