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DESIGN CRITERIA

14.01 SCOPE

.1 These landscape standards and specifications shall apply to all new parkland and trailways acquired through subdivision development as well as to all landscape areas within rights-of-way (R.O.W.) of roadways and utilities in the City of Nanaimo including: medians, soft landscape areas between the curbs and the R.O.W. lines, and plantings in urban plaza and sidewalk areas. Safety for utility lines, drivers and pedestrians must be ensured when developing treed boulevards.

.2 The general design and construction of the landscape shall be in accordance with the standards set out in this section. All standards and specifications must be followed. Specific projects may warrant amendments to the standards herein but those amendments must be approved in writing by the City Engineer.

.3 During Pre-Construction Stage, the following must be completed and accepted: ***(REVISED MAY 2020)***

(a) Submission of a landscape plan complete with restoration planting, tree locations and irrigation design by a Landscape Architect following the standards and specifications herein.
(b) Installation of landscaping may be completed with the exception of the trees once the plan is accepted and only if timing is appropriate for planting.
(c) Submission of a detailed maintenance plan which addresses maintenance requirements outlined in the Landscape Maintenance sub-section of Section 14 – Landscape. ***(REVISED MAY 2020)***

.4 During Construction Stage the City Engineer must be notified of the following:

(a) Inspection of all pipe in ground (if required) to ensure it is exposed with bedding material prior to back fill.
(b) Inspection of the backflow prevention assembly and point of connection as per Standard Drawing I-1 if required before back fill. ***(REVISED MAY 2020)***
(c) Inspections to ensure T-joint couplings and installed (if required) before back fill at the location where future trees will be planted.
(d) Inspection of the irrigation controller installed (if required).
(e) Completion of soil samples and testing to be done in accordance with Section 14.14. A copy of the report must be sent to the City Engineer prior to installation.
(f) Inspection of the seed, turf and plantings must be done by the City Engineer when installed by the developer.

.5 During Maintenance Stage, the following must be completed: ***(REVISED MAY 2020)***

(a) Inspection of planted material immediately after planting; ***(REVISED MAY 2020)***
(b) Follow accepted maintenance plan; ***(REVISED MAY 2020)***
(c) Occur once per month from April to October; ***(REVISED MAY 2020)***
(d) Watered on a regular basis during dry conditions; ***(REVISED MAY 2020)***

(e) Weeding, invasive plant removal, pest and disease control, remedial pruning; ***(REVISED MAY 2020)***
(f) Plant replacement as required, ***(REVISED MAY 2020)***

as per Section 14.0 - Landscape, sub-section of Landscape Maintenance. ***(REVISED MAY 2020)***

.6 At the End of Maintenance Inspection Prior to Bond Release, the following must be completed:

(a) Final inspection of irrigation and all landscaping.
(b) Where a final inspection includes a parkland acquisition, the inspection shall ensure all requirements have been completed as per the request of the City Engineer.
(c) Testing of irrigation after installation. All lines are to be charged to ensure there are no breaks or leaks in the system.
(d) As-built drawings (with any revisions noted) must be provided to the City Engineer.
(e) If not already installed, the City of Nanaimo Urban Foresty Department will install boulevard trees in planned locations when the majority of build out has occurred and maintain with irrigation, watering truck or adopt a tree program. ***(REVISED MAY 2020)***

PLANTING

14.02 DRIVER VISIBILITY AND CLEARANCE

.1 Do not obstruct the line of vision at intersections within the triangular area bounded by the intersection of lot lines and a line joining each lot line 7 m from their intersection.

.2 The maximum mature maintained height for plant materials located within sight distance triangles at intersections shall be 300 mm above finish grade.

.3 Specify trees near approaches to left turn slots, driveways or pedestrian crosswalks which can be pruned up from the base to a minimum height of 1.5 m. Shrubs in these areas shall not exceed 300 mm in mature height.

.4 Locate trees a minimum of 1.0 m distance from the pavement or curb face, unless planted in accordance with Standard Drawing P-5 or P-6.

.5 Tree branch clearances requirements are: 5 m the over traveled portion of road and 2 m over the sidewalk.

14.03 MINIMUM SETBACKS FOR TREES

.1 Setbacks for trees to objects shall be as follows:

TABLE 14-1

SETBACK TREES FROM	DISTANCE
Underground streetlight conduit or irrigation main	0.6 m
Other underground utilities	1.2 m
Lamp Standards	6.0 m
Steel and wooden utility poles	3.0 m
Driveways	2.0 m
Catch basins	2.0 m
Manholes, valves boxes, services	1.2 m
Sewer service boxes	1.5 m
Fire Hydrants	2.0 m
Road intersection	7.0 m
Curb Face	1.0 m
Sidewalk	0.85 m
Buildings – fastigiate (columnar) tree	2.0 m
Buildings – regular crown tree	3.0 - 5.0 m

14.04 MINIMUM LANDSCAPE AREA DIMENSIONS AND MAXIMUM GRADES

.1 The minimum width for grass boulevard shall be 1.0 m, 1.5 m or greater preferable. Maximum slope for lawns to be 3:1.

.2 The minimum width for shrub or ground cover beds shall be 0.6 m, 1.0 m or greater is preferred. Maximum slope for shrub or ground cover beds to be 2:1.

.3 The minimum width for a landscaped median shall be 2 m from curb face to curb face. This will allow for the minimum 1 m wide planting bed and 0.5 m wide splash aprons to be constructed in accordance with Standard Drawing No. P-4 and Standard Drawing No. CS-7. ***(REVISED MAY 2020)***

.4 Median Islands narrower than 2 m from curb face to curb face shall be poured with a broomed or stamped finish in accordance with Standard Drawing No. CS-7. ***(REVISED MAY 2020)***

.5 The minimum width of boulevards for tree planting shall be 1.85 m measured from face of curb.

14.05 PLANT MATERIAL SELECTION

.1 All plant materials shall meet the following criteria:

(a) Plants shall have the ability to withstand adverse conditions such as airborne pollutants, maximum sun exposure and reflected heat from pavements, high winds and abrasive forces, occasional snow loading and exposure to salt from road clearing operations, and limited root zone soil volumes.

(b) Plants shall be hardy to Zone 7 or colder.

(c) Plants shall be capable of reduced water demand following a minimum of two years establishment period. ***(REVISED MAY 2020)***

(d) Plants shall have relatively low maintenance attributes including: fine to medium leaf size and canopy density; non-fruit bearing or having only berry-sized non-staining fruits; low susceptibility to disfiguring or fatal diseases and infestations; infrequent demands for pruning; fertilizing and other cultural requirements.

(e) Plants shall be of appropriate size and form at maturity to meet criteria in Section 4.02 – Driver Visibility and Clearance.

.2 Lawns/Fine Grass, Rough Grass and Wildflowers:

(a) Sod shall be used on all lawn/fine grass areas. Seeding shall require approval of the City Engineer.

(b) Rough grass and wildflowers areas shall be seeded. Seeding method shall be noted on drawings.

(c) Areas to be seeded with grades greater than 4:1 and/or highly erodible soils shall be hydroseeded with a nurse crop seed mix, a hydraulically applied erosion control mulch, or erosion control blanket. Erosion control method to be noted on drawings.

.3 Trees shall be selected such that:

(a) Boulevard or 'street' trees shall be of at least two different genus, species and cultivar, alternately planted, within a given block. Median tree species may vary. ***(REVISED MAY 2020)***

(b) Street trees species shall vary between intersecting streets.

.4 All streets trees shall meet the following criteria:

(REVISED MAY 2020)

(a) Ability to withstand pruning for pedestrian, vehicle and/or building clearance without compromised to tree health or form.

(b) Absence of species/varietal characteristics of structural weakness, susceptibility to wind damage, or thin, easily damaged bark,

.5 Select street trees according to proposed site conditions either from: Table 14-2 or:

(a) An alternative source provided that the proposed trees meet the site criteria contained within the relevant Parts of Table 14-2 and all other criteria contained in this section.

(b) Obtain written approval from the City Engineer for tree selections not take from Table 14-2.

TABLE 14-2

PART 1 – Trees For Directly Under Hydro Lines

Minimum allowable soil volume per tree 13.5 cu.m. with 1 m depth pit. ***(REVISED MAY 2020)***
Selection criterion for alternative trees not listed in Part 1: Mature height not greater than 7.62 m.

SCIENTIFIC NAME	COMMON NAME
Albizia Julibrissin ***(REVISED MAY 2020)***	Silk Tree ***(REVISED MAY 2020)***
Acer ginnala	Amur Maple (tree form)
Acer platinoides 'Globosom'	Globe Norway Maple
Prunus yedoensis	Akebono Cherry
Cercis Canadensis 'Forest Pansy ***(REVISED MAY 2020)***	Red Bud
Carpinus Caroliniana ***(REVISED MAY 2020)***	Pink Perfection Cherry American Hornbeam ***(REVISED MAY 2020)***
Cornus Eddie's White Wonder	Eddie's White Wonder Dogwood
Parrotia Persien ***(REVISED MAY 2020)***	Persian Ironwood ***(REVISED MAY 2020)***
Styrax Japonica***(REVISED MAY 2020)***	Japanese Snowbell ***(REVISED MAY 2020)***

PART 2 – Trees for Beside Hydro Lines (Min. 2.75 m Lateral Distance from Nearest Line)

Minimum allowable soil volume per tree 13.5 cu.m. with 1 m depth pit.
Trees listed in Part 1 may also be used.
Selection criterion for alternative trees not listed in Part 2: Mature spread not greater than 5 m.

SCIENTIFIC NAME	COMMON NAME
Acer platanoides 'Columnare'	Columnar Norway Maple
Acer platanoides 'Crimson Sentry'	Crimson Sentry Norway maple
Acer rubrum 'Bowhall'	Bowhall Red Maple
Carpinus betulus 'Fastigiata'	Fastigiate Hornbeam
Ginkgo biloba 'Princeton Sentinel'	Princeton Sentinel Gingko
Fagus sylvatica 'Fastigiata' ('Dawyckii')	Fastigiate Beech
Prunus sargentii 'Columnaris'	Columnar Sargent's Cherry
Quercus robur 'Fastigiata'	Fastigiate English Oak
Tilia cordata 'Corzam'	Corinthian Linden

(REVISED MAY 2020)

PART 3 -NOT USED-

PART 4 – Trees for Available Soil Volumes of 20 cu.m. per Tree or More, 1 m pit Depth

Trees listed in Parts 1-3 may also be used.
Selection criterion for alternative trees not listed in Part 3: Mature height no greater than 20 m.

SCIENTIFIC NAME	COMMON NAME
Acer rubrum cvs.	Red Maple cultivars
Quercus coccinea	Scarlet Oak
Quercus rubra	Red Oak
Tilia x euchlora	Crimean Linden
Robinia pseudoacacia	Black Locust
Robinia pseudoacacia cvs	Black Locust cultivars
Nyssa Sylvatica ***(REVISED MAY 2020)***	Blackgum ***(REVISED MAY 2020)***

PART 5 – Trees for Wide Boulevard or Wide Median Use Only

Trees listed in Parts 1-4 may also be used.
Trees in the Part require a minimum available root zone of 20 cu.m. per tree with a minimum width of 3.5 m.

SCIENTIFIC NAME	COMMON NAME
All non-dwarf coniferous spp.	
Fagus sylvatica (sp., & full size cultivars)	European beech
Liquidambar styraciflua	Sweetgum
Liriodendron tulipifera	Tulip tree
Platanus acerifolia	London Planetree
Ginkgo biloba ***(REVISED MAY 2020)***	Ginkgo Tree ***(REVISED MAY 2020)***
Zelkova serrata cv.	Japanese Zelkova
Quarcus robur	English Oak

14.05A RIPARIAN AND RESTORATION PLANT MATERIAL SIZE, SPACING AND LOCATION ***(REVISED MAY 2020)***

.1 Minimum size and spacings for riparian and restoration replanting specifications for level 4, level 5 and level 6 areas shall be as follows: ***(REVISED MAY 2020)***

VEGETATION TYPE	MINIMUM SIZE	MINIMUM SPACING
Native trees	2 gallon or 4 cm caliper	1 plant / 3 m on center
Native willows	Whips	1 plant / 1.5 m^2
Shrubs	1 gallon	1 plant / 0.75 – 0.5 m^2
Small shrubs and ground covers	1 gallon	1 plant / 0.5 m^2
Perennials	4 inch pot	1 plant / 0.5 m^2

(REVISED MAY 2020)

14.06 STREET TREE SIZE, SPACING AND LOCATION

.1 Trees shall be minimum 5 cm caliper measured at 1.4 m above the rootball at the time of planting, and of uniform size if planted in a boulevard row.

.2 Minimum number of boulevard trees shall be calculated as follows:

TREE SIZE	SINGLE FAMILY RESIDENTIAL
Medium Trees (± 10 – 20 mm ht.)	Greater of 1 per lot or 15 m
Small Trees (Under 10 m ht.	Greater of 1 per lot or 10 m

.3 Plantings of trees closer than 6 m on centre shall require the written approval of the City Engineer.

