

Specification

1. GENERAL

Scope of Specification

This specification covers the materials, installation and testing requirements for the construction of the Dow Street Water Quality and Quantity Works. This Specification shall be read in conjunction with the Design Drawings and other relevant Specifications.

This specification covers the following items of work:

- ▶ Surface Drainage;
- ▶ Stormwater Pits and associated structures;
- ▶ Raingarden Works; and
- ▶ Landscape Works

Setting Out

The Contractor shall be responsible for accurately setting out of the works on the site in accordance with the drawings and survey information supplied, and for checking works in progress. The Contractor shall advise the Superintendent once set out is completed and prior to proceeding with works. Should the Contractor discover any discrepancy in the drawings or on the site, they shall immediately notify the Superintendent before proceeding with the works.

Documentation

Drawings

- ▶ The Drawings, together with the Specification, show the extent and details of the Works to be constructed.
- ▶ The locations of the various existing structures and features shown on Drawings and the given dimensions of such structures / features are believed to be correct, but do not purport to be absolutely so. They have been shown for information, and information so given is not to be construed as a representation that such structures or features will be found or encountered as drawn, or that these dimensions are accurate. The Principal does not warrant the accuracy of such information provided by or on behalf of the Principal.
- ▶ The location of existing structures shall be confirmed prior to the commencement of site Works.
- ▶ Details necessary for the construction of any part of the Works may have to be deduced from several Drawings.
- ▶ Although the Drawings are prepared to scale, work shall be based upon dimensions shown on the Drawings and not on dimensions scaled from the Drawings.
- ▶ In the event that details shown on any Melbourne Water Standard Drawings included in the Contract Documents differ from those shown on other Drawings or

the requirement of the Specification, refer the matter to the Superintendent for resolution.

Shop Drawings

- ▶ The Superintendent shall be furnished with all Shop Drawings necessary for fabrication prior to the commencement of fabrication. The shop drawings for the structural steelwork shall be prepared in accordance with AS 1100 and AS 1101.3, showing relevant details of each assembly, components and connection.
- ▶ The shop drawings shall provide information relative to fabrication, surface treatment and erection, including, but not limited to:
 - Identification marks;
 - Steel type and grade;
 - Dimensions;
 - Fabrication methods, including, where applicable, hot or cold forming, post-weld treatments;
 - Location, type and size of bolts;
 - Bolt Categories;
 - Orientation of members;
 - Surface preparation methods and coating systems;
- ▶ For each drawing, three or more hard copies, i.e. printed on paper, shall be supplied.
- ▶ Fabrication shall not commence until the relevant shop drawings have been reviewed and approved by the Superintendent.

Quality Assurance

- ▶ All quality management procedures and all quality control testing shall be conducted as required and the records made available to the Superintendent.
- ▶ Detailed fabrication drawings shall be supplied to the Superintendent together with all Specifications, certificates, sample tests, methods and schedules, as required by the Specification

Standards and Codes

- ▶ Except as is otherwise specified, all materials and workmanship shall comply with the requirements of such Standards, Codes and other related documents issued by the Standards Association of Australia as may be applicable to any parts of the Works.
- ▶ In the event of there being no relevant Australian Standard, Code or other related document, Standards and Codes of the British Standards Institution or of the American Society for Testing and Materials shall apply and in that order of precedence. If, during the course of Works, there is an amendment to any Standard, Code or related document relevant to the Works, the Superintendent will direct whether the amendment is to apply.
- ▶ Where any Australian Standard, Code of Practice or regulation not specified in this Document is to be employed, the Superintendents approval shall be sought for the alternative to be used.

Process Procedures

All work activities to be completed on this Project require a Process Procedure, prepared in accordance with the relevant Australian Standards used within the Project and with Australian and Victorian Legislation. Process Procedures shall be submitted to the Construction Manager and their approval gained prior to the commencement of any Works.

Documentation

Principal's Specifications

- ▶ The Works shall be constructed in accordance with the requirements of this Specification and the following Melbourne Water Standard Specifications:

Melbourne Water Standard Specification	Title
20.A.003	Supply of Pre-Mixed Concrete
20.A.004	Concrete Construction
21.A.038	Sands, Crushed Rock and Crushed Scoria
LDM Section 6 ¹	Construction Specification

Where this Specification is in conflict with or inconsistent with the Melbourne Water Standard Specifications listed in the paragraph above or the drawings or City of Port Phillip specifications the following shall take precedence unless directed otherwise by the superintendent:

1. The Drawings;
2. This Specification; (please refer to Melbourne Water Standard Specifications attached as zip files).
3. MW Standard Specification; and
4. City of Port Phillip Specifications.

