CITY OF KELOWNA

BYLAW NO. 10481

Amendment No. 14 to Subdivision, Development and Servicing Bylaw No. 7900

A bylaw to amend the "City of Kelowna Subdivision, Development and Servicing Bylaw No. 7900".

The Municipal Council of the City of Kelowna, in open meeting assembled, enacts that City of Kelowna Subdivision, Development and Servicing Bylaw No. 7900 be amended as follows:

1. THAT the Title page of **SCHEDULE 4 OF BYLAW NO. 7900 CITY OF KELOWNA DESIGN STANDARDS** be deleted in its entirety and replaced with a new Title page of **SCHEDULE 4 OF BYLAW NO. 7900 CITY OF KELOWNA DESIGN STANDARDS** as outlined in Schedule "A" attached to and forming part of this bylaw;

2. AND THAT **SCHEDULE 4 OF BYLAW NO. 7900 CITY OF KELOWNA DESIGN STANDARDS** be amended by adding new sub-sections **6A – LANDSCAPE AND IRRIGATION WATER CONSERVATION, 6B – LANDSCAPE and 6C - IRRIGATION** before **7. HILLSIDE STREET STANDARDS** as outlined in Schedule "B" as attached to and forming part of this bylaw;

3. AND THAT **SCHEDULE 5 OF BYLAW NO. 7900 CITY OF KELOWNA CONSTRUCTION STANDARDS**, **1. CONSTRUCTION SPECIFICATIONS** Index page be amended by deleting the following:

"INDEX

SECTION

S01570 – Traffic Regulation

S02223 – Excavation, Trenching and Backfilling

S02224 – Roadway Excavation, Embankment and Compaction

S02226 – Aggregates and Granular Materials

S02512 – Hot Mix Asphalt Concrete Pavement

S02666 – Waterworks

S02721 – Storm Sewers

S02725 – Manholes and Catch Basins

S02731 – Sanitary Sewers

S02732 – Sewage Forcemain

S02734 – Video Inspection

Appendix A Water Main Testing and Tie-in Procedure"

and replace it with the following:

"INDEX

SECTION

4. AND THAT **SCHEDULE 5 OF BYLAW NO. 7900 CITY OF KELOWNA CONSTRUCTION STANDARDS**, **1. CONSTRUCTION SPECIFICATIONS** be amended by adding in their appropriate numeric location the following new sub-sections:

   a. Irrigation System S02667;
   b. Topsoil and Finish Grading S02921;
   c. Structural Soils S02922;
   d. Soil Cells S02923; and
   e. Planting of Trees, Shrubs & Ground Covers S02950

   as outlined in Schedule "C" as attached to and forming part of this bylaw;

5. AND THAT **SCHEDULE 5 OF BYLAW NO. 7900 CITY OF KELOWNA CONSTRUCTION STANDARDS**, **2. STANDARD DRAWINGS** , **CITY OF KELOWNA STANDARD DRAWINGS INDEX AND CROSS-REFERENCE TO MMCD** Table be amended by adding the following to the end of the table:

	LANDSCAPING AND IRRIGATION – 6 (B) Landscaping			
		Added	SS-L.01	Growing Medium - Lawn
		Added	SS-L.02	Growing Medium – Planting Bed
		Added	SS-L.03	Growing Medium - Boulevard
		Added	SS-L.04a	Tree – in Grass Open Space
		Added	SS-L.04b	Tree – in Planting Bed
		Added	SS-L.04c	Boulevard Tree – in Grass
		Added	SS-L.05a	Boulevard Tree – in Structural Soil (Plan)
		Added	SS-L.05b	Boulevard Tree – in Structural Soil (Section A-A')
		Added	SS-L.06a	Boulevard Tree – in Soil Cell (Plan)
		Added	SS-L.06b	Boulevard Tree – in Soil Cell (Section A-A')
		Added	SS-L.07	Root Barrier at Paving
	LANDSCAPING AND IRRIGATION – 6 (C) Irrigation			
		Added	SS-IR.01a	Backflow Prevention Assembly ¾"
		Added	SS-IR.01b	Backflow Prevention Assembly 1" to 2"
		Added	SS-IR.01c	Backflow Prevention Assembly 1" to 2"
		Added	SS-IR.01d	Backflow Prevention Assembly 21/2" to 4"
		Added	SS-IR.01e	Backflow Prevention Assembly 21/2" to 4"
		Added	SS-IR.02a	Irrigation Vault 1" to 2"
		Added	SS-IR.02b	Irrigation Vault ¾"
		Added	SS-IR.03	Irrigation Cabinet Double
		Added	SS-IR.04a	Trench Section w/o Sleeving
		Added	SS-IR.04b	Thrust Blocks
		Added	SS-IR.05a	Stand Alone Isolation Value 50mm and Under
		Added	SS-IR.05b	Electric Control Value 24VAC
		Added	SS-IR.06a	Control Zone Kit 25mm
		Added	SS-IR.06b	Control Zone Kit 38mm
		Added	SS-IR.07	Mainline Drain Value
		Added	SS-IR.08a	Irrigation Value Box Small Size
		Added	SS-IR.08b	Irrigation Value Box Medium Size
		Added	SS-IR.08c	Irrigation Value Box Large Size
		Added	SS-IR.09	Wired Splice Box
		Added	SS-IR.10a	Sprayhead Sprinkler
		Added	SS-IR.10b	Rotor Sprinkler
		Added	SS-IR.11a	Dripline Header Assembly
		Added	SS-IR.11b	Root Watering System (Double)
		Added	SS-IR.11c	Tree Dripline
		Added	SS-IR.12a	Hydrant/Blow-Out Assembly 50mm
		Added	SS-IR.12b	Quick Coupler
		Added	SS-IR.12c	Lateral End Flush Valve
		Added	SS-IR.12d	Hose Bib
		Added	SS-IR.13	Temporary Boulevard Irrigation

6. AND THAT **SCHEDULE 5 OF BYLAW NO. 7900 CITY OF KELOWNA CONSTRUCTION STANDARDS**, **2. STANDARD DRAWINGS** , be amended by adding the following Standard Drawings in their proper location as outlined in Schedule “D” as attached to and forming part of this bylaw;

7. This bylaw shall come into full force and effect as of the date of adoption. _____

8. This bylaw shall be cited as "Bylaw No. 10481, being Amendment No. 14 to Subdivision, Development and Servicing Bylaw No. 7900".

Read a first, second and third time by the Municipal Council this 28th day of March, 2011.

Adopted by 2/3 majority of the Municipal Council of the City of Kelowna this

_____
Mayor

_____
City Clerk

SCHEDULE 4

OF BYLAW 7900

CITY OF KELOWNA

DESIGN STANDARDS

DESIGN STANDARDS
6. LANDSCAPE AND IRRIGATION

6A. LANDSCAPE AND IRRIGATION WATER CONSERVATION

6A.1 General

6A.1.1 Application

For purposes of this bylaw, an automatic irrigation system means any outdoor watering device that includes a timeclock, connected valves opened by the timeclock, and underground distribution pipe to water outlets used for watering plant materials.

These landscape standards and specifications shall apply:

(a) To all landscape areas within highway limits in the City of Kelowna including: medians, soft landscape areas between the curbs and the highway limits, and plantings in urban plaza and sidewalk areas.

(b) To new construction and rehabilitated landscapes for City projects including all utilities and facilities for water, sanitary sewer, drainage, electrical and communication Works and Services infrastructure.

The following exemptions to the requirements of Section 6 apply:

(a) Projects where the sum of all new or renovated landscape areas does not exceed 100 square metres in area are exempt from the requirement for landscape and irrigation plan and detail submittals set out in these requirements.

(b) Projects without an automatic irrigation system are exempt from the irrigation system design guidelines, but the landscape, grading and soil management requirements and related drawing submittals other than irrigation drawings still apply;

Landscape and irrigation shall be designed, installed and operated to meet the requirements of the City of Kelowna Water Regulation Bylaw No. 10480, including the requirement to not exceed the Landscape Water Budget for landscape areas of the project and to calculate the Estimated Landscape Water Use.

The standards specified herein reflect the City’s minimum expectations and are intended for most applications. These standards may be enhanced or revised by the City or the Owner at the discretion of the City Engineer where the Works and Services are intended for large, complex, unusual and innovative applications and provided they meet the intent and objectives of the requirements herein.

6A.1.2 Qualifications

The Owner, at their expense, shall retain as a Qualified Professional a Landscape Architect registered with the British Columbia Society of Landscape Architects (BCSLA) to design, inspect and certify all landscape Works and Services covered by this section.

The Owner, at their expense, shall retain as a Qualified Professional a Certified Irrigation Designer registered with the Irrigation Industry Association of British Columbia (IIABC) to design, inspect and certify all irrigation Works and Services covered by this section.

With proper qualifications from both BCSLA and IIABC, one individual may serve as both the Landscape Architect and Certified Irrigation Designer.

For the Works and Services covered by this section the Landscape Architect(s) and/or Certified Irrigation Designer(s) shall have the powers and responsibilities prescribed elsewhere in this bylaw to the Contract Administrator.

6A.2 Water Conservation Requirements and Report

All subject applications shall include a Landscape Water Conservation Report – either as a set of drawings or a bound report - that defines how the development will meet the design requirements for water conservation. The report shall meet the requirements of the City prior to “Issued for Construction” Documents or Building Permits under this bylaw. The Landscape Water Conservation Report shall:

(a) Include the calculations for the proposed landscape area of Landscape Water Budget and Estimated Landscape Water Use in the format as required by the City of Kelowna (equivalent to Schedule C in the City of Kelowna Water Use Bylaw No. 10480).

(b) Indicate by drawings, notes, specifications and if necessary other written materials how the application complies with or varies from the Design Criteria 6A.2.1and 6A.2.2 below.

(c) The City may, at its discretion, accept the information in two stages: Stage One requires the report and a conceptual landscape drawing with corresponding hydrozone and Landscape Water Conservation Report – and may be submitted at the Preliminary Layout Review or Application for Subdivision Approval stage for Subdivision Projects, or Building Permit application stage for Works and Services in Development Projects. Stage Two requires detailed landscape and irrigation drawings and specifications, and update to the report and calculations, to be generally consistent with and substituting for the earlier design concept submission – Stage Two must be submitted and approved prior to City Engineer’s “Issued for Construction’ documents in both Subdivision and Building Permit processes.

6A.2.1 Landscape Design

The Applicant shall appoint a Qualified Professional to create and submit a Landscape Plan and supervise installation to produce a landscape installation that:

(a) Groups planting areas into ‘hydrozones’ of high, medium and low or unirrigated/unwatered areas. Submit a plan diagram and table showing the extent and area of hydrozones in the project.

(b) Shows appropriate use of plant material with similar water demand within hydrozones.

(c) Maximizes the percentage of landscape area that is unirrigated/unwatered area, commensurate with landscape aesthetics and plant survival e.g. using pervious paving, unplanted stone or organic mulch, pervious deck (strive for a minimum of 25% of the total landscape area).

(d) Maximizes retention or replanting of vegetation with low water-use requirements after the establishment period e.g. existing native vegetation to remain, wildflower meadow, rough grass, xeriscape plant species (strive for a minimum of 25% of the total landscape area).

(e) Designs to minimize mown turf areas that are high water use areas (strive for 25% of total landscape area, and consider a maximum of 50% of the total landscape area) – substitute with areas of lower water use treatments.

(f) Provides mulch cover to shrub and groundcover areas, to reduce evaporation from soil

(g) Uses recirculated water systems for any water features such as pools and fountains.

(h) Ensures landscape installation standards including growing medium depth and quality to meet the requirements of this bylaw. A submitted soils report or notes on the plans shall indicate proposed growing medium depth, amendments, and shall refer to appropriate sections of the reference or supplementary specifications, or the qualified professional shall supply a custom specification of similar detail.

(i) Includes the following written declarations signed by a licensed Landscape Architect qualified by the British Columbia Society of Landscape Architects (BCSLA):

> At the time of application:“This landscape plan is subject to and complies with the Landscape Water Conservation Design requirements of the City of Kelowna for the efficient use of water”.
>
> At the time of substantial performance of the construction: “This landscape installation complies substantially with the submitted water conservation and landscape plans, specifications and reports.”

6A.2.2 Irrigation Design

If irrigation is to be installed, the Applicant shall appoint a Qualified Professional to create and submit an Irrigation Plan and supervise installation to produce an irrigation system that:

(a) Groups irrigation circuits/ zones into ‘hydrozones’ of high, medium and low or unirrigated areas consistent with the landscape planting plan.

(b) Uses reclaimed or recycled water or rainwater capture from roofs or rain barrels for outdoor water use when such is available, as a substitute for use of potable water.

(c) Minimizes use of high-volume spray heads, and employs drip or low volume irrigation where practical to meet the watering needs of hydrozones.

(d) Uses surface or subsurface drip irrigation or low volume irrigation technology to water long, narrow or irregularly shaped areas including turf areas less than 2.4m in width.

(e) Keeps drip, spray and rotor heads (different precipitation rates) on different irrigation circuits.

(f) Designs with irrigation head-to-head coverage in accordance with manufacturer’s specifications.

(g) Ensures matched precipitation rates on each irrigation circuit.

(h) Minimizes the elevation change in each irrigation circuit – and where required provides pressure compensating devices to minimize pressure variations or check valves to stop low head drainage.

(i) Ensures irrigation mainlines are proved leak-free with hydrostatic tests, as a part of the construction quality assurance review. Re-test irrigation mainlines after major repair or nearby excavation work.

(j) Provides pressure regulating devices to ensure irrigation outlets are operating at the manufacturer’s optimum pressure range.

(k) Designs head placement and type, and adjusts head radius, arc and alignment to avoid overspray of paved surfaces or buildings.

(l) If irrigating slopes greater than 25%, designs an irrigation system with a precipitation rate not greater than 20mm/hour.

(m) Provides automatic shut off devices that shut off the system in cases of pipe leak or breakage, and that shut off the system when rain is present.

(n) Installs - and programs to minimize water use – one or more ‘Smart Controllers’ with water-conserving functions. Acceptable Smart Controllers are identified in the City of Kelowna Water Regulation Bylaw 10480. Includes a written Irrigation Schedule or equivalent instructions for operation of the Smart Controller, with a copy stored with

the controller cabinet, that adjusts the amount of applied water scheduled to be applied on a daily basis – schedule different run-times as weather changes, by using the weather-sensitive features of a Smart Controller. In cases where manual irrigation

(o) program adjustment is temporarily required, adjust water programming at least once per month to recognize that highest water need is in July and lower water needs exist in other months of the growing season.

(p) Ensures irrigation design and installation standards including adjustments and scheduling meet the requirements of the Supplementary Specifications in , Schedule 5 Construction Standards, or a custom or alternate irrigation specification at a similar level of detail provided by the Qualified Professional.

(q) Includes the following written declarations signed by a Certified Irrigation Designer qualified by the Irrigation Industry Association of BC (IIABC):

> At the time of application:“This irrigation plan is subject to and complies with the Irrigation Water Conservation Design requirements of the City of Kelowna for the efficient use of water.”
>
> At the time of substantial performance of the construction: “This irrigation installation complies substantially with the submitted water conservation and irrigation plans, specifications and reports”.

DESIGN STANDARDS
6. LANDSCAPE AND IRRIGATION

6B. Landscape

6B.1 General

6B.1.1 General Landscape Requirements

The general design and construction of the landscape shall be in accordance with the standards set out in this section.

Street Tree plantings shall be required on streets and highways in all subdivisions where new roads (including cul-de-sacs) or road extensions are required.

All soft Boulevard and Median Areas within the highway limits shall be landscaped to the standards of *Section 6B.2 Boulevard* and *Section 6B.3 Medians.*

Rough grass or wildflower mixture may be used on all or part of boulevards visually backed by areas of woodland or rural appearance - subject to the approval of the City Engineer.

The Landscape Maintenance Period for landscape establishment shall be one year from the date of Substantial Performance of the landscape components of the work. All landscape areas shall be provided establishment maintenance which shall include irrigation maintenance and watering, mowing, weeding, pruning and supplemental fertilization until the end of the Landscape Maintenance Period. The Landscape Maintenance Period shall continue until a Certificate of Acceptance of all Landscape Works and Services is issued by the City upon the expiration of the Landscape Maintenance Period.

Plants or other materials that fail in the Landscape Maintenance Period shall be replaced at no cost to the City. Replacement trees shall be guaranteed for a further year after planting, with maintenance and replacements repeated until trees are provided that are acceptable to the City at the end of the Landscape Maintenance Period.

The use of Naturescape or similar wildlife habitat principles in landscape development is encouraged. Refer to Naturescape Kit Southern Interior, available from Naturescape British Columbia.

Site and planting design shall co-ordinate with watering 'hydrozones' and irrigation plans in accordance with *Sub-Section 6C – Irrigation*.

All landscape and irrigation products, installation and operations shall be completed in accordance with the requirements of Schedule 5 of this Bylaw.

6B.1.2 Landscape Plan Requirements for Works and Services

For landscape Works and Services that will be owned by the City of Kelowna, the Owner's Qualified Professional is required to submit the following plans, gain City 'Issued for Construction" documents, and certify construction quality assurance. Landscape plan and design submittals required are:

(a) Landscape Plan

(b) Landscape Grading Plan

(c) Landscape Water Conservation Report as required by the Water Regulation Bylaw.

The following information shall be shown on the Landscape Plan:

(a) property lines and easements.

(b) buildings, edge of pavement, curb lines and curbs, sidewalks, lighting fixture locations, surface utilities and related service boxes or other elements that would affect the landscape and street tree location.

(c) Location of all existing vegetation to remain.

(d) Location of retaining walls and existing or proposed slopes that exceed 3:1 vertical.

(e) Location of all proposed trees, shrubs, ground cover and lawn areas.

(f) Indication of which areas will be seeded grass vs sodded lawn.

(g) Plant list showing botanical name, common name, size at planting, quantity, typical spacing, and root zone volume of supplied growing medium for trees.

(h) Location of all proposed trees, shrubs, ground cover and lawn areas.

(i) Hydrozone information table for the project.

(j) Planting hydrozones – delineate and label each hydrozone by number, letter or other method and identify each area of similar water requirement e.g. high, medium, low, or no supplemental water after establishment. Hydrozones may be shown on a separate drawing if required for clarity.

(k) Water features, if applicable.

(l) Type of mulch and application depth.

(m) Growing medium depths for each planting type.

The following information shall be shown on the Landscape Grading Plan:

(a) Spot elevations of top and bottom of retaining walls and at top and bottom of any slopes exceeding 3:1

(b) Drainage patterns by slope arrow and percent slope. Drain inlets or culvert inlet elevations.

(c) Finished floor elevations if applicable.

(d) General shaping of finished grades by a combination of proposed contour, spot elevations and slope arrows for landscape areas that are bermed, dished, or that have noteworthy grading constraints or design intents.

(e) Stormwater retention or infiltration facilities if applicable.

(f) Rain harvesting or catchment technologies if applicable.

The general requirements used by the City for review of the Landscape and Grading Plan is specific to the site and use thereof. The landscape design shall:

(a) respond functionally and aesthetically to existing and proposed land uses, utilities, terrain and flood patterns, drainage facilities, roads, driveways, cycle, transit and pedestrian facilities;

(b) promote accessibility as it relates to pedestrians, cyclists and people with limited physical or visual abilities

(c) consider appearance of the proposed plant material and site landscape, including appropriateness, aesthetics, visual screening, sight lines and functionality

(d) provide access for maintenance equipment and personnel;

(e) allow for cost effective maintenance methods and practices;

(f) provide access to park, recreation or environmental opportunities;

(g) incorporate protection of existing trees where feasible;

(h) consider protection of the natural environment and restoration or enhancement of natural habitat;

(i) coordinate with engineering site drainage, water levels, ponding and overland flow;

(j) consider design features that minimize the opportunity for crime and undesirable behavior;

(k) provide for weed control;

(l) coordinate with sediment and erosion control practices;

(m) follow fire hazard reduction principles.

The completed Landscape and Grading Plan(s) shall be considered part of the package that forms the "issued for Construction" documents.

6B.1.3 Landscape Construction

Prior to the start of construction the Owner shall provide the City with a schedule of construction of the landscape and irrigation Works and Services and Related Work. In addition, the Owner shall provide the City with the name and contact information for the Consulting Landscape Architect and Engineer, Certified Irrigation Designer, the general Contractor and the Landscape Contractor of the site, as well as the designated Contract Administrator for each of the Landscape and Irrigation works.

Proposed changes to the landscaping from that shown on the "Issued for Construction" Landscape Drawings or related documents shall be submitted to the City for review and approval at least five (5) working days prior to anticipated construction of the change. Submission of a proposed change in no way implies or suggests approval of the proposed change by the City.

Changes to the landscaping performed without approval from the City will not be accepted at the time of Substantial Performance or Total Performance. Changes to the landscaping performed without approval from the City will be corrected by the Owner at the Owner's expense or the cost of making the corrections will be held back by the City upon release of the Performance Bond.

6B.2 Boulevard Landscape

Unless specified otherwise herein boulevards shall be vegetated with sodded lawn or densely planted groundcover. Rough grass and/or wildflower seeding may be used on boulevards and side slopes that are visually backing onto natural or rural areas, or for temporary boulevard treatments, subject to the approval of the City Engineer.

For the boulevards of arterial and collector roads within Urban and Village Centre DP areas, the treatment shall be as per the streetscape improvement plan for that area.

For boulevards adjacent to commercial property and locations outside Urban/Village Centre DP areas, or where no plan is in place, the boulevard treatment shall generally be turf or hard-surfaced, and shall include street trees and irrigation. Acceptable hard surface materials for the boulevard may include:

(a) unit pavers
(b) exposed aggregate concrete;
(c) stamped and coloured concrete;
(d) irrigated turf; or
(e) xeriscape or dryland landscaping

For boulevards where the land use of the adjacent property is industrial, institutional or multi-family the boulevard treatment shall generally be street trees and turf or dryland landscaping, serviced and maintained by the Owner of the parcel with the boulevard frontage.

For boulevards where the land use of the adjacent property is one, two or four-family residential or park, and where the boulevard is accessible for maintenance mowing and watering from the adjacent property, the boulevard treatment shall generally be street trees and turf,

For boulevards where it is unlikely that the adjacent property owner will be able to adequately maintain the boulevard, the boulevard treatment shall generally be hard surfaced and may include street trees. Acceptable boulevard materials in these cases may include:

(a) unit pavers; or
(b) exposed aggregate concrete

6B.3 Median Landscape

The landscaping of medians shall be designed and constructed generally as follows:

(a) for Highway 97 and Highway 33 - with sloped aprons of concrete unit pavers with irrigated street trees and irrigated landscaping;

(b) in Urban Centre and Village Centre DP Areas - except as described above or per the approved streetscape improvement plan for that area, with sloped aprons of concrete unit pavers and irrigated street trees; or

(c) elsewhere - with sloped aprons of exposed aggregate concrete, concrete unit pavers or stamped and coloured concrete and irrigated street trees..

The landscaping of roundabouts and cul-de-sac islands shall have a hard surface material or landscaping with low shrubs or groundcovers, and should feature:

(a) a single specimen tree;

(b) a group of like trees; or

(c) public art if the roundabout or cul-de-sac is in an Urban or Village Centre. The selection, design and placement of public art shall be made in cooperation with the Public Art Committee.

Lighting of trees or public art in a median shall be provided as required by the Parks Division or the Public Art Committee.

6B.4 Utilities Coordination with Planning

Underground utilities shall be aligned and buried to provide a continuous 1.0m deep utility-free trench beneath tree planting locations.

Planting and paving design shall be co-coordinated with the design and construction of surface utility boxes, such that boxes fall entirely within either a paved surface or entirely within a planted surface but not partly in paving and partly in planting and that grades and alignment of boxes match the final design and construction of all elements to create a co-coordinated and orderly appearance, free of trips and hazards.

6B.5 Plant Material

6B.5.1 Urban Trees in Pavement

Select urban trees in pavement in accordance with Section 6B.5.6.

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.

6B.5.2 Planting Details and Procedures

Landscape Drawings shall specify the appropriate planting detail standard from the City of Kelowna Standard Details.

All planting shall meet the City of Kelowna Specifications in Schedule 5.

6B.5.3 Planting Provisions in Single Family Subdivisions

Street trees and landscape finish of the public highway fronting occupied homes shall be completed no later than the date that 85% of the homes in a single family development are completed and occupied. Earlier completion dates are encouraged provided that landscape maintenance and repair is provided at no cost to the City until such time as units are occupied.

Planting of street trees in the hot dry summer period of June, July and August is discouraged, due to the risk of failure of the planting caused by heat and drought.

Minimum number of boulevard trees shall be calculated as follows:

(a) Medium Trees (± 10 - 20m ht. at maturity) Greater of 1 per lot or 15m.

(b) Small Trees (Under 10m ht. at maturity) Greater of 1 per lot or 10m.

(c) Plantings of trees closer than 6m on centre shall require the written concurrence of the City Engineer.

(d) Locate trees fronting on single family lots in locations that avoid all utility service alignments and driveways. Generally this will lead to tree placement in the half of the lot frontage away from the driveway side, and not at either the lot centerline or at a lot line.

6B.5.4 Plant Material Selection

6B.5.4.1 Plant Materials:

(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) Plant hardiness requirements vary by elevation. Plants shall be hardy to Canadian Plant Hardiness Zone 5A to 1A as site conditions dictate.

(c) Plants shall be capable of reduced water demand following a one year establishment period.

(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 and non-toxic 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 6B.5.6 *Street Tree Selections and Soil volumes*.

6B.5.4.2 Lawns/Fine Grass, Rough Grass and Wildflowers:

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

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

(c) Areas to be seeded with grades greater than 3:1 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.

6B.5.4.3 Trees:

(a) Boulevard or 'street' trees shall be of a single species/cultivar on either side of the street within a given block. Median tree species may vary.

(b) Street tree species shall vary between intersecting streets. Street tree selection will be made with consideration of maintaining a diverse and varied street tree distribution across a neighbourhood to minimize disease risks.

(c) All street trees shall have:

i. A compact or upward branching structure.

ii. Ability to withstand pruning for pedestrian, vehicle and/or building clearance without compromise to tree health or form.

iii. Absence of species/varietal characteristics of structural weakness, susceptibility to wind damage, or thin, easily damaged bark.

6B.5.5 Street Tree Size, Spacing and Location

Trees shall be minimum 5 cm caliper measured at 300mm above the rootball at the time of planting, and of uniform size if planted in a boulevard row.

Tree branch clearance requirements are 5m over the traveled portion of road and 2.25m over the sidewalk.

6B.5.6 Street Tree Selections and Soil Volumes

Refer to City of Kelowna website for requirements for tree species selections: http://www.kelowna.ca/CM/Page292.aspx

Trees for directly under Hydro lines

(a) Minimum allowable soil volume per tree is 4 cu.m. with 1m depth pit.

(b) Mature height not greater than 7.62m.

Trees for beside hydro lines

(a) Minimum lateral distance from nearest line 2.75m.

(b) Minimum allowable soil volume per tree is 4 cu.m. with 1m depth pit.

(c) Mature spread not greater than 5m.

Trees for limited available soil volume

(a) Minimum allowable soil volume per tree is 4 cu.m. with 1m depth pit.

(b) Mature height not greater than 10m.

Trees for available soil volumes of 9 cu. m. or greater

(a) 1m pit depth

(b) Mature height not greater than 20m.

Trees for a wide boulevard or wide median use only

(a) Minimum available root zone of 20 cu. m. per tree

(b) Minimum boulevard or median width of 3.5m

6B.5.7 -Setbacks for Trees

Minimum setbacks for trees to objects in new developments shall be as follows:

Underground street light conduit or irrigation main	0.6m
Other underground utilities	3.0m
Lamp standards	6.0m
Steel and wooden utility poles	3.0m
Driveways	1.5m
Catch basins	1.5m
Manholes, valve boxes, services	3.0m
Sewer service boxes	3.0m
Fire hydrants	2.0m
Road intersection	7.0m
Curb face (see SS-L3 for Root Barriers required)	0.5m
Sidewalk	0.85m
Curb face and sidewalk with root barrier	0.60m
Buildings - fastigiate (columnar) tree	2.0m
Buildings - regular crown tree	3.0-5.0m

The City Engineer may consider custom setbacks where trees are being installed in existing streets with established utilities.

6B.6 Landscape Maintenance Schedule

The Owner's qualified professional shall submit a maintenance schedule with the Certificate of Substantial Performance. It shall include timing and arrangements for:

(a) Routine inspection
(b) Aerating and dethatching turf areas
(c) Replenishing mulch
(d) Fertilizing
(e) Pruning
(f) Weeding

The project applicant is encouraged to implement sustainable or environmentally-friendly practices for overall landscape maintenance.

DESIGN STANDARDS
6. LANDSCAPE AND IRRIGATION

6C. Irrigation

6C.1 General Irrigation Requirements

(a) A complete and working automatic irrigation system shall be provided for all landscaped areas within a high, medium or low hydrozone of a Highway, utility parcel or utility facility. Temporary watering provisions shall also be made for planted areas of a 'non-irrigated' hydrozone – to allow for watering through a maximum 1 year establishment period or in severe drought.

(b) Boulevard trees, shrubs and ground covers shall be watered from an automatic irrigation system.

(c) Urban trees in pavement shall be irrigated with an automatic irrigation system that may include bubblers or drip elements.

(d) Sleeves shall be provided under sidewalks and driveways, and to medians / islands, as required for installation and maintenance of the irrigation system without removing surface paving.

(e) Provide a flow sensor and master valve, both connected to the controller, that will stop flow to the system or irrigation circuit in cases of an irrigation water leak. Provide an isolation gate valve upstream of all automatic sprinkler valves.

(f) Design to water plant materials with different watering requirements (e.g. grass vs. shrub areas and high vs medium vs low water use shrub areas) on different valve circuits.

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

(h) Every drip system 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.

(i) The Irrigation System shall perform to within 15% of the targeted application efficiency standards for irrigation systems, as determined by the Irrigation Association and the Irrigation Industry Association of British Columia, as follows:
   i. Spray Zones: 75% or higher;
   ii. Rotor Zones: 80% or higher;
   iii. Microjet Irrigation Zones: 85% or higher.
   iv. Drip Irrigation Zones: 90% or higher.

(j) Sprays and rotors shall be designed with head to head coverage to meet the application efficiency standards.

(k) It is the responsibility of the Certified Irrigation Designer to identify to the Owner and to the City of Kelowna any landscape impediments, existing or planned, that will impede reaching the targeted efficiencies. At the discretion of the City of Kelowna, irrigation system design audits may be performed to ensure design efficiency has been met.

(l) The Irrigation System shall be designed with minimal pressure losses where possible. Pressure losses between any two sprinklers on the same zone shall be less than 10%.

(m) Pipes shall be sized to allow for a maximum flow of 1.5m/sec.

(n) The Irrigation System shall be sized and designed to 80% of Point of Connection available flow and pressure; allowing for 20% growth of system or 20% reduction in operating pressure while retaining targeted operational efficiencies.

(o) Locate Point of Connection or Pedestal to meet the following requirements:

i. No Pedestal or Point of Connection locations will be permitted with medians without the explicit written consent of the City of Kelowna.
ii. No Pedestal location shall be subject to application of irrigation watering.
iii. No Point of Connections shall be placed within a sidewalk without the explicit written consent of the City of Kelowna.

(p) The irrigation design shall include voltage loss calculations to the electrical control valve furthest from the controller. The drawings are to include:

i. A chart comparing the actual voltage drop to the allowable voltage drop on common and zone signal wires;
ii. Voltage loss shall not exceed the maximum voltage loss as specified by the manufacturer of the irrigation controller;
iii. Indicate wire locations, wire gauge required, spare wires and necessary splice box locations on the Contract Drawing.

(q) Install one spare control wire for every five (5) electric control valves connected to the controller;

(r) Install one spare common wire for every ten (10) electric control valves connected to the controller.

(s) Irrigation sleeves shall be installed to route irrigation lines under hard surfaces and features. Non-metallic CSA approved electrical conduit shall be installed adjacent to irrigation sleeves.

(t) Electric control valves used in the design of the Irrigation System are to remain consistent in size and manufacturer, where possible. Renovations or additions to the Irrigation System shall use the same manufacturer, model and size that exist on site. It is permissible to use an electric control valve from a different manufacturer for specialized applications. In general:

i. Electric control valves must be sized to the design flow;
ii. Drip and Micro irrigation zones must include filtration and pressure regulation to manufacturers' specifications. Drip and Micro zones must have an isolation valve prior to zone valve for maintenance of filtration.
iii. Unless it has deemed not possible, valves are to be located on the periphery of green spaces and where available, within planting beds.
iv. Design approval will be required to insert valve locations within hardscape surfaces.

(u) Sprinklers used in the design of the Irrigation System are to remain consistent in size, nozzling and manufacturer. Renovations or additions to the existing Irrigation System shall use the same manufacturer, model and size that exist on site. Sprinkler choice is based upon:

i. Available operating pressure at the base of the sprinkler;
ii. Desired radius;
iii. Type of landscape/plant material to be irrigated.
iv. Preference will be given to sprinklers incorporating pressure compensating devices.
v. Preference will be given to sprinklers incorporating check valves to reduce low head drainage.

(v) Sprinkler arcs, radius and alignment are to be designed and capable of adjustment to minimize overspray onto adjacent surfaces outside of landscape areas.

(w) Drip line and emitters must incorporate technology to limit root intrusion.

(x) Specify all irrigation components from a coordinated manufacturer's line listed in the Subdivision, Development & Servicing Approved Products List Policy 266.

(y) All irrigation products, installation and operations shall be completed in accordance with the requirements of Schedule 5.

(z) The Landscape Maintenance Period for landscape establishment shall be one year from the date of Substantial Performance of the landscape components of the work. All landscape areas shall be provided establishment maintenance which shall include irrigation maintenance and watering.