.4 Locate trees at least 1 m offset from the curb face.

.5 Locate trees on fronting on single family lots at the center of the lot frontage unless otherwise approved by the Engineer.

14.07 URBAN TREES IN PAVEMENT

.1 Select urban trees in pavement in accordance with Table 14-2.

.2 Select and site urban trees in pavement to eliminate long term above-ground and below-ground conflicts with utilities, buildings and structures, and pedestrian and vehicular traffic.

.3 Urban Trees in Pavement shall be referenced to City of Nanaimo Standard Drawing P-5, P-6 or P-7, or when alternates are proposed, the drawings shall include project-specific tree planting details show, by plan and cross section:

(a) Typical view of surrounding pavements, curbs, above and below ground utilities, light standards, and adjacent buildings and structures.
(b) Typical details of proposed rooting environment including tree pit dimensions, subgrade scarification, drainage structure if required, topsoil mix layers or 'horizons', root deflecting structure location and type if required, location and type of irrigation device and pipe, and soil surface treatment such as tree grate, porous pavement or other; and
(c) Typical above ground details such as staking, special appurtenances, pruning for headroom etc.

14.07A STRUCTURAL SOILS COMPOSITES ***(REVISED MAY 2020)***

.1 Structural soils composites such as soil cells shall be used with the approval of the City Engineer. ***(REVISED MAY 2020)***

IRRIGATION

14.08 GENERAL IRRIGATION DESIGN REQUIREMENTS

.1 Design irrigation in industry-standard metric units on standard metric sheets.

.2 Irrigation design requirements shall be identified by the Road Classification as per Section 9.0 – Streets, Traffic Signs and Markings as summarized below:

ROAD TYPE	IRRIGATION REQUIREMENTS
Locals	Watering truck for specified time period, followed by adopt-a-tree program, above ground donuts and bags around trees. Consider front yard trees and trees in boulevard.
Collectors Arterials	Supportive of irrigated landscaping with maintenance under private landowner's control. Fully irrigated boulevards and/or medians attached to central control for the waterwise program.
(REVISED MAY 2020)	

.3 An automatic irrigation system is required where boulevard trees, shrubs and ground covers are to be irrigated.

.4 Each urban tree shall be irrigated with at least two visible 0.5 gpm bubblers in accordance with the City of Nanaimo Standard Drawing No. I-10.

.5 Irrigation systems shall be designed to supply water on a demand basis by employing a soil moisture probe to override the controller during periods of soil moisture.

.6 In grassed boulevards fronting institutional, commercial and residential uses with potential for heavy pedestrian traffic between the curb and the sidewalk, grass areas shall be irrigated. Low traffic grassed boulevards may be installed without irrigation, but manual watering for establishment and maintenance is required. The City Engineer's decision on irrigation requirements for grass areas shall be final.

14.09 IRRIGATION SERVICE CONNECTIONS

.1 Design service connections from City of Nanaimo water main to, and including, water meter chamber, to be in accordance with Section 5- Water Distribution System.

.2 Required backflow prevention in accordance with the City of Nanaimo Standard Drawing No. I-1 and Section 5 – Water Distribution System, Cross Connection Control. ***(REVISED MAY 2020)***

.3 Measure static water pressure at or near the point of connection and include with irrigation system design.

14.10 IRRIGATION SYSTEM PARAMETERS

.1 Maximum design flow velocity to be 1.5 m/sec.

.2 Size pipes and valves for minimum friction loss.

.3 Specify all irrigation components from a coordinated manufacturer's line listed in the Approved Products List.

.4 Design head-to-head coverage for turf and shrub areas.

.5 Design sprinkler circuits with matched precipitation heads. Do not mix heads with varied precipitation rates on the same circuit.

.6 Specify low flow heads for sloping areas.

.7 Where surface sprinklers are used, ensure unobstructed sprinkler coverage to tree bases from at least two sides.

.8 Every drip circuit shall be designed with a filter, pressure regulator, flush valve and air relief valve. The drip component manufacturer's instructions for installation and maintenance shall be included in the project specifications.

.9 Minimize overspray on paved surfaces.

SECTION 14 – LANDSCAPE SPECIFICATIONS

PLANTING

14.11 SUBSTITUTIONS

.1 Requests for substitutions in plant material species shall be submitted to the Engineer in writing, with proof of a plant search area that extends throughout BC wholesale nurseries, and may only be submitted after the Contract has been awarded to the successful bidder.

14.12 REFERENCE STANDARDS

.1 Unless otherwise specified, all planting, sodding, and seeding procedures to be in accordance with BCNTA/BCSLA Landscape Standard latest edition.

.2 Do all pruning to International Society of Arboriculture (ISA) Best Management Practices Tree Pruning 2008.

.3 Reference standards for landscape maintenance shall include project specifications and the most recently amended version of the following:

(a) B.C.S.L.A./B.C.N.T.A. British Columbia Landscape Standard
(b) International Society of Arboriculture Guide for Establishing Values of Trees and Other Plants, a Guide to Plant Appraisal and Best Management Practices.
(c) Canadian Fertilizer Act
(d) Canadian Fertilizer Quality Assurance Program
(e) Canadian Nursery and Landscape Association – Standards for Nursery Stock
(f) Seeds Act
(g) Canadian Soil Conservation Act
(h) BC Landscape Standard
(i) Bylaw No. 4695 – Nanaimo Tree Protection
(j) Bylaw No. 7102 – Pesticide Use
(k) ANSIA300 Tree Care Operations – Tree, Shrub and other Woody Plant Maintenance – Standard Practices
(l) Field Guide to Noxious Weeds and other Selected Invasive Plants of British Columbia, Ministry of Agriculture and Lands.
(m) Guide to Weeds in BC and Seven Steps to Managing your Weeds, Weeds BC
(n) Federal Pest Control Products Act
(o) Federal Plant Quarantine Act
(p) Federal Fisheries Act
(q) Federal Migratory Bird Regulations
(r) Federal Food and Drug Act
(s) Federal Pesticide Residue Compensation Act
(t) Provincial Integrated Pest Management Act
(u) Provincial Plant Protection Act
(v) Provincial Wildlife Act
(w) Federal and Provincial Weed Control Act
(x) Handbook for Pesticide Applicators and Pesticide Dispensers, Ministry of Environment

(y) IPM Manual for Landscape Pests, Ministry of Environment
(z) Ministry of Environment, Pesticide Control Branch: 810Blanshard Street, Victoria, BC, V8W 3E1
(aa) WorkSafeBC: Standard Practices for Pesticide Applicators.
(bb) BC Ministry of Transport Guidelines for Maintenance
(cc) Invasive Plant Alerts, Ministry of Agriculture and Lands.

The intent of the supplemental documents is to provide additional information. Information provided in the supplemental documents does not replace or supersede the MoESS requirements.

14.13 PROTECTION

.1 Prevent damage to all existing curbs, sidewalks, pavement, utilities and structures, plants, trees etc. Refer to Section3 – General Requirements for conditions affecting work around existing structures and utilities. ***(REVISED MAY 2020)***

14.14 SOIL SAMPLES AND TESTING

.1 City Engineer's approval of topsoil, sub-soil and bulk organic amendments at source, or for re-use of on-site native soils, is required. A reference sample of topsoil taken from the same source pile as the analysis sample shall delivered to the Engineer, accompanied by a memorandum of assurance from the Contractor that the soil so delivered shall be the soil used in the Contract. On-site soils used shall be tested before the landscape work is tendered to establish suitability. Copies of test results and required modification reports shall be included in the bid documents.

.2 All soils and bulk organic amendments supplied by the Contractor shall be tested by a soil testing laboratory agreed to by both the Contractor and the City Engineer, at the Contractor's expense. The Contractor shall arrange for such testing in a timely fashion to meet the requirements set out in Section14.14.4.

.3 Except where otherwise indicated in the drawings or specifications, the recommendations of the soil testing laboratory shall be the bases of requirements for soil amendments.

.4 The Contractor shall submit the soil analysis report to the City Engineer 48 hours prior to commencement of work.

.5 The submission for soil analysis shall include:

(a) Minimum 1 kg, sample of each: topsoil, native sub-soil intended for re-use, and bulk organic amendments.
(b) Project planting details and information regarding intended landscape applications for the soil.

.6 The soil analytical requirements shall include:

(a) pH
(b) lime requirement to achieve a pH of 6.5
(c) soluble salts or electrical conductivity (E.C.)
(d) % Sands + % Fines (Silt and Clay) + % Organic Matter = 100%
(e) % Total Nitrogen
(f) Available levels of phosphorus, potassium, calcium and magnesium.

.7 The laboratory analysis shall include recommendations for:

(a) Soil amendments to bring soil attributes to acceptable levels as outlined in this specification. Fertilizer applications, by category of plant type, to bring topsoil mix fertility to levels outlined in this specification.

14.15 TOPSOIL FOR GRASS AREAS

.1 Topsoil for lawn and fine grass areas shall be unamended topsoil.

.2 Topsoil for rough grass and wildflower areas shall be unamended topsoil or native subsoil.

14.16 UN-AMENDED TOPSOIL

.1 All supplied topsoil shall be fertile, friable natural loam containing minimum 4% organic matter for clay loams and 2% organic matter for sandy loams. When modified according to the recommendations of the soil testing laboratory, topsoil shall be capable of sustaining vigorous plant growth.

.2 Topsoil shall be free from any inclusions of sub-soil, lumps of clay, stones and roots over 50 mm diameter, toxic materials, crabgrass, couch grass, blackberry, morning glory, horsetail, or other noxious weeds and weed seeds.

.3 Unamended topsoil shall have a texture falling within the allowable ranges for percentage dry-weight mineral fraction:

Gravel	>2 mm & <75 mm	0-10%
Sand	>0.05 mm & <2 mm	50-70%
Silt	>0.002 mm & <0.05 mm	10-25%
Clay		0-15%

.4 Un-amended topsoil shall have the following chemical properties:

pH	5.5 - 7.0	
salinity	sat. extract conductivity	<3.0 millimhos/cm @ 25°C
boron	concentration in saturated extract	<1.0 ppm

14.17 SUB-SOIL

.1 Sub-soil shall be either:

(a) native subsoil, free of stones larger than 75 mm, and having the chemical and physical properties falling within the acceptable ranges specified in Section14.16.3 and Section14.16.4 for un-amended topsoil, or
(b) un-amended topsoil

.2 Native sub-soil not meeting the criteria specified in Section14.17.1(a) shall be removed from site and legally disposed of.

.3 Sub-soil shall be free of any toxic materials, pavements, construction debris, deleterious materials, (crabgrass, couch grass, blackberry, morning glory, horsetail, or other noxious weeds and weed seeds).

.4 On-site subsoil intended as a component of growing medium shall be protected against contamination from plants, plant parts, invasive and noxious species, insect plants, plant pathogenic organisms and other extraneous organic and non-organic materials and toxins. Refer to the following regulations:

(a) WorkSafeBC – Occupation Health and Safety Regulations
(b) BC Ministry of Environment Regulations
(c) Canadian Environmental Protection Act
(d) Weed Control Act (Federal and Provincial)
(e) BC Ministry of Agriculture and Lands Regulations
(f) Canadian Master Specifications, Construction Specifications Canada
(g) National Master Specifications, Construction Specifications Canada

.5 Submit sub-soil for testing as required in Section 14.14.1.

14.17A GROWING MEDIUM PROPERTIES

.1 Growing medium properties are based on different levels of maintenance and irrigation in accordance to the British Columbia Landscaping Standard as follows:

(a) Properties of Growing Medium for Level 1 "Well Groomed" Area:

Level 1 areas: intensive, high standard of maintenance is anticipated, after the end of the Construction Maintenance Period as specified within Section 14.87.4. Irrigation is recommended in all instances and is necessary in all areas, "on-slab" or under cover. The textural classification for these growing media by the Canadian System of Soil Classification is "Sand" to "Loamy Sand". Plant selection, irrigation requirements and maintenance intensity should consistently respond to the exceptional nature of the growing medium. ***(REVISED MAY 2020)***			
Growing Medium Types:	*1L*	*1H*	*1P*
Applications:	Low traffic Lawn Areas Trees and Large Shrubs	High Traffic Lawn Areas	Planting Areas
Texture:	Percentage of Dry Weight of Total Growing Medium		
Coarse Gravel • Larger than 19 mm • Smaller than 40 mm	0 - 1%	0 - 1%	0 - 1%
All Gravel • Larger than 2 mm • Smaller than 40 mm	0 - 5%	0 - 5%	0 - 5%
Sand: • Larger than 0.05 mm • Smaller than 2 mm	50 - 70%	80 - 90%	50 - 70%
	Percentage of Dry Weight of Total Growing Medium Excluding Gravel		
Silt: • Larger than 0.002 mm • Smaller than 0.05 mm	10 - 25%	5 - 15%	10 - 25%
Clay: • Smaller than 0.002 mm	0 - 20%	0 - 5%	0 - 20%
Clay and Silt Combined	Maximum 25%	Maximum 15%	Maximum 25%
Organic Content	3 - 10%	3 - 5%	10 - 20%
Acidity (pH)	6.0 - 7.0	6.0 - 7.0	5.5 - 6.5
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.		