Materials and Equipment Specified By Name

Whenever any material or equipment is specified by patent, proprietary or trade name, or by the name of a manufacturer, such specification shall be considered as used for the purpose of describing the material or equipment desired but does not imply that such material or equipment automatically complies with any further requirements of this Specification. Such name shall be considered as if followed by the words "or approved equal" whether or not such words appear.

The contractor may use material or equipment with equal or better quality performance in substitution for those specified with the approval of the superintendent.

¹ Land Development Manual Section 6 – Refer to http://ldm.melbournewater.com.au/content/construction_specifications/construction_specifications.asp

2 EXCAVATION

Drainage During Construction

GENERAL: Make all necessary allowances and construct temporary works to ensure that adequate drainage is maintained across the site during construction. Include allowances for provision, operation and maintenance of all equipment, which may be required including pumps, pipework and the like.

DRAINAGE OF FILL: Ensure that all placed fill surfaces are free draining during construction.

DRAINAGE OF SITE: Provide adequate drainage around the Works area, including site offices and stockpiles, to ensure that any disruption to the Works due to adverse weather conditions is minimised.

REQUIREMENT: The base of any excavation which has been disturbed by the action of water or any construction activity such that it does not meet the requirements of this Specification shall be rectified by the Contractor.

Excavation

General Requirements

The Contractor must:

- ▶ Carry out all excavation works in accordance with the requirements of the Mines Act 1958 Regulations and Statutory Rules, Occupational Health and Safety Act, and all relevant Codes of Practice;
- ▶ Notify the Victorian WorkCover Authority prior to commencement of excavation works;
- ▶ Nominate the Mine Manager or statutory equivalent for the project;
- ▶ Comply with the general provisions of Section 21 of the Occupational Health and Safety Act; and
- ▶ Comply with the Victorian WorkCover Authority Codes of Practice.

Methods of Excavation

For the purpose of this Specification, the methods of excavation are defined as follows:

- ▶ Excavation is the removal of ground from the surface to a depth necessary to execute the Works.
- ▶ Excavations required for pits and other structures.

Excavation

- ▶ Existing pavements including footpaths shall be saw cut 100 mm outside the excavation line prior to excavation.
- ▶ Extent:

The extent of an excavation must not exceed the minimum area by more than 100 mm unless approved by the Superintendent.

- ▶ Depth:

With the exception of where a special base is required, the depth of excavation must be within 100 to 150 mm below the proposed level of the bottom of the raingarden. The excavation floor must be trimmed to reduce variations in the floor level to not more than 25 mm in a 2 m length.

- ▶ Excavation of raingardens are to be supported in a manner to maintain the nominal area and depth as shown in the drawings and minimise disturbance of surrounding soils. The Contractor is required to detail their proposed method and forward to superintendant for approval prior to commencing work.

Securing the Excavation

- ▶ Excavations must be stable and adequately secure the ground surrounding the excavation against movement.
- ▶ Excavations must be barricaded appropriately during and after work hours for public safety, and provide any necessary signage.
- ▶ For trenches, all ground support must be withdrawn as the refilling of the excavation proceeds, except where its withdrawal would endanger the safety of the Works, buildings, structures, streets and other surfaces over and adjacent to the line of the Works.
- ▶ If the ground support is left in position in open excavations, the ground support must be cut off at a depth at least 600 mm below the original ground surface.

Nature of Ground

- ▶ If ground conditions endanger adjoining property, adjacent structures, trees, major services or require a change in construction method, the Superintended shall be notified.
- ▶ Any slippage that may occur during the course of the Works must be removed. The excessive excavation and refill resulting from slippage must be dealt with in accordance with Clause titled "Excessive Excavation" in this Specification.

Excessive Excavation

Where the excavation depth and width exceed those specified in the Clause entitled "Tolerances" in this Section, the Superintendent shall be notified and will assess the structural requirements of the pipe, culvert, structure or pavement section to determine appropriate remedial action.

Excavation of Unsuitable Material

- ▶ Unsuitable materials may be classified as wet soils, softened soils, loose soils, highly permeable soils and soils not meeting the requirements of Table 2 of EPA Information Bulletin 448 and EPA Information Bulletin 655.
- ▶ If the unsuitable material cannot be reworked or treated it must be disposed of in accordance with Clause titled "Disposal of Surplus Excavated Material" of this specification.