6C.2 Irrigation Plan and Irrigation Design Report Requirements for Works and Servies

For irrigation Works and Services that will be owned by the City of Kelowna, the Owner's Qualified Professional is required to submit the following plans and reports, gain City "Issued for Construction" status, and certify construction quality assurance:

a) Irrigation Plan
b) Landscape Water Conservation Report (in accordance with Water Use Regulation Bylaw 10480)
c) Irrigation Design Report
d) Maintenance Schedule

The following information shall be shown on the Irrigation Plans and Landscape Water Conservation Report

(a) Name and contact information for the IIABC Certified Designer.

(b) Name and contact information for the water utility provider and the electrical utility provider.

(c) property lines

(d) buildings, edge of pavement, curb lines and curbs, sidewalks, lighting fixture locations, surface utilities and related service boxes or other elements that would affect the irrigation system – but with an objective of minimizing drawing clutter.

(e) Location of all existing vegetation to remain.

(f) Location of retaining walls and slopes that exceed 3:1 vertical.

(g) Landscape Water Budget, and Estimated Landscape Water Use and calculations (in accordance with Schedule C of the Water Regulation Bylaw No. 10480 - may be a separate Landscape Water Conservation Report).

(h) Hydrozones shall be designated by number, letter or other designation.

(i) Designate the areas irrigated by each valve (irrigation zones) and assign a number to each valve.

(j) Indication of which irrigation zones will be automatic vs manual watering systems. Clearly identify any 'temporary zones': those zones which are intended to operate for less than a two (2) year grow in period.

(k) Schematic layout showing all points of connection, backflow prevention, water meters, electrical supply and meters, winterization facilities, timeclocks, heads, valves, piping, sleeves, sensors and other elements critical to construction and maintenance of the irrigation system.

(l) Irrigation legend describing brand, model and size of timeclocks, heads, valves, piping, sleeves, sensors and all other elements shown on the irrigation plan.

(m) Any details specific to the project that are not included in Schedule 5.

The Irrigation Design Report shall be submitted with the Irrigation Plans, in booklet form on 8.5 x 11 paper and shall include:

(a) Static water pressure obtained either by pressure gauge reading from the site; or from the City of Kelowna.

(b) Design flow calculations indicating maximum water flows required to irrigate the proposed site in the desired water window;

(c) Water utility jurisdiction; inclusive of any regulations or restrictions imposed by the said water utility that will affect the operation of the Irrigation System.

(d) The electrical requirements necessary to operate the proposed Irrigation System. Verification from the applicable electrical utility that the service is available and what is required to route it to the necessary location(s);

(e) Identification of the micro-climates throughout the proposed site;

(f) A chart illustrating a zone by zone breakdown of the following items;
   i. Type of plant material
   ii. Product Type (micro, spray, rotor); and area based calculated precipitation rates.
   iii. Required operating pressure
   iv. Required zone flow
   v. Zone valve size

(g) Scheduling data utilizing a maximum ET value of 7"/month (Kelowna July ET); taking into consideration soil type, slope and micro-climate. Show the cumulative watering time required to water all circuits in the project. Except where otherwise required or approved, the irrigation water window shall not be greater than 6 hours per day on an odd or even scheduling format.

6C.3 Establishment Watering Provisions in Single Family Subdivisions

Watering provisions are required for establishment of all street tree planting. Automatic irrigation systems to be provided to the boulevard area as an extension of privately held irrigation systems on the fronting lot. Provide irrigation sleeves across the sidewalk at the lot centerline and across the driveway as necessary to accommodate the irrigation pipe connecting all landscape areas and the fronting boulevard and medians.

In cases where boulevard landscape and related irrigation is being installed in advance of single family lots being occupied, the developer is to install a temporary irrigation system to water the boulevard. When private homes are constructed and occupied, within 6 months of occupancy the developer must arrange to have the boulevard irrigation fronting each lot removed from the temporary irrigation system and attached permanently to the irrigation system of the fronting lot. Design of the temporary irrigation system may follow one of two general arrangements:

FULL LANDSCAPED BOULEVARD: generally in accordance with Schedule 5 Standard Drawing "Temporary Boulevard Irrigation", based on a spray or drip irrigation system to serve grass, groundcover, shrubs and trees in the boulevard, OR

TREES ONLY BOULEVARD: if trees only are being planted, with dryland or paved landscape in between, a Root Watering System (Double) on public property shall be provided that meets the requirements Schedule 5 Standard Drawings.

(a) For temporary boulevard irrigation systems, and/or for permanent median irrigation systems, water supply, backflow prevention and irrigation smart controller shall be provided in central location(s) in the subdivision, with valves and distribution piping designed in accordance with Section *6C – Irrigation*. Water supply may be obtained from the services of the new lots. A water billing account must be established prior to use.

(b) Irrigation sleeves for the temporary or permanent boulevard and median systems shall be provided under all driveways or other paved areas to provide pipe access to all landscape areas within the highway for installation and maintenance of the irrigation system without removing surface paving.

(c) The City will withhold part of the maintenance bond at a value of 140% of the cost of connecting temporary irrigation in boulevards to permanent irrigation systems on fronting private lots, and abandonment of any temporary irrigation system. If this conversion is not completed by the Developer within 6 months of home occupancy, the City may if necessary at the Developer's expense undertake the connection of the boulevard irrigation system to the adjacent private lot system and decommission the temporary irrigation with its own forces.

6C.4 Irrigation Service Connections

Except as required otherwise all landscaped areas of a Highway or Utility Facility shall be serviced with a metered water service (50mm diameter, and a metered electrical service (120/240 volts, 60 amps minimum). Provision of water and electrical services by the Owner shall include the establishment of service accounts with the utility providers, all necessary permits, testing and certification, and all materials, labour, fees and utility costs necessary to provide the service until the end of the Landscape Maintenance Period.

1.0 GENERAL

.1 Section S02667 refers to those portions of the work that are unique to the complete installation of a fully automatic underground irrigation system, including all necessary preparatory work and all electrical, wiring and plumbing connections, and maintenance work during the guarantee period. This section must be referenced and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.1	Project Record Documents	Section 01721
.2	Cast-in-Place Concrete	Section 03300
.3	Precast Concrete	Section 03300
.4	Aggregates and Granular Materials	Section 02226
.5	Topsoil and Finish Grading	Section 02921
.6	Hydraulic Seeding	Section 02934
.7	Seeding	Section 02933
.8	Sodding	Section 02938
.9	Planting of Trees, Shrubs and Ground Covers	Section 02950

1.2 References

.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred herein, are fully described in References – Section 02000.

1.3 Codes and Permits

.1 Perform all work of this section in strict accordance with all municipal, provincial, or federal guidelines, regulations, and codes. Requirements of these specifications not conflicting therewith, exceeding code requirements govern.

.2 Be responsible for obtaining all necessary permits and approvals required to undertake and complete the work. I Include costs for required permits and approvals in tendered prices.

1.4 Quality Assurance

.1 Be a Certified Irrigation Contractor (CIC) with a minimum of 5 years of industry experience and a member in good standing of one of the following organizations:

.1 Irrigation Industry Association of British Columbia (IIABC)

.2 The Irrigation Association (IA)

Provide documented proof of 5 years of industry experience, good standing membership in one of the above associations and CIC certification within 5 days of receipt of Notice to Proceed.

.2 Be certified as a Field Safety Representative – Class LO, Low Energy Systems and registered with the British Columbia Safety Authority as an Electrical Contractor. Provide documented proof of same within 5 days of receipt of Notice to Proceed.

.3 If the design involves HPDE, be certified in Plastic Pipe Fusion by the British Columbia Institute of Technology or an approved equivalent to fuse and install High Density Polyethylene Pipe. Provide documented proof of same within 5 days of receipt of Notice to Proceed.

.4 All electrical components or products specified or used in construction of the proposed irrigation system must be CSA approved and installed in accordance with all local, provincial, and national electrical codes.

.5 Install all irrigation components per manufacturer's recommendations, instructions and specifications. If unsure on how to install or use a specific product consult manufacturer to ensure proper installation and operation.

.6 All materials to be new and without flaws.

.7 All equipment specified and installed from various manufacturers to be compatible with existing equipment and other products specified for the irrigation system.

.8 The completed system to efficiently and uniformly irrigate all areas and perform as required by these specifications.

1.5 Scheduling and Shop Drawings

.1 Ensure that sequencing of irrigation work is carried out in coordination with work of other trades and that sleeves, wire, pipes, valves and other equipment are installed when appropriate.

.2 Plan, schedule and execute work to ensure a supply of water is available for landscape establishment and maintenance purposes at the appropriate time, in adequate amounts, and operating at design pressures to ensure satisfactory irrigation of all landscaped areas.

1.6 Substitutions

.1 Where materials are specified by brand name and model number, such specifications will be deemed to facilitate a description of the materials and material quality and establish a standard for performance and quality against which proposed substitutes will be evaluated.

.2 Proposed substitutes to match specified materials in, performance, flow, and pressure loss so as to not compromise the intent of the design or overall performance of the irrigation system.

.3 Materials proposed as substitute products must meet or exceed the quality and performance of the specified materials.

.4 Install and operate proposed substitutes according to their manufacturer's recommendations.

.5 Include sufficient descriptive literature and product samples with proposed substitute to enable evaluation.

.6 During the tender period proposed substitutions must be submitted to the Tender Administrator and the City of Kelowna at least 10 days prior to Tender Closing Date for consideration as an Approved Equal.

.7 After contract award proposed substitutions submitted to the Contract Administrator and City of Kelowna after the tender period must be made within 5 days of Notice to Proceed and must allow 5 days for review.

.8 Substitution requests by Contractor shall have no impact on the Milestone Date.

.9 Purchase or installation of materials that are not specified will not be paid for unless:

.1 The materials have been reviewed and approved by Contract Administrator and City of Kelowna as an Approved Equal as per Section 7.0, Instructions to Tenderers, or

.2 The materials have been reviewed and approved

by Contract Administrator and City of Kelowna as a Change Order, per Section 7.3 of the General Conditions

.10 Installation of materials that are not specified or are not an Approved Equal to be removed and replaced with the specified material at Contractor's expense.

.11 Shop Drawings of irrigation system are required for any and all aspects of irrigation system not included in the Drawings. This includes but is not limited to:

.1 Revisions to irrigation system design not previously addressed in Contract Documents, including revisions to irrigation system design which markedly alter the original design, as determined by the City Engineer.

.2 Installation details for irrigation components not addressed in Contract Documents

.3 Details required by Contract Administrator for review of proposed substitutes

.4 Tasks identified in project specifications as requiring a Shop Drawing

.12 A revised Irrigation Design Report shall be required in tandem with Shop Drawings for revisions that markedly alter the original design, as determined by the City Engineer

.13 Submit Shop Drawing and revised Irrigation Design Report to Contract Administrator and City of Kelowna, for review, comment and approval or rejection.

1.7 Irrigation Record Drawings

.1 Further to Schedule 3, maintain accurate scaled records of installed irrigation system and its components on a marked-up set of Contract Drawings on a daily basis during construction. Show all deviations from Contract Drawings. Make marked-up Contract Drawings available to Contract Administrator upon request.

.2 Retain a qualified survey instrument operator to record exact location of all irrigation components as installed, including but not limited to:

.1 All irrigation surface components: e.g. sprinklers, valve locations, grounding point, controller components, wire splice boxes, valve boxes, vaults

.2 All irrigation sub-surface components: e..g mainlines, laterals, pipe tees, ells, thrust blocks, pipe size changes, grounding components, sleeve

ends

Prepare surveyed Record Drawings. Clearly and legibly show all components of the irrigation system as installed. Identify each zone numerically, complete with precipitation rate and USgpm per zone. Prepare Record Drawings in digital (AutoCAD 2008 *.dwg and Adobe *.pdf) and hard copy formats

1.8 Operating Manual

.1 Prepare a complete Operating Manual for installed irrigation system. Content of Operating Manual to include:

.1 Irrigation Design Report

.2 Equipment operating instructions

.3 Maintenance instructions including winterization and spring start up procedures

.4 Product literature

.5 Parts lists

.6 Irrigation watering schedule

.7 Two (2) sets of all keys and specialized tools or equipment required for commissioning, operation or maintenance of irrigation system

.8 Signed copies of irrigation inspection reports and test results

.9 Copies of plumbing permit, electrical permit and low voltage certification

.10 Product warranty documentation for all controllers, meters, backflow prevention devices, valves, filters, sensors, electronic components and related irrigation components. Date the warranties with the date of Substantial Performance

.11 Written guarantee

1.9 Submittals

.1 Submit complete set of Record Drawings to Contract Administrator prior to issuance of Certificate of Substantial Performance. Submit digital and hard copy Record Drawings in full size (22x34”) and reduced (11x17”) sizes, including one (1) laminated, 11”x17” copy of Record Drawings in controller cabinet.

.2 Submit complete Operating Manual to Contract Administrator prior to issuance of Certificate of Substantial Performance.

1.10 Measurement for Payment

.1 Supply and installation of water service will be measured as a lump sum. The work includes:

.1 Permits and fees

.2 Supply, installation, testing and adjustment of the connection to water source and booster pump if required

.3 Master valve

.4 Water meter

.5 Flow sensor

.6 Backflow prevention device

.7 Blowout assembly

.8 Pressure reducing valve

.9 Filters

.10 Vaults, valve boxes & lids

.11 Fittings

.12 Excavation, trenching, sleeves, backfill and restoration

.13 All incidentals necessary for the proper installation and operation of a complete water service to the irrigation system

.2 Supply and installation of electrical service will be measured as a lump sum. The work includes:

.1 Permits & fees

.2 Electrical meter

.3 Supply, installation and testing of the connection to electrical source

.4 Excavation, trenching, conduits, backfill and restoration

.5 All incidentals necessary for the proper installation and operation of a complete electrical service to the irrigation system

.3 Supply and installation of irrigation control system will be measured as a lump sum. The work includes

.1 Permits & fees

.2 Supply, installation, testing, programming, and adjustment of irrigation system controller

.3 Transmitters & decoders

.4 Electrical conduits

.5 Controller cabinets

.6 Vaults, valve boxes & lids

.7 Fittings

.8 Excavation, trenching, backfill, and restoration

.9 All incidentals necessary for the proper installation and operation of a complete irrigation control system

.4 Supply and installation of pipes, valves, sprinklers and dripline will be measured as a lump sum. The work includes but is not limited to:

.1 Supply, installation, testing and adjustment of irrigation pipe

.2 Sleeves and conduit,

.3 Zone control valves

.4 Micro-irrigation control zone kits

.5 Electric control wire, common wire,flow sensor wire, and spare wires

.6 Drain valves

.7 Isolation valves

.8 Pressure regulators

.9 Swing joint assemblies

.10 Sprinklers

.11 Emitters, bubblers, dripline, and root watering systems

.12 Air / vacuum relief valves

.13 Fittings

.14 Vaults, valve boxes & lids

.15 Excavation, trenching, backfill and restoration

.16 All incidentals necessary for the proper installation and operation of a complete irrigation system

.5 Payment for Record Drawings and Operating Manual will be measured as a lump sum.

.6 Payment for irrigation system tests, inspections, maintenance, winterization and spring start-up during the warranty period will be incidental to the work under this section.

1.11 Tests and Inspections

.1 Refer to General Conditions, Clause 4.12, Tests and Inspections.

.2 At various milestones during construction inspection and testing of components will be required to ensure performance of irrigation system meets expected standards.

.3 Provide equipment and personnel necessary for performance of inspections and tests.

.4 As a condition of issuance of Certificate of Substantial Performance confirm in writing to the City of Kelowna, at least one week prior to application for Substantial Performance, the following inspections and successful tests:

.1 Certified backflow prevention device test per BCWWA.

.2 Mainline pressure test

.3 Ground grid connection inspection and earth ground test

.4 System coverage and operation test

.5 Dripline/emitter inspection and test, if applicable

.6 HDPE pipe strap test if applicable

.7 Vault drainage test

.5 Conduct all inspections and tests in presence of Contract Administrator and request Contract Administrator issue signed report to Contractor within three days regarding each test result. Request attendance of Contract Administrator for proposed inspection or test at least 3

days prior to proposed inspection or test.

.6 Keep work uncovered and accessible until successful completion of inspection or test.

1.12 Backflow Prevention Device Test

.1 Conduct backflow prevention device test per American Water Works Association standard using qualified personnel.

1.13 Mainline Pressure Test

.1 Perform mainline pressure test to identify potential leaks and ensure mainline is able to operate at design pressure and maintain system pressure.

.2 Conduct mainline pressure test prior to backfilling of mainline.

.3 Fill mainline with water and expel all air from pipe. Maintain water in pipe as follows:

.1 24 hours for PVC mainline

.2 3 hours for HDPE mainline

.4 Subject mainline to hydrostatic pressure of 150psi or twice the optimum design operating pressure of the mainline and not to exceed 200psi.

.5 Stop supply of make-up water to mainline and record hydrostatic pressure in mainline.

.6 Visually inspect mainline and fittings for leaks.

.7 Record hydrostatic pressure in mainline 3 hours after supply of make-up water stopped.

.8 Determine test result based on difference in recorded pressures at beginning and end of test as follows:

.1 Passed test: Less than 5% difference

.2 Failed test: Difference of 5% or greater

.9 Identify source of leak and replace any and all defective materials and workmanship as necessary to eliminate leak.

.10 Repeat mainline pressure test and make replacements as necessary until a passed result is achieved.

1.14 Ground Grid Connection Inspection and Earth

.1 Conduct ground grid connection inspection and earth ground prior to operation of irrigation controller.

Ground Test

.2 Visually inspect all Cad Weld connections or approved equal to ensure AWG #6 single strand copper ground wire is securely bonded to copper ground rods or plates.

.3 Connect Earth Ground Tester (Megger) to AWG #6 single strand copper ground wire(s) per manufacturer’s recommendations.

.4 Conduct earth ground test per recommendations of irrigation controller manufacturer.

1.15 System Coverage and Operation Test

.1 Conduct system coverage and operation test after installation and operation of complete irrigation system and prior to issuance of Certificate of Substantial Performance.

.2 Conduct visual inspection to confirm that:

.1 Head spacing does not exceed that shown on Contract Drawings

.2 Where applicable, irrigation piping should be designed to follow the contours of the land in an effort to minimize low head drainage situations.

.3 Heads, boxes, vaults and trenches are at specified elevation relevant to finished grade and not subject to settlement or lifting

.3 Conduct operational tests to verify that:

.1 Controller can be programmed manually on site and remotely via Owner’s central irrigation control system

.2 Controller can send and receive communication with Owner’s central irrigation control system10 consecutive times without a missed communication

.3 Controller responds to flow sensor

.4 Operating pressure is within design parameters

.5 Each zone can be operated automatically and in succession via programmed controller

.6 Performance provides head to head coverage

.7 There is no overspray onto different control zones, hard surfaces or other improvements

1.16 Dripline/Emitter Inspection

.1 Perform inspection and testing of dripline/emitter manifold and lines to identify potential leaks and confirm

manifold, driplines and emitters are able to operate at design pressure. Conduct inspection and testing prior to backfilling of manifold, driplines or emitters.

.2 Fill manifold and lines with water at operating pressure and maintain pressure for 1 hour. Visually inspect manifold, driplines and fittings for leaks. Confirm that emitters are functioning correctly. Identify sources of leaks and replace any and all defective materials and workmanship as necessary to eliminate leak.

.3 Repeat inspection and testing and make replacements as necessary until no further leaks are identified.

1.17 HDPE Pipe Strap Test

.1 Conduct HDPE pipe strap test at least 1 hour after fusion weld has been made and prior to backfilling of HDPE pipe on those fusion welds where, upon visual or tactile inspection, the bead does not roll back properly or is not consistent in height or width.

.2 HDPE pipe strap test consists of:

.1 Cut fusion weld from pipe, allowing 200mm on either side of weld to work with

.2 Cut pipe lengthways through fusion weld to create a strap 25mm wide

.3 Bend strap back on itself

.4 If weld breaks repeat test on another fusion weld, chosen by Contract Administrator. If second fusion weld fails then all welds become suspect and the HDPE pipe cannot be installed until the reason for the fusion joint failures is determined

.5 If fusion weld does not break then weld is acceptable and no further testing of similar welds is required

.6 Replace or repair tested pipe strap

1.18 Vault Drainage Test

.1 Conduct vault drainage test when vault is installed and backfilled and prior to installation of backflow prevention device and water supply line in vault.

.2 Fill point of connection vault with water to a depth of 300mm and leave water to drain.

.3 Determine test result based on time required for water to

drain below finish grade of drain rock in bottom of vault:

.1 Passed test: 1 hour or less

.2 Failed test: Greater than 4 hours

2.0 PRODUCTS

2.1 Water Service and Meter

.1 Unless already installed or otherwise required by the water utility having jurisdiction over the site provide a metered water service, including but not limited to:

.1 Plumbing permit

.2 Backflow prevention device; with permit as required

.3 Establishment and verification of water account with appropriate utility provider

Supply and install water meter in accordance with requirements of water utility.

.2 Conform size of water meter to mainline diameter and allow for minimal pressure losses.

2.2 Electrical Service and Meter

.1 Unless already installed or otherwise required by the electrical utility having jurisdiction over the site provide a metered electrical service, including but not limited to:

.1 Electrical permit

.2 Electric meter

.3 Establishment and verification of electrical account with appropriate utility provider

.2 Type and size of electrical service to be as specified on Contract Drawings.

.3 Unless specified otherwise electric meter to be supplied and installed per standards and specifications of electrical utility.

2.3 Isolation Valve

.1 Acceptable isolation valves include the following:

.1 Up to 2" see Approved Products List

.2 Greater than 2" per Contract Drawings

2.4 Flow Sensor

.1 Flow sensors impellors to be brass or stainless steel for up to 1" size, and glass filled nylon over 1" size, sized to match system low and high flows.

.2 Acceptable wire for flow sensor to be shielded, direct burial instrument cable and includes the following:

.1 Beldan

.2 Approved Equal

2.5 Master Valve

.1 Acceptable master valves are specified on the Approved Products List.

Ensure master valve is sized to maximum and minimum flow parameters shown on Contract Drawings.

2.6 Pressure Reducing Valve

.1 Acceptable water pressure reducing valves are specified on the Approved Products List.

2.7 Backflow Prevention Device

.1 Acceptable double check valve assemblies (DCVA) are specified on the Approved Products List.

.2 Acceptable Reduced Pressure Backflow Assemblies (RPBA) are specified on the Approved Products List.

2.8 Blowout Assembly

.1 Blowout assembly to be 50mm brass gate valve with brass hydrant adapter and threaded cap on swing joint assembly.

2.9 Vault and Lid

.1 Acceptable vaults and matching lids for point of connection equipment and components are dependent on service size and include the following:

.1	¾"	one (1) KonKast 1031 vault with Excel 4840-1 lid
.2	1" to 2"	one (1) KonKast 1102 with Excel 3974-2 lid
.3	2 ½" to 3"	two (2) KonKast 1102 with Excel 3974-2 lid
.4	Larger than 3" per Contract Drawings	

.2 Lids to have recessed hinges and locking hardware.

2.10 Vault Drain

.1 Perforated Schedule 40 PVC pipe, 4" diameter, with threaded inlet cover having maximum 13mm grated openings.

2.11 Ground Assembly

.1 Ground assembly consists of CSA and BC Electrical Code endorsed products per irrigation controller manufacturer's recommendations for grounding.

2.12 Irrigation Controller

.1 Irrigation controller and associated components per Drawings.

2.13 Pulse Decoder

.1 Acceptable pulse decoders are specified on the Approved Products List.

2.14 Pulse Output Transmitter

.1 Acceptable pulse output transmitters are specified on the Approved Products List.

2.15 Controller Cabinet

.1 Acceptable controller cabinets by Kelowna Steel Fabricators and include the following:

.1 Double post # KSH-21

.2 Irrigation cabinet to be finished using:

.1 One coat of Zinc Chromate Primer (General Paint or Tremclad)

.2 Two coats of General Paint Exterior Alkyd #CW033W

.3 Cabinet hinges to allow for grease application.

2.16 Electric Control Valve

.1 Acceptable electric control valves are specified on the Approved Products List.

.2 Size electric control valve in accordance with valve manufacturer's recommendations for the design flow.

.3 Include pressure regulating modules as required to provide the optimum operating pressure for each irrigation circuit and head/outlet specification.

.4 Acceptable manufacturers of control zone kits for drip irrigation are specified on the Approved Products List.

.5 Size control zone kit for drip irrigation based on zone flows. Refer to manufacturers recommendations to specify the suitable control zone kit.

2.17 Manual Control Valve

.1 Acceptable manual control valves include the following:

.1 Up to 2" see the Approved Products List

.2 Greater than 2" per Contract Drawings

2.18 Pressure Regulating Module

.1 Acceptable pressure regulating modules are specified on the Approved Products List.

.2 Size in-line pressure regulating module per manufacturer’s recommendations for drip irrigation application.

.3 Ensure pressure regulating module is compatible with control valve of zone it is installed on.

2.19 Low Flow Control Valve

.1 Acceptable low flow control valves for drip zones are specified on the Approved Products List.

2.20 Low Flow Filter

.1 Acceptable low flow filter for drip zones are specified on the Approved Products List.

.2 Filter to be commercial grade filter appropriate for low flow rates and with an external indicator showing of filter is clean or dirty.

2.21 High Flow Filter

.1 Acceptable high flow filter for irrigation system are specified on the Approved Products List.

2.22 Quick Coupler Valve

.1 Acceptable quick coupler valves are specified on the Approved Products List.

2.23 Swing Joint Assembly

.1 Fabricated with three threaded Schedule 40 PVC elbows and one threaded Schedule 80 PVC nipple.

.2 Length of nipple shall be such a length to permit installed head or valve to be set as specified.

.3 Diameter of nipple to match inlet for valve or head shown on Contract Drawings.

2.24 Lateral Flush Cap

.1 Ball valve with street elbow and flexible hose on swing joint assembly.

2.25 Valve Box

.1 Irrigation valve boxes are specified on the Approved Products List.

.2 Valve box and matching lid and extensions to be commercial grade and green in colour.

.3 Valve box to have locking lid with stainless steel bolt locking device and appropriate washers.

2.26 Control Wire

a. Control wire from irrigation controller to electric control valve to be minimum #14 gauge, direct burial, type TWU-40 wire. Control wire to be any colour other than white, blue, purple or red.

b. Common wire from irrigation controller to electric control valve to be minimum #12 gauge direct burial, type TWU-40 wire. Common wire to be white in colour.

c. Master valve wire from the controller to valve to be minimum #14 gauge direct burial, type TWU-40 wire. Wire to be red in colour.

d. Spare control wire to be blue in colour.

e. Spare common wire to be white in colour.

f. All connectors to be new, two-step, CSA approved for water tight applications and assembled according to the manufacturer’s recommendations.

2.27 Wire Splice Box

.1 Wire splice boxes and lids boxes are specified on the Approved Products List.

.2 Wire splice box and matching lid and extensions to be commercial grade and grey in colour. Wire splice box to have locking lid with stainless steel bolt locking device and appropriate washers

2.28 Irrigation Sleeve

.1 Class C-900 PVC for irrigation sleeve in bored hole or under hard surface.

.2 Irrigation sleeve diameter to be minimum 4” or twice the diameter of main or lateral line running through it, whichever is greater.

.3 Control wire conduit to be a minimum 2” diameter electrical conduit, per code.

2.28 Polyvinyl Chloride (PVC) Pipe

.1 Conform to CSA B137.3-93.

.2 New condition, extruded form virgin, high impact materials, solvent weldable with belled ends, continually and permanently marked showing manufacturer’s name, material, size, pressure rating, and CSA approval.

.3 PVC pipe to be as follows:

.1 Class 200 PVC pipe for pipe sizes ¾” to 2¼” in diameter

.2 Bell & Spigot gasket joint pipe c/w concrete thrust blocking for pipe sizes 2½" in diameter and greater

2.30 Polyethylene (PE) Pipe

.1 New condition CSA Series 100, MDPE in new condition, extruded from virgin materials, continually and permanently marked showing manufacturers name, material, size, and pressure rating.

2.31 High Density Polyethylene (HDPE) Pipe

.1 New condition CSA Approved, extruded from virgin materials, continually and permanently marked showing manufacturers name, material, size, and pressure rating.

.2 Material to be listed by the Canadian Standards Association (CSA) and Plastic Pipe Institute (PPI) as a PE-3408 resin with a hydrostatic design basis (HDB) of 1600psi for water at 23°C. Material to comply with ASTM D-1248 as a Type III Class C, Category 5, Grade P34 material and with ASTM D-3350 as a 345434C cell material.

.3 Acceptable HDPE pipe is dependent on operating pressure and to have Standard Density Ratios (SDR) as follows:

.1 Max. pressure up to 100psi: SDR-17.0

.2 Max. pressure exceeding 100psi: SDR-11.0

2.32 Fittings

.1 New condition Schedule 40 PVC conforming to ASTM D-2466-97 (and F438-97 for CPVC) standards and of the same material as pipe. Fittings to be designed for solvent welding to PVC pipe except where valves and risers require threaded joints.

.2 Nipples to be threaded Schedule 80 PVC and manufactured from same material as the pipe.

.3 At the point where the supply source changes from metal to PVC pipe, the metal end of the pipe must be an FIPT (female) adapter and the PVC fitting a MIPT (male) adapter.

.4 Flange couplers may be used upon approval of Contract Administrator.

.5 Fittings for HDPE pipe to be Schedule 80 PVC insert fittings complete with stainless steel gear clamps.

.6 Fittings for HDPE pipe to be butt fusion type for end-to-end joints.

.7 SDR rating of HDPE fittings must match the SDR rating of the HDPE pipe specified.

.8 HDPE pipe fittings to be molded or fabricated by the pipe manufacturer. HDPE pipe fittings and flange adapters made by contractors or distributors are prohibited.

.9 Fittings for dripline and drip emitters to be compatible with specified dripline or emitter and as recommended by manufacturer.

2.33 Pipe Solvent and Primer

.1 PVC pipe solvent and primer combinations recommended by manufacturer and suitable for use with specified materials and application.

.2 Use solvent and primer as directed by manufacturer. Use only solvent and primer that meets local codes.

.3 Primer for cleaning pipe and fittings to be P70 or P72 and compatible with solvent used.

.4 The use of wet and dry solvent and primer is prohibited.

2.34 Copper Pipe and Fittings

.1 Copper pipe and fittings per BC Plumbing Code per applicable use.

.2 All pipe and fittings installed in mechanical rooms, parkades, or routed through the interior of buildings to be copper.

2.35 Brass Pipe and Fittings

.1 Brass pipe and fittings per BC Plumbing Code per applicable use.

.2 All pipe and fittings installed irrigation vault to be brass per Drawings.

2.36 Thrust Block

.1 Thrust blocks to be 20MPa at 28 day strength. Thrust blocks can be either:

.1 Poured in place concrete

.2 Pre-cast concrete block

.2 Size and shape of the concrete thrust block will depend on type of joint, size of pipe, width of trench, and type of soil, per Drawings

2.37 Sprinklers – General

.1 Make, model, nozzle size, and features of sprinklers as specified on Contract Drawings.

.2 All sprinklers installed in sport field turf areas to be equipped with the manufacturer-supplied rubber covers.

2.38 Sprayhead Sprinkler

.1 Acceptable sprayhead sprinklers are specified on the Approved Products List.

.2 Required pop-up height for sprayhead sprinklers to be as shown on Contract Drawings.

2.39 Rotor Sprinkler

.1 Acceptable rotor sprinklers are specified on the Approved Products List.

2.40 Dripline

.1 Dripline shall incorporate root intrusion technology and be as shown on Contract Drawings.

.2 Pressure compensating driplines are specified on the Approved Products List.

2.41 Drip Emitter/Bubbler

.1 Drip emitters/bubblers shall be as shown on Contract Drawings.

.2 Drip emitters/bubblers are specified on the Approved Products List.

2.42 Sand

.1 Sand to be pit run sand, per Section 02226

2.43 Drain Rock

.1 Drain rock to be drain rock, per Section 02226.

2.44 Water

.1 Free of impurities that would inhibit germination and growth or may be harmful to people or the environment.

.2 Test water from sources other than treated potable water for suitability in irrigation to determine that it meets the requirements of this section.

3.0 EXECUTION

3.1 Existing Conditions

.1 Report existing conditions at variance with Contract Drawings to Contract Administrator.

.2 Verify locations of underground utilities prior to commencing excavation and conduct work so to prevent interruption and damage to services and utilities. Make good all damages to same at Contractor's cost.

.3 Verify location of all services in building walls before boring or drilling holes. Make good all damages to same at Contractor's cost.

.4 Protect existing conditions and completed work from disturbance during Work. Make good all damages to same at Contractor's cost.

.5 Adjustments to installation of irrigation system to avoid existing conditions, completed work and utilities will be permitted subject to prior approval by Contract Administrator.

3.2 Layout

.1 Locations of irrigation components shown on plans is schematic in nature. Coordinate actual location of irrigation components with landscaping, building and physical features of site. Confirm proposed changes to location of irrigation components in writing with Contract Administrator prior to installation. Changes that markedly alter the irrigation design in the opinion of the City Engineers require submission of Shop Drawings and updated Irrigation Design Report to City of Kelowna for their permission to proceed. Record all approved revisions on a marked-up set of Contract Drawings

.2 Layout and stake irrigation system per Contract Drawings to confirm:

.1 Layout is within project boundary and property lines

.2 Site grades are consistent with Contract Drawings

.3 Damage to root system of existing trees is minimized

.4 Installation of irrigation components to be a minimum of 1 meter outside the dripline of existing trees

.5 Minimum horizontal and vertical clearances from electrical and other utilities are met

.6 Location of all sleeving, main lines, cabinets, vaults, valve boxes, splice boxes and ground grid assembly

.3 Have layout inspected and approved by the Contract Administrator before commencement of work. Adjust layout as instructed by Contract Administrator.

.4 During construction it may be necessary to adjust the layout of the irrigation system. Request layout changes to Contract Administrator prior to execution of work.

.5 Do not modify irrigation layout without written approval of Contract Administrator.

3.3 Excavation

.1 Excavate to ensure depth and bedding requirements are met.

.2 All excavation is unclassified. Report any material or site condition that cannot be excavated by normal mechanical or manual means or that may affect excavation to required depth to Contract Administrator prior to excavation.