(b) Properties of Growing Medium for Level 2 "Groomed and Level 3 "Moderate" Areas:

Level 2 and 3 areas: routine, high to moderate standard of maintenance is anticipated, after the end of the Construction Maintenance Period as specified within Section 14.87.4. Automatic irrigation is recommended, however such areas can be adequately irrigated through consistent use of manual irrigation equipment. The textural classification for these growing media by the Canadian System of Soil Classification is "Loamy Sand" to "Sandy Loam". These growing media accommodate a wide selection of plants; they create a balance between good drainage and water retention and are suited to moderate, normal maintenance practices. "On-slab" areas should be treated as Level 1 areas, with corresponding increase in sand content and decrease in silts and clays. ***(REVISED MAY 2020)***			
Growing Medium Types:	*1L*	*1H*	*1P*
Applications:	Low traffic Lawn Areas Trees and Large Shrubs	High Traffic Lawn Areas	Planting Areas
Texture:	Percentage of Dry Weight of Total Growing Medium		
Coarse Gravel • Larger than 19 mm • Smaller than 40 mm	0 - 1%	0 - 1%	0 - 1%
All Gravel • Larger than 2 mm • Smaller than 40 mm	0 - 5%	0 - 5%	0 - 5%
	Percentage of Dry Weight of Total Growing Medium Excluding Gravel		
Sand: • Larger than 0.05 mm • Smaller than 2 mm	50 - 80%	70 - 90%	40 - 80%
Silt: • Larger than 0.002 mm • Smaller than 0.05 mm	10 - 25%	0 - 15%	10 - 25%
Clay: • Smaller than 0.002 mm	0 - 25%	0 - 15%	0 - 25%
Clay and Silt Combined	Maximum 35%	Maximum 15%	Maximum 35%
Organic Content	3 - 10%	3 - 5%	10 - 20%
Acidity (pH)	6.0 - 7.0	6.0 - 7.0	4.5 - 6.5
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.		

(c) Properties of Growing Medium for Level 4 "Open Space/Play", Level 5 Background and Natural Area", and Level 6 "Service & Industrial" Areas:

Level 4, 5, and 6 areas: high standard of maintenance is neither anticipated nor required, after the Construction Maintenance Period as specified within Section 14.87.4. Irrigation may be provided, but more frequently only temporary watering is done for establishment maintenance. The textural classification for this growing medium by the Canadian System of Soil Classification is "Sandy Loam" to "Loam". These soils provide a quality growing medium, albeit with reduce percolation and resistance to compaction. These may be imported soils, however existing soils may meet these requirements or it may be possible to amend them to meet the requirements. Plant selections must respond to the limitations of the growing medium and to modest maintenance expectations. If soil must be imported to augment existing topsoil (due to insufficient volumes on-site or damage to on-site topsoil by constructive activities), the imported growing medium should be similar to the on-site soil and should be mixed with it. Different soil types should not be layered. Where the growing medium has reduced percolation characteristics additional drainage measures may be required.		
Growing Medium Types:	*3L*	*3H*
Applications:	All Lawn Areas, Trees & Large Shrubs	Planting Areas
Texture:	Percentage of Dry Weight of Total Growing Medium	
Coarse Gravel • Larger than 19 mm • Smaller than 40 mm	0 - 3%	0 - 3%
All Gravel • Larger than 2 mm • Smaller than 40 mm	0 - 10%	0 - 10%
	Percentage of Dry Weight of Total Growing Medium Excluding Gravel	
Sand: • Larger than 0.05 mm • Smaller than 2 mm	30 - 70%	30 - 70%
Silt: • Larger than 0.002 mm • Smaller than 0.05 mm	15 - 50%	15 - 50%
Clay: • Smaller than 0.002 mm	15 - 30%	15 - 30%
Clay and Silt Combined	Maximum 60%	Maximum 60%
Organic Content	2 - 10%	5 - 20%
Acidity (pH)	6.0 - 7.0	4.5 - 7.0

14.18 'A HORIZON' SOIL MIX

.1 'A horizon' soil mix shall be topsoil amended as recommended by the soil testing lab to have the following properties, in addition to the physical and chemical properties of un-amended topsoil:

(a) Dry weight not to exceed 1350 kg/cu.m.
(b) Saturated weight not to exceed 1600 kg/cu.m.
(c) Total nitrogen to be between 0.2% & 0.6% by weight.
(d) Available phosphorus to be 20-250 ppm.
(e) Available potassium to be 50-1000 ppm.
(f) Percentage by dry weight of organic matter to be:
  (i) 3-5 % for high traffic lawn areas
  (ii) 3-10 % for low traffic lawn areas, trees and large shrubs
  (iii) 10-20 % for planting areas
  (iv) 5-20 % for natural areas
(g) Carbon to Nitrogen Ratio shall not exceed 40:1.
(h) Fertility (nitrogen, phosphorus and potassium) and pH may be modified either during mixing and screening, or after growing medium is placed.
(i) Salinity – the saturation extract conductivity shall not exceed 3.0 milliohms/cm at 25°C (77°F). If higher, it shall be leached with fresh water through irrigation or precipitation prior to planting.
(j) Boron – the concentration in the extract shall not exceed 1.0 ppm.
(k) Sodium – the sodium adsorption ratio (SAR) as calculated by analysis of the saturation extract shall not exceed 8.0.

.2 Stripping of topsoil shall commence only after the area has been cleared of all scrub, plant material, invasive and noxious plants and their reproductive parts, grass, stumps, rocks 100 mm (4 in) or greater, and other extraneous organic and non-organic materials and contaminants.

.3 Where testing shows topsoil suitable for use in its present condition or as a component of a growing medium, it shall be stockpiled where shown on the drawings or in areas designated for stockpiling as approved by the City Engineer and it must be protected from adverse weather conditions as well as other contaminants.

.4 Onsite topsoil used as a growing medium shall have an acidity range of pH 6.0-7.5 and shall contain a dry weight percentage of organic matter as referred to in Section 14.18.1(f).

.5 Onsite topsoil shall have a salt conductivity of less than 3.0 milliohms/cm at 25°C (77°F). If higher, it shall be leached with clean water through irrigation or precipitation prior to planting.

.6 Death of plants during the first year that can be attributed to plant pathogenic organisms or toxic materials in the growing medium may be an indication that the growing medium did not meet the City of Nanaimo's Standards and Specifications at the time of installation may result in a requirement that the contractor remove and replace affected plants and faulty growing medium at no additional cost to the Owner.

.7 Excessive weed and invasive plant growth in a growing medium during the first year may be an indication that unacceptable levels of invasive plant seeds or parts were present in the growing medium at the time of installation. Such a determination may result in a requirement that the contractor remove all weeds and invasive plant roots and reduce the growth to acceptable levels at no additional cost to the Owner.

14.19 PEAT MOSS

.1 Soil Amendments shall be virtually free from sub-soil, sawdust, commercial wood products, stones, lumps, plants or their roots, building materials, invasive of noxious plants and their reproductive parts, non composted wood, wood waste, insect pests, plant pathogenic organisms, chemical pollutants or substances at levels toxic to plants, and other extraneous materials that detract from the desirable physical and chemical properties required for landscaping purposes.

.2 Peat moss shall be Horticultural grade, partially decomposed fibrous or cellular stems and leaves of Sphagnum Mosses with a texture varying from porous to spongy fibrous, fairly elastic and substantially homogeneous with a pH value of not less than 3.5 and not greater than 6.5. It shall be brown in colour and medium to coarse shredded, particles 10 mm size or less.

(a) Salinity: the saturation extract conductivity <2.0 millimhos/cm @ 25°C.
(b) Nitrogen content shall be >0.8% based on dry weight.

14.20 MANURE

.1 Manure shall be well-rotted farm animal manure or mushroom manure, such that liquids have been eliminated, and the material is crumbly, free from weed seeds, rocks, sticks, and other deleterious material and contain not more than 40% by volume of sawdust, straw, or shavings.

(a) Manure shall be free of harmful chemicals, and shall have salt content that gives and electrical conductivity reading of between .5 and .6 mmhos/cm.
(b) Manure shall contain not less than 1.0% nitrogen based on dry weight.
(c) All particles in manure shall pass a 6.35 mm standard sieve.
(d) Manure shall be virtually free from weed and invasive plants and their seeds and reproductive parts, coliform, pathogens, rocks, sticks and rubble.

14.21 COMPOSTED LEAF OR WOOD WASTES

.1 Submit samples of composted wood waste or leaf mould for chemical analysis to soil testing lab for consideration for use as an organic amendment in the 'A horizon' topsoil mix.

.2 The total carbon to total nitrogen ratio in the composted leaf or wood waste shall not exceed 40:1.

.3 Uncomposted wood wastes or leaves shall not be present in the topsoil mix.

.4 Composted leaf of wood wastes must be virtually free from all viable weed and invasive plants and their seeds or other plant reproductive parts, coliform, pathogens and chemical or organic contaminates that may be detrimental to plant or animal health.

.5 Composted leaf or wood wastes must contain less than 0.5% by volume of contaminants such as rocks, plastic, metal or glass.

.6 Refer to Section 14.29 for much specifications.

14.22 FERTILIZERS

.1 Fertilizers shall meet the requirements of the Canada Fertilizer Act.

.2 Types, formulations and rates of application of fertilizers and liming agents shall be as recommended by a laboratory soil specialist and based on test results of the growing medium.

.3 Fertilizers shall be in granular, pellet or prill and must be dry and free slowing and have a guaranteed N-P-K analysis and be in manufacturer's original packaging, stored in waterproof containers clearly marked with the name of the manufacturer, weight and analysis.

.4 Fertilizers shall be spread evenly over the placed growing medium with an appropriate mechanical spreader and incorporated into the grow medium.

.5 There should be a minimum of at least three (3) weeks separation between the application of lime and fertilizers.

.6 Lime may be added to the growing medium at the time of screening or cultivated into the top 100 mm (4in) of growing medium after it is in place.

14.23 -NOT USED-

14.24 LIME

.1 Lime shall be applied as per soil analysis recommendations.

.2 Growing medium shall require not more than 0.5kg/m^2 (0.10lb/ft^2) of dolomite lime to reach the required pH level.

14.25 WATER

.1 Water for landscape installation shall be free from organic or chemical contaminants detrimental to healthy plant growth.

14.26 TREE, PLANT MATERIALS, RIPARIAN AND RESTORATION *(REVISED MAY 2020)*

.1 All plant materials shall meet or exceed the standards identified on the landscape construction drawings with respect to size, grading and quality.

.2 All riparian and restoration plant materials shall meet or exceed the minimum size and spacing design criteria as per Section 14.05. ***(REVISED MAY 2020)***

.3 Plants shall be characteristic of the genus, species and cultivar as indicated on the construction drawings and specified herein.

.4 All plants shall be nursery grown under similar climatic conditions to the project site. Plants shall not be pruned prior to delivery unless pre-approved by the Engineer. Container stock shall have been established in the size of container specified for at least six (6) months prior to delivery. The roots shall not have grown beyond the limits of the container.

.5 It is the Contractor's responsibility to verify and comply with all regulations regarding the inter-regional movement of plant material, including nursery stock, within the Province of British Columbia. Imported plant materials must be accompanied by copies of the necessary permits and import licences required by Federal and Provincial regulations.

.6 Plants shall be properly proportioned; not weak, thin or elongated.

.7 Plants shall have normal, well-developed branches and vigorous, fibrous root systems. They shall be healthy and free from defects, decay, girdling roots, sunscald injuries, abrasions of the bark, and plant diseases, insect pests eggs, borers and all forms of infestation.

.8 Trees shall have straight stems unless uncharacteristic for the species/cultivar. Pruning wounds shall show healthy callous growth at the branch collar without bark tearing or fungal growth. Cambium tissue shall be moist and exhibit the correct colouration for the species. Plants exhibiting fungal staining shall be rejected.

.9 All plant materials shall conform to the measurements specified in the drawings except that plants larger than specified may be used if approved by the Engineer. The use of such plants shall not increase the contract price. If larger plants are used, the ball of earth shall be increased in proportion to the size of the plant. All plants shall be measured when the branches are in their normal position. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to root base or from branch tip to branch tip. Where trees are measured by caliper (cal.), reference is made to the diameter of the trunk measured 300 mm above ground as the tree stands in the nursery.

.10 Native plants shall be propagated in nurseries and not harvested from wild sites, except where salvaged from an area where the native vegetation will be destroyed and authorization for harvest has been obtained. All collected native plants shall be held and maintained in a nursery until new roots have formed through the burlap or other suitable packing material, or in the case of containerized plants, until such time that the roots grow to fill and hold the soil within the container.