Disposal of Surplus Excavated Material

- ▶ Excavated materials that are unsuitable or not required for permanent construction must be progressively disposed of.
- ▶ Excavated material shall be tested for compliance with EPA requirements prior to removal from site.
- ▶ Excavated material which does not comply with Table 2 of Industrial Waste Resource Guideline - IWRG 621 SOIL HAZARD CATEGORISATION AND MANAGEMENT shall be handled according to EPA approved methods.
- ▶ Where material is disposed of in permanent stockpiles, it must be placed and compacted in accordance with Clause titled "Compaction of Fill Materials" of this specification. Overfilling to allow for consolidation is not required.
- ▶ The disposal area must be free draining and trimmed to reasonably regular lines and stable slopes.
- ▶ All surface rock and rubble is to be disposed of off site

Demolition of Existing Pipelines and Other Structures

Scope

Demolish and dispose of all rubble and debris generated by the demolition process of the works.

General Requirements

- ▶ Demolish and dispose of all pipelines and structures necessary to construct the works.
- ▶ Where a component to be demolished is attached to a component to remain, care shall be taken to minimise damage to the remaining component. Any damage caused to a remaining component as a result of the demolition work shall be repaired by the Contractor to the satisfaction of the respective owner (e.g. VicRoads or City of Port Philip).
- ▶ Remove from the Site and dispose of all demolished materials and debris in accordance with the Site Environmental Management Plan. No demolished materials are to be buried on-site.
- ▶ Any effect from spillage during transit shall be corrected by the Contractor shall be in accordance with state legislation and asset owners requirements.
- ▶ Adequately support excavations to allow demolition of existing pipelines and associated structures.
- ▶ Provide supports to adjacent structures where necessary, sufficient to prevent damage resulting from the Works.
- ▶ The use of explosives is not permitted.
- ▶ Clear away temporary supports at completion of demolition works to allow construction of new structures.

Backfilling of Excavations

General

- ▶ Bedding types for works in accordance with the design drawings or manufactures specifications.
- ▶ Impact loading of the pipeline and structures must be avoided during placement of backfill material.
- ▶ When backfilling the space between manholes/pits and the sides of the excavations, the Contractor must ensure that the manhole is not displaced.
- ▶ The Contractor must backfill any excavation to form a reliable, effectual and lasting support to the adjoining ground.
- ▶ Over-excavation around structures where future works may be required must be backfilled in accordance with the Clause titled "Excessive Excavation" of this Specification to correct any deficiencies of backfilling exposed by settlement.

3. RAINGARDEN WORKS

PE Lining

The PE liner is to be installed as indicated in the drawings. The excavation area nominated for the PE liner is to be free from protrusions (i.e. rocks & roots) that could puncture the liner.

The specified liner is the Proliner LDPE smooth Geomembrane 0.40 mm thickness supplied by Global Synthetics or approved equivalent. The liner is to be installed in accordance with the manufacturer's specifications to form a water tight seal.

Filter Layers

Installation of the coarse sand *transition* layer and soil *filter media* is to be undertaken carefully to avoid displacement of the layers and in lifts of no more than 200 mm.

On the placement of each layer a light compaction (e.g. with a light tapper) is to be undertaken to minimise subsidence and prevent uneven drainage. Any excessive compaction is not desirable and any ruts that occur on the surface need to be de-compacted prior to Mulching.

Final Surface Levels and Grades

It is intended that the final surface of the filter will be planar except for the areas adjacent to the kerb openings and outlet pits where indicated in the drawings. The surface is to be graded to within +/- 50 mm of the grade and level indicated on the plans. The final grading of the filter surface is to be confirmed by level survey or string lines.

Raingarden Soil Media

The soil filter media is to be in accordance with the specifications below based on the *Guideline Specifications for Soil Media in Bioretention Systems (FAWB, 2009)*²

Filter Layer Material

Material as indicated on the drawings as Filter Material shall consist of the following.

- ▶ The material can be of siliceous or calcareous origin and should be a sandy loam to loamy sand. The soils should contain some organic matter but be low in nutrients. The depth of filter media will vary in accordance with the drawings.
- ▶ Filter materials shall have a saturated hydraulic conductivity in the range of 180 – 400 mm/h unless otherwise approved by the superintendent. Filter materials, which comply with the particle size grading outlined in Table 1, will generally meet saturated hydraulic conductivity specifications.