.3 Identify and recycle all suitable materials recovered during construction.

.4 Remove and dispose of buried debris exposed during excavation, including decommissioned irrigation materials and underground utilities, which may impede the proper installation and operation of irrigation system.

3.4 Water Service and Account

.1 Establish water utility account and obtain permits and approvals necessary to install and operate irrigation system.

.2 Review regulations and restrictions imposed by applicable water utility with Certified Irrigation Designer and advise Contract Administrator of any regulations or restrictions that will affect operation of proposed irrigation system. Provide Contract Administrator with options necessary to respond to any regulations or restrictions affecting operation of proposed irrigation system.

.3 Coordinate with water utility as required to confirm availability, suitability, and location of an acceptable service connection.

.4 Isolate water service prior to installation of any irrigation components.

.5 Install water service to point of connection with additional isolation valves similar to SS-W50.

3.5 Electrical Service and Account

.1 Within 5 days of receipt of Notice to Proceed provide Contract Administrator with information necessary for Owner to make application to electrical utility for service connection.

.2 Obtain permits and approvals necessary to install and operate irrigation system.

.3 Coordinate with electrical utility as required to confirm the availability, suitability, and location of an acceptable service connection.

.4 Install all electrical connections in accordance with local, provincial and national electrical codes.

.5 Install 120v AC on opposite side of the mainline trench from 24v AC irrigation control / communication wires to prevent "cross talk" from a higher voltage. Where 120v AC cable is not installed adjacent to irrigation mainline install it in non-metallic electrical conduit.

3.6 Water Meter

.1 Install water meter per Drawings and requirements of water utility.

3.7 Isolation Valve

.1 Install isolation valve per Drawings.

3.8 Flow Sensor

.1 Install flow sensor in location specified on Drawings.

.2 Flow sensor wire to run continuously, with no splices, between flow sensor and irrigation controller.

.3 Follow manufacturer's recommendations for installation and wiring of flow sensor.

3.9 Master Valve

.1 Install master valve per Drawings.

3.10 Pressure Reducing Valve

.1 Install pressure reducing valve (PRV) per manufacturer's recommendations in location shown on Contract Drawings and as required to maintain operating pressure within manufacturer's recommended range.

.2 Adjust PRV to provide water at design pressure for the sprinkler furthest from control valve.

3.11 Backflow Prevention Device

.1 Install Double Check Valve Assembly (DCVA) in lockable concrete vault or a locked mechanical room, per Drawings.

.2 Install Reduced Pressure Backflow Assembly (RPBA) a minimum of 300mm above finished grade per manufacturer's recommendations and Drawings . Install RPBA on reinforced concrete pad with pipe restraints bolted to floor to restrain and support assembly.

.3 Construct reinforced concrete pad for RPBA 150mm larger than the proposed enclosure in all directions. Construct reinforced concrete pad on a 150mm thickness of granular base compacted to 95% S.P.D. Provide vault drain directly below discharge valve and connect to drain pit, dry well, manhole or catch basin.

.4 Install acceptable lockable enclosure over the RPBA large enough to secure the assembly and any associated components attached to this point.

.5 Install backflow prevention device in accordance with all applicable codes and bylaws and in accordance with the current Cross Connection Control Manual Accepted Procedure and Practice (American Water Works Association).

.6 Install backflow prevention devices with positive drainage and room for maintenance and servicing.

.7 Support backflow prevention device with specified supports per manufacturer's recommendations for locations of the support points.

3.12 Blowout Assembly

.1 Install blowout assembly per Drawings.

3.13 Vault and Lid

.1 Install vault in location shown on Contract Drawings or in alternate location approved or directed by Contract Administrator.

.2 Support and brace point of connection components, piping and valves within vault using adjustable aluminium pipe stands complete with riser, pipe clamps, base plate and galvanized or stainless steel fittings in the quantity per service size indicated as follows:

.1	¾"	2 supports
.2	1" to 2"	3 supports
.3	2 ½" to 3"	3 supports per vault
.4	Larger than 3"	per Contract Drawings

.3 Lids to have recessed hinges and locking hardware.

.4 Use brass pipe for all piping inside vault and extend brass piping outside the vault a minimum of 300mm beyond vault. Make union of brass pipe with other pipe in valve box or vault using specified fitting.

.5 Make connections of PVC pipe and metal pipe using male threads on PVC pipe and female threads on metal pipe.

.6 Install vault drain and connect to drain pit, dry well, manhole or catch basin.

3.14 Ground Assembly

.1 Install ground assembly in location shown on Contract

Drawings or the revised location approved by the Contract Administrator.

.2 Use the rod, plate and wire configuration as recommended by manufacturer of irrigation controller and per BC Electrical Code.

3.15 Irrigation Controller

.1 Install irrigation controller in controller cabinet.

.2 Coordinate controller installation with that of other electrical components.

.3 Install controller and wiring in accordance with local, provincial and national electrical codes.

.4 Install and test the ground assembly using a “Megger” to ensure earth resistance to ground does not exceed controller manufacturer’s recommendations.

.5 Install communication components per manufacturer’s recommendations and establish communication between controller and Owner’s central irrigation control system, including relays or boosters as necessary.

.6 Prior to issuance of Certificate of Substantial Performance request irrigation program from Contract Administrator and set controller program accordingly.

3.16 Pulse Decoder

.1 Install pulse decoder in controller cabinet per manufacturer’s recommendations.

3.17 Pulse Output Transmitter

.1 Install pulse output transmitter in controller cabinet per manufacturer’s recommendations.

3.18 Controller Cabinet

.1 Install controller cabinet in location shown on Contract Drawings or in alternate location approved or directed by Contract Administrator.

.2 Orient alignment of controller cabinet as approved by Contract Administrator to provide optimal observation of irrigation system in operation.

.3 Install controller cabinet using a poured in place concrete pad mount.

.4 Provide electrical service to controller cabinet as shown on Contract Drawings.

.5 Install electric meter in the irrigation cabinet per electrical utility’s requirement.

.6 Install only GFI breakers in controller cabinet electrical panel.

.7 Install 1 duplex 120v AC GFI receptacle, on dedicated breaker, in controller cabinet.

3.19 Electric Control Valve

.1 Install in valve box per manufacturer’s recommendations and Drawings .

.2 Identify electric control valve with permanent label or tag indicating zone number of valve.

3.20 Manual Control Valve

.1 Install in valve box per manufacturer’s recommendations and Drawings.

.2 Identify manual control valve with permanent label or tag indicating zone number of valve.

3.21 Pressure Regulating Module

.1 Install pressure regulating module in same valve box as low flow control valve, per manufacturer’s recommendations and Drawings.

.2 Adjust pressure regulating module to provide water at design pressure for head, emitter or end of dripline farthest from control valve.

3.22 Low Flow Control Valve

.1 Install low flow control valve in valve box at beginning of each drip irrigation zone, per manufacturer’s recommendations and Drawings.

.2 Identify low flow control valve with permanent label or tag indicating zone number of valve.

3.23 Low Flow Filter

.1 Install low flow filter in same valve box as low flow control valve, per manufacturer’s recommendations and Drawings .

3.24 Quick Coupler Valve

.1 Install per manufacturer’s recommendations in valve box per Drawings .

.2 Install quick coupler valve on swing joint assembly in upright plumb position.

.3 Install non-corrosive metal clamp on quick coupler valve to prevent uninhibited turning of the valve.

.4 Do not install quick coupler in same valve box as electric control valve.

3.25 Swing Joint Assembly

.1 Fabricate assembly of triple swing joint using three threaded Schedule 40 PVC elbows and one threaded Schedule 80 PVC nipple.

.2 Install swing joint assembly to rotate clockwise when depressed.

.3 Tape threads of PVC fittings with Teflon tape and make hard hand tight.

2.26 Lateral Flush Cap

.1 Install lateral flush cap on swing joint assembly in valve box.

.2 Coil hose in valve box.

3.27 Valve Box

.1 Install all manual and electric control valves, control zone kits and quick coupler valves in valve boxes or concrete vault as shown on Drawings.

.2 Except as shown otherwise on Contract Drawings or approved otherwise by Contract Administrator, locate valve boxes in planting beds and locate for ease of access, maintenance, and testing.

.3 Install valve box flush with finish grade and arrange in a neat and orderly manner.

.4 Provide minimum 150mm clearance between valve box and all components within.

.5 Valve box must not contact irrigation pipe. Use 150mm height matching valve box extensions as required.

.6 Up to three 1" control valves or two 1½" control valves may be contained within a single valve box provided there is 100mm of clearance between valves. Install valve 2" and larger in their own valve box.

3.28 Control Wire

.1 Install control wire per code and by qualified personnel employed by the company holding the electrical permit.

.2 Bury control wire per applicable code and in no case above the bottom side of parallel pipe.

.3 Bed control wire in sand with minimum 50mm sand around control wire. Where control wire is in same trench as pipe, place wire beside pipe with horizontal clearance of a minimum of 50mm and in accordance with BC Electrical Code depth.

.4 Bundle multiple lengths of wire in same trench or conduit

with ties at maximum 3.0m intervals.

.5 Install wire with minimum 600mm length of coiled slack at all changes of direction, in wire splice boxes and at connections to controlled components.

.6 Identify all control wires entering controller cabinet with permanent label or tag indicating zone number of valve operated by each control wire.

.7 Maintain consistent wire colour through wire splice box.

.8 Minimize wire splices. Where wire splices are unavoidable make splice only in wire splice box using specified connector.

.9 Identify spliced wire with permanent label or tag indicating zone number of spliced control wire.

.10 Where specified on Contract Drawings, install extra control wire to wire splice box. Provide 600mm length of coiled slack of each wire end in wire splice box. Identify extra control wire as 'extra' wire with permanent label or tag.

3.29 Wire Splice Box

.1 Locate wire splice box in planting bed where possible and locate for ease of access, maintenance, and testing.

.2 Install wire splice box per Drawings and arrange in a neat and orderly manner.

.3 Do not install valves in wire splice box.

3.30 Irrigation Sleeve

.1 Install irrigation sleeves in locations shown on Contract Drawings.

.2 Install irrigation sleeve to depth as follows:

.1 Mainline Piping

.1 600mm below walkways
.2 750mm below driveways, roads and plazas

.2 Lateral Piping

.1 300mm below walkways
.2 600mm below driveways, roads and plazas

.3 Install sleeve to extend 1.0m past edge of hard surface into soft landscape surface.

.4 Cap sleeve with removable plug or cover. Maintain plug in sleeve until such time as pipe or wire is ready to be

installed.

.5 Bed sleeve as follows:

.1 Under walkways, 100mm of sand placed all around

.2 Under driveways, roads and plazas**,** compacted base aggregate all around per materials shown on Drawings.

.6 Bury a piece of detectable metal on top of each end of sleeve to enable location of sleeve end by metal detector after burial.

.7 Stake location of each end of sleeve prior to backfilling such that top of stake is 300mm above finished grade and maintain. Label exposed end of stake with the word "sleeve".

.8 Record location of sleeve ends and label size of sleeve on Record Drawings.

.9 Remove sleeve stake after submission of Record Drawings.

3.31 Pipe and Fittings

.1 Verify that all pipe, fittings, primer and cements are compatible for proper installation.

.2 Minimum burial depth and clearances for pipe and wire to be per Drawings.

.3 Do not locate open side of trench any closer than 300mm from hard surface or feature.

.4 Keep inside of pipe and outside of pipe ends clean at all times. Cap or plug open pipe ends to keep out dirt and debris.

.5 Cut PVC pipe ends at right angle to pipe length. Clean burrs prior to joining pipe and fittings.

.6 Do not apply cement or solvent weld pipe or fittings under wet or muddy conditions.

.7 Follow manufacturer's recommendations for use of pipe primer and cement.

.8 Immediately prior to joining pipe and fittings wipe contact surfaces clean with primer on clean rag.

.9 Apply light coat pipe of cement on inside of fitting and heavier coat on outside of pipe. Insert pipe into fitting and give a quarter turn to seat cement. Wipe excess cement from outside of pipe.

.10 Make plastic to metal joints with plastic male adapters.

.11 Wrap male threads of threaded fittings with minimum 3 wraps of Teflon tape immediately prior to making connection.

.12 Flush all irrigation pipe fully to remove accumulation of dirt and debris prior to installation of heads, dripline, emitters and filters. Flush all laterals in a manner approved by the manufacturer to prevent clogging of screens, nozzles and emitters.

.13 Follow manufacturer’s recommendations to install pipe in a manner that provides for expansion and contraction of pipe in trench.

.14 Conduct water service flow test and obtain approval of Contract Administrator prior to backfilling main line.

.15 Conduct mainline pressure test and HDPE pipe strap test and obtain approval of Contract Administrator prior to backfilling lines.

.16 Sidewall fusion of HDPE pipe is not acceptable.

.17 For HDPE pipe conduct HDPE pipe strap test obtain approval of Contract Administrator prior to backfilling HDPE pipe.

.18 Set mainlines and laterals on sand and backfill with sand to clearance limit shown on Drawings .

.19 For pipe in growing medium of landscaped areas backfill trench with growing medium and tamp in lifts to achieve compaction equal to the adjacent growing medium.

.20 For pipe in native soil, sub-surface fill, rocky soils and aggregate base or subbase material backfill remainder of trench with suitable non-sand material under 25mm in diameter and free of materials that could result in settling or damage to pipe or surface improvements.

.21 Install 14 gauge insulated trace wire (purple) on top of all mainline and lateral piping. Extend and fasten trace wire into valve boxes, vaults and sleeves.

.22 Install thrust blocks at all changes in direction of PVC pipe 2½” in diameter or greater, and for any change in direction of gasketed pipe.

3.32 Thrust Block

.1 Place thrust block to support the pipe joints from separating, not to prevent the pipe from heaving. Do not

cover top of pipe with concrete thrust blocking at change from a horizontal alignment to a vertical alignment.

.2 For thrust blocks installed in disturbed soils (e.g. compacted backfill) increase the thrust block area by 50%.

.3 Place 2 ply of 6mil polyethylene between pipe and thrust block.

.4 Allow concrete to set before backfilling trench or pressurizing line.

.5 Obtain approval from Contract Administrator prior to backfilling thrust block.

3.33 Sprinkler

.1 Install per manufacturer's recommendations and in location shown on Contract Drawings.

.2 Location of heads as illustrated on Contract Drawings is intended as a guide to layout of heads. Establish actual head locations in the field to ensure complete and adequate coverage of all areas to be irrigated and no overspray onto adjacent surfaces and improvements. Do not exceed head spacing shown on Contract Drawings.

.3 Where obstructions or site improvements hinder or block head to head coverage advise Contract Administrator and determine best method to maximize coverage.

.4 For head adjacent to hard surface or improvement set head as shown on Drawings.

.5 For flat surfaces install head plumb to finished grade. For sloped surfaces install head perpendicular to half the grade of the slope.

.6 Mount pop-up heads on triple swing-joint assembly. Connect bottom inlet of sprinkler to swing joint assembly, not side inlet. Adjust swing joint assembly to set head flush with finish grade. Tape threads of PVC fittings with Teflon tape and make hard-hand tight.

.7 Adjust arc, radius of coverage and flow at each sprinkler to achieve even head to head coverage of area to be irrigated, with minimum over spray onto other surfaces.

3.34 Dripline

.1 Install per manufacturer's recommendations in location shown on Contract Drawings.

.2 Install pressure regulating module, low flow control valve and low flow filter at beginning of each drip zone.

.3 Do not install driplines or emitters of different flow rates

on the same zone.

.4 Place dripline on prepared surface. Surface to free of sharp rocks or other objects that may damage dripline. Surface to be at grade necessary for dripline to be at specified depth after placement of remainder of topsoil or growing medium.

.5 Placement of dripline by trenching using hand or mechanical methods permitted only if specified as such on Contract Drawings or upon written approval of Contract Administrator.

.6 Do not drive or operate equipment over exposed dripline.

.7 Make all zone connections and test manifold, lines and fittings for leaks prior to placement of topsoil or growing medium over manifold, dripline and emitters.

.8 Thoroughly flush each zone after installation and before beginning regular operation of drip zone.

3.36 Drip Irrigation for Planting Beds

.1 For dripline in planting bed stake dripline using manufacturer's recommended stakes at 450mm on centre.

3.37 Drip Irrigation for Turf Areas

.1 For turf area irrigated by dripline install temporary spray irrigation system as shown on Contract Drawings or approved Shop Drawing and maintain until end of Landscape Maintenance Period.

.2 Operate both the temporary spray and dripline systems during the Landscape Maintenance Period in a co-ordinated way to both deliver optimum watering and to prove the performance of both systems. Temporary spray zones must meet efficiency standards and comply with head to head spacing policy.

3.38 Emitter/Bubbler

.1 Install per manufacturer's recommendations and as shown on Drawings.

.2 Install pressure regulating module, low flow control valve and low flow filter at beginning of each emitter zone.

3.39 Hose Bib

.1 Install as shown on Drawings

3.40 Clean-up and Restoration

.1 Remove all waste and debris resulting from irrigation installation from site.

.2 Restore all disturbed surfaces to original condition and repair all trench settlement.

3.41 Instructions to Owner

.1 Instruct Owner in complete operating and maintenance procedures for irrigation system, including start-up, winterization, and programming.

.2 Review Record Drawings and Operating Manual with Owner on site.

3.42 Maintenance – General

.1 Inspect, operate, maintain and adjust irrigation system through the Landscape Maintenance Period until issuance of Certificate of Acceptance to ensure it operates as intended, including but limited to:

.1 Adjust irrigation program to ensure survival, health and growth of the plant material and respond to soil conditions, climate and seasons of site

.2 Clean sprinkler heads and adjust coverage to eliminate over watering, under watering and overspray onto adjacent surfaces

.3 Monitor and clean filtration equipment

.4 Restore grass areas, planting beds, hard surfaces and improvements affected by trench settlement and erosion

.5 Respond to requests from Contract Administrator for program adjustments, servicing, adjustments and repairs

3.43 Maintenance – Winterization

.1 During Landscape Maintenance Period be responsible for winterization of irrigation system at end of growing season and prior to onset of air temperatures below 0º Celsius. Be liable for any damage resulting from late or improper winterization.

.2 Request presence of Owner at winterization at least 5 days prior to proposed winterization.

.3 Winterization includes but is not limited to:

.1 Saturation of soil with water to a depth of 300mm to provide deep watering of all lawn areas, planting beds and tree pits

.2 Deactivation of controller

.3 Drainage and blow-out of entire irrigation system

.4 Contact water utility provider to determine if water meter is to be removed for winter. Remove and store water

meter, or assist the water utility with removal of water meter, as directed by water utility.

3.44 Maintenance – Spring Start-up

.1 During Landscape Maintenance Period be responsible for spring start-up of irrigation system at beginning of growing season or within 10 days of request for start-up from Owner. Be liable for any damage resulting from late or improper start-up.

.2 Ensure Owner is present for spring start-up. Request presence of Owner at least 5 days prior to proposed start-up.

.3 Prior to spring start-up contact water utility provider and examine service connection to determine if the water meter needs to be re-installed or re-activated. Re-install the water meter, or assist water utility with re-installation of the water meter, as directed by water utility.

.4 Spring start-up includes but is not limited to:

.1 Checking and testing for leaks

.2 Cycling irrigation control program through all zones to ensure proper function and performance

.3 Checking and adjusting heads and emitters to achieve even coverage with minimum over spray onto other surfaces

.4 Testing of backflow prevention device. Submit test results to Contract Administrator and place copy of test results in irrigation cabinet

.5 Saturation of the soil with water to a depth of 300mm to provide deep watering of all lawn areas, planting beds and tree pits

3.45 Guarantee

.1 Submit written guarantee, in approved form, stating that all work showing defects in materials, workmanship or operation will be repaired or replaced at no cost to Owner for a period of one year from date of Substantial Performance.

.2 Guarantee includes the supply of labour, materials and equipment necessary for the repair and replacement of damaged or defective materials and workmanship. Guarantee also includes spring start-up, winterization, maintenance, necessary testing, program corrections or adjustments and restoration of settled trenches.

.3 Guarantee will not apply to materials or workmanship

damaged after Substantial Performance by causes beyond the Contractor’s control, such as vandalism or abuse.

1.3 Source Quality Control

.1 Replace clause with:

"Within 5 days of receiving Notice to Proceed advise Contract Administrator of location of each proposed source of supply of growing medium and amendment (e.g. peat moss, manure, compost). Make proposed sources of supply available to Contract Administrator for viewing and sampling.

.3 Add clause:

"Do not manufacture, supply or place growing medium and amendments that will not or do not meet the physical and chemical properties described in this Section without prior written approval of Contract Administrator".

.4 Add clause:

"After all growing medium is placed allow minimum 20 days for Contract Administrator to have placed growing medium sampled and analysed before determining if growing medium is compliant with this Section and if a full or partial payment for supply and placement of growing medium is owed to Contractor."

1.4 Measurement and Payment

.1 Replace clause with:

"Payment for growing medium, imported topsoil and re-use of native topsoil will be made separately for each type of growing medium and topsoil specified, and includes supply of materials, screening, mixing, handling, subgrade scarification, placement to specified thickness, finish grading and application of fertilizers, organic material and other amendments. Payment for growing medium, imported topsoil and re-use of native topsoil will be by actual area provided to specified thickness."

.2 Replace clause with:

"Payment for topsoil and finish grading will be withheld pending Contract Administrator's review of the soil analysis results."

.3 Replace clause with:

"Payment for excavation, screening and stockpiling of native topsoil will be made under Section 02210 – Site Grading.

.4 Add clause:

"If analysis of placed growing medium indicates that the physical or chemical properties of the material varies from the limits and ranges specified in this Section, the Contract Administrator may do one or a combination of the following**:**

.1 Require removal and replacement of growing medium that does not meet the limits and ranges specified in this Section.

.2 Require the application and incorporation of soil amendments to enable the soil to meet the physical and chemical requirements specified in this Section.

.3 Accept the work at a reduced price determined by G.C. 9 Valuation of Changes and Extra Work.

.4 No additional payment will be made for removal, replacement, repair or adjustment of growing medium or other work, including removal and replacement of plant material and irrigation components, that is or may be impacted by removal and replacement of unsuitable growing medium.

1.5 Inspection and Testing

.2 Add clause:

"Submit 1.0kg sample of each proposed material and amendment to Contract Administrator and soil testing laboratory."

.3 Add clause:

"Independent soil testing laboratory to be approved by Contract Administrator."

.4 Add clause:

"Have testing laboratory analyse samples for chemical, physical and biological properties specified in this Section, to include pH, lime requirements, soluble salts or electrical conductivity (E.C.), % Sands + % Fines (Silt and Clay) + % Organic Matter = 100%, % Total Nitrogen, and available levels of phosphorous, potassium, calcium and magnesium."

.5 Add clause:

"Have testing laboratory advise on suitability of material for intended use and make recommendations for manufacture and amendment of growing medium to meet requirements of Contract Documents."

2.7 Manure

.6 Add clause:

"Use of manure to be approved in writing by Contract Administrator prior to mixing or placement."

2.10 Table 2

Replace Table 2 with:

"Table 2: Properties of Growing Medium for Different Applications

	Tree Pits & Low Traffic Lawn Areas	High Traffic Lawn Areas	Planting Beds & Planters	Naturalized Grass	Naturalized Beds
Particle Size (% of dry weight mineral fraction per Canadian System of Soil Classification)					
Gravel >2mm	0-5	0-5	0-5	0-10	0-10
Sand 0.05mm-2mm	50-70	80-90	50-70	30-70	30-70

Silt 0.002mm-0.05mm . .	10-25	5-15	10-25	15-50	15-50
Clay <0.002mm	0-20	0-5	0-20	15-30	15-30
Silt + Clay	25 max	15 max	25 max	60 max	60 max
Acidity (pH)	6.0-7.0	6.0-7.0	5.5-7.0	6.0-7.0	6.0-7.0
Organic Content . . . . . (% of dry weight)	3-5	3-5	15-20	5-10	10-15
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."				

2.11 Compost

.1 Add clause:

"Compost to be uniform blend of natural source-separated organic materials, composted such that it is brown-black in colour and has carbon to nitrogen ratio of 25 to 1 or lower and pH 6 to 7. Compost to be substantially free from subsoil, pests, roots, wood, construction debris, undesirable grasses or weeds, and seeds or parts thereof. Compost to be substantially free from toxic materials, crabgrass, couchgrass, equisetum, other weeds, and seeds or parts thereof."

.1 Add clause:

"Use of compost to be approved in writing by Contract Administrator prior to mixing or placement."

3.4 Placing Growing Medium

.5 Replace clause with:

"Place growing medium to minimum depth after settlement specified on Contract Drawings. Where no depth is specified on Contract Drawings place growing medium to minimum depth after settlement specified in Table 3.

.6 Add clause:

"Determination of minimum growing medium depth after placement will be made at the time of inspection for Substantial Performance."

3.10 Drainage Control

.1 Add clause:

"Provide proper water management and drainage of site during construction. Include silt traps, erosion control measures, temporary water collection ditches, as well as maintenance during construction period."

1.0 GENERAL

Section S02922 refers to those portions of the work that are unique to the use of structural soils for the planting of trees and landscaping in pedestrian and vehicular areas. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.10	Concrete Walks, Curbs and Gutters	Section 02523
.11	Cast-in-Place Concrete	Section 03300
.12	Aggregates and Granular Materials	Section 02226
.13	Excavation, Trenching and Backfilling	Section 02223
.14	Roadway Excavation, Embankment and Compaction	Section 02224
.15	Geosynthetics	Section 02498
.16	Granular Base	Section 02233
.17	Topsoil and Finish Grading	Section 02921
.18	Planting of Trees, Shrubs and Ground Covers	Section 02950

1.2 Mix Design

Ratio of materials for structural soil mix design to be approximately as follows:

.1 Crushed stone: 100 unit dry weight
.2 Growing medium: 20 unit dry weight
.3 Soil stabilizer: 0.03 units dry weight

Actual mix design subject to material characteristics, site conditions and Contract Administrator's approval of materials and mix sample.

Prepare up to three different structural soil mix design ratios and submit to Contract Administrator for review and comment.

Based on direction of Contract Administrator prepare up to three different sample structural soil mixes, minimum 0.5m^3 volume each, and deliver to site for review and approval of one sample by Contract Administrator.

1.3 Delivery, Storage and Handling

.1 Minimize handling and movement of structural soil to prevent

segregation of growing medium from crushed stone.

.2 Do not handle, deliver or place structural soil in frozen, wet or muddy conditions.

.3 Deliver materials to site at or near optimum compaction moisture content.

.4 Place structural soil as shown on Contract drawings within 24 hours of delivery to site. Do not store material on site.

.5 Protect excavation from freezing conditions, accumulation of water and contamination until placement of structural soil. Maintain protection of excavation and placed structural soil until installation of hard surfaced roadway or pedestrian surface above.

.6 Structural soils that are excessively wet, segregated or contaminated will be rejected. Remove rejected structural soil from site and replace with approved material at Contractor's expense.

1.4 Site Conditions

.1 Inspect all areas to receive structural soil prior to placement.

.2 Before proceeding with Work of this Section check and verify dimensions, quantities, grade elevations, drainage, compaction and contamination.

.3 Report defects in dimensions, quantities, grade elevations, drainage, compaction and contamination to Contract Administrator immediately and make good to satisfaction of Contract Administrator prior to placement of structural soil.

1.5 Scheduling

.1 Schedule placement of structural soil after all affecting walls, curbs, footings and utility work in the area have been installed.

.2 Coordinate schedule with scheduling of other trades on site.

1.6 Measurement and Payment

.1 Payment for structural soil will be made separately for each type of structural soil specified, and includes crushed stone and growing medium material supply, mixing, amendments, site preparation, placement, compaction, geotextiles, protection of work and incidentals. Payment for structural soil will be by actual volume placed.

.2 Payment for excavation, backfilling and embankment of structural soil work area will be made under Section 02223 - Excavating, Trenching and Backfilling or Section 02224 - Roadway Excavation, Embankment and Compactions, as provided in the Schedule of Quantities and Unit Prices.

.3 Payment for placement and compaction of subbase and base associated with structural soil will be made under Section 02234 - Granular Subbase and 02233 - Granular Base, as provided in the Schedule of Quantities and Unit Prices.

.4 Payment for pedestrian or vehicle surfaces above structural soil will be made under separate sections as appropriate

.5 Payment for tree planting, associated non-structural growing medium, root barrier and tree grates will be made under separate sections as appropriate.

1.7 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections.

.2 Refer to Section 02921 - Topsoil and Finish Grading - 1.3 and 1.5.

.3 Submit 10.0kg sample of each proposed crushed stone material to Contract Administrator and testing laboratory.

2.0 PRODUCTS

2.1 Crushed Stone

.1 Crushed stone to be crushed granite greater than 19mm and less than 50mm in size and conforming to the following graduations:

ASTM Sieve Designation	Percent Passing
40mm	90-100
25mm	20-55
10mm	10

.2 Ratio of aggregate dimensions not to exceed 2.5:1 for any two dimensions chosen.

.3 Minimum 90 per cent with one fractured face and minimum 75 percent with two or more fractured faces.

2.2 Growing Medium

.1 Growing medium to be as specified in Section 02921 for tree pit or planting bed application as shown on Contract Drawings.

2.3 Soil Stabilizer

.1 Soil stabilizer to be non-toxic organic binder or hydrogel. Acceptable soil stabilizers include:

.1 Natural Solution by Sport Turf Inc, 604-850-7857
.2 Gelscape by Amereq Corporation, 800-832-8788

2.4 Filter Fabric

.1 Non woven filter fabric to conform to the following designations:

.1	Grad Tensile Strength, per ASTM D-4632:	400kN
.2	Tensile Elongation, per ASTM D-4632:	50%
.3	Mullen Burst, per ASTM D-3786:	1270kPa
.4	Flow rate, per ASTM D-4491:	6300 l/min/m^2

2.5 Root Barrier

.1 Root barrier to be per Section 02950 - Planting of Trees, Shrubs and Ground Covers .

3.0 EXECUTION

3.1 Manufacturing and Mixing

.1 Use approved materials only.

.2 Manufacture and mix structural soil off-site using appropriate soil measuring, mixing and shredding equipment of sufficient capacity and capability to assure proper quality control and consistent mix ratios. Mixing of structural soil at site not permitted.

.3 Mix materials in ratios per approved mix design and sample. Supplier to provide mix design to City of Kelowna. Subject to supplier mix design, the mix may be approximately 100 units dry stone, 20 units growing medium, and 0.03 units soil stabilizer.

.4 Do not manufacture structural under freezing conditions.

.5 Prepare first batch of structural soil with Contract Administrator present at mixing site to confirm appropriate moisture content and mixing procedure for manufacture of structural soil.

.6 Growing medium should shred and break down without clumping into a fine crumbly texture.

.7 Add moisture gradually and evenly during the blending and turning operation as required to achieve the required moisture content. Soils shall not be overly wet or dry. Maintain adequate moisture content during the mixing process. Measure and monitor amount of soil moisture regularly during mixing process.

.8 Mix sufficient material in advance of the time needed at the job site to allow adequate time for final quality control testing as required by the progress of the work.

.9 Protect storage piles from rain, erosion and contamination.

3.2 Site Preparation

.1 Excavate sub-grade to specified depths, slopes and widths as shown on Drawings. Maintain required angles of repose of adjacent materials and protect adjacent structures from damage and structural compromise. Do not over excavate compacted sub-grades of adjacent pavement or structures.

.2 Confirm that the sub-grade is at specified elevations and compaction.

.3 Clear excavation of all construction debris, trash, rubble, fuels, oils, concrete and foreign material. Replace over-excavated subgrade with approved material and compact to specified grade and compaction.

.4 During placement protect adjacent walls, walks, utilities and structures from damage or staining by structural soil. Make good any damage or staining to adjacent wall, walk, utility or structure at Contractor's expense.

3.3 Structural Soil

.1 Place structural soil in 150mm thick lift and compact lift to 95% Modified Proctor Density and obtain approval of compaction before placement of next lift. Continue until structural soil is at its finished grade.

.2 Call for inspection of placed structural soil by Contract Administrator.

.3 Protect structural soil from freezing, excessive rain or moisture, erosion, silts, clays, cement, concrete, contaminants and pollutants.

3.4 Filter Fabric

.1 Install filter fabric on structural soil per Contract Drawings immediately after inspection and approval by Contract Administrator.

.2 Provide 600mm overlap at all joints.

3.5 Granular Base

.1 Supply and install aggregate base course above structural soil system as shown on Contract Drawings and as specified in Section 02233 - Granular Base.

.2 Install granular base course on filter fabric immediately after installation of filter fabric.

3.6 Protection of Work

.1 Protect structural soil and filter fabric from vehicles, equipment, other materials and excessive moisture.

.2 Use temporary fencing or hoarding to keep vehicles and equipment away off structural soil area until final surface materials are placed.

3.7 Clean Up

.1 Dispose of surplus materials and all construction debris off site.

1.0 GENERAL

Section S02923 refers to those portions of the work that are unique to the use of soil cells for the planting of trees and landscaping in pedestrian and vehicular areas. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.19	Concrete Walks, Curbs and Gutters	Section 02523
.20	Cast-in-Place Concrete	Section 03300
.21	Aggregates and Granular Materials	Section 02226
.22	Excavation, Trenching and Backfilling	Section 02223
.23	Roadway Excavation, Embankment and Compaction	Section 02224
.24	Geosynthetics	Section 02498
.25	Granular Base	Section 02233
.26	Irrigation System	Section 02667
.27	Topsoil and Finish Grading	Section 02921
.28	Planting of Trees, Shrubs and Ground Covers	Section 02950

1.2 Mock Up

.1 Prior to the installation of soil cell system, construct a mock up of complete installation. Construction of mock up to be in presence of Contract Administrator.

.2 Mock up to be a minimum $10m^2$ in area and to consist of complete soil cell system, including soil cell frames, geogrid, growing medium, soil cell deck and geotextile, all installed in excavation on prepared and approved granular base, geotextile and subgrade.

.3 Mock up may, upon approval of Contract Administrator, remain as part of the installed work at end of project if it remains in good condition and meets requirements of Contract Documents. Otherwise mock-up to be removed at Contractor's expense.