.11 Collected plants shall not be used without prior approval in writing by the Engineer.

.12 Balled and burlapped conifers and trees in excess of 3 m height must have been dug with a sufficiently large firm rootball to contain 75% of the fibrous and feeder root system. Rootballs shall be free of invasive weeds.

.13 All nursery grown plant materials shall conform to the most current versions of the Canadian Nursery Landscape Association/Canadian Standards for Nursery Stock and the BCNTA Standard for Container Grown Plants.

.14 A comprehensive pest management system should be developed to protect plants and trees which may have been weakened or stressed and made susceptible to disease and insect pressure due to disturbance during transportation, storage and planting.

.15 Rootballs and soil in containers shall be free of invasive and noxious plants.

14.27 SOD

.1 The quality and source of nursery sod shall comply with standards outlined in 'British Columbia Standard for Turfgrass Sod' published by Canadian Nursery Trades Association, and the B.C. Society of Landscape Architects, latest edition. Quality Grade shall be No. 2 Standard unless shown otherwise on the drawings. The turfgrass sod shall be grown from a seed mixture containing Kentucky Bluegrass (Poa pratense) or Turf-type perennial Ryegrass (Lolium perenne) and not less than 40% by weight of Creeping Red Fescue (Festuca rubra). At time of site delivery, the sod shall contain no more than 2% of other strains or species of grass or clovers, and no visible broadleaf weeds, and shall be of sufficient density that no surface soil is visible when mowed to a height of 38 mm.

.2 The source of the sod shall be pre-approved by the City Engineer. Source substitutions shall not be made without the written approval of the City Engineer.

14.28 GRASS AND WILDFLOWER SEED MIXTURES

.1 Grass seed mixture quality and source to comply with standards for lawns and grass outlined in the 'British Columbia Landscape Standard' published by the Canadian Nursery Trades Association, and the B.C. Society of Landscape Architects, latest edition. Seed mixture are to be suited to the climate, terrain, establishment and maintenance conditions under which they are to grow. All seed mixtures are to meet the requirements of:

(a) Seeds Act
(b) The Provincial Weed Control Act

.2 Fine grass seed mixture quality grade shall be Certified Canada No. 1, or as specified No. 2 Standard. Seed mixture shall contain the following: Perennial Turf Type Ryegrass (Lolium perenne) and/or Kentucky Bluegrass (Poa pratense), and not less than 40% by weight of Creeping Red Fescue (Festuca rubra) and/or Chewings Fescue (Festuba rubra commutata).

.3 Rough grass seed mix shall contain the following: less than 10% by weight Kentucky Blue (Poa pratense) grass and/or Turf-type perennial Ryegrass Ryegrass (Lolium perenne), and not less than 50% by weight of Creeping Red Fescue (Festuca rubra) and/or Chewings Fescue (Festuca rubra commutata)

.4 The wildflower seed mix shall be such that it meets the requirements of the Seeds Act and be free of any invasive plant species or potentially invasive species.

.5 Nurse crop – Annual Rye grass (Lolium multiflorum).

.6 The following invasive species must be removed from all sites:

- Bamboo – (Bambusa sp.)
- Morning Glory – (Convolvulus arvensis)
- Scotch Broom – (Cytisus scoparius)
- English Ivy – (Hedera helix)
- Giant Hogweed – (Heracleum mantegazzianum)
- English Holly – (Ilex aquafolium)
- Policemen's Helmet/Himalayan Balsam – (Impatiens glandulifera)
- Dead-nettle Lamium – (Lamiastrum gleubdolon)
- Purple Loosestrife – (Lythrum salicaria)
- Himalayan Blackberry – (Rubus armeniacus) (discolour)
- Evergreen Blackberry – (Rubus laciniatus)
- Tansy – (Tanacetum vulgare)
- Periwinkle Species – (Vinca major, Vinca minor)
- Butterfly bush – (Buddleja davidii)
- Carpet Burweed – (Soliva sessilis)
- Daphne/Spurge-Laurel – (Daphne laureola)
- Eurasian Water-milfoil – (Myriophyllum spicatum)
- Garden/Yellow Loosestrife – (Lysimachia vulgaris)

- Lamium – (Aegopodium podagraria)
- Burdock Species – (Arctium lappa, A. minus)
- Common Tansy – (Tanacetum vulgare)
- English Hawthorne – (Crataegus monogyna)
- Hairy Cat's Ear – (Hypochaeris radicata)
- Orchardgrass – (Dactylis glomerata)
- St. John's Wort – (Hypercium perforatum)

.7 The following noxious species must be removed from all sites:

- Annual Sowthistle – (Sonchus oleraceus)
- Bohemian Knotweed – (*Fallopia x bohemica*)
- Bur Chervil – (*Anthriscus caucalis*)
- Canada Thistle – (Cirsium arvense)
- Common Reed – (*Phragmites australis subsp. australis*)
- Crupina – (*Crupina vularis*)
- Dalmation Toadflax – (*Linaria dalmatica*)
- Dense-flowered Cordgrass – (*Spartina densiflora*)
- Diffuse Knapweed – (Centaurea diffusa)
- Dodder – (Cuscuta spp.)
- English Cordgrass – (Spartina anglica)
- Flowering Rush – (Butomus umbellatus)
- Garlic Mustard – (Alliaria petiolata)
- Giant Hogweed – (Heracleum mantegazzianum)
- Giant Knotweed – (Fallopia sachalinensis)
- Giant Mannagrass / Reed Sweetgrass – (Glyceria maxima)
- Gorse – (Ulex europaeus)
- Himilayan Knotweed – (Polygonum polystachyum)
- Hound's-tongue – (Cynoglossum officinale)
- Japanese Knotweed – (Fallopia japonica)
- Jointed Goatgrass – (Aegilops cylindrica)
- Leafy Spurge – (Euphorbia esula)
- Milk Thistle – (Silybum marianum)
- North Africa Grass – (Ventenata dubia)
- Perennial Sowthistle – (Sonchus arvensis)
- Purple Loosestrife – (Lythrum salicaria)
- Purple Nutsedge – (Cyperus rotundus)
- Rush Skeletonweed – (Chondrilla juncea)
- Saltmeadow Cordgrass – (Spartina patens)
- Scentless Chamomile – (Matricaria maritima)
- Smooth Cordgrass – (Spartina alterniflora)
- Spotted Knapweed – (Centaurea maculosa)
- Tansy Ragwort – (Senecio jacobaea)
- Velvetleaf – (Abutilon theophrasti)
- Wild Oats – (Avena fatua)

- Yellow Flag Iris – (Iris pseudacorus)
- Yellow Nutsedge – (Cyperus esculentus)
- Yellow Starthistle – (Centaurea solstitialis)
- Yellow Toadflax – (Linaria vulgaris)
- Common Crupina – (Crupina vulgaris)
- Giant Reed – (Arundo donax)
- Kudzu – (Pueraria Montana)
- Poison Hemlock – (Conium Maculatum)
- Russian Knapweed – (Acroptilon repens)
- Jimsonweed/Devil's Apple – (Datura stramonium)
- Orange Hawkweed – (Hieracium aurantiacum)
- Saltwater Cordgrass – (Spartina patens)
- Wild Chervil – (Anthriscus sylvestris)

14.29 MULCH

.1 Bark mulch shall be 50 mm and minus Douglas Fir/ Hemlock bark chips, dark brown in colour and shall be virtually free of invasive and noxious seeds and reproductive parts, soil, stones, salts or other harmful chemicals, or other extraneous matter that would prohibit seed germination or the healthy development of plant material.

.2 Other mulch materials shall only be used when indicated in the drawings.

.3 Do not store bark mulch on paved sidewalks.

.4 Mulch is not intended to replace vegetation as a sole ground cover, nor is it to be used as a growing medium in landscape applications.

14.30 PLANTING ACCESSORIES

.1 The following products shall only be installed when indicated in the construction drawings.

(a) TREE STAKES – shall be nominal 50 mm by 50 mm wood or 75 mm round pressure-treated wood, or equivalent to be pre-approved by the City Engineer.
(b) TENSIONING DEVICE – 19 mm wide flat woven polypropylene or nylon webbing.
(c) ROOT DEFLECTING BARRIER – 61 cm by 61 cm copolymer polypropylene of 2.16 mm thickness, 50% post consumer recycled plastic, with 12.7 mm raised moulded root directing ribs c/w anti lift tabs.
(d) TREE GRATES – must be cast iron, aluminum or bronze and the safety standards of the castings are to meet the requirements as per ASTM A48. Tree grates shall be square or round in shape. Tree grates must be installed in a proper perimeter frame with non-tamper attachments and must allow for incremental enlargement to accommodate the tree growth and to protect the tree from injury. Patterns can vary to pertain to the project or neighbourhood aesthetics, however the opening dimensions of the decorative designs shall be less than 12 mm in width or diameter.

14.31 REPLACEMENTS

.1 All plant materials damaged or found not in a healthy satisfactory growing condition during the maintenance and guarantee period, or which, in any other way, do not meet the requirements of the specifications, shall be replaced at the Contractor's expense.

.2 All required plant material replacements shall be by identical species/cultivar and size to the original, as indicated in the drawings.

.3 Where identical replacements are not available, submit a written proposal to the City Engineer. Gain approval from the City Engineer prior to installation of the replacement plan materials.

.4 Replacement shall be made at the next appropriate season to a maximum of four (4) months from identification of the requirement for plant replacement.

.5 Replacement plants shall be maintained and guaranteed by the Contractor to the completion of the next full growing season, or the completion of the original maintenance and guarantee period whichever is later.

14.31A STRUCTURAL SOILS COMPOSITES ***(REVISED MAY 2020)***

.1 Structural soils shall be used with the approval of the City Engineer.

.2 Structural soils composites shall be composed of growing medium and clear crush granular components in accordance with the following recommended base ratio of materials. Ensure sufficient moisture (25% to 75% of field capacity) to provide a homogeneous mixture with consistent properties throughout the composite soil. Peat moss shall not be used in the preparation of structural soil. ***(REVISED MAY 2020)***

.3 Soil Component Proportion By Weight: ***(REVISED MAY 2020)***

Growing Medium	15% to 20% Dry Weight
Clear Crush	25 mm to 75 mm Clear Crush 80% to 85% Dry Weight
Hydrogel/Stabilizer*	0.01% to 0.02%

(REVISED MAY 2020)

*Hydrogel/Stabilizer is applied as a soil tackifier to ensure even distribution and blending of the component materials. Refer to manufacturer specifications for appropriate mixing proportions. ***(REVISED MAY 2020)***

.4 Growing medium properties for use as a component in structural soils shall conform to MoESS Section 14.18 'A Horizon' Soil Mix. ***(REVISED MAY 2020)***

.5 Clear crush gravel properties for use as a component in structural soils shall conform to Section 8 – Aggregates and Granular Material specifications. Gravel gradation shall consist of 25 mm to 75 mm clear crush washed rock free of any foreign elements or materials. ***(REVISED MAY 2020)***

SECTION 14 – LANDSCAPE
DESIGN CRITERIA

IRRIGATION

14.32 SCOPE

.1 Irrigation work required includes supply of all materials, labor and equipment to install a complete and operation irrigation system as specified herein and as shown on the construction drawings including:

(a) Excavation, piping, valves, heads, drip emitters and devices, controller, and complete installation, testing maintenance, adjustment and guarantee of the system.
(b) Water supply connection and backflow prevention assembly including supply, excavation, installation, and testing in accordance to the B.C. Plumbing Code. ***(REVISED MAY 2020)***
(c) Backflow prevention assembly installation and testing in accordance to CSA B64.10 and CSA B64.10.1. ***(REVISED MAY 2020)***
(d) 110 VAC and low voltage electrical wiring including supply, excavation and installation.
(e) Restoration of all existing landscape areas to condition prior to commencement of work on site, to the satisfaction of the Engineer.
(f) Inspection must be completed by the City Engineer during and after installation, and before the bond is released.

.2 Only those products approved by the City Engineer and listed on the City of Nanaimo Approved Product List will be accepted for installation.

14.33 PERMITS AND FEES

.1 Obtain all permits and pay required fees to any governmental agency having jurisdiction over the work. Inspections required by local ordinances during the course of construction shall be arranged as required. On completion of the work, satisfactory evidence shall be furnished to the City Engineer to show that all work has been installed in accordance with the ordinances and code requirements, including certificates from the Electrical Inspector.

SECTION 14 – LANDSCAPE
DESIGN CRITERIA

14.34 STANDARDS

.1 Work shall be in accordance with mechanical (plumbing) and electrical standards, codes and regulations including the following:

(a) The National Building Code of Canada and its supplements.
(b) Current C.S.A. and A.S.T.M. Specifications for assemblies, pipes and fittings, including: ***(REVISED MAY 2020)***

(i)	copper pipe:	ASTM B42
(ii)	PVC water pipe:	CSA B137.3 or ASTM D2241.
(iii)	PVC fittings:	ASTM D2466 or ASTM D2467
(iv)	PVC solvent cement:	ASTM D2564
(v)	Backflow Prevention Assemblies: ***(REVISED MAY 2020)***	CSA B64.10 & B64.10.1.