² FAWB, 2009 - Facility for Advancing Water Biofiltration Guidelines available <http://www.monash.edu.au/fawb/products/fawb-filter-media-guidelines-v3-june-2009.pdf>

Table 1 Raingarden Filer Media Grading Requirements

Description	Proportion	Grading
Clay & Silt	<3%	<0.05 mm
Very Fine Sand	5 - 30%	0.05 - 0.15 mm
Fine Sand	10 - 30%	0.15 - 0.25 mm
Medium to Coarse Sand	40 - 60%	0.25 - 1.0 mm
Coarse Sand	7 - 10%	1.0 - 2.0 mm
Fine Gravel	<3%	2.0 - 3.4 mm

- ▶ The filter media should be well-graded and should have all particle size ranges present from the 0.075 mm to the 4.75 mm sieve (as defined by AS1289.3.6.1 - 2009). There should be no gap in the particle size grading, and the composition should not be dominated by a small particle size range. This is important for preventing structural collapse due to particle migration.
- ▶ Filter Media must meet the testing criteria as detailed in Section 0.

Organic Matter for Ameliorating top 100 mm of Filter Layer

The **top 100 mm of the filter medium** should be ameliorated with appropriate organic matter, fertiliser and trace elements with the constituents and quantities detailed in Table 2.

Table 2 Organic Matter for top 100 mm of Filter material

Constituent	Quantity (kg/100 m ² filter area)
Granulated poultry manure fines	50
Superphosphate	2
Magnesium sulphate	3
Potassium sulphate	2
Trace Element Mix	1
Fertilizer NPK (16.4.14)	4
Lime	20

Transition Layer

Material as indicated on the drawings as Transition Layer shall consist of the following.

- ▶ A 100 mm depth clean, well-graded sand material containing <2% fines; and
- ▶ a 7 mm washed gravel screenings.

Note: Scoria or quartz are not considered suitable materials for this application.

- ▶ To avoid migration of the filter media into the transition layer, the particle size distribution of the sand layer should be assessed to ensure it meets 'bridging criteria', that is, the smallest 15% of the sand particles bridge with the largest 15% of the filter media particles (Water by Design, 2009; VicRoads, 2004):
 - D15 (transition layer) $\leq 5 \times$ D85 (filter media) where: D15 (transition layer) is the 15th percentile particle size in the transition layer material (i.e., 15% of the sand is smaller than D15 mm), and
 - D85 (filter media) is the 85th percentile particle size in the filter media.

Drainage Layer

The drainage layer collects treated water at the bottom of the system and encourages infiltration into the surrounding soils. Material as indicated on the drawings as Drainage Material shall consist of the following:

- ▶ Drainage layer material is to be clean, crushed scoria, of 20 mm particle size.

Landscape Material

For all landscaping materials (including timber, rock, mulch, topsoil, turfing and plants) refer to the relevant clauses of Section 0 of the specification.

Testing

Filter Media - Testing Requirements

Testing is to be independently conducted by a NATA approved laboratory, and a copy of the test results to be sent to the project superintendent for approval, prior to the filter soil installation. To determine whether a soil is suitable the following tests should be undertaken from samples taken from the on site stockpile of all filter soil material to be used for the Works:

1. Particle size distribution (PSD)

Variation in large particle sizes is flexible and an approved material does not have to be screened. However, the particle size distribution of the smaller particles (clay and silt) is a crucial element of the filter media specification and as such testing in accordance with AS1289.3.6.1 – 2009 would be required.

2. Filter Media

Filter media must be tested for the following:

- i. Total Nitrogen (TN) Content – 600 - 800 mg/kg;
- ii. Orthophosphate (PO₄³⁻) Content – <55 mg/kg. Soils with total phosphorus concentrations >100 mg/kg should be tested for potential leaching. Where plants with moderate phosphorus sensitivity are to be used, total phosphorus concentrations should be <20 mg/kg;
- iii. Organic Matter Content – Between 3 and 5% (w/w).. In order to comply with both this and the TN and PO₄³⁻ content requirements, a low nutrient organic matter will be required;
- iv. pH – as specified for 'natural soils and soil blends' 5.5 – 7.5 (pH 1:5 in water);

- v. Electrical Conductivity (EC) – as specified for ‘natural soils and soil blends’ <1.2 dS/m;
- vi. Phosphorus – <100 mg/kg. Soils with phosphorus concentrations >100 mg/kg should be tested for potential leaching. Where plants with moderate phosphorus sensitivity are to be used, phosphorus concentrations should be <20 mg/kg; and
- vii. Saturated Hydraulic Conductivity – of potential filter media should be measured using the ASTM F1815-06 method. This test method uses a compaction method that best represents field conditions and so provides a more realistic assessment of hydraulic conductivity than other test methods.

Media that do not meet these specifications should be rejected or amended.

Optional Testing:

- viii. Dispersibility – this should be carried out where it is suspected that the soil may be susceptible to structural collapse. If in doubt, then this testing should be undertaken.