1.3 Site Conditions

.4 Inspect all areas to receive soil cells prior to placement.

.5 Before proceeding with work check and verify dimensions, quantities, grade elevations, drainage, compaction and contamination.

.6 Report defects in dimensions, quantities, grade elevations, drainage, compaction and contamination to Contract Administrator immediately and make good to satisfaction of Contract Administrator prior to construction of soil cell system.

1.4 Delivery, Storage and Handling

.7 Deliver packaged materials in original, unopened containers showing weight, certified analysis and name and address of manufacturer.

.8 Do not handle, deliver or place bulk materials in frozen, wet or muddy conditions.

.9 Deliver materials to site at or near optimum compaction moisture content.

.10 Protect excavation from freezing conditions, accumulation of water and contamination until placement of soil cells, growing medium, geotextile and root barrier. Maintain protection of excavation and placed material until installation of hard surfaced roadway or pedestrian surface above.

.11 Growing medium, granular base and backfill that is excessively wet, segregated or contaminated will be rejected. Remove rejected material from site and replace with approved material at Contractor's expense.

1.5 Layout and Elevation Control

.1 Provide layout and elevation control during installation of soil cells. Utilize grade stakes, benchmarks, surveying equipment and other means and methods to ensure that layout and elevations conform to layout and elevations shown on Contract Drawings

1.6 Scheduling

.3 Schedule installation of soil cells after all affecting walls, curbs, footings and utility work in the area have been installed.

.4 Coordinate schedule with scheduling of other trades on site.

1.7 Measurement and Payment

1. Payment for soil cells will be made separately for each vertical column of soil cell assembly, and includes all soil cell components, growing medium, site preparation, placement, geogrid and geotextile, protection of work and incidentals. Payment will be made separately for assemblies comprised of one, two or three layers of soil cell frames.

2. Payment for excavation, backfilling and embankment of soil cells will be made under Section 02223 - Excavating, Trenching and Backfilling or Section 02224 - Roadway Excavation, Embankment and Compaction, as provided in the Schedule of Quantities and Unit Prices.

3. Payment for placement and compaction of granular base will be made under Section 02233 - Granular Base, as provided in the Schedule of Quantities and Unit Prices.

4. Payment for pedestrian or vehicle surfaces above soil cells will be made under separate sections as appropriate

5. Payment for tree planting, associated non-soil cell growing medium, root barrier,tree grates and concrete surrounds will be made under separate sections as appropriate.

1.8 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections and Testing.

.2 Refer to Section 02921 - Topsoil and Finish Grading - 1.3 and 1.5.

2.0 PRODUCTS

2.1 Soil Cell

.1 Soil cell to be fiberglass-reinforced polypropylene structure, or other materials, designed to support sidewalk loads, designed to be filled with growing medium for the purpose of growing tree roots, and for rainwater filtration, detention and retention.

.2 Acceptable soil cell systems include the following:

.1 Silva Cell by DeepRoot Partners, including:

.1 Silva Cell frame: 400x600x1200mm
.2 Silva Cell deck: 50x600x1200mm, including manufactured installed galvanized steel tubes
.3 Silva Cell modified: 400x600x150mm modified Silva Cell frame designed to stiffen and align frames as growing medium and backfill is placed
.4 Silva Cell deck screws: manufacturer supplied stainless steel screws to attach decks to frames

.2 Approved Equal

2.2 Anchor Spike

.1 Galvanized steel spike with spiral twist, 8mm diameter and 250mm length.

2.3 Drainage Pipe

.1 Drainage pipe to be perforated drain pipe per Section 02721 - Storm Sewers - 2.7, as specified on Drawings.

.2 Fittings to be compatible with specified pipe and by same manufacturer.

.3 PVC pipe solvent and primer combinations shall be as recommended by manufacturer and suitable for use with specified materials and application.

2.4 Inspection Riser Assmebly

.1 Inspection riser to be 100mm diameter Schedule 40 non-perforated PVC pipe per Section S02667– Irrigation System. Cut four (4) 3mm wide slots in bottom of pipe that extend to soil cell deck to allow water access for inspection.

.2 Fitings and caps to be compatible with specified pipe and by same manufacturer. Cap to be solid threaded cleanout or removable inlet grate designed to fit inspection riser and be compatible with pedestrian traffic and operational practice.

2.5 Geogrid

.1 Geogrid to be high molecular weight high tenacity polyester multifilament yarns woven in tension and polymer-coated, with the following ASTM D 6637 mechanical properties:

.1	Tensile strength:	29.2 kN/m
.2	Creep reduced strength:	18.5 kN/m
.3	Long term allowable design load:	18.5 kN/m
.4	Grid aperture size (machine direction):	22.2mm
.5	Grid aperture size:	25.4mm
.6	Mass /unit area (ASTM D 5261):	254.3 g/m^2

2.6 Geotextile

.1 Geotextile to be non woven polypropylene fabric, with the following properties:

.1	Grab tensile strength:	167.8 kg
.2	Grab tensile elongation:	50%
.3	Mullen burst strength:	2,620 kPa
.4	Puncture strength:	58.97 kg
.5	Apparent opening size:	US sieve 80 (0.180mm)
.6	Water flow rate:	3,870.8 l/min/m^2
.7	Minimum roll width:	3600 mm

2.7 Granular Base

.1 Granular base and subbase to be as shown on Contract Drawings and to conform to Section 02233 - Granular Base.

2.8 Backfill

.1 Backfill material adjacent to soil cells to be as shown on Contract Drawings.

2.9 Growing Medium

.1 Growing medium to be as shown on Contract Drawings and to

conform to Section 02921– Topsoil and Finish Grading.

2.10 Root Barrier

.2 Root barrier to be per Section 02950 - Planting of Trees, Shrubs and Ground Covers - 2.15.

3.0 EXECUTION

3.1 Soil Cell Frame

.1 Confirm that granular base meets compaction requirements of 95% of maximum dry density in accordance with ASTM D698 Standard Proctor method prior to placement of soil cell frame units.Grade sub-base surface on a plane parallel to the proposed finish grade above.

.2 Identify tree openings, utility routes and edges of hard surfaces above soil cells on granular base using spiked string and/or spray paint.

.3 Confirm that width and length of excavation are a minimum of 150mm beyond the edges of the Soil Cells. Layout location of all drain lines. Do not locate drain lines within 150mm of any Soil Cell post. Provide field engineering when drain lines are being installed to assure that the slope on all drains is 1% minimum towards intended outfalls. Place frame units by hand.

.4 Place first layer of frame units on prepared and approved granular base and geotextile. Work away from tree and utility openings. Place frame units no less than 25mm apart and no more than 75mm apart.

.5 Verify that horizontal and vertical position of frame units are consistent with required locations and dimensions of tree and utility openings, paving edges, surfaces and other structures to be constructed above soil cells. Report conflicts to Contract Administrator and make adjustments as necessary.

.6 Ensure that each frame unit sits firmly on granular base. Ensure frames do not rock or bend over any stone or other obstruction and do not bend into dips in base.

.7 Check each frame unit for damage prior to placing in excavation. Do not use frame units that are cracked or chipped

.8 Secure soil cell to granular base with four anchor spikes driven through molded holes in base of frame unit.

.9 For applications where soil cells are installed over waterproofed structures, develop a spacing system consistent with requirements of waterproofing system and do not use anchor spikes that will come within 150mm of any waterproofing

material. Submit shop drawing of spacing and anchoring system for approval by Contract Administrator.

.10 Do not walk on frame units.

.11 Install next layer of frame units on top of previous layer. Build layers as stacks of frame units set one directly over the other. Do not set frame unit half on one unit below and half on another unit.

.12 Register each upper frame unit on top of lower frame unit post. Ensure contact points are free of dirt, mud and debris prior to placement. Ensure each upper unit is solidly seated on unit below. Rotate each frame registration arrow in the opposite direction from frame unit below to ensure connector tabs firmly connect.

.13 Install no more than two layers of frame units before installation of growing medium and backfill.

3.2 Modified Soil Cell Frame

.1 Install modified frame unit on top of frame unit prior to installation of growing medium and backfill.

.2 Modified frame unit is required only during installation and compaction of growing medium and backfill.

.3 Do not walk on modified frame units.

.4 Remove modified frame unit prior to installation of deck unit and as installation of growing medium and backfill progresses across soil cell framework.

.5 Remove modified frame unit prior to the installation of deck unit.

.6 Place and remove modified frame units by hand.

3.3 Geogrid

.1 Install geogrid curtain prior to installation of growing medium and backfill.

.2 Geogrid curtain is required between edge of soil cell and any backfill or granular base beyond extent of soil cell framework that will support pedestrian or vehicular paving.

.3 Install geogrid curtain where required. Do not install geogrid curtain between edge of soil cell and any planting area or tree opening adjacent to soil cell.

.4 Pre-cut geogrid to allow for 150mm minimum underlap below backfill, and 300mm minimum overlap above soil cell deck.

.5 Where soil cell layout causes a change of direction in plane of

geogrid, slice top and bottom flaps of geogrid and fold so it lies flat on top of soil cell deck and granular base course along both planes.

.6 Provide 300mm minimum overlap between different sheets of geogrid.

.7 Secure geogrid to frame units and deck units with 4.5mm x 300mm plastic zip ties in locations recommended by manufacturer.

.8 After deck unit is secured in place fold 300mm overlap of geogrid over top of unit.

3.4 Growing Medium and Backfill

.1 Install root barrier as shown on Contract Drawings. Protect root barrier from damage and displacement during installation of growing medium and backfill.

.2 Install growing medium and backfill as indicated on Contract Drawings. The process of installation requires that these two materials be installed and compacted together in alternating lifts to achieve correct compaction relationships between the materials.

.3 Place growing medium in soil cell framework and spread by hand or hand tool through each soil cell in a maximum 200mm lift. Work soil under horizontal beams of soil cell frame and utility conduit to eliminate air pockets there. Ensure equipment bucket does not contact soil cell framework. Hold plywood sheet against geogrid during placement and compaction of growing medium to protect geogrid and maintain consistent separation of materials.

.4 Finalize installation of utility conduit, drainage pipes and irrigation where shown on Contract Drawings.

.5 Compact growing medium lift by stepping on entire exposed surface of growing medium. Do not step on frame units. Ensure there is a minimum of 250mm of growing medium over horizontal beams of frame units before beginning compaction. Leave top 50mm of frame unit exposed above growing medium to allow placement of next layer of frame units.

.6 Compact growing medium to 85% of standard proctor density. Remove growing medium that is over compacted and reinstall.

.7 Place backfill to 95% of maximum dry density in space between geogrid and sides of excavation and spread by hand adjacent to soil cell framework to provide maximum 200nn lift. Ensure geogrid under lap lays flat under backfill. Ensure equipment

bucket does not contact soil cell framework. Hold plywood sheet against geogrid during placement and compaction of backfill to protect geogrid and maintain consistent separation of materials. Do not place backfill material in tree or planting bed opening.

.8 Compact backfill per Contract Documents. Ensure compaction equipment does not contact soil cell frame or deck.

.9 Repeat placement and compaction of growing medium and backfill in lifts to top of topmost frame unit. Finish grade of growing medium to be 25mm below bottom of deck unit, except as indicated otherwise on Contract Drawings.

.10 Do not place final lift of backfill until adjacent deck unit is secured in place. Then install and compact backfill flush with soil cell deck. Ensure compaction equipment does not contact deck unit.

.11 Maintain modified frame unit in place until installation of deck unit.

3.5 Soil Cell Deck

.1 Obtain Contract Administrator's approval of placement and compaction of growing medium and backfill prior to installation of soil cell deck.

.2 Process for installation of deck units requires that deck units be installed immediately after removal of modified frame units.

.3 Remove modified frame unit.

.4 Ensure contact points are free of dirt, mud and debris prior to placement. Register deck unit on top of frame unit post. Do not set deck unit half on one frame unit below and half on another frame unit. Ensure deck unit is solidly seated on frame unit.

.5 Snap deck unit onto frame unit using snapping mechanism on corners of deck unit. A rubber mallet may be used to hammer snaps into place.

.6 Secure deck unit corners to frame unit posts using screws provided by manufacturer.

3.6 Geotextile

.1 Place geotextile over top of soil cell deck and where indicated on Drawings.

.2 Extend geotextile minimum 450mm beyond outside edge of excavation. Overlap geotextile joints minimum 450mm. Cut geotextile to provide minimum 200mm overlap of tree, planting

and utility openings.

3.7 Inspection Riser Assembly

.1 Install inspection riser assembly on top of geotextile in location shown on Contract Drawings immediately prior to placement of granular base. Maintain assembly in fixed position during placement of granular base and final hard surface treatment.

3.8 Geotextile

.1 Supply and install geotextile under soil cell system as shown on Contract Drawings and per Section –02498 - Geosynthetics.

.2 Supply and install geotextile on soil cell deck as shown on Contract Drawings and per Section 02498 - Geosynthetics.

.3 Place geotextile over top of soil cell deck and where indicated on Drawings.

.4 Extend geotextile minimum 450mm beyond outside edge of excavation. Overlap geotextile joints minimum 450mm. Cut geotextile to provide minimum 200mm overlap of tree, planting and utility openings.

.5 Repair cut or damaged geotextile with a second piece of geotextile prior to placement of granular base. Overlap edges of cut or damaged area with second piece by a minimum of 300mm.

3.9 Granular Base

.1 Supply and install granular sub-base course under soil cell system as shown on Contract Drawings and as specified in Section 02233 - Granular Base.

.2 Supply and install aggregate base course above soil cell system as shown on Contract Drawings and as specified in Section 02233 - Granular Base.

.3 Maximum tolerance for deviations in finished surface of granular base for soil cell system is 6mm over a 1200mm distance. Adjust granular base under each frame unit to provide a continuous solid base of support to required grade elevation.

.4 Install granular base course on geotextile immediately after installation of geotextile.

.5 Place granular base on soil cell system from one side of soil cell deck to other, to ensure geotextile and granular base conforms to cell deck contours.

.6 Do not place or spread granular base in several positions at same time.

.7 Load granular base onto soil cell system from equipment located outside limits of soil cell excavated area. Do not drive vehicles or operate equipment directly on top of soil cell deck, geotextile or granular base. Do not drive vehicles or operate equipment greater than 450kg directly on granular base over soil cell deck.

.8 Spread granular base on soil cell system using hand tools or by light use of equipment bucket.

.9 Compact granular base in lifts not to exceed 150mm, to 95% of maximum dry density. Compact granular base on top of soil cell system using walk behind type vibratory plate tamper, vibratory roller or jumping compacter having a maximum weight of 450kg.

.10 For alternate method of placing and compacting granular base on top of soil cell system (e.g. for large area, small area, area of difficult access) submit shop drawing of proposed equipment and procedure to Contract Administration for approval.

3.10 Protection of Work

.3 Protect soil cell system, geotextile and granular base from vehicles, equipment, other materials and excessive moisture.

.4 Use temporary fencing or hoarding to keep vehicles and equipment away off soil cell area until final surface materials are placed.

3.11 Clean Up

Dispose of surplus materials and all construction debris off site.

1.9 Measurement and Payment

.1 Replace clause with:

"Payment for trees will be for each plant of the size and species specified on Contract Drawings. Payment includes tree supply, excavation and scarification of tree pits, tree placement, growing medium around rootball, tree pit mulching, edging, staking and guying as applicable and other incidentals as specified under Section S02950 including maintenance until end of the Landscape Maintenance Period."

.2 Replace clause with:

"Payment for shrubs, groundcovers, grasses, perennials and annuals will be for each plant of the size and species specified on Contract Drawings. Payment includes plant supply, excavation and scarification of planting pits, plant placement, growing medium around rootball and other incidentals as specified under Section S02950 including maintenance to until end of the Landscape Maintenance Period."

.3 Add clause:

"Payment for tree rings, tree grates, tree guards and tree boxes includes supply, preparation, finishing, installation, fittings, shop drawings and incidentals, as shown on Contract Drawing."

.4 Add clause:

"Payment for root barrier will be for each type and size supplied and installed as shown on Contract Drawings."

.5 Add clause:

"Payment for planting bed mulch includes supply and placement of mulch to specified thickness and hand or mechanical edging of mulched beds."

2.1 Plant Material

.2.12 Replace clause with:

"All trees and plants to be inspected by Contract Administrator upon delivery to site and prior to planting."

.3 Add clause:

"Submit written requests for plant material substitutions to the Contractor Administrator for review within 20 days of receiving Notice to Proceed. Provide explanation for requested substitution and evidence that the plant material is not available within 500km of the site."

2.4 Mulch

.1 Replace clause with:

"Mulch to be 'Glenmore Grow', by City of Kelowna landfill operations, free of all soil, stones, sticks, roots or other extraneous matter."

2.5 Stakes

.1 Replace clause with:

"Stakes to be as shown on Contract Documents."

.2 Add clause:

"Where not otherwise shown on Contract Documents stakes to be pressure treated wood 50-70mm diameter approximately 2.0m long."

2.6 Guying Collar

.1 Replace clause with:

"Acceptable products for guying collars and tree ties include the following:

.1 Deep Root ArborTie series
.2 Approved Equal"

2.13 Tree Rings, Grate, Frames, Guards and Boxes

Add clauses:

".1 Tree rings, grates, frames, guards and boxes to be as shown on Contract Documents.

.2 Where not otherwise shown on Contract Documents tree rings, grates, frames, guards and boxes to be per Shop Drawing approved by Contract Administrator."

2.15 Root Barrier

Add clauses:

".1 Acceptable root barrier products include the following:

.1 Deep Root UB series
.2 Approved Equal

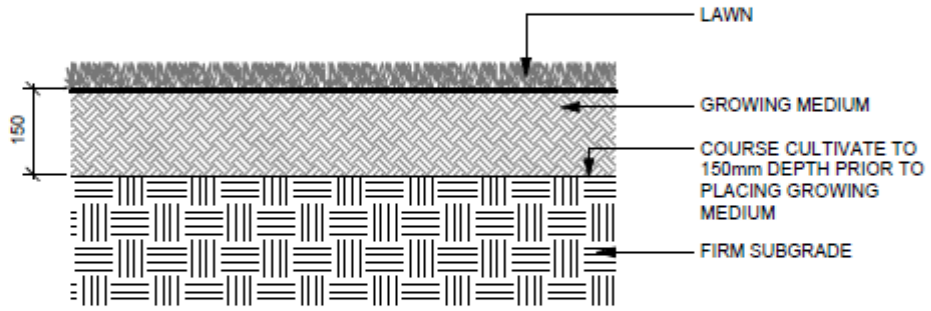
.2 Depth and length of root barrier product to be as shown on Contract Drawings."

3.7 Mulching

.2 Replace clause with:

"Ensure minimum depth of mulch is 75mm after settlement."

City of Kelowna

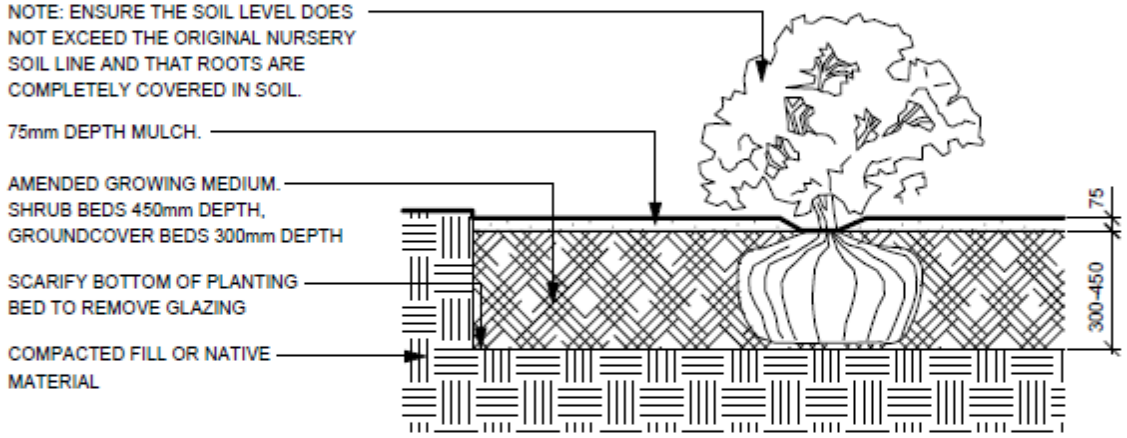


N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	DETAIL No. :
	Growing Medium - Lawn	**SS-L.01**

City of Kelowna

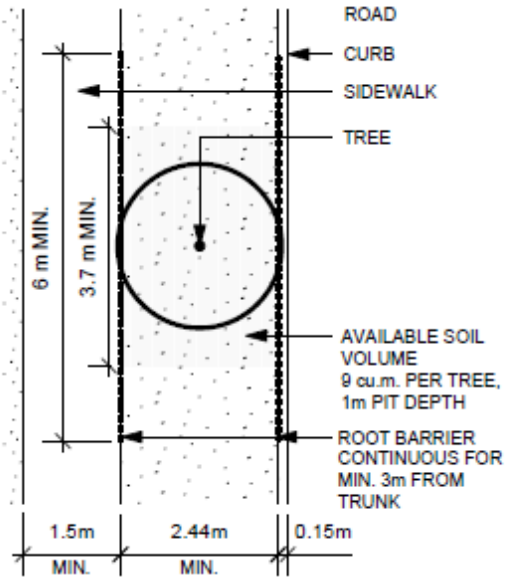


N.B. All dimensions in millimetres, unless noted otherwise

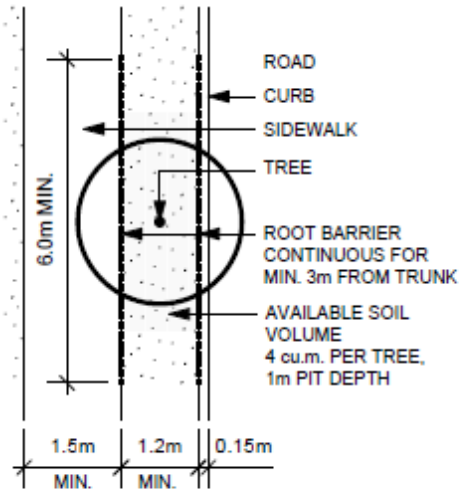
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	DETAIL No. :
	Growing Medium - Planting Bed	**SS-L.02**

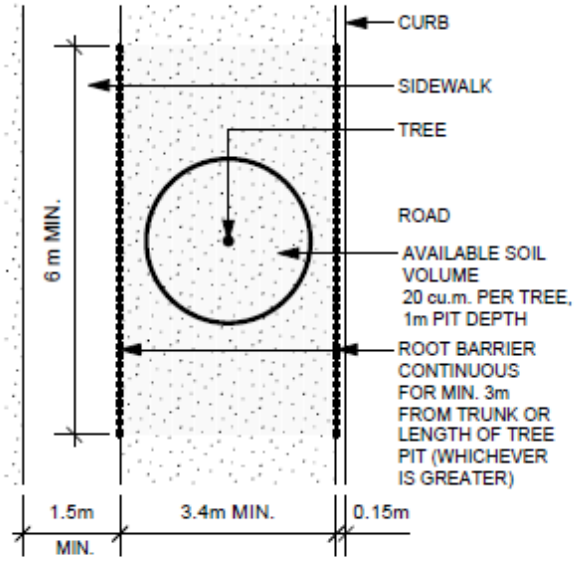
City of Kelowna



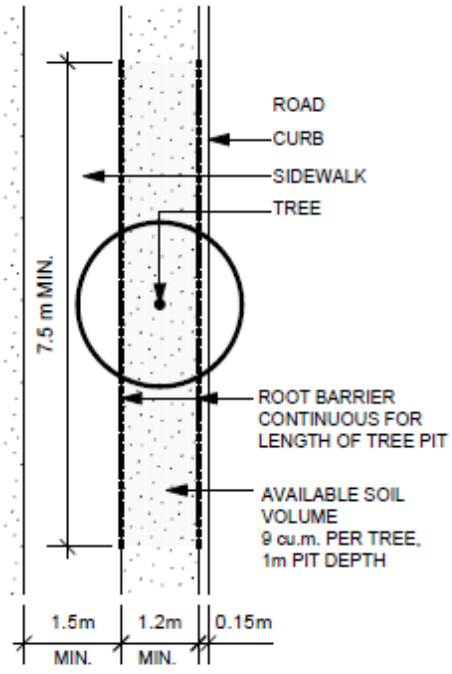
TREE PLANTING WITH 9 cu.m ROOT ZONE
PLAN VIEW in 2.44m BOULEVARD



TREE PLANTING WITH 4 cu.m ROOT ZONE
PLAN VIEW in 1.2m MIN. BOULEVARD



TREE PLANTING WITH 20cu.m ROOT ZONE
PLAN VIEW in 3.4m BOULEVARD



TREE PLANTING WITH 9 cu.m ROOT ZONE
PLAN VIEW in 1.2m BOULEVARD

N.B. All dimensions in millimetres, unless noted otherwise

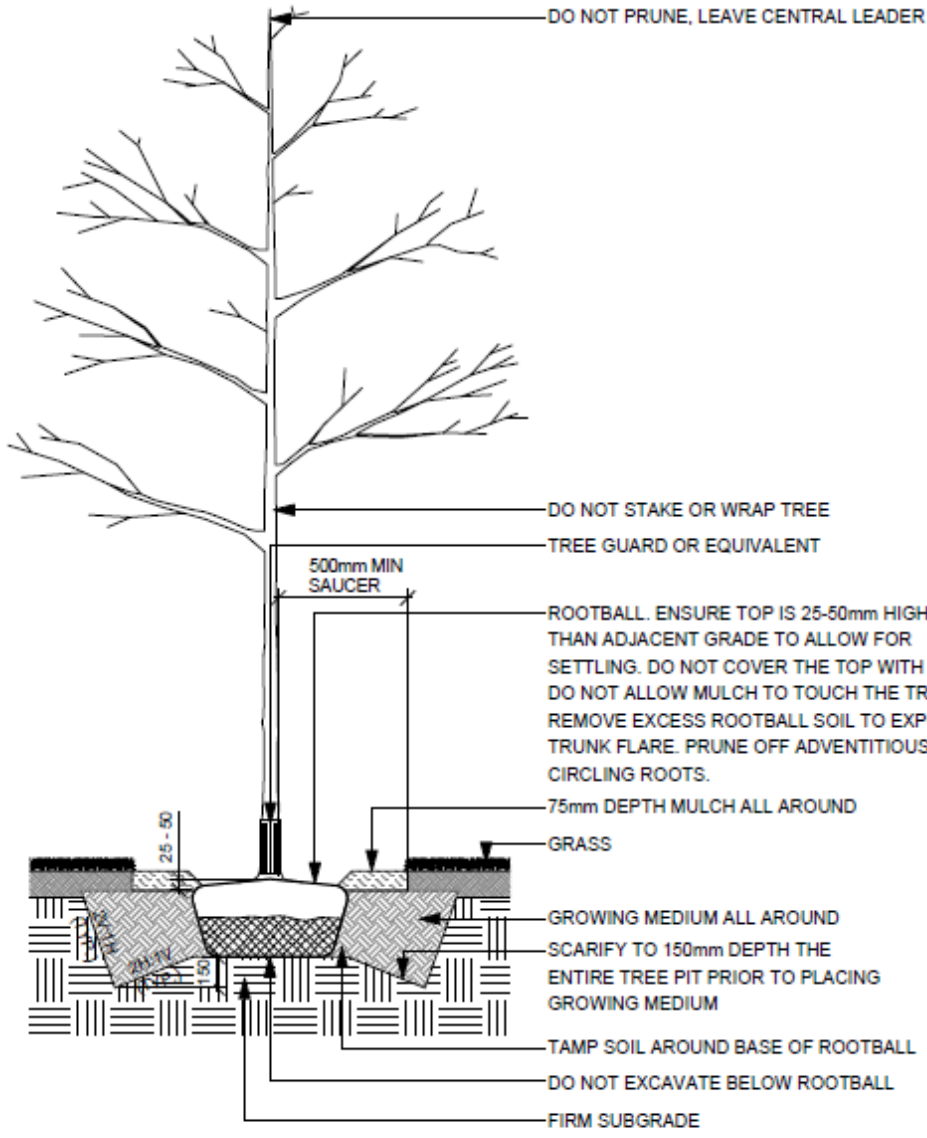
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE : **Growing Medium - Boulevard**	DETAIL No. : **SS-L.03**

City of Kelowna

NOTES :

1. DO NOT STAKE OR WRAP TREE UNLESS TO ALLOW FOR LOCALIZED TREE SWING. REFER TO SPECIFICATIONS.
2. DO NOT DISTURB THE ROOTBALL OR PLANTING PIT OF THE TREE WITH THOSE OF OTHER TREES AND SHRUBS PLANTED IN THE PLANTING BED.
3. USE ROOT BARRIER ADJACENT TO HARD SURFACE WHERE TREE TRUNK IS WITHIN 3.0m OF HARD SURFACE.



N.B. All dimensions in millimetres, unless noted otherwise

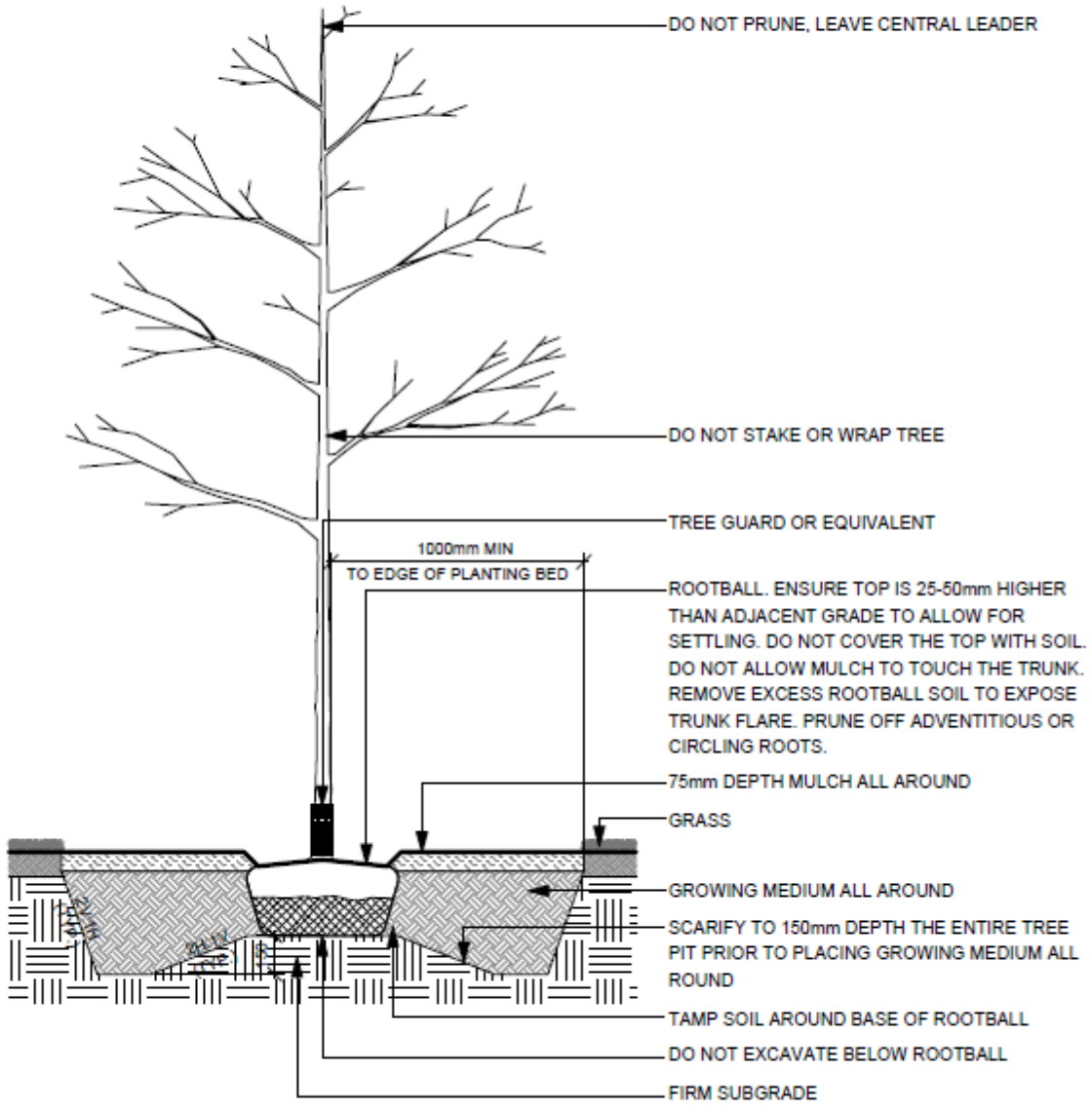
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	DETAIL No. :
	Tree - in Grass Open Space	**SS-L.04a**

City of Kelowna

NOTES :

1. DO NOT STAKE OR WRAP TREE UNLESS TO ALLOW FOR LOCALIZED TREE SWING. REFER TO SPECIFICATIONS.
2. DO NOT DISTURB THE ROOTBALL OR PLANTING PIT OF THE TREE WITH THOSE OF OTHER TREES AND SHRUBS PLANTED IN THE PLANTING BED.
3. USE ROOT BARRIER ALONG EDGE OF PLANTING BED WHERE TREE TRUNK IS WITHIN 3.0m OF HARD SURFACE.