(c) The B.C. Plumbing Code.

.2 Irrigation installers shall have the following qualifications:

(a) Irrigation Technicians Level 2 Certification,
(b) Low Voltage Electrical Certification and
(c) Active BCWWA Cross Connection Control Tester Certification. ***(REVISED MAY 2020)***

.3 All irrigation systems shall plan for future expansion. Sufficient wires, as requested by the City Engineer, shall be supplied at the time of installation from the controller to end of system where the potential for future expansion may exist.

14.35 ACCEPTABLE PRODUCTS

.1 Acceptable products shall be in new condition with the size, manufacturer and features shown in the design.

.2 If irrigation systems with products other than shown in the design are proposed, the Contractor shall undertake the following prior to commencing construction:

(a) Produce complete shop drawings showing the type and location of all heads and nozzle numbers, pipe location and sizes, and all part model numbers and specifications;
(b) Submit hydraulic calculation work sheets for the re-designed system to demonstrate that all parameters have been calculated;
(c) Submit the shop drawings in triplicate and gain the written approval of the Engineer.

14.36 IRRIGATION PLASTIC PIPING

.1 Plastic pipe shall be semi-rigid, extruded from PVC resin type 1 grade 2 normal impact in accordance with applicable codes and standards.

.2 All polyvinyl chloride (PVC) plastic pipe and fittings must be marked as to size and class and their pressure and strength rating must exceed that of one and one half times the working pressure of the system.

.3 All PVC pipe shall be schedule 40 PVC.

.4 Flow volumes and velocities shall always be considered to minimize head loss.

.5 Flow velocities shall not be permitted to exceed 1.52 m per second.

.6 Specified pipes shall be rated at 1.5 times maximum operating pressure.

14.37 IRRIGATION PLASTIC FITTINGS

.1 All plastic fittings shall be a minimum of schedule 40 PVC molded fittings.

14.38 SWING JOINT ASSEMBLIES

.1 Triple joint assemblies for all sprinklers shall consist of:

(a) 3 schedule 40 PVC street elbows (MIPT x FIPT)
(b) 1 schedule 80 PVC threaded nipple, length to suit (MIPT x MIPT)
(c) 1 schedule 40 PVC threaded tee (slip x slip x FIPT)

.2 Triple swing joint assemblies for quick coupler valves shall consist of:

(a) 1 schedule 40 PVC threaded tee
(b) 2 brass threaded nipples, length to suit (MIPT x MIPT)
(c) 2 brass threaded elbows (FIPT x FIPT)
(d) 1 brass threaded street elbow (MIPT x FIPT)
(e) 1 brass threaded riser, 100 mm (4”) length, (MIPT x MIPT)

14.39 IRRIGATION METAL PIPE & FITTINGS

.1 All metal pipe shall be copper except in quick couple swing joint assemblies. All metal fittings shall be copper, brass, or bronze as shown in the Standard Drawings.

14.40 SOLVENT CEMENT

.1 Solvent cement and primer shall be of a type recommended for the PVC pipe class, schedule, and maximum size.

.2 The Contractor shall ensure that the shelf life of the cement, as labeled by the manufacturer on the container, has not been exceeded.

14.41 SPRINKLER HEAD RISERS

.1 Where risers are not of the pop-up type, sprinkler head risers shall be schedule 80 PVC pipe. Pipe shall be cut in a standard pipe cutting tool with sharp cutters. Ream only to full diameter of pipe and clean all rough edges or burrs. Cut all threads accurately with

sharp dies. Not more than three (3) full threads shall show beyond fittings when pipe is made up. Use Teflon tape on all PVC threaded connections.

14.42 IRRIGATION BEDDING MATERIAL

.1 Bedding within the pipe zone shall be in accordance with Section 4.17 – Bedding Within Pipe Zone, except that bedding material shall be well graded sand, with a minimum of 75 mm on all sides of the irrigation pipe.

14.43 SPRINKLER HEADS

.1 Sprinkler heads shall be as shown on irrigation construction plans. See legend and notes for correct model numbers and operating pressures.

.2 Sprinklers shall perform to manufacturer's specifications including diameter of throw and gallonage at specified pressures.

14.44 IRRIGATION VALVES

.1 Valves are to be as shown on irrigation construction plans and shall have the same size isolation gate valve. See legend and notes for correct model numbers.

14.45 IRRIGATION WATER SERVICE CONNECTIONS

.1 All materials for water service connection including saddle, pipe, valves, water meter and chamber to be in accordance with Section 5- Water Distribution System.

14.46 IRRIGATION CASING SLEEVES

.1 Irrigation casing sleeves under sidewalks, driveways and road paving and/or through walls, shall be installed prior to the construction of the paved surfaces and/or walls. Sleeves to be SDR 35 PVC pipe, size as indicated on the drawings, with ends capped and staked until such time as irrigation pipe is installed.

.2 The Contractor shall be responsible for locating all sleeves.

.3 Irrigation sleeving to be between 300 mm – 450 mm below finished grade.

14.47 CONTROLLERS

.1 Controller model numbers shall be as noted on the irrigation construction plans.

.2 Automatic controllers shall provide all necessary features for programming as is shown on the irrigation design plan. Controllers shall be encased in a sturdy metal, lockable, weatherproof mounting box and must be easily accessible for maintenance. All electrical controllers shall be CSA approved or be of a type approved by local electrical authorities.

.3 Refer to the City of Nanaimo Approved Product List for the controllers that are acceptable for installation.

14.48 MOUNTING LOCATION

.1 Controller mounting shall be as noted on the irrigation construction plan.

14.49 VALVE BOXES

.1 All in-line valves shall be grouped wherever possible and installed in plastic irrigation boxes with a solid lid marked "irrigation". Plastic shall have a minimum tensile strength of 45kPa as measured according to ASTM D 638 and shall be unaffected by moisture, light, corrosion and extreme temperatures. The valve box shall be sized to accommodate the number of valves grouped in the manifold with allowance for room to service the valves, minimum 75 mm clearance. The valve boxes are to be bolted. Quantity as required; see irrigation construction plan.

14.50 BACKFLOW PREVENTION ASSEMBLY ***(REVISED MAY 2020)***

.1 A Backflow prevention assembly shall be supplied and installed where noted on the irrigation construction drawing. Such devices shall meet or exceed all local ordinances and requirements governing such a cross connection. ***(REVISED MAY 2020)***

.2 A backflow prevention assembly shall be successfully tested in accordance with CSA B64.10.1 after: ***(REVISED MAY 2020)***

(a) installation, ***(REVISED MAY 2020)***
(b) backflow incident, ***(REVISED MAY 2020)***
(c) alteration of the irrigation system, ***(REVISED MAY 2020)***
(d) cleaned, repaired or overhauled, ***(REVISED MAY 2020)***
(e) relocated, ***(REVISED MAY 2020)***
(f) annually, or ***(REVISED MAY 2020)***
(g) as required by the City Engineer. ***(REVISED MAY 2020)***

.3 Testing and certification shall be by a certified BCWWA backflow assembly tester with an active certificate. ***(REVISED MAY 2020)***

.4 Reports on all testing, maintenance and repairs shall be documented on the specified forms and tags by the backflow assembly tester. Tags shall be affixed to the assembly and form submitted to the City Engineer. ***(REVISED MAY 2020)***

.5 Refer to the City of Nanaimo Approved Product List for the backflow prevention assemblies that are acceptable for installation. ***(REVISED MAY 2020)***

14.51 24 VOLT CONTROL WIRING

.1 24-volt electric control lines from controller to automatic valves shall be CSA approved direct burial minimum (#14 AWG TWU-40) wire of a different colour than the 110-volt power to controllers.

.2 Splicing shall be made with water-proof wiring kits.

.3 (a) All wiring to be installed and tested in accordance to the most current B.C. Electrical Code.
(b) All wiring shall be protected by being bundled and taped at 3 m intervals and installed beneath the irrigation line.
(c) All wire splices must be contained in a valve box.
(d) Sufficient extra wire shall be left in each valve box such that the splice may be lifted above grade. Wires shall be neatly coiled.
(e) White wire is only be used as the common wire and all other colours used shall be consistent from valve to controller.

14.52 POWER WIRING

.1 All 110-volt AC wiring shall be installed in accordance Section 10 Roadway Lighting and Traffic Signals.

14.53 GATE VALVES

.1 Gate valves 50 mm or larger shall be in accordance with Section 5.24 – Water Main Valves. Gate valves smaller than 50 mm in size shall be bronze conforming to ASTM B62.

.2 Gate valves or approved quarter turn ball valves shall also be used in any case where a manual drain valve is required.

14.54 QUICK COUPLING VALVES

.1 Quick coupling valves, keys and valve boxes shall be as noted in the irrigation construction drawings.

.2 Internal parts to be removable and with adjustable flow control.

PLANTING

14.55 SCHEDULING AND CO-ORDINATION

.1 Topsoil shall not be handled in a wet or frozen condition or in any manner in which the soil structure is adversely affected.

.2 Plant trees, shrubs, and ground covers only during periods that are normal for such work as determined by local weather conditions, and when seasonal conditions are conductive to successful adaptation of plants to their new location.

14.56 SHIPPING, STORAGE AND ON-SITE HANDLING OF PLANT MATERIALS

.1 Co-ordinate shipping of plants and pre-planting preparation to minimize the time lapse between shipping and planting to ensure a maximum of (36) hours storage of plant material on-site.

.2 Cover any plants not in a state of dormancy to prevent desiccation during transit.

.3 During loading, transportation, off-loading, and planting, protect all trees against damage to stems and branches. Protect bark against chafing from chains, cables, equipment, or other trees by a wrapping of cardboard or burlap. Separate entangled tree branches without damage to branches.

.4 Plants with broken or abraded trunks or major branches will not be accepted. Prune damaged twigs to ISA pruning guidelines using secateurs.

.5 Unload and check all plants immediately upon arrival and water if necessary. Condition of plants should be documented by the contractor.

.6 Immediately cover and protect bare root stock from damage to roots by frost, sun, and wind.

.7 Handle material supplied in pots and containers by the container only to reduce breakage of branches and leaves.

.8 Handle balled and burlapped plant materials with caution to maintain the firmness of the balls. No plants shall be used when the ball of earth surrounding the roots has been cracked or broken preparatory to or during the process of planting, or when the burlap, staves, and ropes required in connection with their transplanting have been removed.

.9 Do not lift trees supplied in wire baskets by the trunk.

.10 Keep plants in a moist condition at all times. Protect all plants against damage and/or drying out until they are planted on the site.

.11 During the growing season, store all plants in containers, balled & burlapped or wire basket in an upright position if not planted immediately and take care to provide enough space between plants such that light reaches all portions of the plant in order to avoid burning when planted out.

.12 Protect rootballs of balled and burlapped material by heeling in with material suitable to protect them from drying out (i.e., sawdust, peat moss, topsoil). Do not store containerized or balled & burlapped plants intended to be planted in the open in a building or in an area of low light intensity for a period exceeding 7 days. Keep all plants well-watered and protected from heat and frost.

.13 Plants shall be acclimatized or "hardened off" against the environmental conditions of their final planting location and shall not be taken directly from shade houses or greenhouses and planted in drastically different environment. Preparation for the new environment should include an appropriate period of storage in an intermediate environment, managing fertilizer applications to avoid excessively lush growth and provision of a graduated watering regime.

14.57 PRE-PLANTING INSPECTIONS

.1 Give 72 hours' notice to the City Engineer for an inspection of plant material at a single plant material assembly point. The City Engineer must give approval of plant material in advance of commencement of planting work.

.2 Acceptance of plant material by the City Engineer at its assembly point does not prevent rejection on-site prior to or after planting operation if, in the opinion of the City Engineer, the plant material has been damaged by the act or omission of the Contractor.

.3 Give 24 hours' prior notice to the City Engineer for each following required inspections:

(a) Prior to commencement of landscape work, give notice to the City Engineer and make the project landscape supervisor available for an on-site inspection of marked locations for planting and as-built conditions and site work by others. The City Engineer may alter the locations of plant materials in the field.
(b) After excavation of plant locations, but prior to placement of sub-soil and installation of plant material, give notice to the City Engineer for inspection of the subgrades.

.4 The City Engineer, at his discretion, may waive one or more of the pre-planting inspections, but this shall not impair the right to reject work or materials which have been damaged or in any way do not conform to the specifications.

14.58 EXCAVATION

.1 The location of all planting pits shall be staked by the Contractor and approved by the City Engineer prior to excavation.