Potential filter media should generally be assessed by a horticulturalist to ensure that they are capable of supporting a healthy vegetation community. This assessment should take into consideration delivery of nutrients to the system by stormwater. Any component or soil found to contain high levels of salt (as determined by EC measurements), high levels of clay or silt particles (exceeding the particle size limits set above), or any other extremes which may be considered retardant to plant growth should be rejected.

Inspection and Hold Points for Raingardens Works

The following elements of the works will constitute hold points for the raingardens:

- ▶ At the completion of drainage connection associated with the raingarden element and before backfill with soil material, which includes gravel, sand, soil and filter medium;
- ▶ Placement of any soil material within the raingarden, which includes gravel, sand and soil filter material; and
- ▶ At practical completion of the raingarden elements.

It is the contractor’s responsibility to provide a minimum of 24 hours weekdays notice (unless agreed to prior) to the superintendent to arrange for a Melbourne Water officer or delegate to attend an inspection for the hold points.

No works shall proceed or be covered up under this section until an officer from City of Yarra and Melbourne Water Corporation has inspected the works. The Superintendent will reserve the right to re-open works if the Contractor fails to give reasonable notice of inspection to the Superintendent. Failure to provide sufficient notification will not result in claims for additional time or monies.

4. PAVEMENT CONSTRUCTION

General

- ▶ The road and footpath pavement, where disturbed by the works, shall be reinstated in accordance with the Drawings and Specification and to the approval of the relevant owner (e.g. City of Port Phillip or VicRoads).
- ▶ Road reinstatement is to extend 100 mm minimum beyond both edges of the trench. Reinstatement is also required where strips of bitumen between the kerb and the reinstatement would otherwise be narrower than 600 mm.
- ▶ Kerb and channels to be reinstated in accordance with the requirements of the City of Port Phillip and VicRoads.

Asphalt

- ▶ The hot mix asphalt used for the road wearing course shall be in accordance with the requirements of City of Port Phillip or VicRoads.
- ▶ All reinstatement works to be chased neatly into existing surface ensuring sufficient cross fall.

Surface Markings

- ▶ Long life white paint (Degador or approved similar) shall be used.
- ▶ Line marking paint for traffic lanes and parking bays must be compatible with road surfacing material and be in accordance with AS 4049.

5. LANDSCAPING WORKS

General landscaping requirements

This section of the Contract comprises the execution generally of the Landscape Works including the supply of all labour and materials as specified. The whole of the works shall be executed in strict accordance with this specification, the General Conditions of Contract, the accompanying drawings and with any working drawings furnished by the Superintendent as work proceeds, and to the satisfaction of the Superintendent.

The specification and drawings represent as fully as possible the requirements and intentions of the Contract. Any other operations which may be reasonably inferred from these documents to form part of the true intent and meaning of this Contract, although not specifically stated as such, will be deemed to have been included and due allowance for their execution must be made.

This section covers the labour, materials, plant and services to carry out the operations necessary for proper performance of the landscape works as shown on the drawings and as specified herein. All works within this section shall be carried out by an approved landscape Contractor and shall include and not be limited to the following:

- ▶ Supply and installation of scour protection;
- ▶ Final trimming, cultivation and incorporation of additives into subgrade;
- ▶ Spreading of topsoil to planting areas;
- ▶ Supply and installation of recycled brick mulch;
- ▶ Supply and installation of plants as specified; and
- ▶ 13 week plant establishment/maintenance period.

Setting Out

The Contractor shall be responsible for accurately setting out of the Landscape works on the site in accordance with the drawings and survey information supplied, and for checking works in progress. The Contractor shall advise the Superintendent once set out is completed and prior to proceeding with works. Should the Contractor discover any discrepancy in the drawings or on the site, they shall immediately notify the Superintendent before proceeding with the works.

Construction

Figured dimensions shall take precedence over scale measurements and large scale drawings over small scale. Unless otherwise specified the drawings and specification shall include everything reasonable for the proper and entire completion of the work, notwithstanding any omission in the Specification or drawings.

Discrepancies between the Specification and drawings shall be verified with the Superintendent before proceeding with the particular work and failure to do so will not be taken as a reason to claim for extra work.

Workmanship and Materials

All materials shall be new unless otherwise specified and all materials and workmanship are to be the best quality throughout and subject to the approval of

Superintendent. The Contractor shall cover all materials susceptible to damage by exposure to weather at a location to the approval of the Superintendent. The Contractor shall be held responsible for any loss or damage occurring in the course of loading, unloading, transit or storage, no matter what the cause.