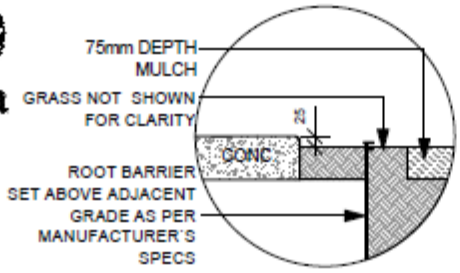


N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	DETAIL No. :
	Tree - in Planting Bed	**SS-L.04b**

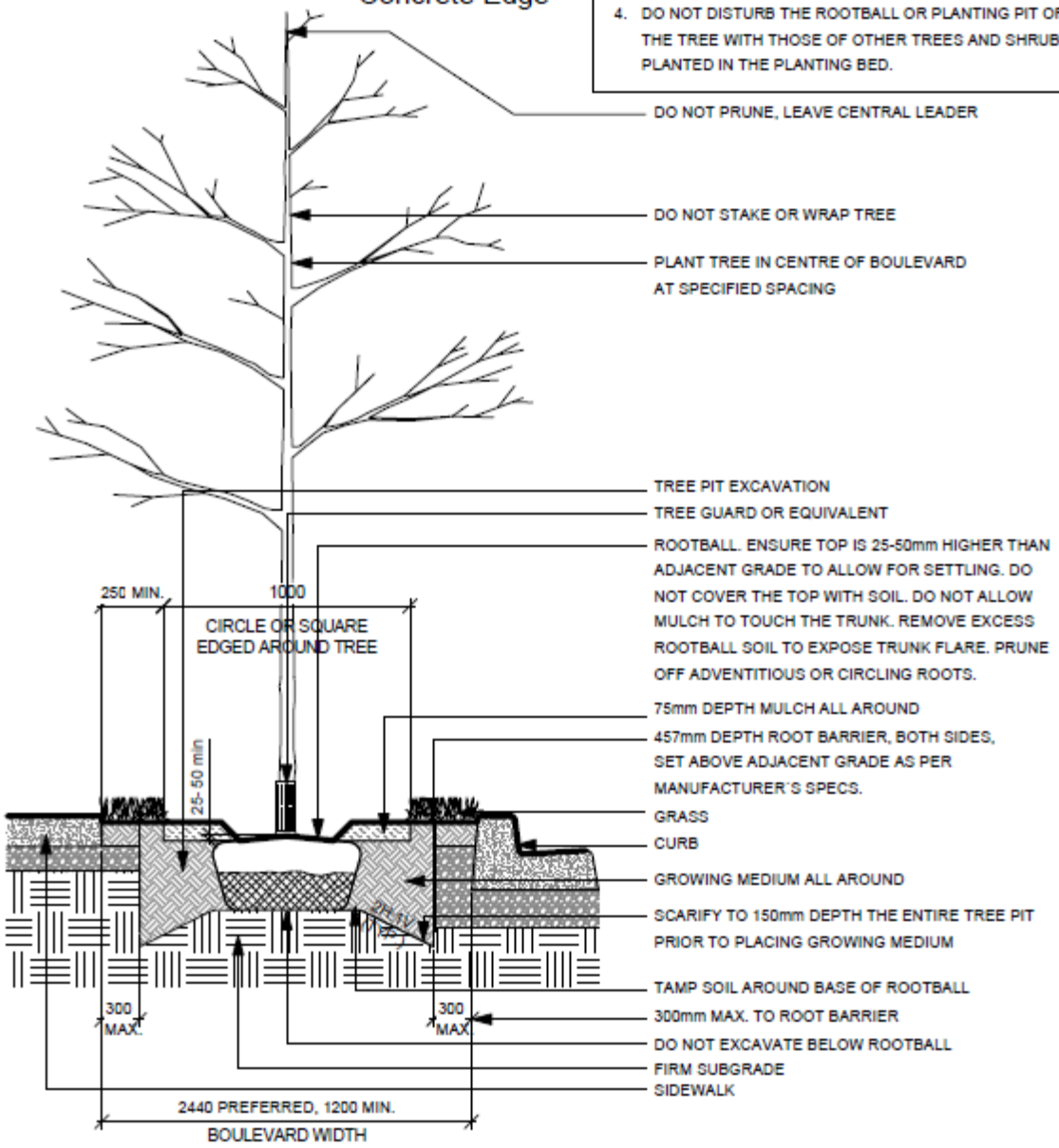
City of Kelowna



Concrete Edge

NOTES :

1. DO NOT STAKE OR WRAP TREE UNLESS REQUIRED BY CITY. WHEN REQUIRED, STAKE TREES USING ARBOURTIE OR EQUIVALENT TO ALLOW FOR LOCALIZED TREE SWING
2. ROOT BARRIER : INSTALLED PER MANUFACTURER'S INSTRUCTIONS.
3. USE ROOT BARRIER ADJACENT TO HARD SURFACE WHERE TREE TRUNK IS WITHIN 3.0m OF HARD SURFACE.
4. DO NOT DISTURB THE ROOTBALL OR PLANTING PIT OF THE TREE WITH THOSE OF OTHER TREES AND SHRUBS PLANTED IN THE PLANTING BED.

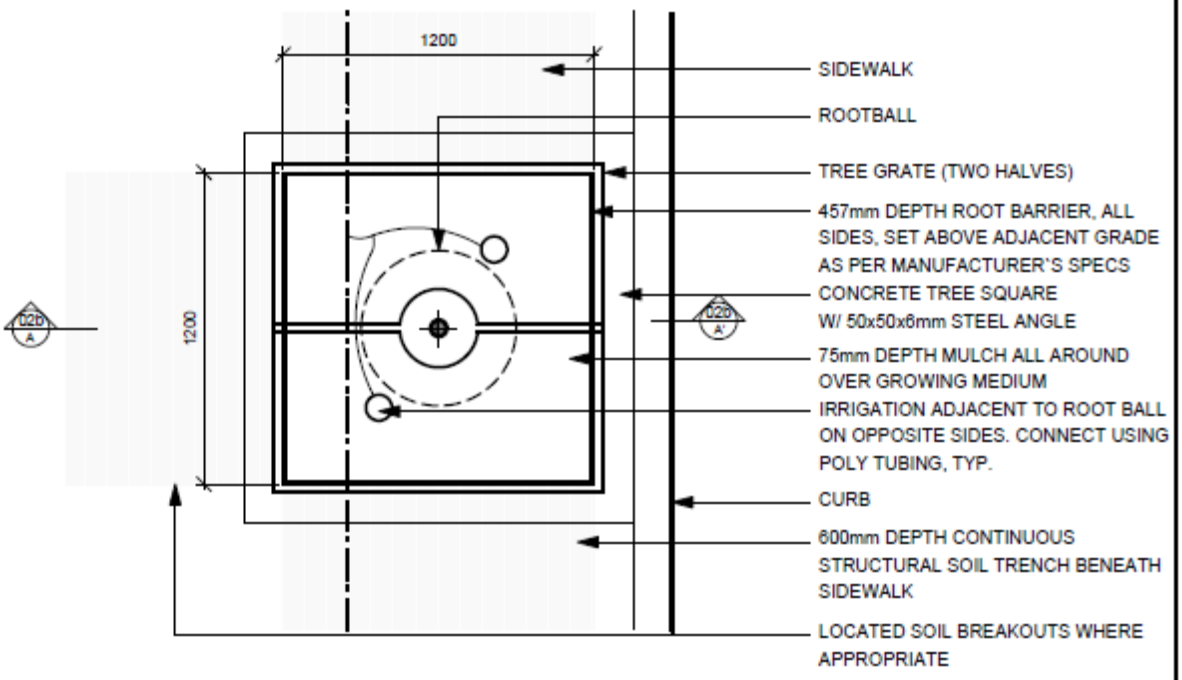


N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE : **Boulevard Tree - in Grass**	DETAIL No. : **SS-L.04c**

City of Kelowna



N.B. All dimensions in millimetres, unless noted otherwise

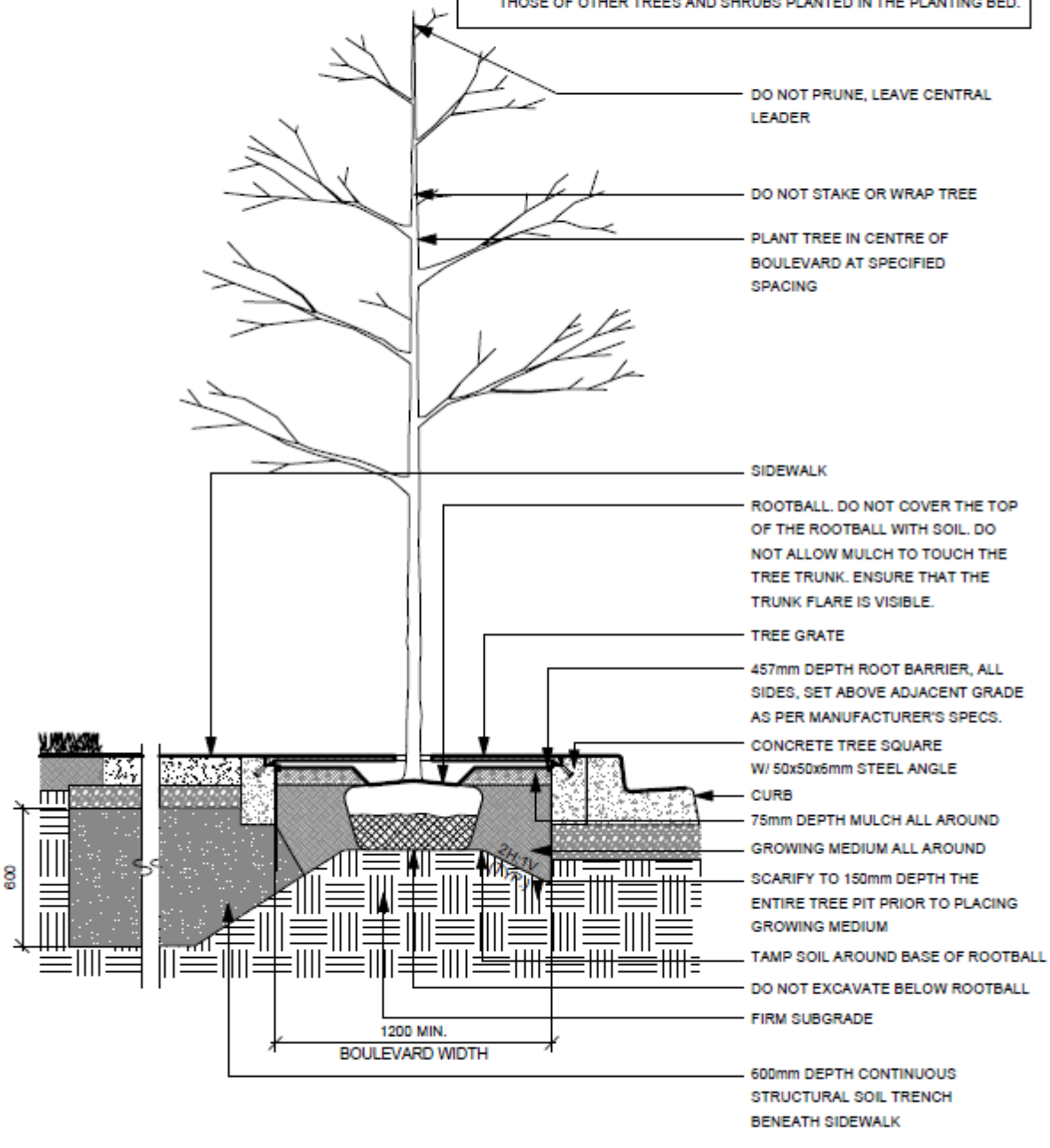
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE : **Boulevard Tree - in Structural Soil (Plan)**	DETAIL No. : **SS-L.05a**

City of Kelowna

NOTES :

1. DO NOT STAKE OR WRAP TREE UNLESS REQUIRED BY CITY. WHEN REQUIRED, STAKE TREES USING ARBOURTIE OR EQUIVALENT TO ALLOW FOR LOCALIZED TREE SWING
2. ROOT BARRIER : INSTALLED PER MANUFACTURER'S INSTRUCTIONS
3. USE ROOT BARRIER ADJACENT TO HARD SURFACE WHERE TREE TRUNK IS WITHIN 3.0m OF HARD SURFACE.
4. DO NOT DISTURB THE ROOTBALL OR PLANTING PIT OF THE TREE WITH THOSE OF OTHER TREES AND SHRUBS PLANTED IN THE PLANTING BED.

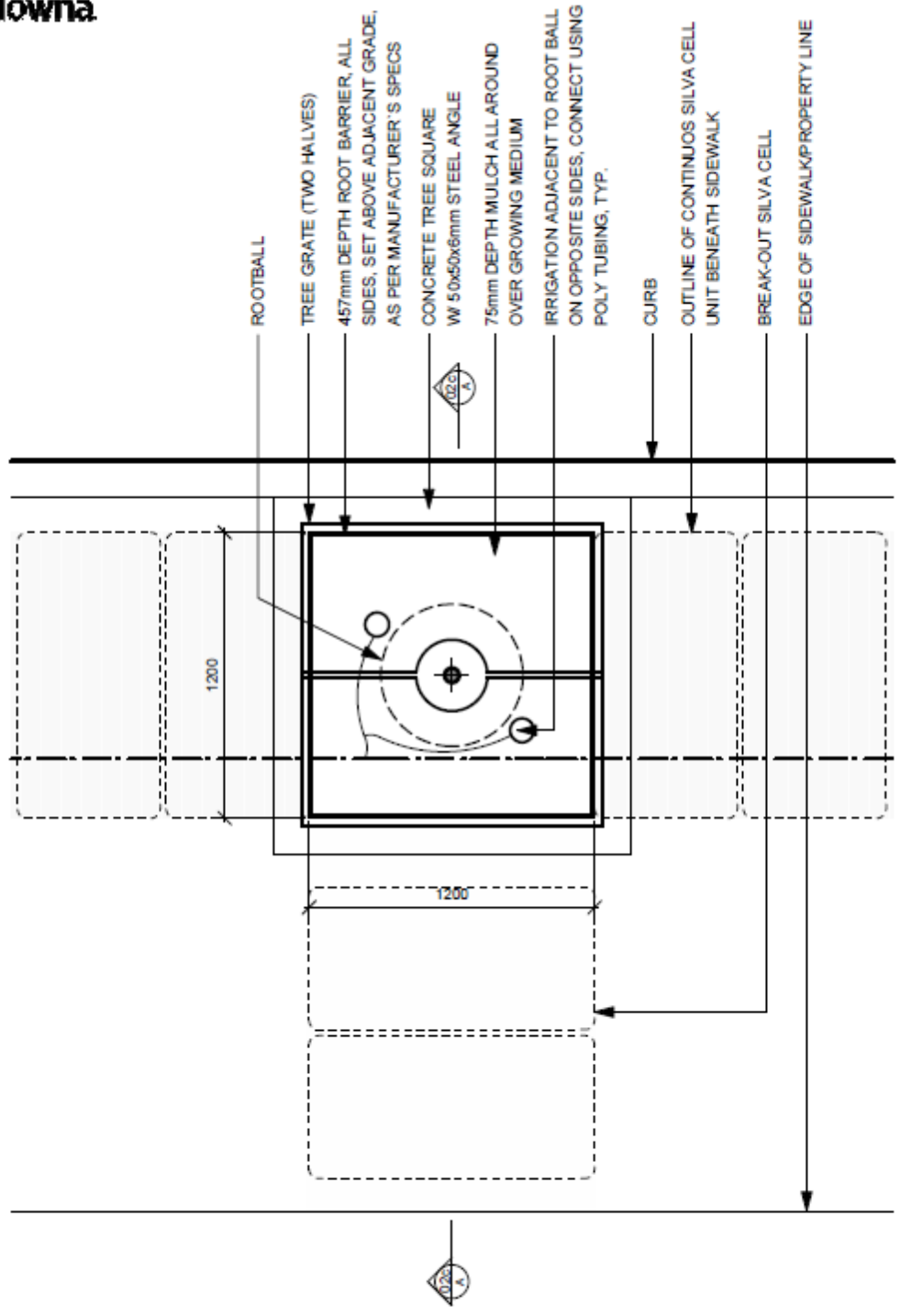


N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	DETAIL No. :
	Boulevard Tree - in Structural Soil (Section A-A')	**SS-L.05b**

City of Kelowna



N.B. All dimensions in millimetres, unless noted otherwise

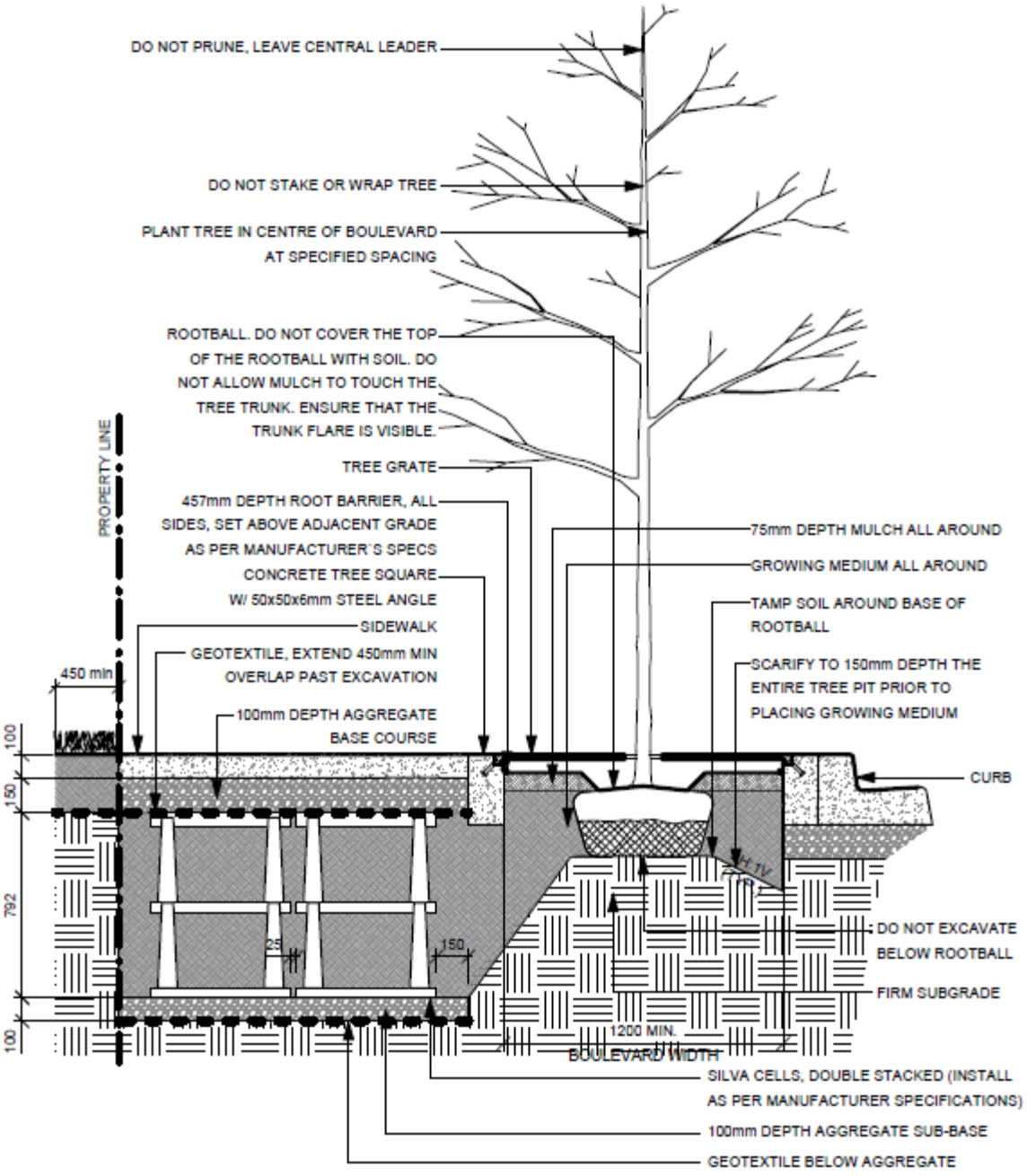
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	Boulevard Tree - in Soil Cell (Plan)	DETAIL No. : SS-L.06a

City of Kelowna

NOTES :

1. DO NOT STAKE OR WRAP TREE UNLESS REQUIRED BY CITY. WHEN REQUIRED, STAKE TREES USING ARBOURTIE OR EQUIVALENT TO ALLOW FOR LOCALIZED TREE SWING
2. ROOT BARRIER : INSTALLED PER MANUFACTURER'S INSTRUCTIONS
3. USE ROOT BARRIER ADJACENT TO HARD SURFACE WHERE TREE TRUNK IS WITHIN 3.0m OF HARD SURFACE.
4. DO NOT DISTURB THE ROOTBALL OR PLANTING PIT OF THE TREE WITH THOSE OF OTHER TREES AND SHRUBS PLANTED IN THE PLANTING BED.

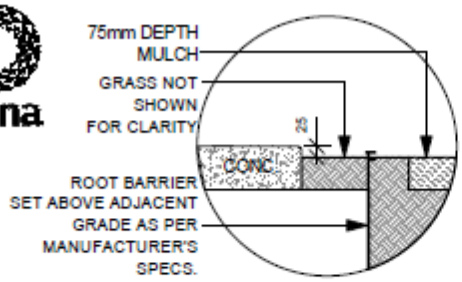


N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	Boulevard Tree - in Soil Cell (Section A-A')	DETAIL No. : SS-L.06b

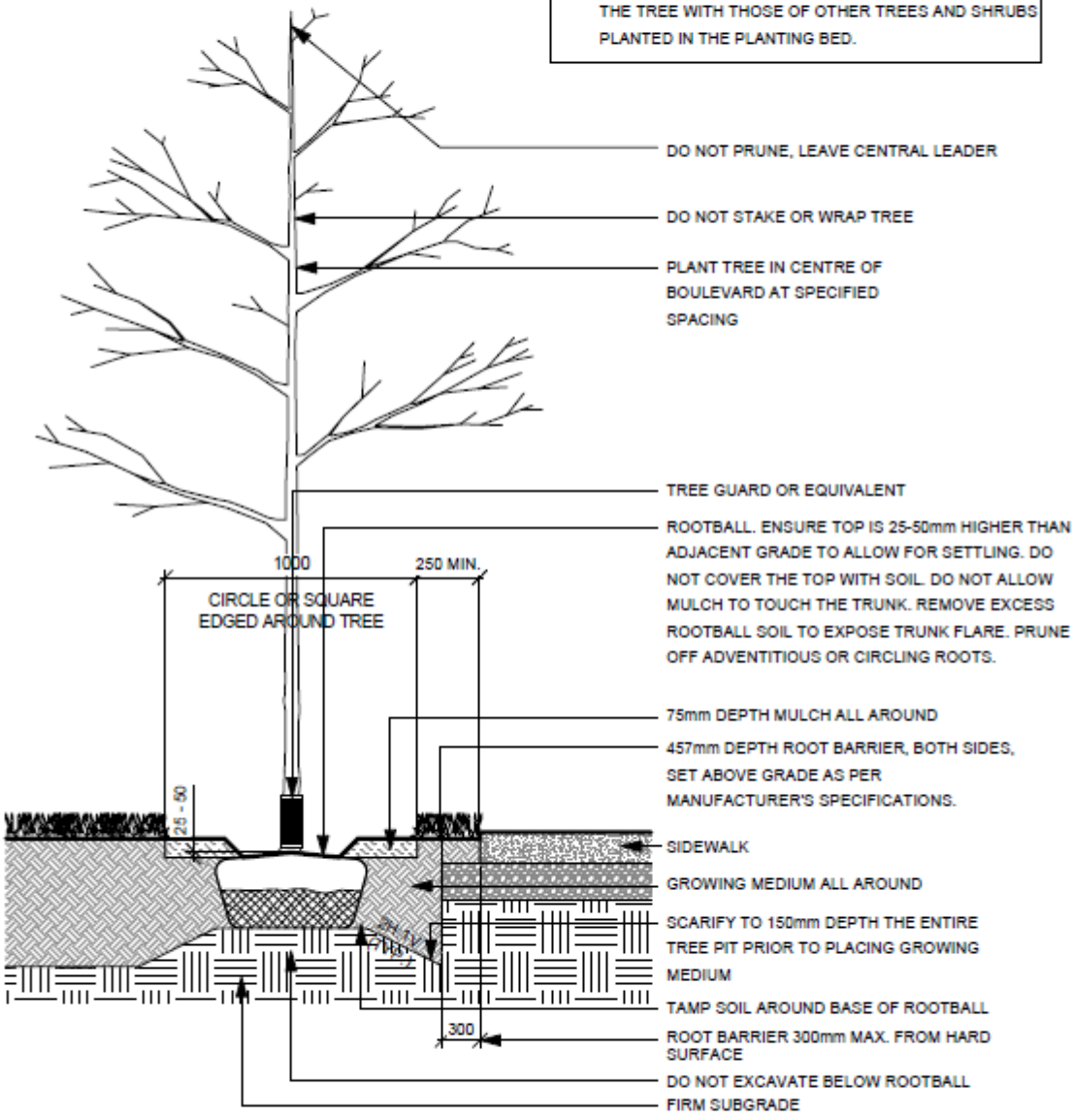
City of Kelowna



Concrete Edge

NOTES :

1. DO NOT STAKE OR WRAP TREE UNLESS REQUIRED BY CITY. WHEN REQUIRED, STAKE TREES USING ARBOURTIE OR EQUIVALENT TO ALLOW FOR LOCALIZED TREE SWING
2. ROOT BARRIER : INSTALLED PER MANUFACTURER'S INSTRUCTIONS
3. USE ROOT BARRIER ADJACENT TO HARD SURFACE WHERE TREE TRUNK IS WITHIN 3.0m OF HARD SURFACE.
4. DO NOT DISTURB THE ROOTBALL OR PLANTING PIT OF THE TREE WITH THOSE OF OTHER TREES AND SHRUBS PLANTED IN THE PLANTING BED.

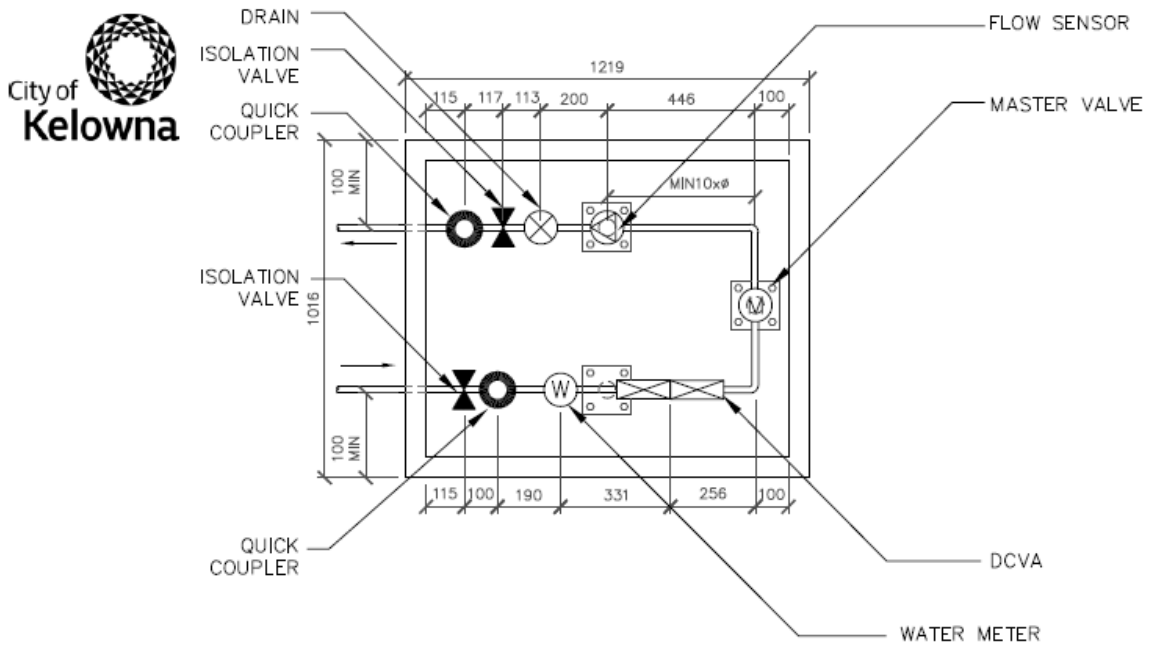


N.B. All dimensions in millimetres, unless noted otherwise

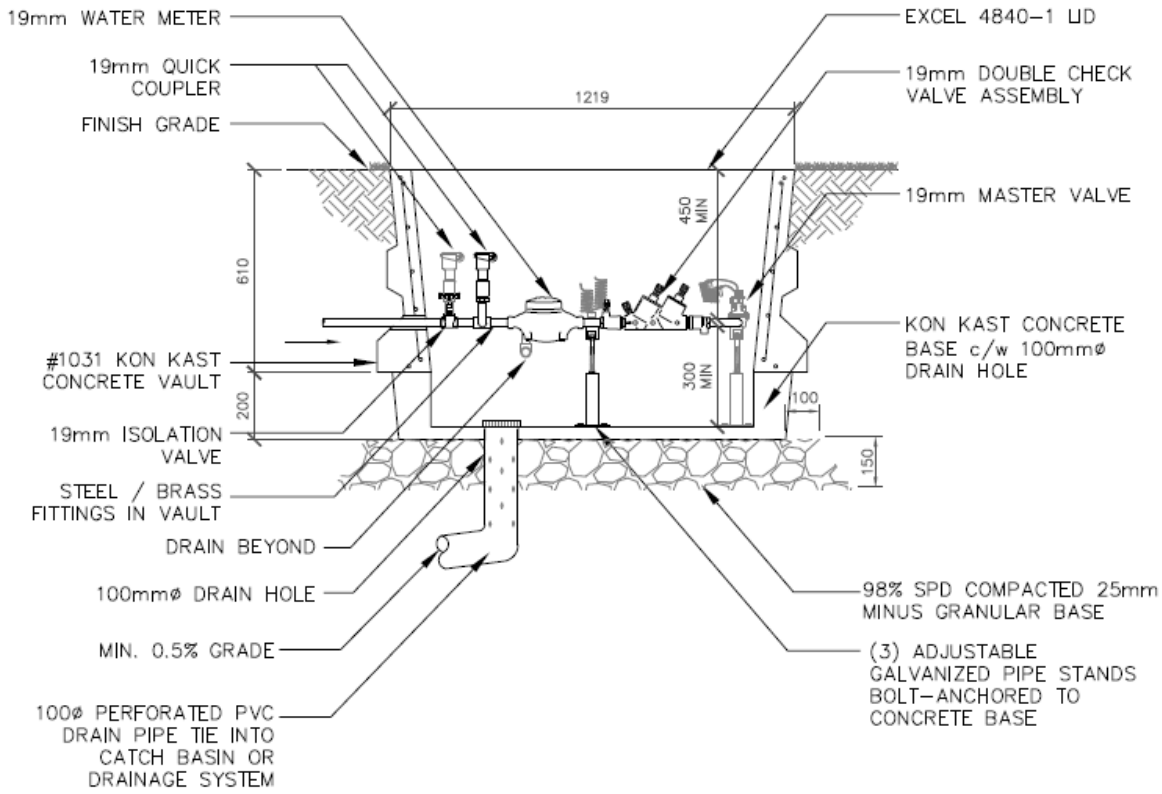
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	DETAIL No. :
	Root Barrier at Paving	**SS-L.07**

City of Kelowna



SCHEMATIC PLAN



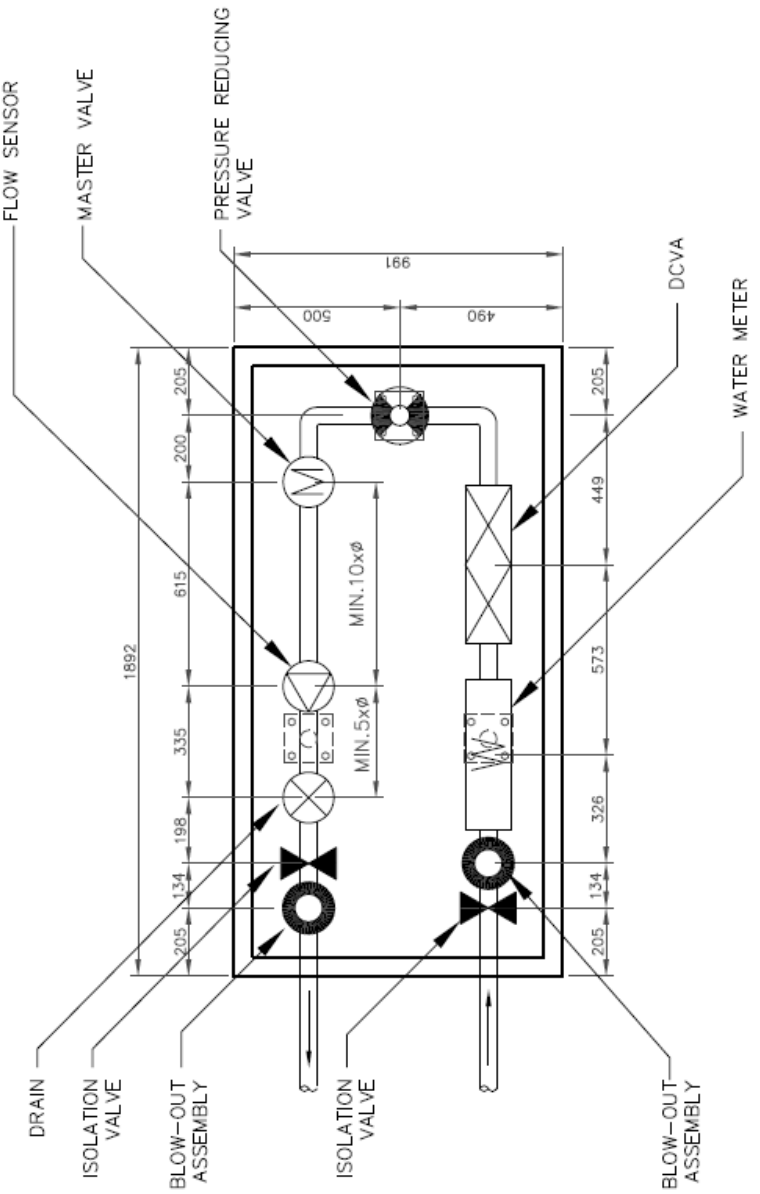
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE: **Backflow Prevention Assembly 3/4"**	DETAIL No.: **SS-IR.01a**