.2 Tree pits, plantation beds and turf areas shall be tested for drainage by the following means: Dig a 250 mm deep by 250 mm wide hole at bottom of pit. Fill with water and allow to drain. Refill hole with water and time rate of fall of water. A rate of fall less than 25 mm (1") per hour indicates inadequate drainage for plant survival and shall be reported to the Engineer, prior to planting. No claim for poor drainage will be accepted after planted has taken place.

.3 Tree planting pits shall be excavated to the dimensions indicated in the drawings. Pit sides wherever possible shall be dug with sloping sides at a preferred angle of 45°, scarified to remove glazing and provide a roughened soil interface. A minimum of 300 mm depth scarified layer of native soil shall be created in the bottom of the tree pit by such means that the layer remains uncompacted prior to the subgrade inspection by the Engineer. Remove all stones larger than 75 mm.

.4 Stockpile excavated soil near tree pit for use, if deemed suitable by testing of the soil testing laboratory.

.5 Shrub beds shall be excavated to allow for a total of:

(a) 300 mm layer of un-amended topsoil
(b) 150 mm layer of 'A' horizon soil mix or as listed within Section 14.58.8, whichever is the greater depth.
(c) 50 mm layer of bark mulch.

.6 Areas of ground covers shall be excavated to allow for a total of:

(a) 150 mm layer of un-amended topsoil.
(b) 150 mm layer of 'A' horizon soil mix or as listed within Section 14.58.8, whichever is the greater depth.
(c) 50 mm layer of bark mulch.

.7 A minimum 150 mm depth scarified layer of native soil shall be created in the bottoms of shrub or groundcover planting pits by such means that the layer remains uncompacted prior to the subgrade inspection by the City Engineer.

.8 Minimum depths of growing medium shall be in accordance to the British Columbia Landscaping Standards as followed:

	A	B	C
Application	Over prepared subgrade which retains some existing topsoil (which retains the "A" horizon)*	Over prepared subgrade where the subsoil drains rapidly	Over structures or where the subsoil drains poorly
Low Traffic Lawn Areas:			
Irrigated	100 mm (4 in)	150 mm (6 in)	150 mm (6 in)
Not Irrigated	100 mm (4 in)	150 mm (6 in)	230 mm (9 in)
High Traffic Lawn Areas	100 mm (4 in)	150 mm (6 in)	
Planting Areas and Planters:			
Ground cover areas	150 mm (6 in)	300 mm (12 in)	230 mm (9 in)
Shall shrubs	300 mm (12 in)	450 mm (18 in)	300-500 mm (12-20 in)
Large shrubs	450 mm (18 in)	600 mm (24 in)	500-900 mm (20-36 in)
Tree Planting Areas:			
At each tree	1000 mm (40 in) deep for as large an area as 500-900 mm (20-36 in) possible around each tree. Recommended area 10 m^2 (108ft^2) or greater. The soil volume should reflect the severity of compaction and grading at the planting site.		
*The combined depth of the existing topsoil and the new growing medium shall meet the minimum depth requirements shown in column B and C.			

14.59 TREE PLANTING

.1 The Contract shall examine the sub-grade before planting, and shall report any conditions of defects on-site which may adversely affect the performance of this section of the work to the Engineer prior to placing topsoil mix.

.2 Root deflecting barrier shall only be installed when and as indicated on the construction drawings.

.3 Soils to be placed in dry weather over relatively dry, approved, free-draining subgrade.

.4 Roughen bottom and sloping side surfaces of tree pit to remove glazing and provide a roughened soil interface prior to placement of tree and subsoil. Adjust elevation under where tree is to be placed so that the nursery soil line on the tree trunk will be 50 mm above finish grade to allow for settlement.

.5 Remove the wire basket before placement in planting pit. With the tree in the planting pit untie and remove burlap and cord from top 1/3 portion of a balled & burlapped rootball. Completely remove, with care, imperishable containers from container-grown or bag –grown trees. ***(REVISED MAY 2020)***

.6 Prior to backfilling, the Contractor shall inspect the root system. Trees with the following defects shall be replaced at the Contractor's expense:

(a) Lack of root ball integrity,
(b) Broken or abraded structural or main roots,
(c) Presence of fungal mass or fruiting bodies and root discolouration,
(d) Poor root development with few fibrous roots, or
(e) Any other evidence of pathogenic or accidental injury.

.7 Unwrap and spread out encircling roots and tease out roots growing at the outside of the rootball.

.8 The tree shall be installed plumb and face to provide the best appearance toward the primary viewing location, as determined by the City Engineer.

.9 Place 2/3 depth of the sub-soil and water to remove air voids.

.10 If indicated in the construction drawings, and prior to completion of backfilling, place tree stakes, avoiding penetration of the root system. Stakes shall be driven plumb and to a sufficient depth in the subgrade that the portion exposed above finish grade equals 1 m height.

.11 Place remaining 1/3 of sub-soil lightly boot tamping to remove air voids. Roughen surface prior to placement of 'A' horizon soil mix.

.12 Place 150 mm depth unamended topsoil then thoroughly till in all amendments specified in the soil analysis report to form the 'A' horizon. The Contractor shall not machine cultivate the soil above the root zone of the tree.

.13 Ensure soil level does not exceed original nursery soil line. Form earth saucer to retain water over rootball and water in the tree.

.14 Secure tree to stakes with counter-tensioned, non-twisted loops of 19 mm polypropylene webbing stapled to the stakes, if required.

.15 Unless otherwise indicated in the construction drawings, place 75 mm bark mulch over soil surface.

.16 Tree grate installation shall be as per the manufacturer's specifications. Refer to Standard Drawing P-6.

14.60 RIPARIAN AND RESTORATION PLANTING ***(REVISED MAY 2020)***

.1 Shrub beds shall be a total of:

(a) 300 mm layer of un-amended topsoil as specified in Section 14.16
(b) 150 mm layer of 'A' horizon soil mix as specified in Section 14.18 or as listed within Section 14.58.8, whichever is the greater depth.
(c) 50 mm layer of bark mulch.

.2 Areas of ground covers shall be a total of:

(a) 150 mm layer of un-amended topsoil as specified in Section 14.16
(b) 150 mm layer of 'A' horizon soil mix as specified in Section 14.18 or as listed within Section 14.58.8, whichever is the greater depth.
(c) 50 mm layer of bark mulch.

.3 Compact unamended topsoil in shrub and groundcover beds to no greater than 80% of corrected maximum dry density. Roughen surface prior to placement or 'A horizon' soil mix.

.4 For the 'A' horizon mix, place an additional 150 mm lift of unamended topsoil over soil depths indicated in Section 14.60.1 or .2, then thoroughly till in all amendments specified in the soil analysis report. Lime, if required, may be added to the topsoil mix at the time of topsoil spreading. All other required fertilizers shall be added to the topsoil mix after it is in place. There should be at least one week between the time of applications of lime and other types of fertilizer. Fertilizer shall be spread with a suitable mechanical spreader and be fully incorporated into the topsoil mix to a minimum depth of 150 mm.

.5 Excavate individual pits in the placed topsoil mix for shrubs, to the same depth, and 1.5 times the width, of the container. Place shrubs to show the best side towards the primary viewpoint. Water shrubs in the pits prior to backfilling with the planting medium.

.6 Rake shrub and ground cover beds to a smooth surface prior to placement of 50 mm depth bark mulch layer.

.7 Plant ground covers through bark mulch layer into the 'A' horizon layer below. The Contractor shall not plant ground covers into the mulch layer without full root burial in the soil.

.8 Rake mulch layer to a smooth finish grade and water bed.

14.61 PRUNING

.1 Trees which, at the time of planting, require the removal of damaged or diseased branches larger than 12 mm diameter, that have broken leaders, or that have a damaged trunk, will be rejected by the City Engineer.

.2 Pruning shall be limited to the minimum necessary to remove dead or damaged secondary branches or twigs, or to provide safe headroom adjacent to streets and sidewalks. Pruning shall be done in such a manner as to preserve the natural character of the plant.

.3 For pruning cuts 12 mm diameter and smaller use clean sharp secateurs. The cut shall be perpendicular to the branch angle and located at the outside edge of the branch collar only, leaving no stub or bark tears.

.4 Pruning cuts larger than 12 mm shall be undertaken according to the current ISA Pruning Guidelines by a qualified person. The 3-cut method shall be employed using a clean sharp pruning saw.

14.62 CUTTING, SHIPPING, AND ON-SITE HANDLING OF SOD

.1 Sod shall be in pieces approximately 0.84 sq. m. in area with the soil portion having a minimum depth of 19 mm.

.2 Co-ordinate shipping of sod to minimize the time lapse between shipping and laying. Co-ordinate with soil placement accordingly.

.3 During transportation protect sod against drying.

.4 Sod shall be installed 24 hours after delivery and within 36 hours of harvesting. Keep sod moist and cool if in the event of any delay in laying. The supplier shall provide, upon request, a label or statement certifying the quality grade, location of sod source and species of grass in the sod and that the sod meets the specifications for the stated grade.

.5 During dry weather, water sod as necessary to ensure its vitality and prevent soil and root loss during handling.

.6 During wet weather allow sod to dry sufficiently to prevent tearing during lifted and handling.

.7 Roll or fold all sod prior to handling to avoid tearing or breakage.

.8 Sod shall have a fibrous root system strong enough that a standard sized section can support its own weight without damage or tearing when suspended vertically by holding up the upper two corners.

.9 Turfgrass sod shall not be harvested or transplanted when excessive moisture or dryness will result in damage to, or failure of the sod.

.10 The height of the grass in the sod at the time of harvesting shall be between 40 mm (1.15 in) and 60 mm (2.5 in), except where otherwise specified.

.11 Turfgrass sod shall be reasonable free from thatch. Up to 13 mm (0.5 in) of thatch (uncompressed) is acceptable. Commercial grade is exempt.

.12 Turfgrass sod shall be free from visible diseases, detrimental fungi and damaging nematodes and soil-born insects, to the extent that with proper installation methods and initial maintenance, new turf will not deteriorate due to such causes.

.13 All turfgrass sod shall be absolutely free from plants designated as noxious weeds, as per Section 14.28.7. Nursery turfgrass sod shall be free of broadleaf weeds, invasive species and undesirable grasses to the extent required for each quality grade. Field turfgrass sod shall not contain more than ten (10) weeds per 10 m^2 (100 ft^2).

.14 Sod shall not be dropped or dumped from vehicles.

.15 Sodded areas shall be protected with warning signs during rooting and the initial maintenance period.

14.63 SOD SCHEDULING AND WORKMANSHIP

.1 Keep site well drained.

.2 Do not lay sod during freezing temperatures or when the ground is frozen.

.3 Sod placed between May 15 and September 15 shall require installation of any automatic irrigation system.

.4 Clean up immediately soil or debris spilled onto pavement and dispose of deleterious materials.

14.64 LAYING OF SOD

.1 Excavate and/or fill and prepare subgrade to a sufficient depth below finish grade to accommodate 150 min. topsoil plus the thickness of the sod.

.2 Scarify top 75 mm surface of subgrade to produce an even loose-textured surface free of stones larger than 75 mm. Remove and dispose of all roots and branches, and all plant parts of blackberry, horsetail, morning glory, Canada thistle or other noxious weeds. Remove and dispose of all paving materials, tar, building materials or other deleterious substances.

.3 The Contractor shall inform the City Engineer of any existing sub-grade conditions which will adversely affect the work in this section.

.4 The finished sub-grade shall be approved by the City Engineer prior to placement of topsoil.

.5 Topsoil shall not be placed when in a wet or frozen condition.

.6 Spread topsoil evenly over the approved sub-grade to a minimum depth of 150 mm and compacted to maximum 85% modified dry density.

.7 Where the soil analysis indicates the addition of granulated lime it shall be incorporated into the soil at the depth and rate specified by the soil testing laboratory at least 3 week prior to the application of the fertilizer.

.8 A turf starter fertilizer, as specified by the soil testing laboratory, shall be incorporated into the soil, at the depth and rate specified, a minimum of 48 hours prior to the laying of sod.

.9 Immediately prior to sod placement, the finished topsoil grade shall be smooth, firm against footprints, with a fine loose-texture.

.10 Lay sod in rows, perpendicular to slope, smooth and even with adjacent areas and surfaces, and with joints staggered. Butt sections closely without overlapping or leaving open joints between pieces.

.11 Water immediately after sod laying to obtain moisture penetration through sod into top 100 mm (4 in) of topsoil mix.

.12 When sod and soil has dried sufficiently to prevent damage, provide close contact between sod and soil by means of a 150 kg roller. Heavy rolling to correct irregularities in grade is not acceptable.

.13 Provide adequate marking of sodded areas with warning signs, to be removed by the Contractor when sodding work has given a Notice of Acceptance.

14.65 SODDING INSPECTIONS

.1 Give 24 hours prior notice to the City Engineer for each following required inspection:

(a) After excavation and preparation of the subgrade but prior to placement of topsoil give notice to the City Engineer for inspection of the subgrades.
(b) Notify the City Engineer when the sod is established for an inspection for acceptance.