Mandatory Inspection of Works

The Contractor is to notify the Superintendent at least three days in advance when each of the following phases are ready for inspection. Failure to advise and gain an inspection of the works at the nominated stage may invalidate the works and require reconstruction to the satisfaction of the Superintendent, wholly at the cost of the Contractor:

- ▶ Set out of all works;
- ▶ Delivery of all plants and trees;
- ▶ Tree hole preparation and installation of first semi-advanced trees with stakes and ties; and
- ▶ Prepared grass areas prior to turfing.

The Contractor is encouraged to combine inspection of one or more phases to facilitate effective management of the Contract period. The Contractor must give a minimum of three working days notice (or as otherwise agreed) of intended inspection dates to the Superintendent.

No works shall proceed or be covered up under this section until the Superintendent has inspected the works. The Superintendent will reserve the right to re-open works if the Contractor fails to give reasonable notice of inspection to the Superintendent.

Samples

The Contractor is to provide the Superintendent with the samples as described in the Specification. Samples are to be approved in writing by the Superintendent before bulk orders are placed or before installation of finishes proceed.

Current Edition

A standard application to the Works shall be the edition last published prior to the closing date for tenders unless otherwise specified.

Comply with the following standards unless otherwise specified:

AS1289 Methods of testing soils for engineering purposes

AS4419 Garden soils for domestic use

Site Copy: Keep on the site a copy of AS4419

Nominated Suppliers

Obtain material from specified supplier were nominated. Substitutions will only be considered if considered meeting or improving the technical, design, aesthetic or performance criteria of the specified product. The Principal reserves the right to reject any substitutions or alternatives offered. All conforming pricing to be based on the nominated supplier, options for alternatives must be clearly indicated along with their item and or cost saving.

1.1 Rock Scour Protection

1.1.1 Type

Rock shall be 100-150MM rocks embedded in place with mortar to a depth necessary for it to be placed on stable, compacted ground Rockwork is to sit proud of finished surface to reduce flow velocity of inlet water. Gaps to be no greater than 40mm and sufficiently raked so mortar is not visible.

1.1.2 Mortar

Mortar to be in accordance with AS A123.

Mix mortar with Bondcrete or approved equivalent, to stone prior to application.

Mortar is to be raked from around rocks so not visible with plants placed around margins in an irregular way to achieve a 'natural' dry creek bed appearance.

1.1.3 Sample

Requirement: Provide samples of rock in specified sizes and colours. Place rock as instructed by Superintendent.

When the stone have been approved, all stone shall in the opinion of the Superintendent matches the sample, or otherwise be rejected.

1.2 Concrete Materials - Plain and Reinforced

1.2.1 Concrete

- (a) The manufacture, supply, delivery of reinforced concrete is to be in accordance with Melbourne Water Specification 20.A.003 'Pre-mixed Concrete'; and to this Specification.
- (b) All concrete work must be in accordance with AS3600 and AS3610. The grade of concrete to be used must be as shown on the Drawings.
- (c) Quality of concrete elements shall be as follows:

Structural Element	Blinding	Other Concrete
Exposure classification	B1	B2
Strength grade	N20	S32
Density (kg/m ³)	-	2400
Max Agg size	-	20
Slump (mm)	-	As required for placement
Cement type	SR	SR
Max water/cement ratio	-	0.45
Max 56 day drying shrinkage		600 x 10 ⁻⁶

Structural Element	Blinding	Other Concrete
Additives	-	Superplasticizers, water reducers

Do not use calcium chloride.

- (d) The Contractor shall provide concrete with:
- (i) An average compressive strength at the completion of curing not less than 75% of the specified f'c;
 - (ii) A cement content not less than 320kg/m³;
 - (iii) A minimum supplementary cementitious materials content 10% of Portland Cement content;
 - (iv) Coarse aggregates comply with VicRoads major works specification;
 - (v) Drying shrinkage strain at 56 days of less than 600 x 10⁻⁶ determined in accordance with AS 1012.13;
 - (vi) Maximum water cement ratio including supplementary cementitious materials of 0.45;
 - (vii) A total reactive alkali content not greater than 3.0kg/m³ Na₂O (equivalent); and
 - (viii) Water reducers and super plasticisers as necessary to achieve suitable workability.
- (e) The Contractor shall submit details of the following for the Superintendent's approval within 14 days of the Date of Acceptance of Tender:
- (i) Proposed readymixed concrete supplier;
 - (ii) Concrete mix designs, aggregates including sources, additives and other constituents;
 - (iii) Target slump;
 - (iv) Characteristic strength (f'c);
 - (v) Drying shrinkage; and
 - (vi) Methods of concrete temperature control, mixing, placement, compaction finishing, protection and curing.
- (f) The Contractor shall provide substantiation of mix design targets, eg. Characteristic strength, drying shrinkage etc. such as production assessment records of previous mix designs.
- (g) The Contractor shall carry out project assessment of concrete in accordance with AS 1379 Appendix B7. Samples shall be taken at the project site. One sample shall be taken for each concrete design mix from each 50 cubic metres of concrete and not less than 5 samples in total shall be taken. Each sample shall comprise three cylinders and at least one shall be tested at 7 days and one at 28 days.