City of Kelowna

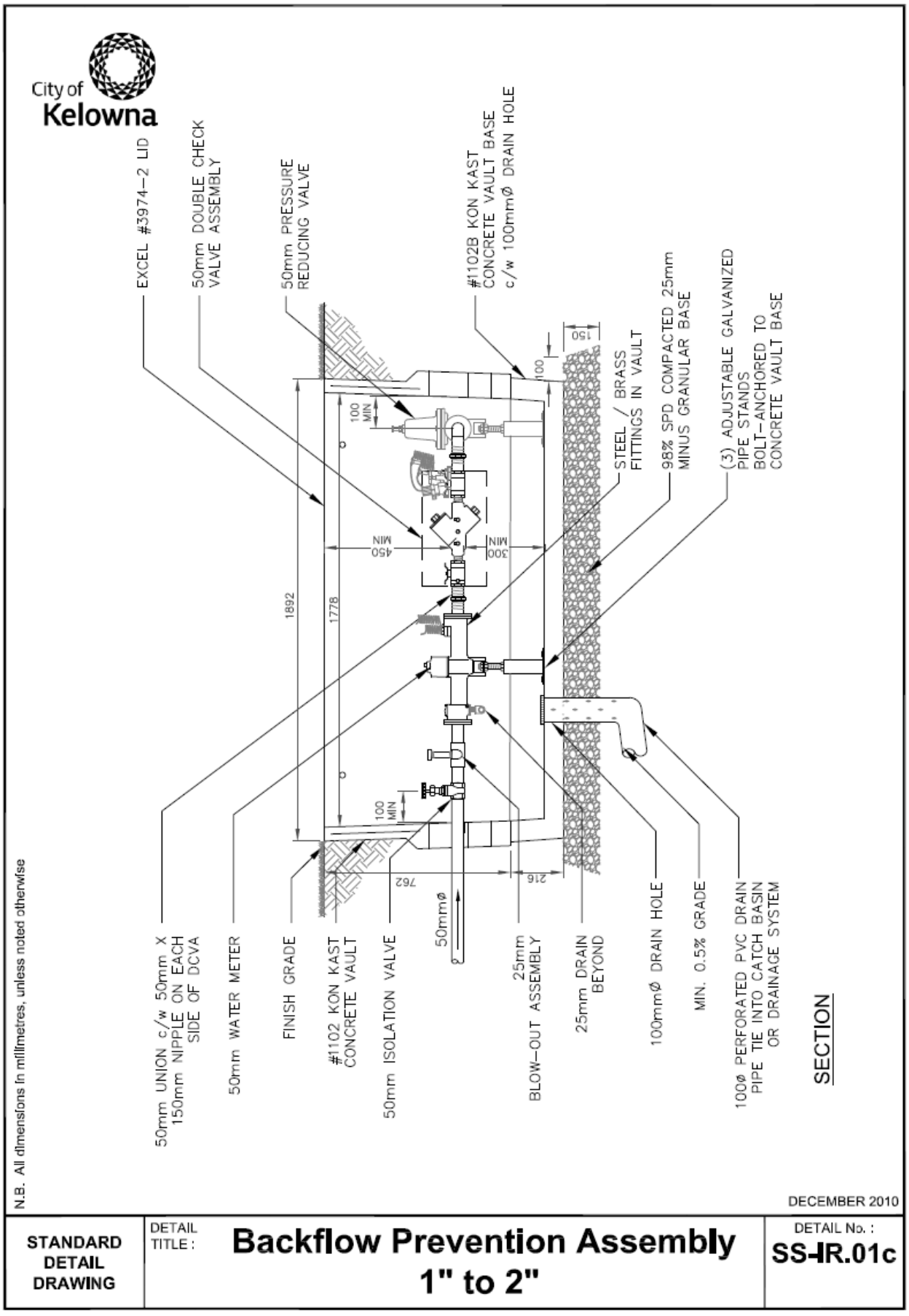


SCHEMATIC PLAN

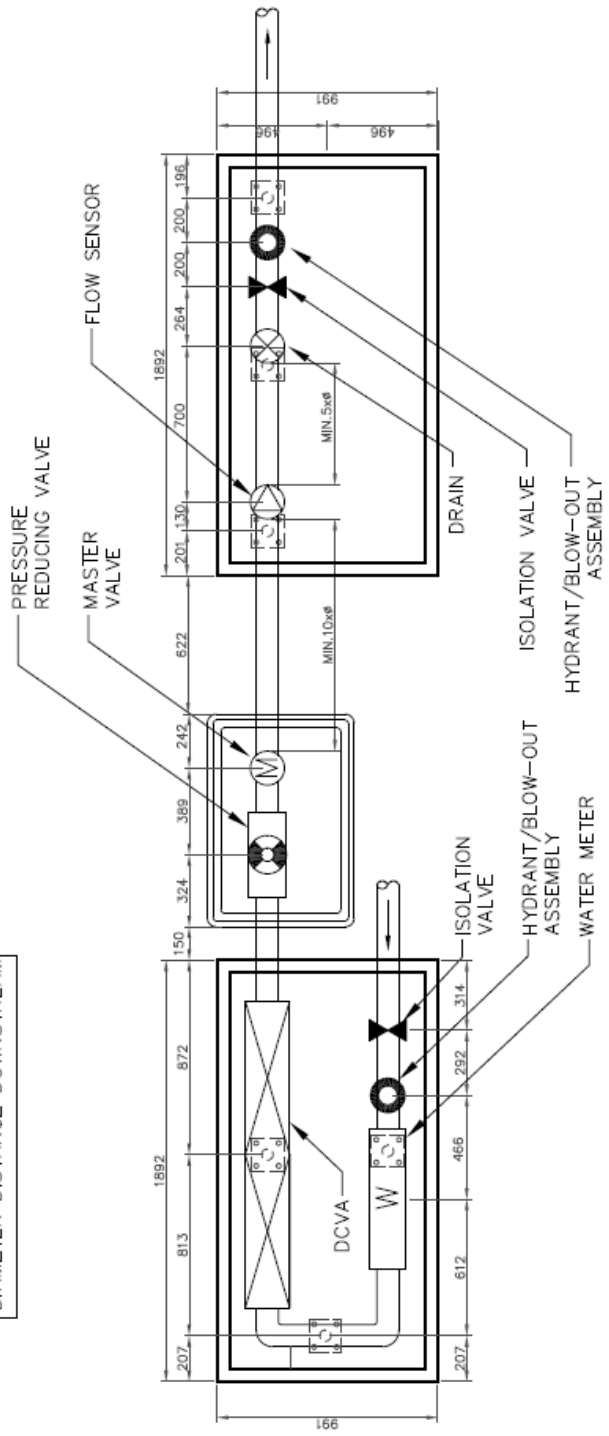
N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE : **Backflow Prevention Assembly 1" to 2"**	DETAIL No. : **SS-IR.01b**


City of Kelowna
EXCEL #3974–2 LID
50mm DOUBLE CHECK VALVE ASSEMBLY
50mm PRESSURE REDUCING VALVE
#1102B KON KAST CONCRETE VAULT BASE c/w 100mmØ DRAIN HOLE
STEEL / BRASS FITTINGS IN VAULT
98% SPD COMPACTED 25mm MINUS GRANULAR BASE
(3) ADJUSTABLE GALVANIZED PIPE STANDS BOLT–ANCHORED TO CONCRETE VAULT BASE
50mm UNION c/w 50mm X 150mm NIPPLE ON EACH SIDE OF DCVA
50mm WATER METER
FINISH GRADE
#1102 KON KAST CONCRETE VAULT
50mm ISOLATION VALVE
50mmØ
25mm BLOW–OUT ASSEMBLY
25mm DRAIN BEYOND
100mmØ DRAIN HOLE
MIN. 0.5% GRADE
100Ø PERFORATED PVC DRAIN PIPE TIE INTO CATCH BASIN OR DRAINAGE SYSTEM
SECTION
N.B. All dimensions in millimetres, unless noted otherwise
DECEMBER 2010
STANDARD DETAIL DRAWING
DETAIL TITLE :
Backflow Prevention Assembly 1" to 2"
DETAIL No. :
SS-IR.01c

City of Kelowna

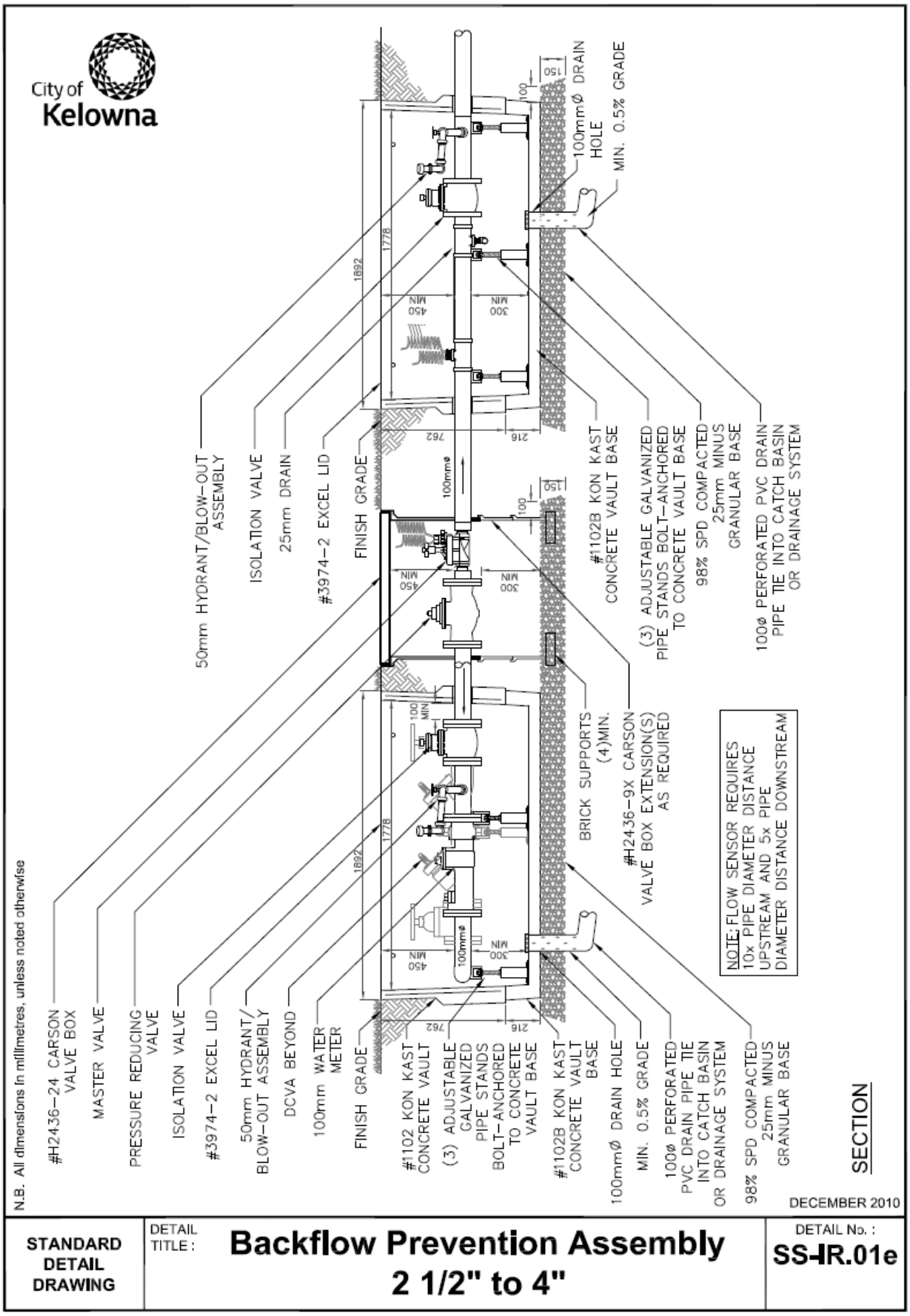


SCHEMATIC PLAN

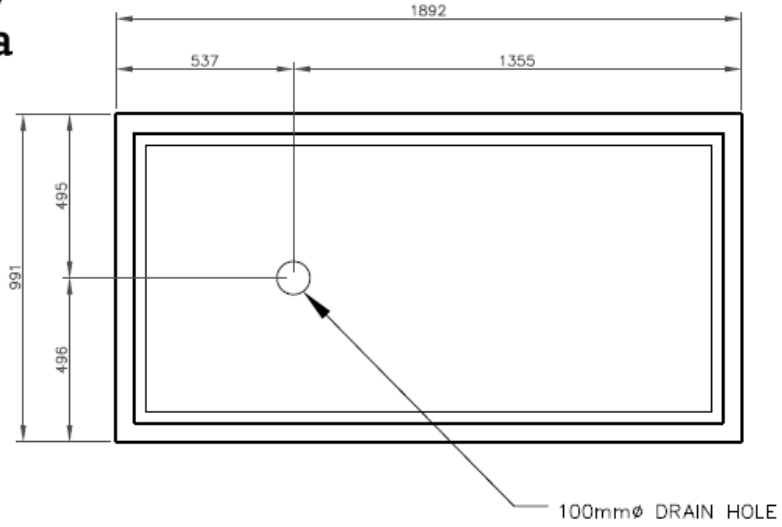
N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

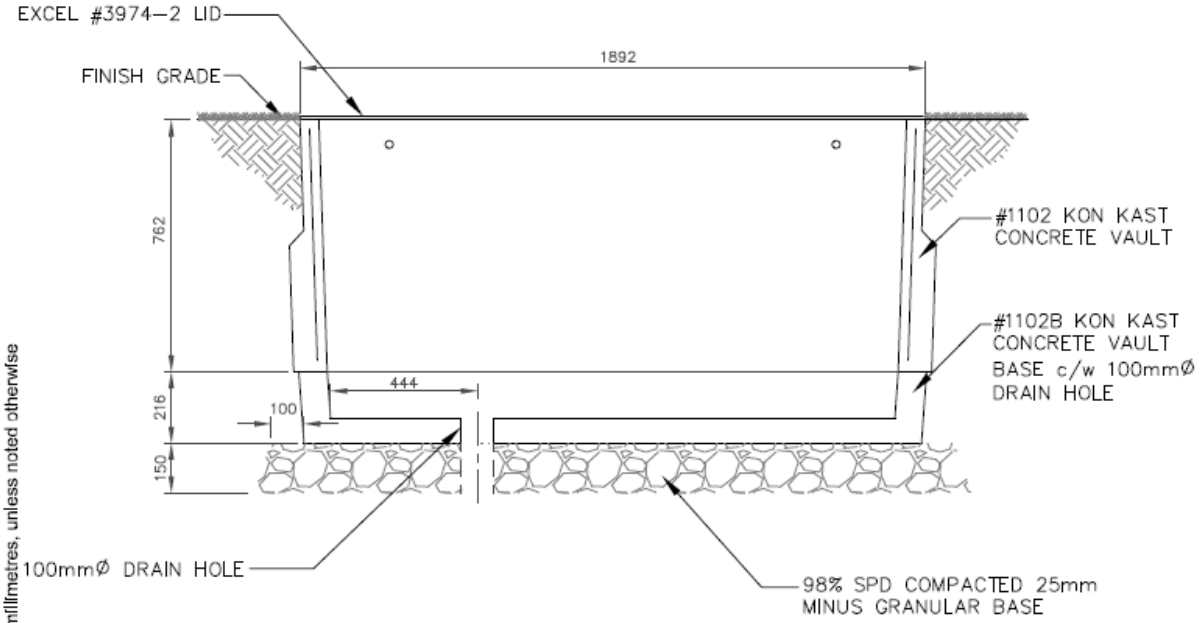
STANDARD DETAIL DRAWING	DETAIL TITLE :	**Backflow Prevention Assembly 2 1/2" to 4"**	DETAIL No. : **SS-IR.01d**


City of Kelowna
N.B. All dimensions in millimetres, unless noted otherwise
#H2436-24 CARSON VALVE BOX
MASTER VALVE
PRESSURE REDUCING VALVE
ISOLATION VALVE
#3974-2 EXCEL LID
50mm HYDRANT/ BLOW-OUT ASSEMBLY
DCVA BEYOND
100mm WATER METER
FINISH GRADE
#1102 KON KAST CONCRETE VAULT
(3) ADJUSTABLE GALVANIZED PIPE STANDS BOLT-ANCHORED TO CONCRETE VAULT BASE
#1102B KON KAST CONCRETE VAULT BASE
100mmØ DRAIN HOLE
MIN. 0.5% GRADE
100ø PERFORATED PVC DRAIN PIPE TIE INTO CATCH BASIN OR DRAINAGE SYSTEM
98% SPD COMPACTED 25mm MINUS GRANULAR BASE
50mm HYDRANT/BLOW-OUT ASSEMBLY
ISOLATION VALVE
25mm DRAIN
#3974-2 EXCEL LID
FINISH GRADE
100mmØ DRAIN HOLE
MIN. 0.5% GRADE
#1102B KON KAST CONCRETE VAULT BASE
(3) ADJUSTABLE GALVANIZED PIPE STANDS BOLT-ANCHORED TO CONCRETE VAULT BASE
98% SPD COMPACTED 25mm MINUS GRANULAR BASE
100ø PERFORATED PVC DRAIN PIPE TIE INTO CATCH BASIN OR DRAINAGE SYSTEM
BRICK SUPPORTS (4)MIN.
#H2436-9X CARSON VALVE BOX EXTENSION(S) AS REQUIRED
NOTE: FLOW SENSOR REQUIRES 10x PIPE DIAMETER DISTANCE UPSTREAM AND 5x PIPE DIAMETER DISTANCE DOWNSTREAM
SECTION
DECEMBER 2010
STANDARD DETAIL DRAWING
DETAIL TITLE :
Backflow Prevention Assembly 2 1/2" to 4"
DETAIL No. :
SS-IR.01e

City of Kelowna



PLAN



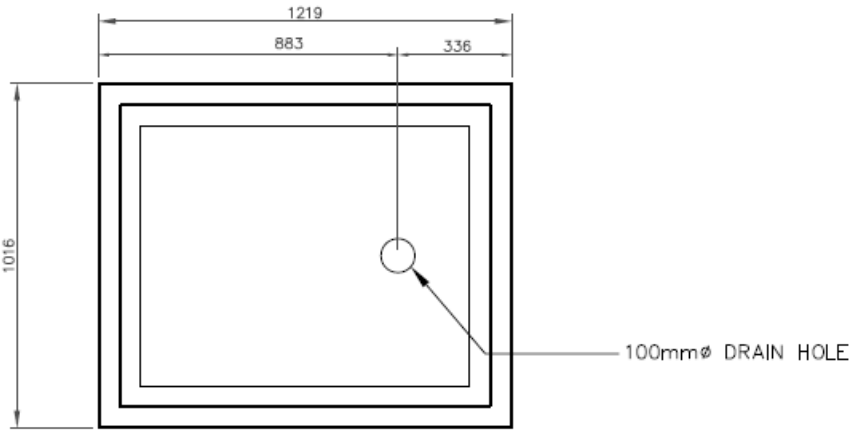
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

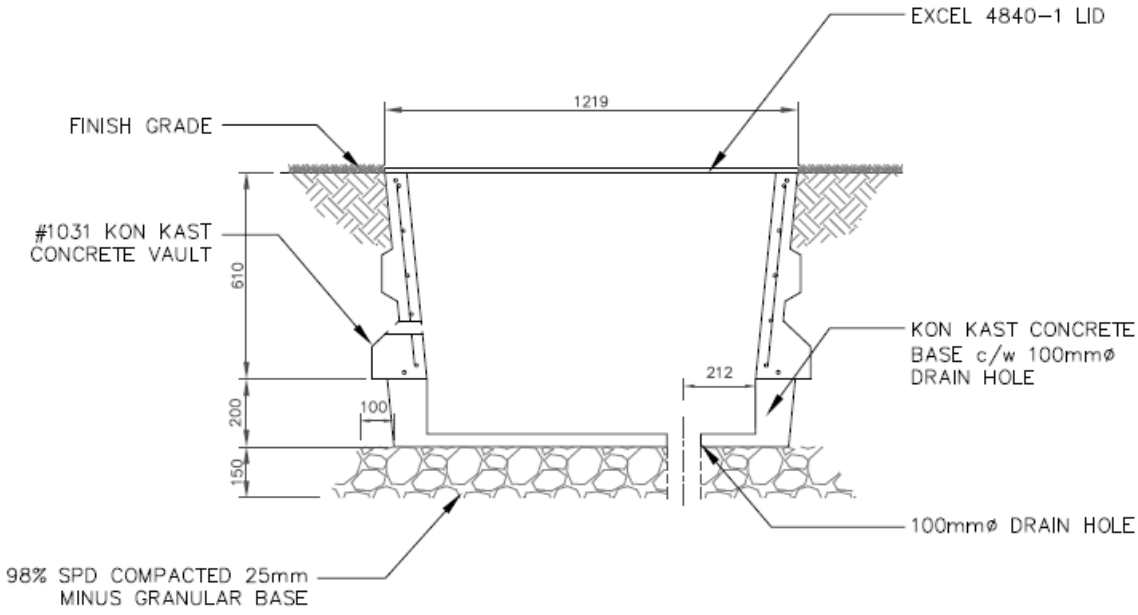
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	Irrigation Vault 1" to 2"	DETAIL No. : SS-IR.02a

City of Kelowna



PLAN



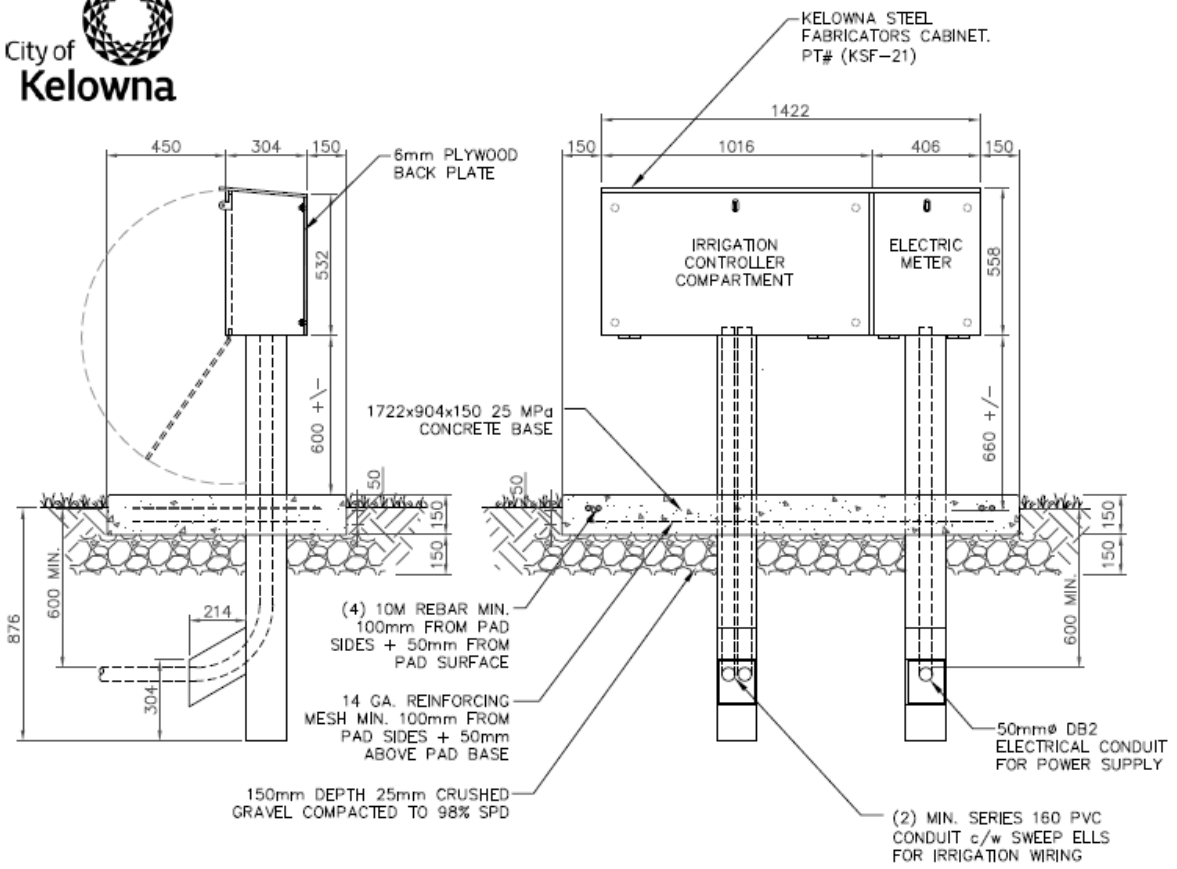
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

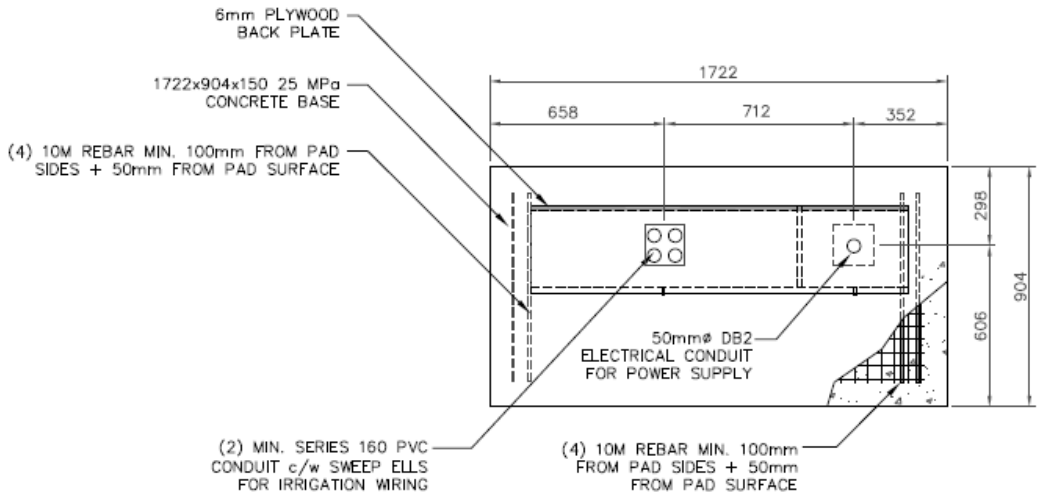
STANDARD DETAIL DRAWING	DETAIL TITLE :	**Irrigation Vault 3/4"**	DETAIL No. : **SS-IR.02b**

City of Kelowna



SIDE ELEVATION

FRONT ELEVATION



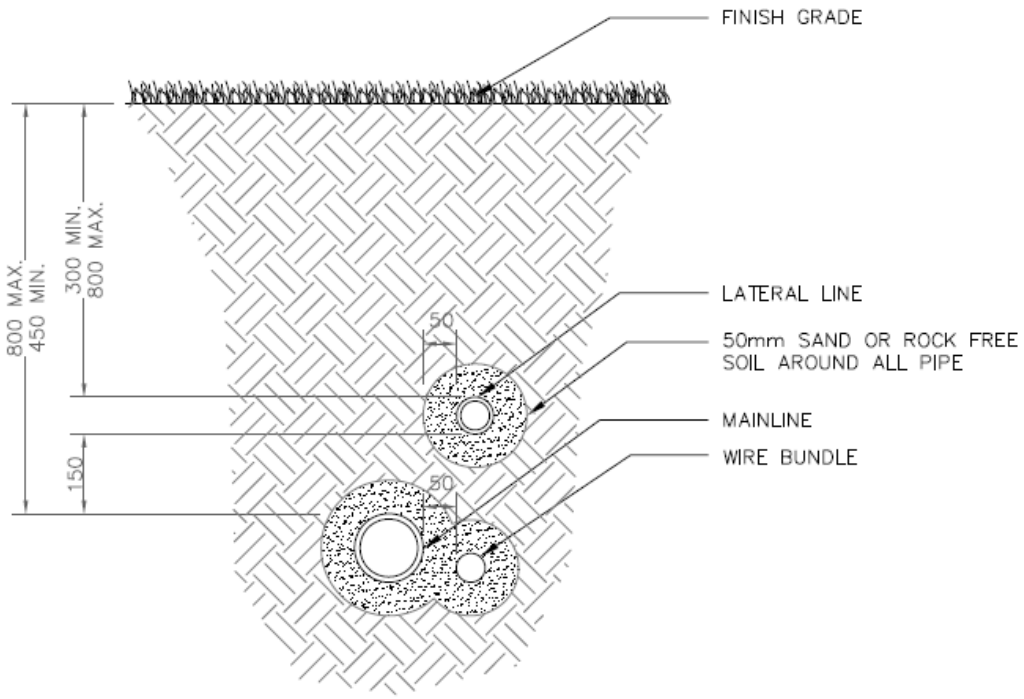
PLAN VIEW

N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	**Irrigation Cabinet Double**	DETAIL No. : **SS-IR.03**

City of Kelowna



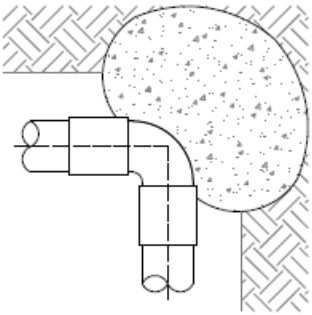
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

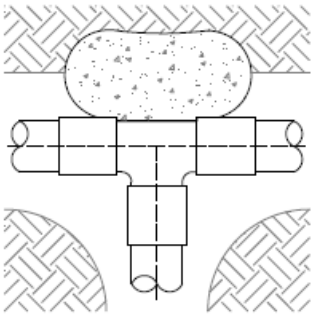
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	**Trench Section w/o Sleeving**	DETAIL No. : **SS-IR.04a**

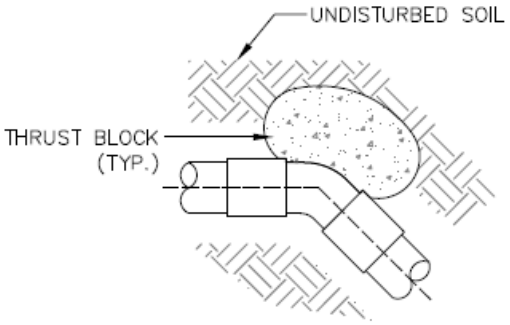
City of Kelowna



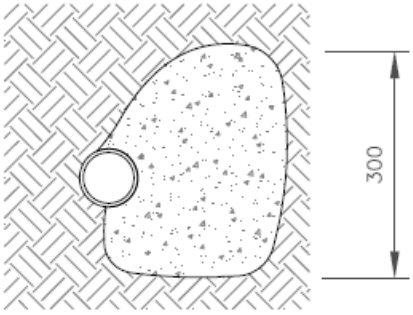
90° ELL PLAN VIEW



TEE PLAN VIEW



45° ELL PLAN VIEW



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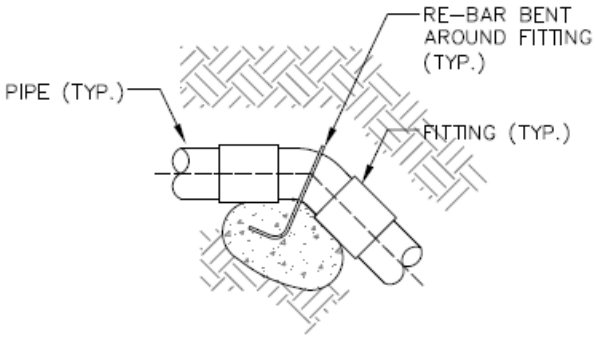
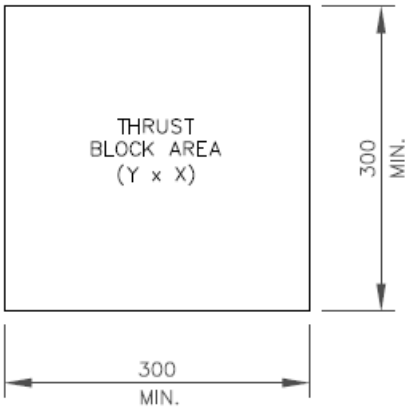
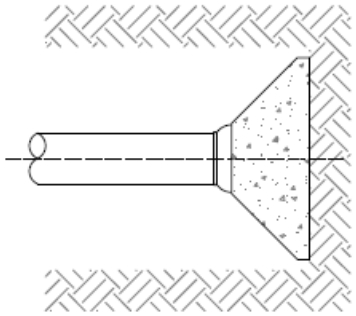


45° ELL ELEVATION



PLAN VIEW



90° ELL PLAN VIEW

	CONCRETE AREAS IN SQUARE METRES						
	PIPE SIZE	100	150	200	250	300	400
TYPE OF FITTING	TEE	0.2	0.4	0.7	1.0	1.4	1.9
	90°	0.3	0.5	0.9	1.4	2.0	2.7
	45°	0.2	0.3	0.5	0.6	1.1	1.4
	END CAP	0.2	0.4	0.7	1.0	1.4	1.9