14.66 SHIPPING, AND ON-SITE HANDLING OF SEED

.1 Deliver and store grass seed in original container showing:

(a) Analysis of seed mixture and % of pure seed.
(b) Year of production and date and location when tagged.
(c) Net Mass.
(d) Percentage germination.
(e) Name and address of distributor.

.2 All seeds to be stored in dry, weatherproof storage places and are to be protected from damage by heat, moisture, rodents or other causes until time of seeding.

14.67 SEEDING SCHEDULE AND WORKMANSHIP

.1 Seed grass and/or wildflower mix during early spring or after the 15th of August to within two weeks of freeze-up.

.2 Keep site well drained.

.3 Perform work under optimum field conditions. Do not undertake seeding operation under adverse conditions including moisture, temperature, wind or scheduling related work.

.4 Clean up immediately soil or debris spilled onto pavement and dispose of deleterious materials.

14.68 SEEDING

.1 Apply seed by Mechanical Dry Seeding method or Hydraulic Seeding method unless otherwise specified. Hand seeding shall only be carried out when site conditions preclude the above methods and must be approved by the City Engineer.

.2 Base application rates of fertilizers, seed mix, mulch and tackifier on analysis of season, climate, terrain, soil, and establishment and maintenance conditions affecting project.

14.69 MECHANICAL DRY SEEDING

.1 Excavate or fill and grade smooth subgrade to within 150 mm of finish grade in areas to be seeded with fine grass. Removed all deleterious and refuse materials. Place 150 mm depth topsoil and fine grade removing humps and hollows. Rough grass/wildflower areas shall be seeded on the native sub-soil graded for drainage, and free of surface rocks and all deleterious materials.

.2 Obtain Engineer's approval of topsoil grade and depth before starting seeding.

.3 Sow during calm weather (winds less than 6 mph) using equipment suitable for the area involved to the approval of the City Engineer. Sow half of the required seed in one direction and the remainder at right angles. Incorporate the seed into the soil a minimum depth of 6 mm simultaneously or within one half hour after seeding operation. Mix carefully with light chain harrow or wire rake and roll area immediately afterward with water ballast type lawn or agricultural type roller.

.4 Water with fine spray, avoiding washing out seed. Apply enough water to ensure penetration to a minimum of 50 mm (2").

.5 Re-seed at 2 week intervals where germination has failed.

SECTION 14 – LANDSCAPE INSTALLATION

14.70 HYDROSEEDING

.1 Do not hydroseed fine grass areas without pre-approval from the City Engineer.

.2 Thoroughly mix seed, fertilizer and hydraulic mulch in water slurry and distribute normally over surface area with approved hydraulic mulcher.

.3 Measure quantities of each material to be charged into hydraulic seeder/mulch tank accurately either by mass or by common accepted system of mass-calibrated volume measurements. Add materials to tank while it is being filled with water and in following sequence: seed, fertilizer, and where applicable, mulch. Thoroughly mix materials into homogeneous water slurry and distribute uniformly over surface area with hydraulic seeder/mulcher.

.4 Keep seeds for legumes in separate containers prior to seeding. If required, add legume seeds with standard product humus culture before mixing with grass/wildflower seed. Protect inoculated seed from exposure to sunlight for periods of over one-half hour. Use seed within eight hours from inoculation or to be re-inoculated.

.5 After charging, do not add water or other materials to mixture in hydraulic mulcher.

.6 Do not leave seed, fertilizer, mulch and water slurry in tank for more than 4 hours. Slurry left in tank over maximum time to not be used for seeding, dispose off-site.

14.71 HYDROSEEDING WITH MULCH

.1 Prepare area to be seeded. Seed wildflower/grasses and 25% of fibre mulch on the first pass, then seed the balance of mulch on the second pass.

14.72 EROSION CONTROL BLANKET

.1 Prepare area and seed.

.2 Apply blanket over designated areas in accordance with manufacturer's instructions.

.3 Anchor blanket in accordance with manufacturer's recommendations which are to be used as minimum standard to ensure that blanket is held down to maintain firm contact.

14.72A STRUCTURAL SOILS COMPOSITES ***(REVISED MAY 2020)***

.1 Structural soils shall be used with the approval of the City Engineer.

SECTION 14 – LANDSCAPE INSTALLATION

IRRIGATION

14.73 EXISTING CONDITIONS

.1 Ensure that existing site features and improvement areas are disturbed as little as possible. Protect existing vegetation throughout installation and do not damage root systems. Return all areas to prior conditions immediately after irrigation installation and testing.

.2 Prior to excavation, the Contractor shall satisfy himself as to the finished grade elevations and density of compaction in existing lawn and planting areas, to ensure restoration of disturbed areas to grades and compaction matching existing.

.3 Existing sod removed to accommodate irrigation installation shall be preserved in a healthy condition and replace subsequent to installation and backfilling, or replaced with new sod.

.4 Notify Engineer if trenching is required through paved areas. The Contractor shall saw-cut and remove paving to the width of the trench. Removal and replacement of paving to match existing shall be the responsibility of the Contractor.

.5 Where trenching for piping or wiring is required through paved roadway areas, provide 150 mm ID SDR 35 sleeve with minimum 600 mm depth cover. Extend sleeve minimum 300 mm into soft landscape areas.

14.74 DELIVERY AND STORAGE

.1 Shipping and handling and installation of materials shall be to manufacturer's recommended instructions, and best workmanship. Particular care shall be taken to avoid scratches and nicks on the plastic pipe. Pipe must be properly stacked and stored in a clean place on the site, keeping dirt out of the pipe at all times.

14.75 WORKMANSHIP

.1 Lay out work as accurately as possible to the construction drawings. Install swing joints, offsets and all fittings to bring the pipe and heads to the locations shown.

.2 If shop drawings or field adjustments to the design are made, the Contractor shall be responsible for full and complete irrigation distribution, and coverage of all irrigated areas and to add any changes made to the as-built drawings.

14.76 EXCAVATION AND TRENCHING

.1 All trenching and backfilling to be in accordance with Section 4 – Trench Excavation, Trenching, and Backfill, and in addition:

(a) Excavated materials shall be carefully place adjacent to the trench in separate piles to avoid contamination of topsoil and excavated materials.

(b) Perform all excavations as required for the installation of the work included under this section, including shoring or earth banks to prevent cave-ins. Restore all surfaces, existing underground installations, etc., damaged or cut as a result of the excavations to their original condition and in a manner approved by the City Engineer.

(c) Excavations through existing landscape areas shall be carried out such that adjacent areas are not contaminated with excavated materials. Backfilling and replacement of topsoil shall be performed in accordance with the specifications such that all existing planting areas are restored to their original condition.

(d) Trenches shall be made wide enough to allow a minimum of 50 mm between parallel pipelines. Trenches for pipelines shall be made of sufficient depths to provide the minimum cover from finish grade as follows:

(i) 45 mm minimum cover over main lines
(ii) 300 mm minimum cover over lateral lines to heads.
(iii) 100 mm minimum over drip lines

.2 Maintain all warning signs, barricades and other safety devices in accordance with the Section 3 – General Requirements.

14.77 WATER AND ELECTRICAL SERVICE CONNECTION

.1 Water Service Connection shall be in accordance with Section 5 – Water Distribution System, and as shown on the construction drawings.

.2 Contractor shall have a qualified Electrician connect the controllers to the electrical supply.

14.78 PIPELINE ASSEMBLY AND INSTALLATION

.1 Do not drag pipe along ground whether single lengths of assembled sections. Damaged pipe shall be rejected and replaced by new pipe and couplings.

.2 Keep pipes clean at all times, blow out with compressed air or water on completion of assembly.

.3 Plastic pipe shall be laid on sand to a compacted depth of 75 mm. A further 75 mm depth of sand shall be placed over plastic pipe prior to backfilling.

.4 Plastic pipe and fittings shall be solvent welded using solvents and methods as recommended by manufacturer of the pipe, except where threaded connections are required. Pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before applying solvent with a non-synthetic bristle brush. All PVC pipe shall be installed in accordance to Section 5.0 – Water Distribution System.

.5 Pip may be assembled and welded on the surface. Snake pipe slightly from side to side to allow for expansion and contraction.

.6 No irrigation line shall be installed so that it runs parallel and directly over another such line or utility.

.7 Leave minimum clearance 50 mm between irrigation lines laid in a common trench.

.8 Make all connections between plastic pipe and metal valves with threaded fittings using plastic male adapters.

(a) Screw fittings shall be carefully tightened with strap wrenches or by other means that do not mark the plastic pipe or plastic fittings.
(b) Pipe wrenches shall not be used on plastic fittings, unless the fittings are a type designed for use with a pipe wrench. Use teflon tape on all threaded fittings.

14.79 VALVES AND CONTROL WIRING

.1 Install valve boxes such that top of structure is at finished grade, accessible for maintenance, in accordance with Section 5 – Water Distribution System.

.2 24-volt wiring of valves to controller shall be undertaken by a certified low energy systems tradesman.

.3 All 24-volt wiring shall be a different colour than the 110-volt power to controller and shall be buried a minimum of 300 mm as per the amended B.C. Electrical Code.

.4 Coil additional 600 mm length of each electrical wire within valve box as extra material.

.5 Splicing shall be minimized. Splices are to be made waterproof with the use of water-proof wiring kits and installed in a valve box as per Standard Drawing No. I-1.

14.80 SPRINKLER HEADS

.1 Install all sprinklers according to manufacturer's specifications.

14.81 CLOSING OF PIPE AND FLUSHING LINES

.1 Cap or plug all openings as soon as lines have been installed to prevent the entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.

.2 Thoroughly flush out all water lines before installing heads, valves and other hydrants.

.3 Test in accordance with Section 14.83 – Backfill and Compacting.

.4 Upon completion of the testing, the Contractor shall complete assembly and adjust sprinkler heads for proper distribution.

14.82 HYDROSTATIC TESTS

.1 Request the presence of the City Engineer at least 48 hours in advance of testing.

.2 Testing to be accomplished at the expense of the Contractor and in the presence of the City Engineer.

.3 Center load piping with small amount of backfill to prevent arching or slipping under pressure.

.4 After welded plastic joints have cured at least 24 hours, fill test section with water and expel all air and cap risers for an additional 24 hours prior to testing. Contractor shall pre-test the circuits, and call the City Engineer for a supervised test once the circuits to be demonstrated meet the test requirements. Contractor shall supply and temporarily install, until tests are approved, a pressure gauge and hose bib to each main and circuit to be tested. Tests to be conducted at 1.5 times the maximum operating pressure (continuous and static water pressure) in the presence of the City Engineer as follows:

(a) Main lines and sub-mains to be tested for 1 hour.
(b) Lateral lines to be tested for 15 minutes.
(c) Pressure loss on the pressure gauge shall not exceed 10% of the test pressure in the time period of the test.

.5 Repair leaks resulting from tests by cutting out and replacing pipe or fittings. Leaks shall not be repaired by patching. Maintain test pressure for a minimum of one hour after replacement of defective parts and re-inspect as per Section 14.83 – Backfill and Compacting, clause 14.83.4.

.6 After approval by the City Engineer, backfill excavations, maintaining pressure in the lines. If there is any indication of a leak, the defective section shall be located and replaced. Flush out the system to remove dirt and then attach the sprinklers using a thread seal tape (PTFE tape).

14.83 BACKFILL COMPACTING

.1 After system is operating and required tests and inspection have been made, backfill excavations and trenches.

.2 All sprinkler head excavations shall be backfilled with sand or topsoil up to within 50 mm of finish grade.

.3 Trenches to be backfilled in accordance with Section 4 – Trench Excavation, Bedding, and Backfill.

.4 Ensure that existing lawn and planting areas are disturbed as little as possible.

.5 Dress off all areas to finish grades.

14.84 CLEAN-UP

.1 Remove from the site all debris and surplus material resulting from work of this section.

14.85 BALANCING AND ADJUSTMENTS

.1 Balance and adjust all components of the system to achieve the most efficient system operation. Balancing and adjustment to include synchronization of controllers and soil moisture sensors, adjustments to pressure regulators, pressure relief valves, sprinkler heads and individual station adjustments on controllers.

.2 Lawn sprinkler heads shall be set flush with the final turf grade by shortening or lengthening the riser as required. During the maintenance period, return and adjust the heads as required to be flush with the final turf grade.

14.86 DRIP COMPONENTS

.1 Install according to the manufacturers' specifications.

.2 Keep pipe ends and components absolutely clean during installation.

.3 Check and clean filter one week after system start-up. Check and clean filter monthly thereafter during the operating season of the maintenance period.

LANDSCAPE MAINTENANCE

14.87 SCOPE

.1 The area of maintenance operations will be all constructed or altered landscape areas in this Contract.