- (h) The contractor shall carry out drying shrinkage testing in accordance with AS1012.13 for each concrete design mix, and report the results to the Superintendent. Samples shall be taken at the project site. Each sample shall comprise three specimens.
- (i) The Contractor must arrange for all deliveries of concrete and give the Superintendent a minimum of 24 hours notice of the proposed supply arrangements each time concrete will be supplied.
- (j) The Contractor must obtain two copies of the Concrete Forwarding Advice Form from the delivery driver and forward them to the Superintendent.
- (k) The Contractor must:
 - (i) Obtain a delivery docket from the delivery driver;
 - (ii) Ensure that the concrete ordered has been delivered; and
 - (iii) Make the delivery docket available to the Superintendent upon request.
- (l) No water may be added after departure from the plant.
- (m) Concrete must be fully placed for use within 90 minutes from commencement of mixing at the plant. The Superintendent may further reduce this time if the ambient air temperature makes this necessary.
- (n) The grade of concrete delivered must be as ordered.
- (o) The Contractor must arrange for concrete testing by a NATA registered tester when directed by the Superintendent.

1.3 Reinforcement Materials

- (a) All reinforcing bars must be deformed steel, Grade 500N, in accordance with AS 4671, AS 1302 and AS 1304 unless otherwise shown on the Drawings.
- (b) Provide standard cogs and hooks in accordance with AS 3600.
- (c) Chairs, spacers, stools, hangers and ties may be used as supports for reinforcement. Supports must be made of concrete or plastics. Pieces of wood, aggregate, brick or the like must not be used. Ferrous metal must not be used in supports.
- (d) Maintain normal clear concrete cover to reinforcement including fitments by approved chairs, spacers, or ties as required to provide adequate support and to prevent displacement of reinforcement by workmen or equipment during fixing and subsequent concrete placement.
- (e) The supports must be able to withstand construction traffic and be sufficient in number and spacing to maintain the reinforcement in its correct position.
- (f) Particular care must be given to the support of light gauge reinforcement and or reinforcements where the concrete will be cast

against the ground. Care must be taken that no damage occurs to any waterproofing cover or vapour barrier and a plastic plate must be placed under each chair.

1.2 mm black annealed wire to be used to tie reinforcement. Reinforcement is represented diagrammatically and is not necessarily in true projection. Set reinforcement out at equal centres where spacing is not nominated.

Garden Bed Preparation

General

These works include the preparation of garden bed areas by cultivation, application of gypsum, and supply and installation of approved topsoil and mulch as detailed on the drawings.

Sub-soil Preparation

- ▶ Remove all weeds, roots, builder's rubbish and other debris.
- ▶ Contractor is to accurately locate, prior to commencement of cultivation, all in-ground services and ensure that these are not disturbed during cultivation.
- ▶ Cultivate to the required depths. Do not disturb services or tree roots; if necessary cultivate these areas by hand. During cultivation, thoroughly mix in any materials required to be incorporated into the subsoil. Cultivate manually within 300 mm of paths or structures. Remove stones exceeding 25 mm, clods of earth exceeding 50 mm, and any weeds, rubbish or other deleterious material brought to the surface during cultivation. Trim the surface to the required design levels after cultivation.

Cultivation Depths

- ▶ Cultivate the subsoil to the following typical depths:
- ▶ Grassed areas (seeded, turf, strip turf, stolonized): 75 mm.
- ▶ Planting areas: 200 mm.