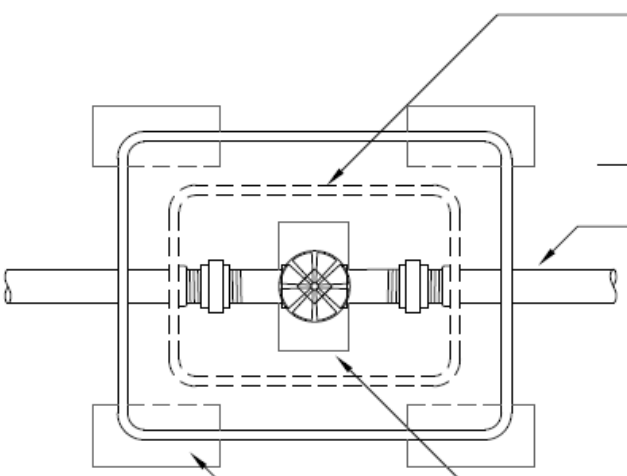
BEARING AREAS OF THRUST BLOCKS

N.B. All dimensions in millimetres, unless noted otherwise

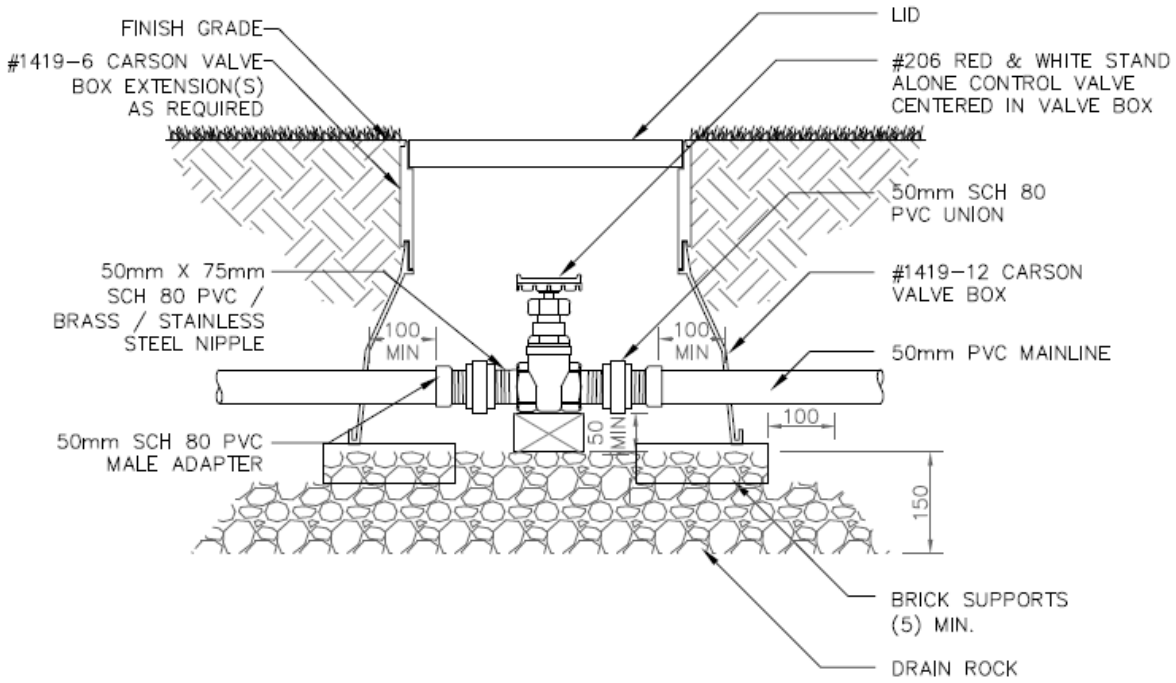
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	DETAIL No. :
	Thrust Blocks	**SS-IR.04b**

City of Kelowna



PLAN



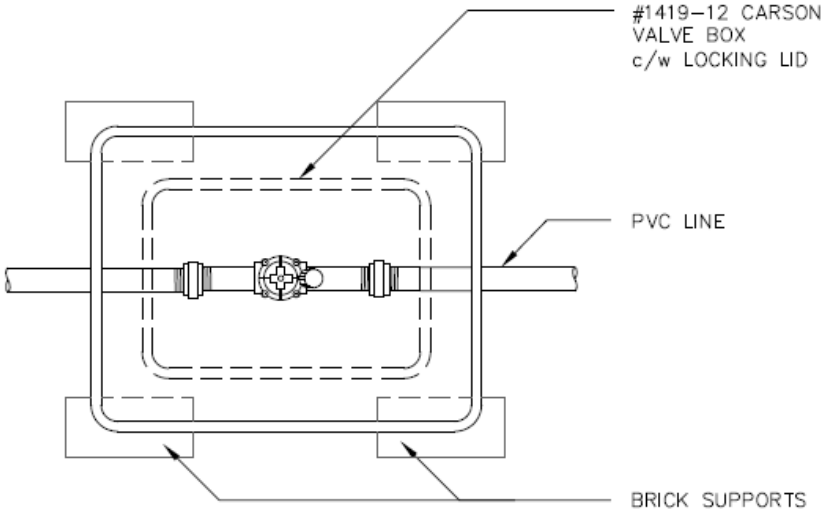
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

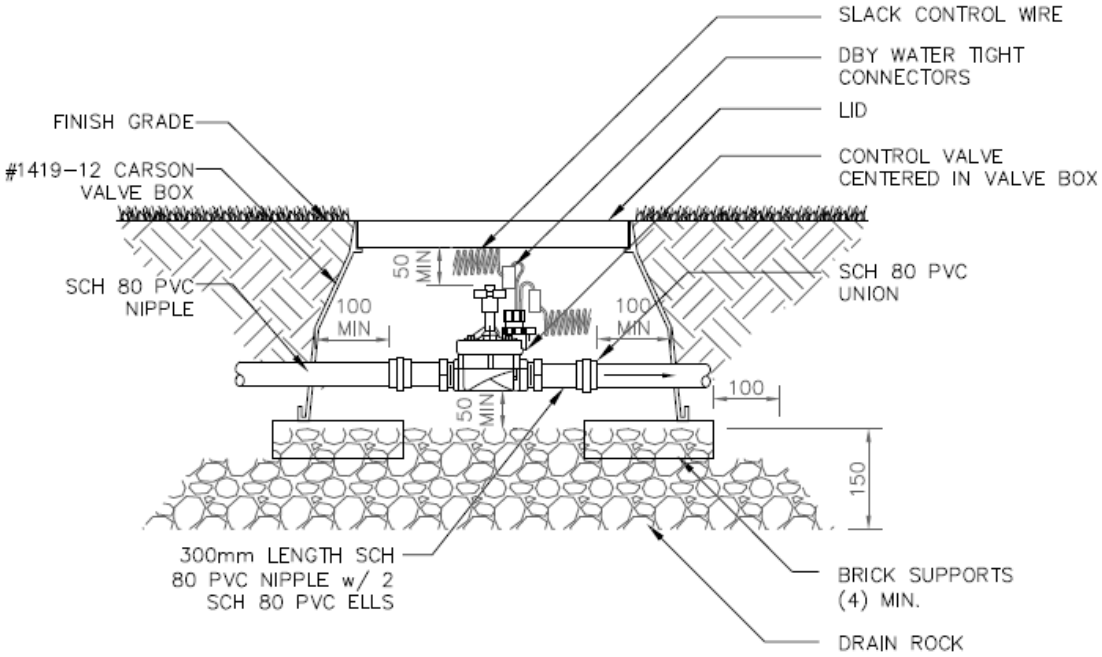
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	Stand Alone Isolation Valve 50mm and Under	DETAIL No. : SS-IR.05a

City of Kelowna



PLAN



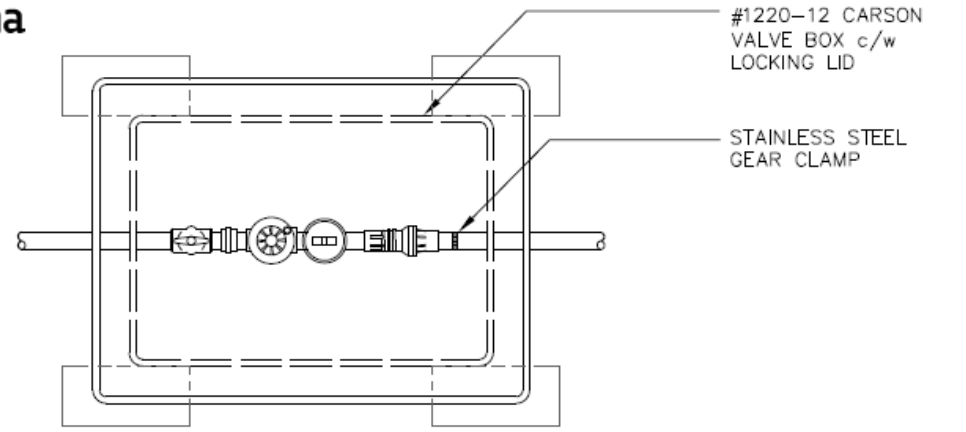
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

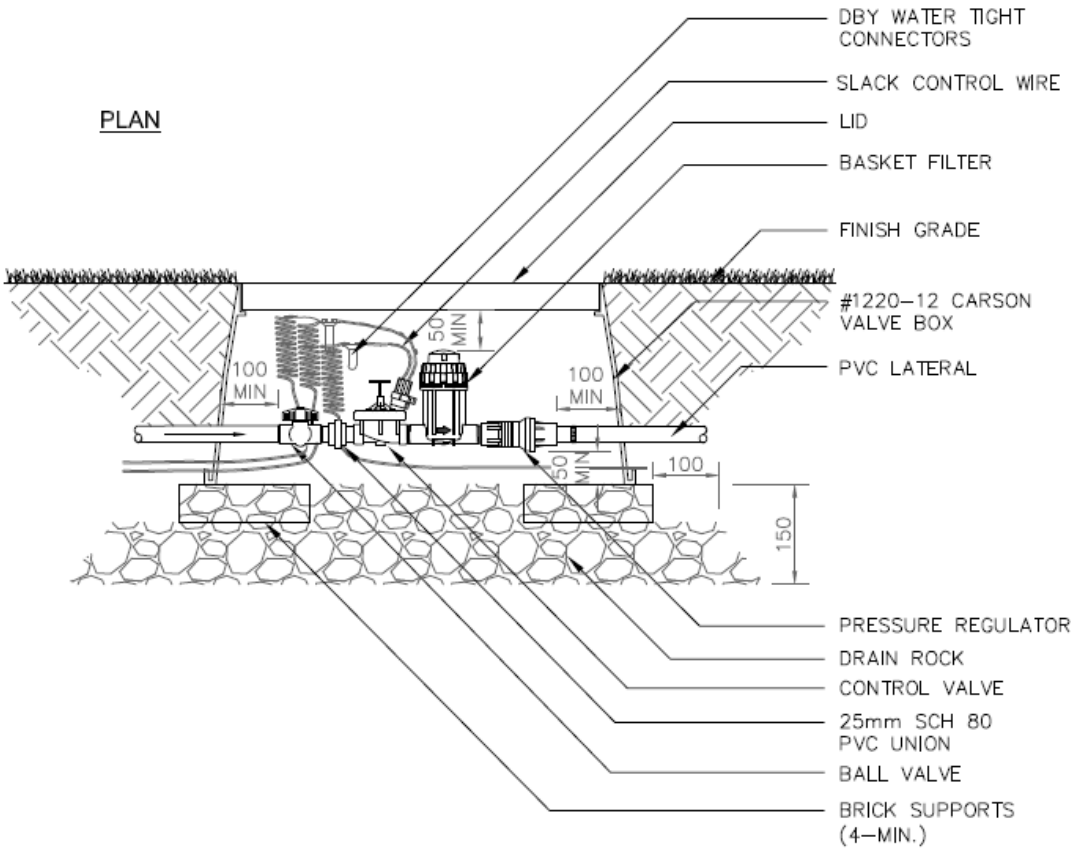
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	**Electric Control Valve 24VAC**	DETAIL No. : **SS-IR.05b**

City of Kelowna



PLAN



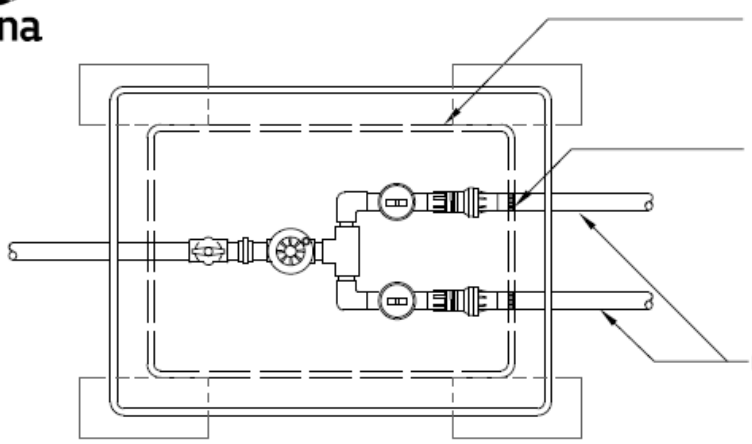
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

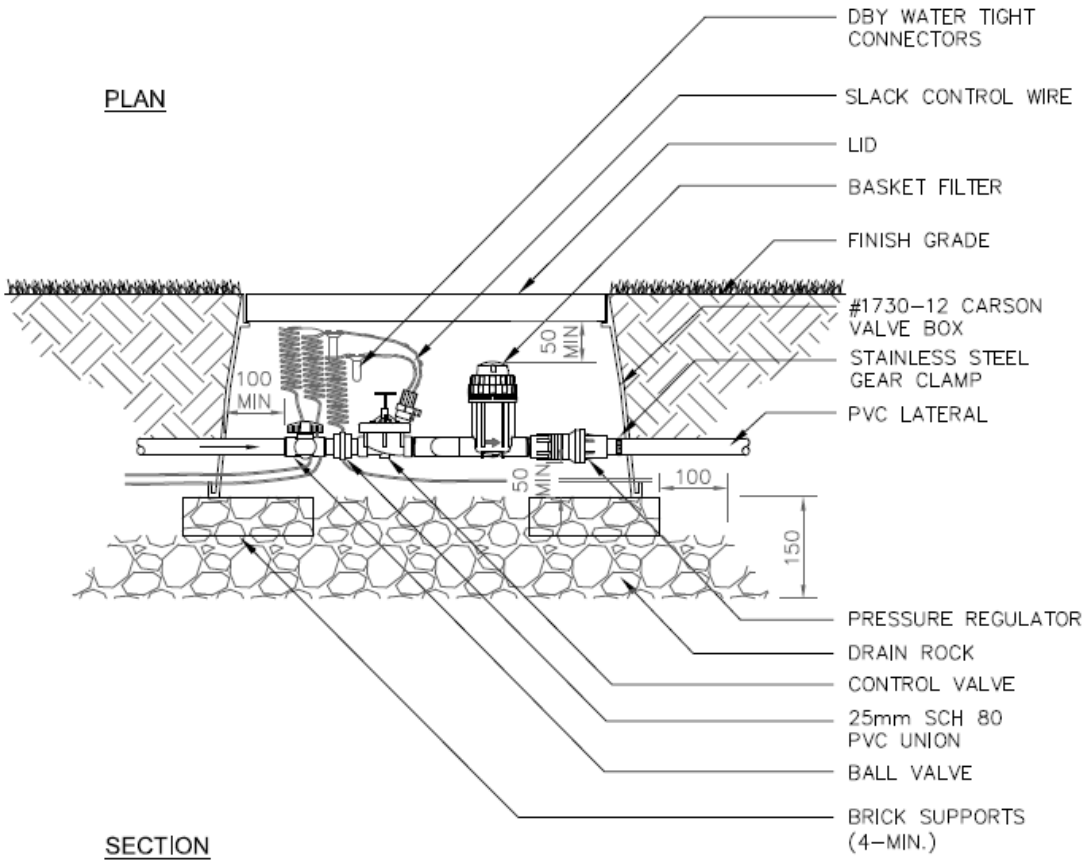
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	**Control Zone Kit 25mm**	DETAIL No. : **SS-IR.06a**

City of Kelowna



PLAN



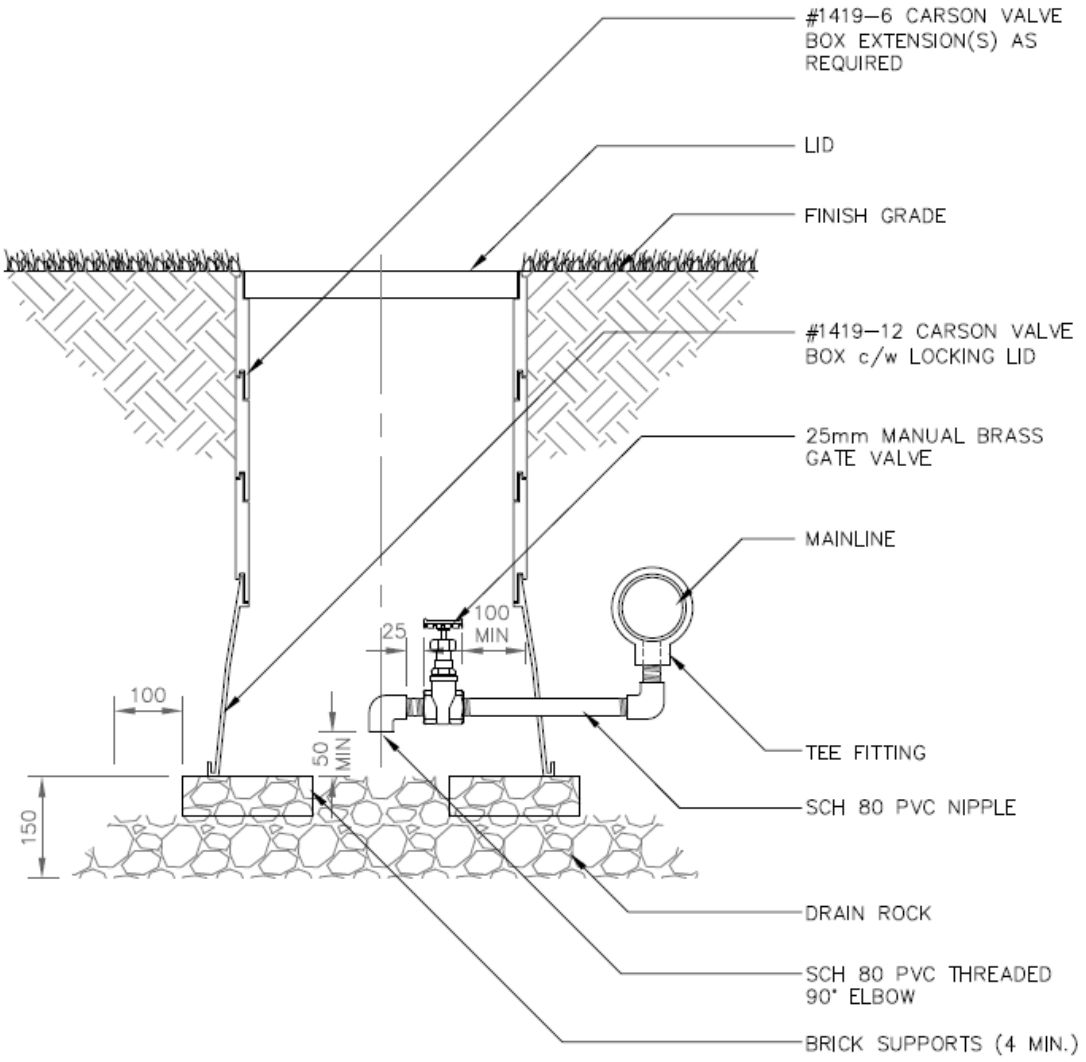
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	**Control Zone Kit 38mm**	DETAIL No. : **SS-IR.06b**

City of Kelowna



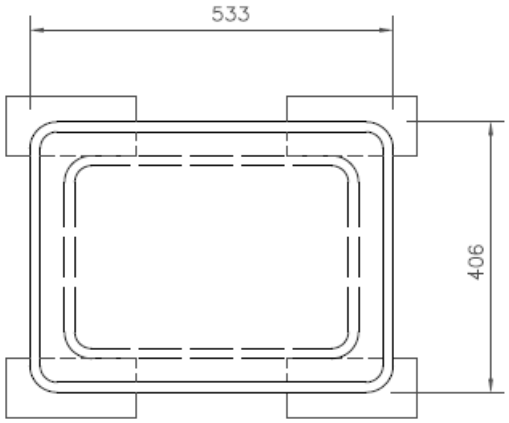
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

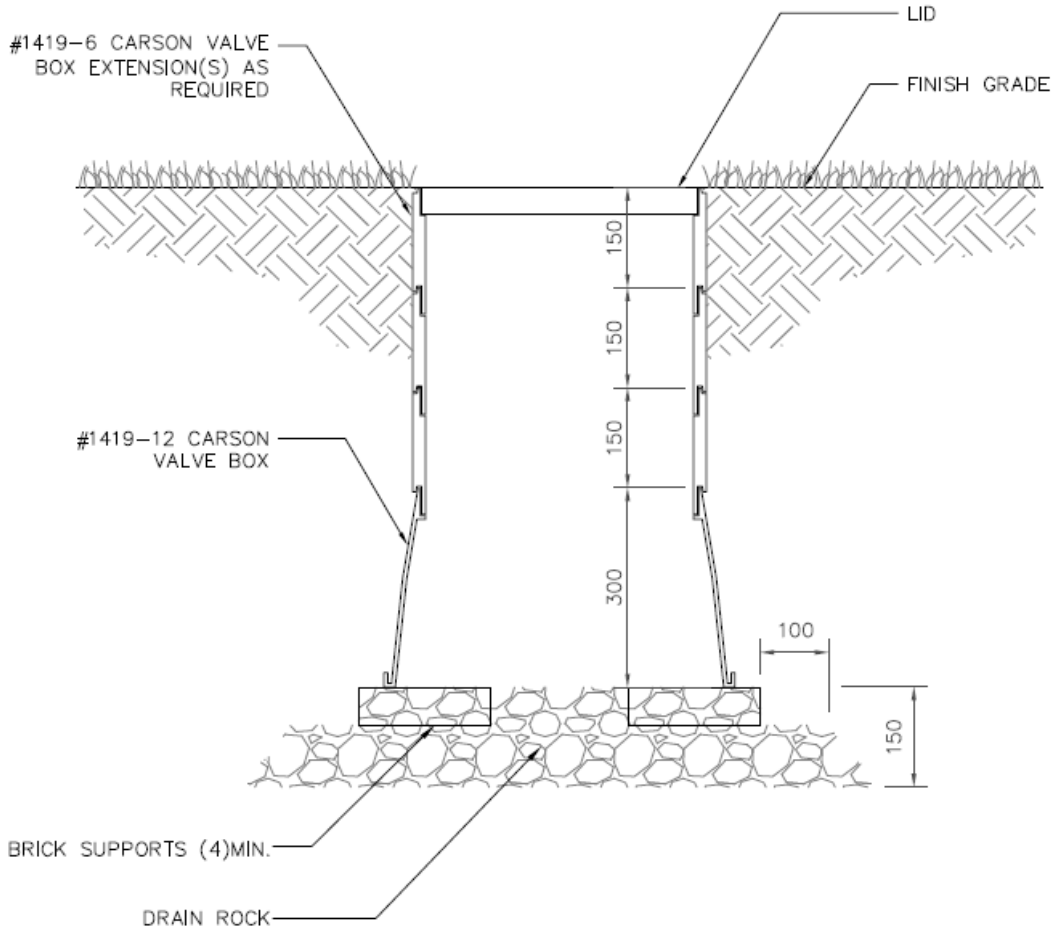
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE : **Mainline Drain Valve**	DETAIL No. : **SS-IR.07**

City of Kelowna



PLAN



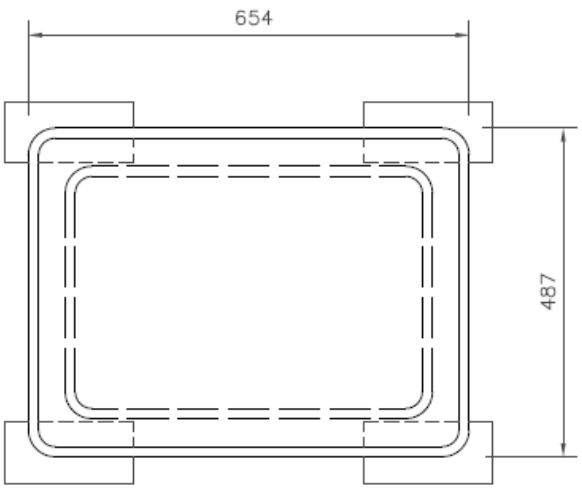
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

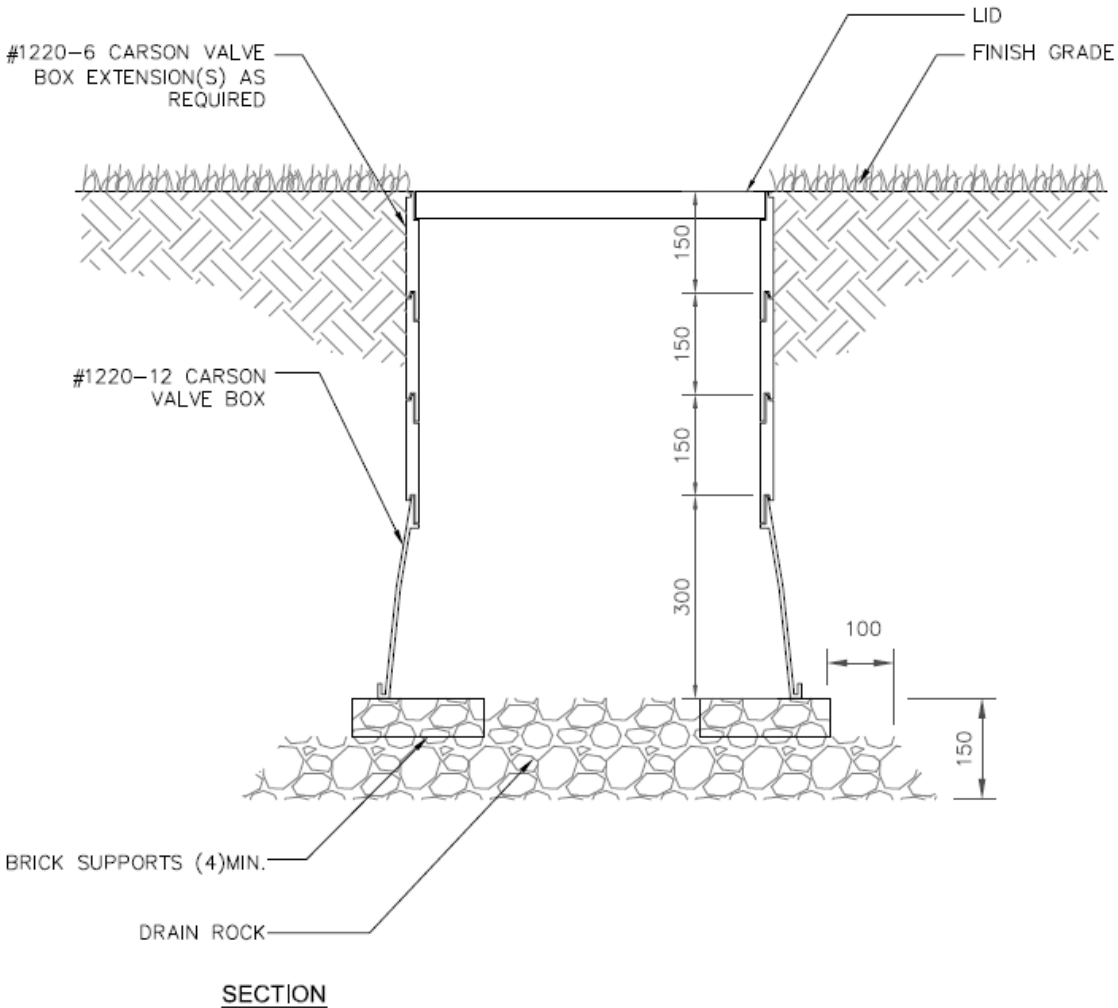
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	**Irrigation Valve Box Small Size**	DETAIL No. : **SS-IR.08a**

City of Kelowna



PLAN



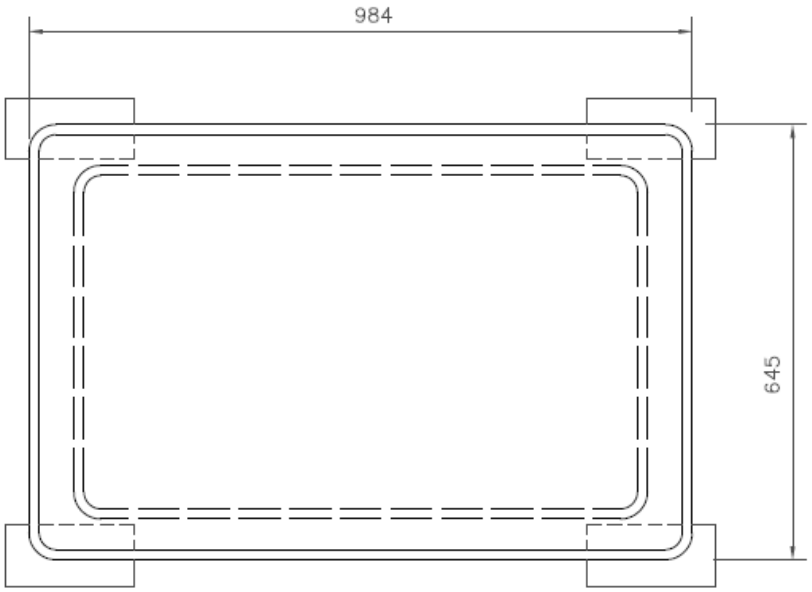
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

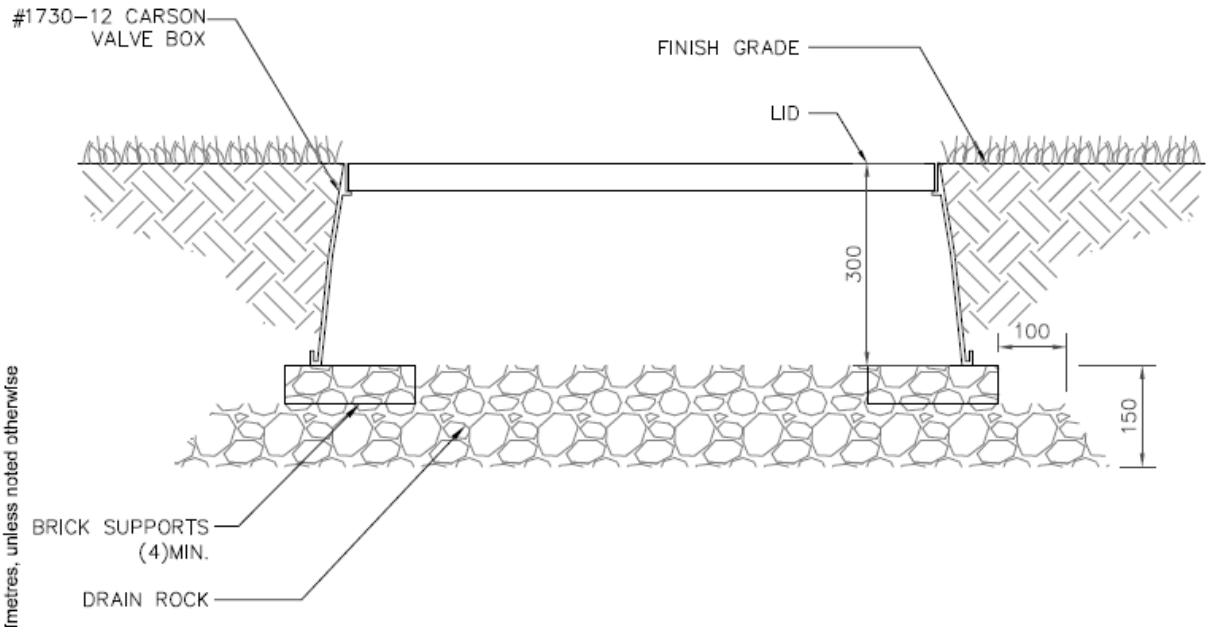
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	Irrigation Valve Box Medium Size	DETAIL No. : SS-IR.08b

City of Kelowna



PLAN



SECTION

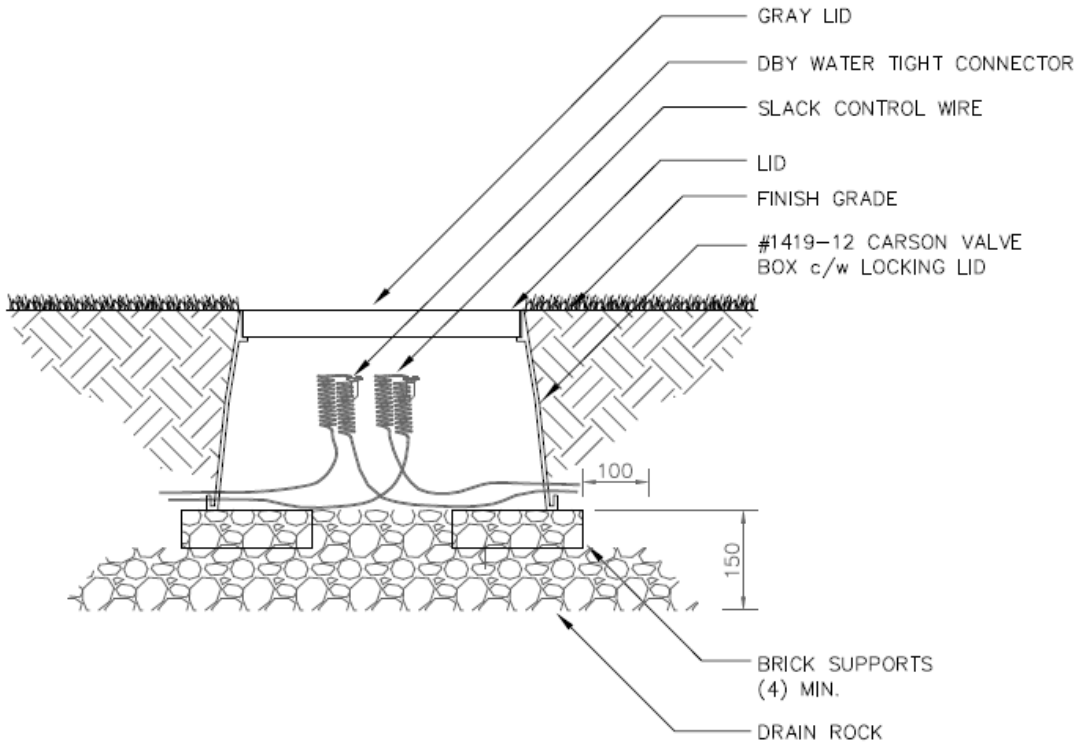
N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	**Irrigation Valve Box Large Size**	DETAIL No. : **SS-IR.08c**

City of Kelowna

NOTE:
ENSURE REQUIRED WIRE DEPTHS
ARE OBSERVED.