.2 Landscape maintenance operations shall meet the "Moderate" Maintenance Level in accordance with the BC Landscape Standard, 2008 Edition, unless otherwise specified herein or subject to a separate agreement.

Moderate Maintenance Level Definition (from BC Landscape Standard, 2008 Edition)	
Objectives	Main objective is a generally neat, moderately groomed appearance, with some tolerance for the effects of "wear and tear," moderate traffic and natural processes.
Appearance Standard	Plants and lawns are healthy, lawns kept within accepted height range for type; invasive plants, with the exception of listed noxious weeks and debris are acceptable within limits between regular visits. Invasive and noxious weeds shall be eradicated. Seasonal plantings in good condition and attractive at appropriate seasons.
Typical Locations	• Most residential, commercial and institutional sites, especially those of medium to large size • Publicly visible portions of industrial sites • Areas for occasional recreational use • Areas viewed from a medium distance
Plant Characteristics	Areas may include some native or naturalized planting; this may be modified for appearance or moderately intensive use.
Traffic Activity Levels	Moderate traffic tolerated; minor deterioration due to traffic is acceptable. Maintenance may include adjustments in response to such "wear and tear".
Maintenance Practices	Routine maintenance of moderate frequency and intensity, with regular monitoring to avoid serious deterioration.

.3 Litter control and garbage pick-up, other than construction clean-up during and after work performed in this Contract, will be supplied by others, or will be subject to a separate agreement.

.4 The maintenance period shall be from the time of planting until the end of the specified maintenance period (minimum two years) from the date of Notice of Acceptance of the landscape works or at the discretion of the City Engineer, or will be subject to a separate agreement. ***(REVISED MAY 2020)***

.5 Maintenance operations for trees, shrubs and ground covers shall occur once per month from April to October, throughout the specified maintenance period and shall include: ***(REVISED MAY 2020)***

(a) Watering, weeding, pest and disease control, remedial pruning;
(b) Plant replacements as required;
(c) Supplemental fertilization as specified by the soil testing laboratory;
(d) Spring and fall clean-up;
(e) Planting beds shall be maintained to be weed-free.

.6 Maintenance operations for sodded and seeded lawn/fine grass areas shall include: watering, mowing, weeding, topdressing and reseeding as required to meet conditions set out in 14.99, throughout the maintenance and guarantee period.

.7 Maintenance operations for rough grass, nurse crop, and wildflower areas shall include: mowing, weeding, topdressing and reseeding as required to meet conditions set out in 14.100 and 14.101, throughout the maintenance and guarantee period.

.8 Maintenance operations for irrigation system shall include: monitoring and adjustment of system, repair as necessary, and winterization and spring startup of the system.

.9 Maintenance operations should, where possible, follow ecologically sound practices such as:

(a) Integrated Pest Management (IPM)
(b) Plant Health Care (PHC)
(c) Composting
(d) Application of Organic Mulches

14.88 REFERENCE STANDARDS

.1 Refer to Section 14.12 for reference standards for landscape maintenance.

14.89 QUALIFICATIONS AND WORKMANSHIP

.1 A qualified professional, for this Section, refers to any individual who is trained as and is certified and recognized, such as:

(a) Diploma in Horticulture
(b) Landscape Horticultural Journeyperson with a Certificate of Qualification by the Industry Training Authority of BC
(c) ISA Certified Arborist

.2 All landscape maintenance personnel shall be skilled in the tasks assigned to them.

.3 Supervisors for landscape crews shall be qualified professionals.

.4 Pesticide handling and application shall be done only be applicators holding current certification within the comprehensive pest management system.

SECTION 14 – LANDSCAPE
LANDSCAPE MAINTENANCE

14.90 PROTECTION

.1 All existing and new plants, site services, curbs, paving, structures, finishes and all other features shall be protected against damage during the work, refer to Section 3.0 of these specifications.

.2 Appropriate measures shall be taken to ensure that no spillage of fuels, fertilizers, toxic construction materials, or other toxic wastes occurs, and where use of such materials is necessary, to ensure that adequate containment facilities and clean-up equipment are utilized.

.3 No toxic or waste materials, fuels and fertilizers shall be stored adjacent to or dumped into water courses or any other water body either on or off the job site, or in a location where spillage could result in seepage into a watercourse.

.4 All toxic wastes and other material shall be disposed of in a manner acceptable to the Owner and in accordance with municipal, provincial and federal regulations.

.5 Appropriate measures shall be taken to ensure that wildlife protection is achieved in accordance with municipal, provincial and federal regulations. ***(REVISED MAY 2020)***

14.91 HANDLING AND STORAGE OF CHEMICALS

.1 Chemicals used during the course of maintenance procedures shall be limited to those that are registered and meet all federal, provincial and regional/municipal regulations and bylaws.

.2 Application, disposal and handling of all chemicals including, but not limited to, herbicides, pesticides, fungicides, and insecticides shall comply to all applicable legislation and regulations, including, but not limited to, the federal Pest Control Products Act, Fisheries Act and Food and Drugs Act; and the provincial Integrated Pest Management Act, Wildlife Act, Weed Control Act, Plant Protection Act and Waste Management Act, the City of Nanaimo Pesticide Use Bylaw 7102 as well as any municipal or regional district legislation.

14.92 VANDALISM

.1 The Contractor shall be responsible for all loss and damage whatsoever which may occur on or to the works, completed or otherwise, until such time as the entire works have been completed and the Notice of Acceptance has been issued.

14.93 END OF MAINTENANCE PERIOD

.1 Notify the City Engineer, 30 days in advance of the end of the maintenance period.

14.94 PRODUCTS AND MATERIALS

.1 Products and materials used in landscape maintenance operations shall meet the requirements of the specifications and referenced standards.

14.95 EQUIPMENT

.1 The Contractor shall supply all equipment, materials, and all other supplies necessary to maintain the Contract landscape area.

.2 Equipment shall be suited to the work at hand, and shall be in good condition. Mowers shall have clean, sharp blades. Safety devices shall be in place and functioning to Workers' Compensation Board requirements.

.3 Pruning equipment shall be kept sharp and sterile to prevent the spread of plant diseases.

.4 Equipment shall be such that the risk of spillage, inadvertent spraying or miss-direction of oil, gasoline, fertilizer or other chemicals is minimized.

.5 Spray equipment shall be of a type which can be adjusted with respect to spray pattern and application rate. Do not use air blast, mist, or fog sprayers. Hose mounted sprayers shall be equipped with a check valve rated for the prevention of backflow, to be located within 1 m of the water source shut off valve.

14.96 WATER

.1 Water supply other than irrigation system will be the responsibility of the Contractor or subject to separate agreement.

.2 Base cost of this work on hand watering as required, and supplemental to the irrigation system if one is supplied, or in cases of breakdown.

.3 Supply all equipment such as pumps, hose, portable sprinklers, tank trucks, etc. if required for watering operations.

.4 Water used for landscape maintenance shall be free from organic or chemical contaminants detrimental to healthy plant growth.

14.97 SCHEDULING

.1 Schedule operations to the type of plant materials being maintained, the intensity and pattern of use of the site, and the seasonal weather patterns.

.2 Adjust maintenance frequency and intensity to the weather patterns of the particular year.

.3 Schedule watering operations to meet the following criteria:

(a) To provide water just prior to, or during, early daylight hours for maximum plant uptake,
(b) To not impede the use of sidewalks or other paved areas during daylight hours, and
(c) In accordance with any watering restrictions in effect at the time.

14.98 TREES, SHRUBS AND GROUND COVERS

.1 The Contractor shall undertake the following maintenance operations, once per month, from April to October, for trees shrubs and ground covers for the duration of the maintenance period: ***(REVISED MAY 2020)***

(a) Monitor all plants at least once per month during the growing season for pest and disease signs: to ensure prompt treatment, minimum damage, and to minimize treatment intensity. Where the application of a pesticide is warranted, notify the City Engineer prior to treatment.

(b) The Contractor shall be required to compensate the Owner for damage caused to non-target plants from the misapplication of herbicides.

(c) The Contractor shall immediately notify the City Engineer, of any major insect, fungal or other pathogenic infestation or disease which will adversely affect the health of the plant materials. If, in the opinion of the Engineer and the City Engineer, the condition cannot be remedied prior to Acceptance, the affected plant materials shall be replaced by the Contractor, at no cost to the Owner.

(d) Provide adequate water during the growing season to ensure healthy turgid growth. During the period from April 15 to September 15, the combined weekly total of natural precipitation and irrigation or water supplied by the Contractor shall be not less than the equivalent of 38 mm of precipitation.

(e) Maintain the mulched areas of shrub and ground cover beds, and at the bases of trees, in a clean, uncompacted, weed-free and grass-free condition. Ensure the total removal of all root parts of weeds. Do not mechanically cultivate over the root zone of any plant material.

(f) Maintain areas to be free of invasive and noxious species. ***(REVISED MAY 2020)***

(g) Remove fallen leaves, twigs and trimmings in a timely fashion to prevent rot, damage to the surrounding landscape, impeded area drainage, or public inconvenience.

(h) Pruning shall only be undertaken in accordance with 14.61. Except as indicated below, or as recommended for a particular species in the technical horticultural literature, prune plant materials during the late autumn after leaf drop or in early spring prior to bud break. Prune trees of the following genus' in autumn only: Betula, Cladastris, Laburnum, Liriodendron, Magnolia. Prune shrubs which bloom on the previous year's grown, shortly after blooming.

(i) Do not fertilize trees planted in the spring until the following spring. Do not fertilize trees planted in the summer or fall until the following spring. Apply only a controlled release complete fertilizer, at the rate recommended by the soil testing laboratory.

(j) Fertilize shrub and ground cover beds with a complete slow release fertilizer in accordance with the recommendations of the soil testing laboratory.

(k) Trees which are staked shall be inspected periodically for state of repair, correct tensioning and for signs of stem abrasion or constriction. Unless otherwise instructed by the City Engineer, the stake shall be removed by the Contractor prior to, and as a condition of, final payment at the end of the maintenance period.

14.99 FINE GRASS AREAS

.1 Maintain fine grass areas to the 'Moderate' standard set out in the BC Landscape Standard 2008 Edition.

.2 Provide sufficient water to keep the sod root zone moist until firmly rooted.

.3 If area was seeded, keep soil moist during germination period and adequately water grassed areas until accepted by the City Engineer. Apply water to ensure moisture penetration 75 mm to 100 mm. Control water to prevent washouts. Seeded areas to be adequately protected with warning signs, temporary wire or twine fences, or other necessary means.

.4 Subsequent to rooting, program irrigation to provide alternate day watering for a total weekly precipitation rate of 38 mm during the growing season.

.5 Topdress and reseed areas which are dead or bare and keep moist until fully established. Use a seed mix that matched the varieties found in the sod or original seed mix.

.6 Weeding must be done when isolated small weed patches (no greater than 4 patches per 5 sq. m) have a width of 150 mm. Weeding (mechanical or chemical) shall kill or remove 90% of weeds or the process shall be repeated within the next two site visits.

.7 Mow at a time and frequency required to maintain the lawn at a height between 62 mm and 38 mm.

.8 Remove and dispose of clippings at each mowing.

.9 At each mowing, trim grass at interface with all non-turf elements such as curbs, pavement surfaces, walls, mulched areas beneath trees, and shrub beds. Do not allow the line of a string trimmer to come into contact with any plant material other than the sod.

.10 Using a sharp edging tool, vertically cut an edge at the perimeter of all shrub beds and mulched areas under trees, three times during the growing season.

.11 Fertilize sod in accordance with the recommendations of the soil testing laboratory at the prescribed interval and rate, and with the type of fertilizer appropriate to the stage of the growing season. Fertilize a minimum of twice during the growing season.

.12 Fertilizer shall be spread with a mechanical spreader that can be calibrated for an even application of fertilizer at a controlled rate.

14.100 ROUGH GRASS AND WILDFLOWER

.1 Mow rough grass once every thirty days. Mow to maximum height of 100 mm. Wildflower mixes to be mowed once in the spring to a height of 150 mm.

.2 Maintain areas to be free of invasive and noxious species. ***(REVISED MAY 2020)***

.3 Refer to Section 14.28 for specifications.

14.101 NURSE CROPS

.1 Mow crop once every 30 days. Mow to a maximum height of 150 mm.

.2 Cut crop prior to going to seed to ensure the annual species do not reseed.

14.102 IRRIGATION SYSTEM

.1 Maintenance of the irrigation system shall include:

(a) Monitoring of the irrigation controller functioning and scheduling;
(b) Adjustment of risers and nozzles for the designed coverage;
(c) Monitoring and cleaning of drip filters and emitters;
(d) Repair or replacement of defective or damaged components; and
(e) Winterization of the system at the end of the growing season, and spring startup.

.2 Winterization shall include flushing, draining, and shut-off of all system components.

.3 Spring startup shall include backflow prevention assembly device field testing/documentation/tagging and submittal, filter cleaning, system charging, monitoring and adjustments. ***(REVISED MAY 2020)***