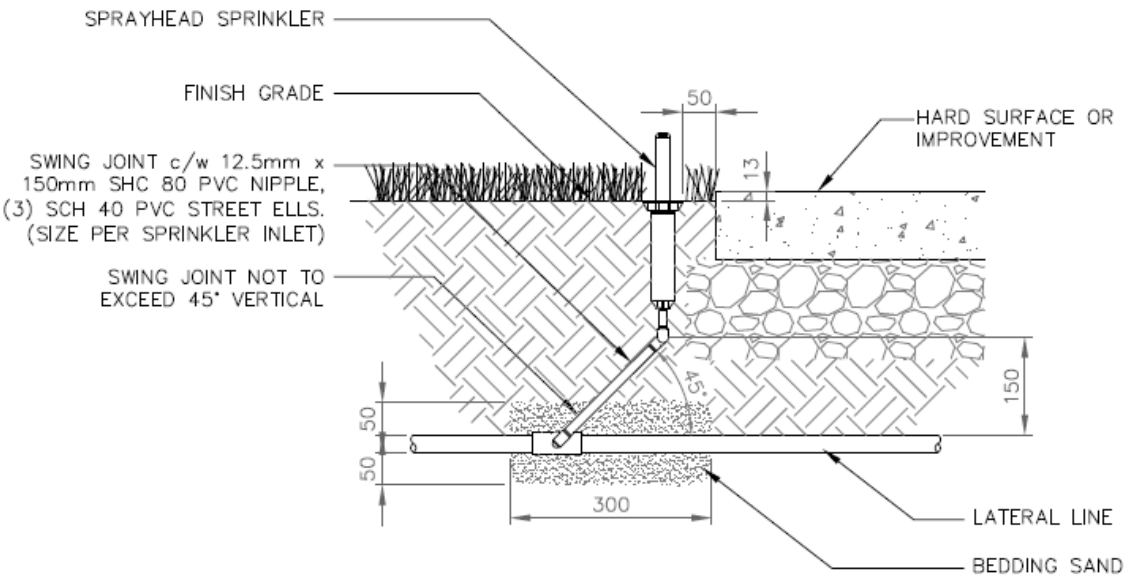
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE : **Wire Splice Box**	DETAIL No. : **SS-IR.09**

City of Kelowna



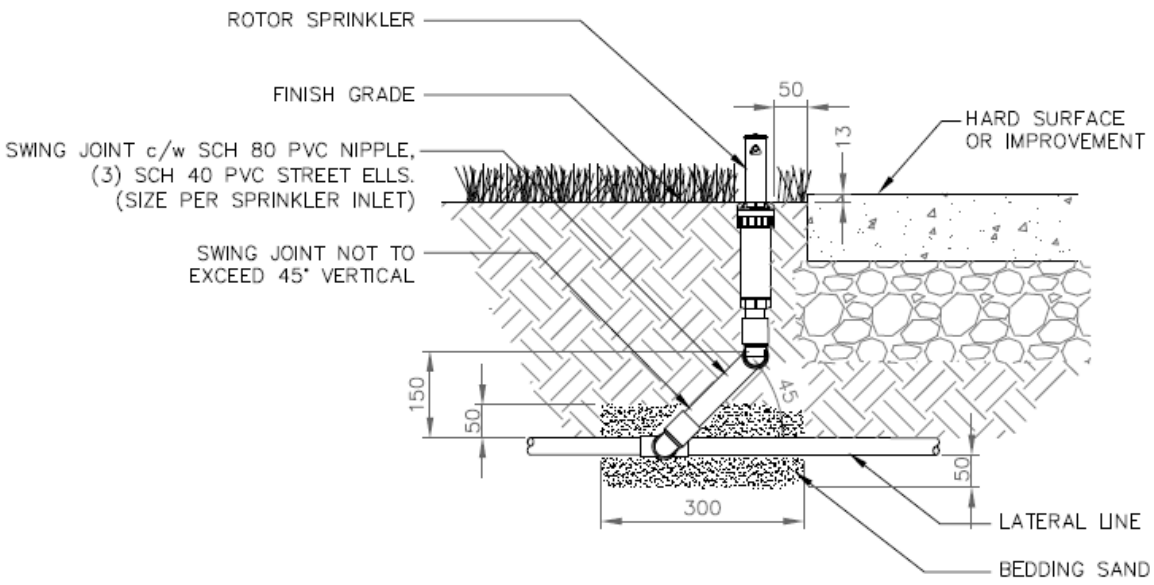
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	Sprayhead Sprinkler	DETAIL No. : SS-IR.10a

City of Kelowna



SECTION

N.B. All dimensions in millimetres, unless noted otherwise

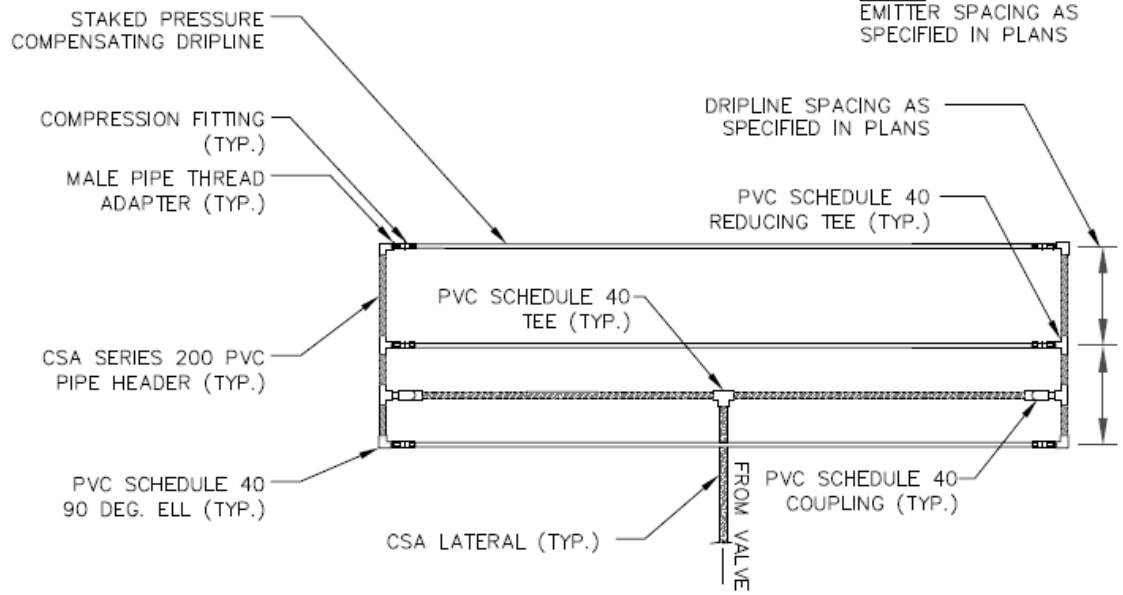
DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	DETAIL No. :
	Rotor Sprinkler	**SS-IR.10b**

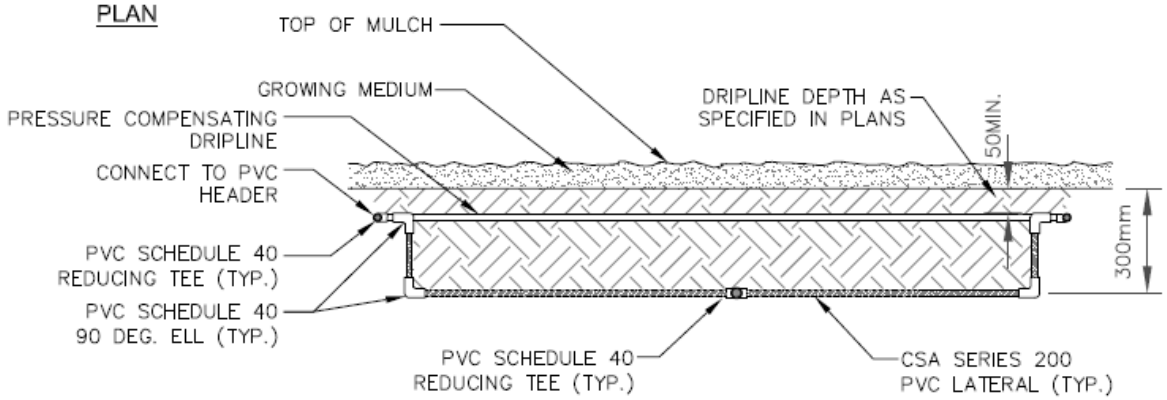
City of Kelowna

NOTES:
1) ASSEMBLY DETAILED DOES NOT REPRESENT HEADERS FOR ALL DRIPLINE AREAS. DETAIL IS INTENDED TO PROVIDE CONTRACTOR WITH THE CONCEPT IN WHICH HEADERS ARE TO BE CONSTRUCTED. REFER TO LAYOUT DRAWING FOR GENERAL LAYOUT OF HEADER IN EACH DRIPLINE AREA.
2) INSTALL ALL HEADERS 150mm INSIDE BACK OF CURB OR PAVED SURFACE.

NOTE:
EMITTER SPACING AS SPECIFIED IN PLANS



PLAN



SECTION

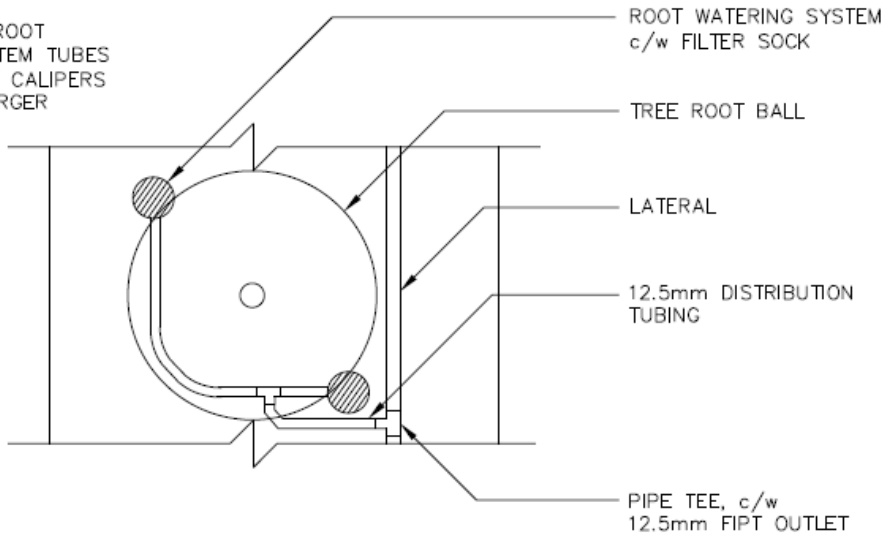
N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE: **Dripline Header Assembly**	DETAIL No.: **SS-IR.11a**

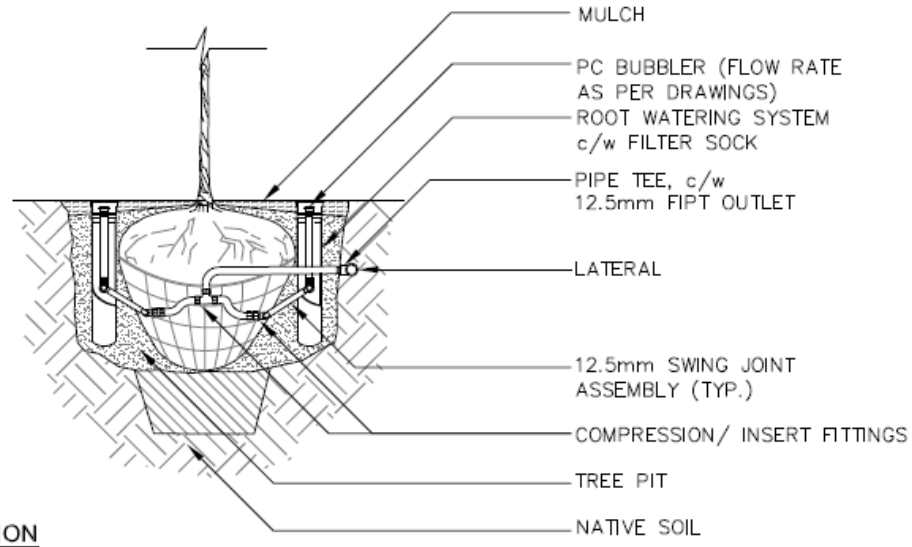
City of Kelowna

NOTE:
INSTALL 2ea ROOT WATERING SYSTEM TUBES FOR TREES w/ CALIPERS 150mm OR LARGER



PLAN

NOTE:
INSTALL ONLY ONE ROOT WATERING SYSTEM WHEN PLANTED TREES ARE LOCATED IN SLOPED GRADING



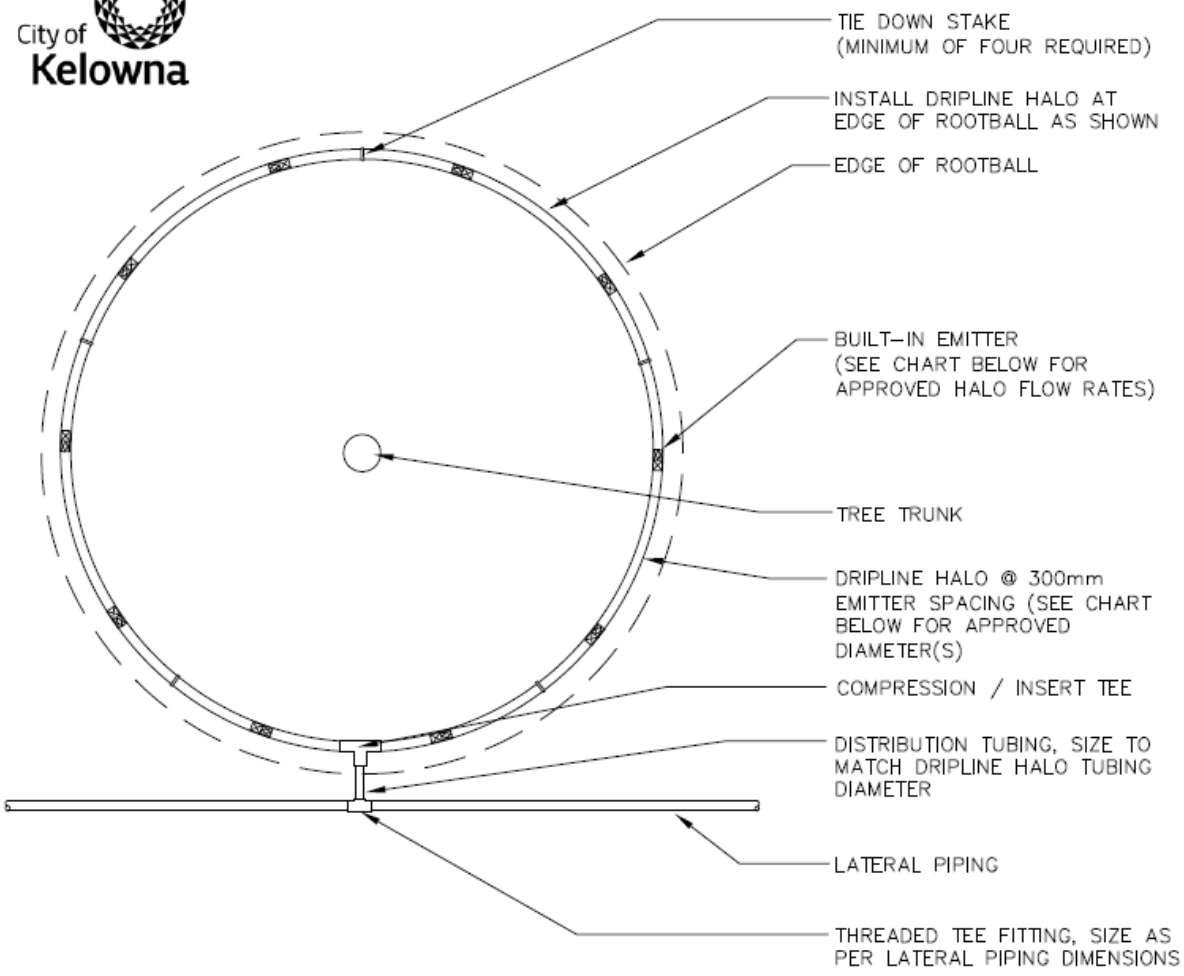
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	**Root Watering System (Double)**	DETAIL No. : **SS-IR.11b**

City of Kelowna



PLAN VIEW

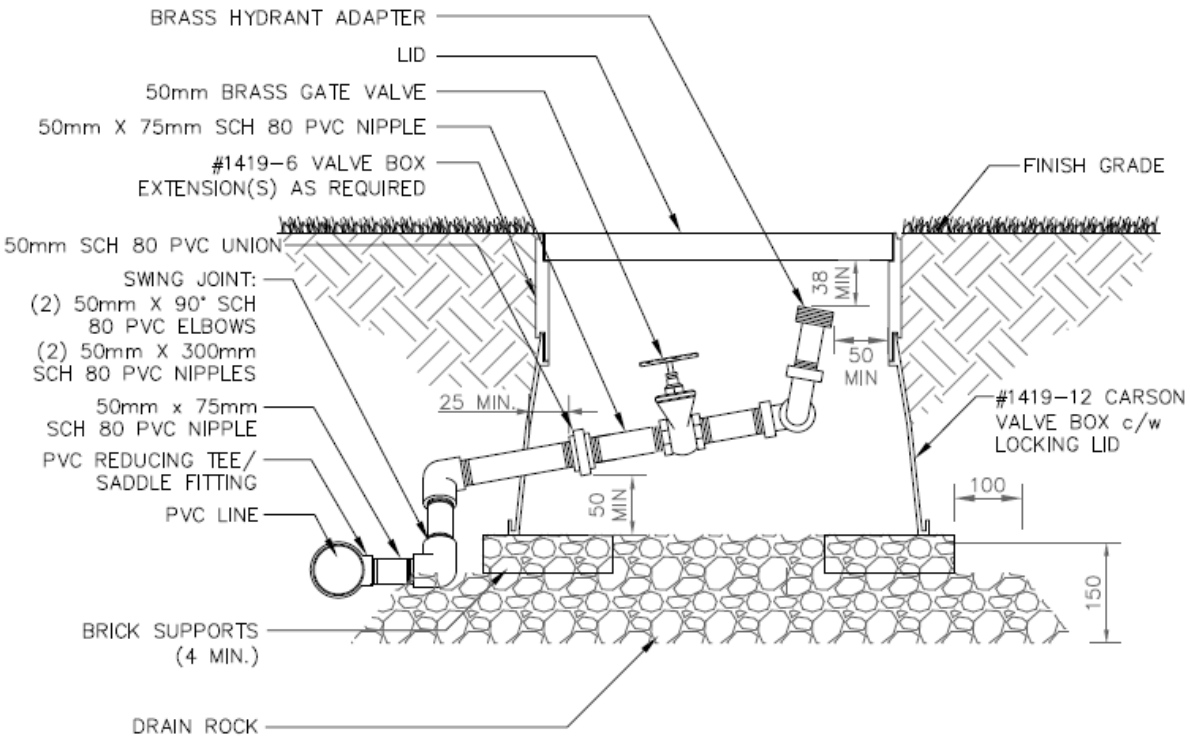
N.B. All dimensions in millimetres, unless noted otherwise

DRIPLINE HALO SPECIFICATIONS FOR TREE IRRIGATION			
DRIPPER FLOW RATE	40" ROOTBALL (10.3ft. DRIP TUBING)	75" ROOTBALL (19.3ft. DRIP TUBING)	90" ROOTBALL (23.5ft. DRIP TUBING)
	10 EMITTERS	19 EMITTERS	23 EMITTERS
0.26 gph	2.6 gph / 0.04 gpm	4.9 gph / 0.08 gpm	6.0 gph / 0.10 gpm
0.40 gph	4.0 gph / 0.07 gpm	7.6 gph / 0.13 gpm	9.2 gph / 0.15 gpm
0.53 gph	5.3 gph / 0.09 gpm	10.1 gph / 0.17 gpm	12.2 gph / 0.20 gpm
0.60 gph	6.0 gph / 0.10 gpm	11.4 gph / 0.19 gpm	13.8 gph / 0.23 gpm
0.90 gph	9.0 gph / 0.15 gpm	17.1 gph / 0.29 gpm	20.7 gph / 0.35 gpm
1.0 gph	10.0 gph / 0.17 gpm	19.0 gph / 0.32 gpm	23.0 gph / 0.38 gpm
	gph = gallons per hour / gpm = gallons per minute		

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	Tree Dripline	DETAIL No. : SS-IR.11c

City of Kelowna



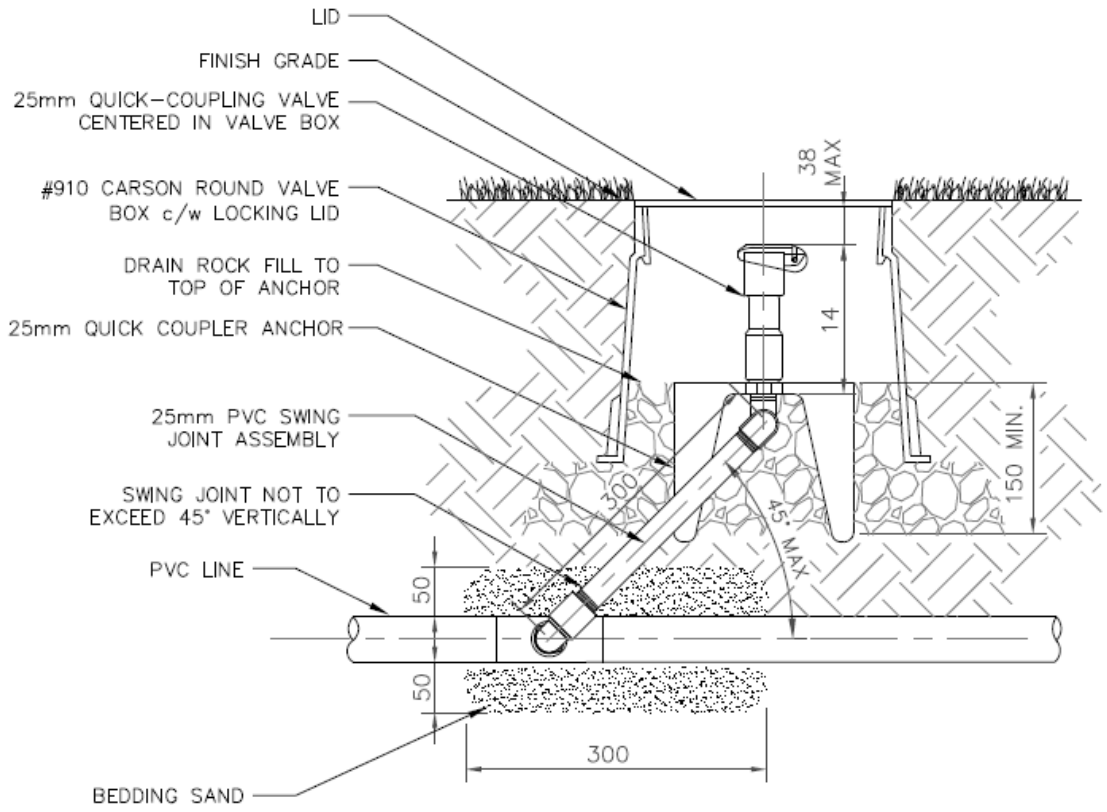
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	Hydrant / Blow-Out Assembly 50mm	DETAIL No. : SS-IR.12a

City of Kelowna



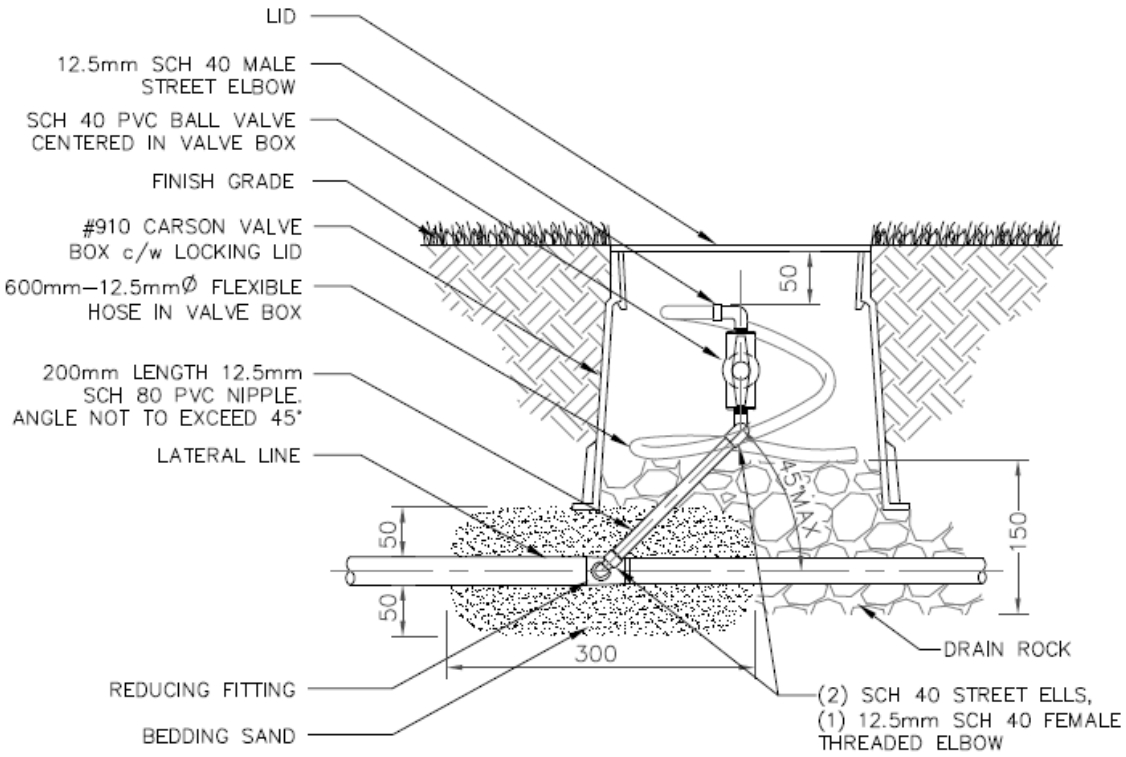
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	Quick Coupler	DETAIL No. : SS-IR.12b

City of Kelowna



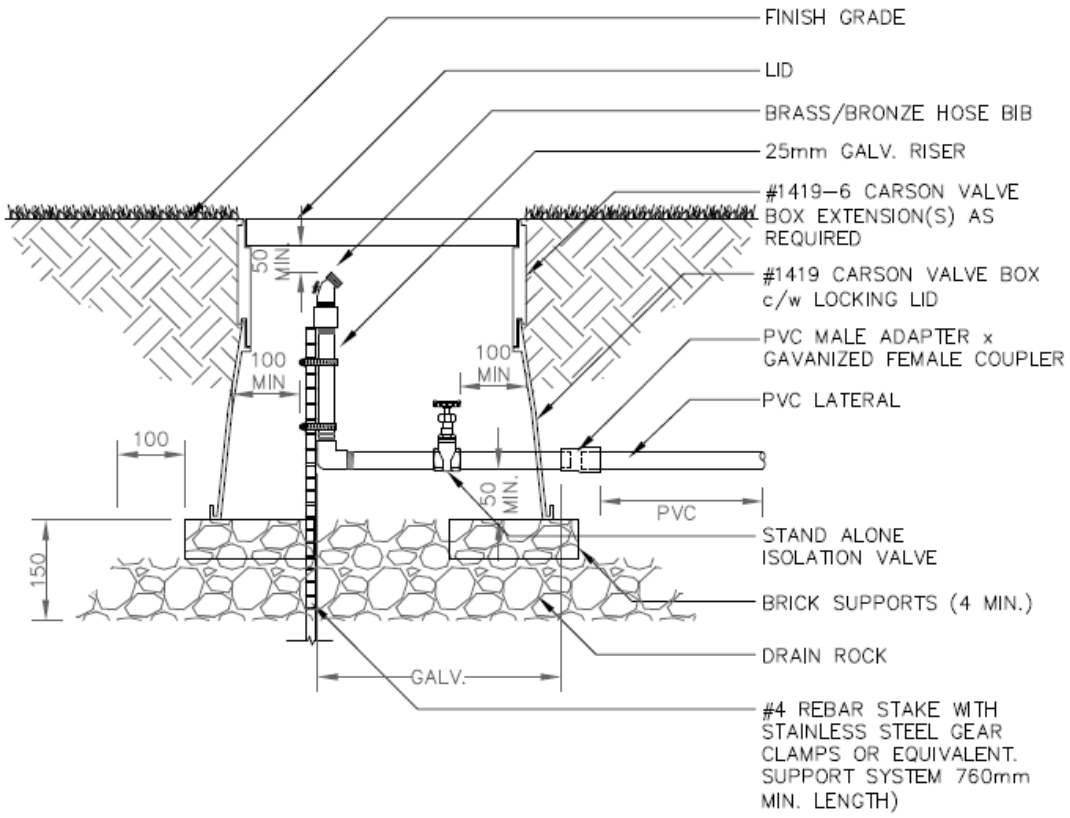
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	DETAIL No. :
	Lateral End Flush Valve	**SS-IR.12c**

City of Kelowna



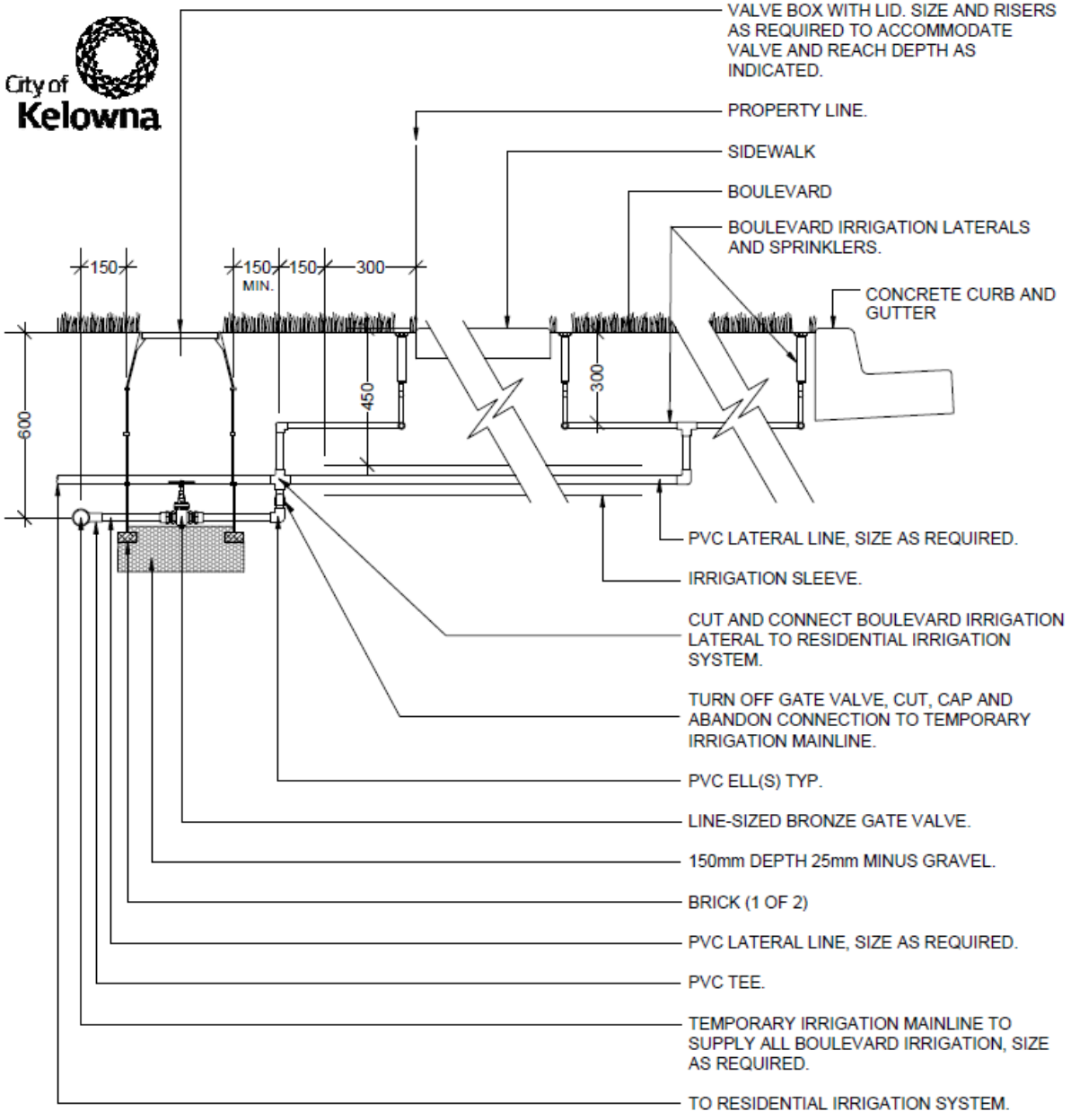
SECTION

N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE : **Hose Bib**	DETAIL No. : **SS-IR.12d**

City of Kelowna



NOTE:

1. AT THE TIME OF BUILDING OCCUPANCY BOULEVARD IRRIGATION OR WATERING SHALL BE PROVIDED BY THE ADJACENT PARCEL OWNER, AND THE CONNECTION TO A TEMPORARY IRRIGATION MAINLINE SHALL BE ABANDONED AT THAT PARCEL.
2. DEVELOPER SHALL BE RESPONSIBLE TO MAINTAIN WATER SUPPLY & TEMP IRRIGATION MAINLINE UNTIL ALL ADJACENT PARCELS CONNECT TO BOULEVARD LATERALS. AT THAT POINT DEVELOPER SHALL DECOMMISSION TEMP IRRIGATION MAINLINE INCLUDING WINTERIZE, CAP OFF AT MAINLINE, REMOVE METER(S) & BFP, TIMECLOCK & ALL WORK TO MAKE GOOD. PERMANENT IRRIGATION SUPPLY FROM FRONTING PROPERTY'S SYSTEMS.

N.B. All dimensions in millimetres, unless noted otherwise

DECEMBER 2010

STANDARD DETAIL DRAWING	DETAIL TITLE :	DETAIL No. :
	Temporary Boulevard Irrigation	**SS-IR.13**