Topsoil Definitions

Site topsoil: Is defined as soil excavated from the site which:

- ▶ Contains organic matter;
- ▶ Supports plant life;
- ▶ Is free from unwanted matter such as:
 - stones over 25 mm diameter;
 - clay lumps;
 - weeds and tree roots;
 - sticks and rubbish;
 - material toxic to plants;
 - is approved by the Superintendent for reuse on site as topsoil;

- ▶ Topsoil mixture: Topsoil and compost or other additives, thoroughly mixed before placing;
- ▶ Top dressing: Coarse or medium soil to AS 2223 clause 4, suitable for application to turf or grass areas;
- ▶ Soil textures: Use topsoils described by the following terms (or their equivalents) which comply generally with the texture classifications and typical uses of AS 2223 Table B2;
- ▶ Fine (loam, silt, clay loam);
- ▶ Medium (sandy loam); and
- ▶ Coarse (sandy soil).

Table 3 Topsoil particle size schedule (% passing by mass)

AS sieve aperture	Soil Textures		
	Fine	Medium	Coarse
2.36	100	100	100
1.18	90 - 100	95 - 100	95 - 100
0.60	75 - 100	75 - 100	70 - 90
0.30	57 - 90	55 - 85	30 - 46
0.15	45 - 70	38 - 55	10 - 22
0.075	35 - 55	25 - 35	5 - 10
0.002		2 - 15	2 - 8

Table 4 Topsoil Properties Schedule

Property	Type	Amount
Nutrient levels	Phosphorus (P) (mg/L)	0.7 - 4
	Potassium (K) (mg/L)	35 - 250
	Sulfur (S) (mg/L)	greater than 40
	Calcium (Ca) (mg/L)	50 - 350
	Nitrogen (N) (mg/L)	100 or less
	Manganese (Mn) (mg/L)	1 - 15
Additives	Gypsum (% by volume)	
	Compost	
Other properties	Organic matter (% by mass)	20
	Soil reaction	pH 6.7
	Soluble salts (% by mass)	0.1
	Moisture content (% by mass)	
	Toxicity index to AS 3743	

Source

Re-use existing site topsoil where the existing soil matches the specification requirements - provide additives such as compost where possible to modify existing soil to ensure compliance with the specification. Import topsoil from an approved off-site source where the site topsoil is not able to meet the specification requirements.

Additives

Topsoil raised to the standard of the appropriate type by the use of additives may be used subject to compliance with the relevant test criteria.

Topsoil Mixture

Where indicated use a topsoil mixture comprising two parts by volume of topsoil type medium, one part coarse soil type and one part of compost as specified, all thoroughly mixed.

Topsoil Stockpiles

Stockpile site topsoil approved for reuse, and imported topsoil where necessary, before placing. Establish stockpiles to sizes and in locations as directed. Provide adequate drainage and aeration. Do not burn off or remove plant growth which may occur during storage. Do not allow traffic on stockpiles. If a stockpile is to remain for more than four weeks, sow with temporary grass.

Topsoil Tests

Provide tests for site topsoil taking soil samples as recommended in AS 2223 Appendix A, and test to the methods in AS 2223 clause 3, or AS 3743, as applicable. Test imported topsoils and submit for approval at least five working days in advance of carting, test resultings stating sieve analysis, organic matter, salt content and PH.

Topsoil Locations

The following types of topsoil shall be placed as shown:

Grassed areas:	Medium
Planting areas:	Medium

Placing Topsoil

Contamination: Where diesel oil, cement or other phytotoxic material has been spilt on the subsoil or topsoil, excavate the contaminated soil, dispose of it off the site, and replace it with site soil or imported topsoil, as directed, to restore design levels.

Placing: Place the appropriate topsoil on the prepared subsoil to the depths shown on drawing. Spread and grade evenly making the necessary allowances so that the required finished levels and contours shall be achieved after light compaction; and grassed areas shall be finished flush with adjacent hard surfaces such as kerbs, paths and mowing strips, where so required.

Spreading: On steep batters the spreading may be by means of a chain drag, provided there is no danger of batter disturbance.

Compaction: Prevent areas of excess compaction from being caused by constructional plant. Compact lightly and uniformly in 150 mm layers and avoid differential subsidence. Produce a finished topsoil surface which is:

- ▶ At design levels; allowing for thickness of mulch where specified;
- ▶ Smooth and free from stones or lumps of soil;
- ▶ Graded to drain freely, without ponding, to catchment points; and
- ▶ Graded evenly into adjoining ground surfaces.

The Contractor is to supply a sample of the imported topsoil to the Superintendent for approval prior to purchasing bulk amount.

Where imported soil and site topsoil are used on the site, rough mixing of the two shall be carried out prior to final placement and grading.

Topsoil depths as referred to on the drawings and details refer to consolidated/compacted depths.

Mulch

GENERALLY: Use mulch that is free of deleterious and extraneous matter such as soil, weeds and sticks. Use organic mulches that are free of stones.

APPLICATION: Place mulch to required depth, clear of plant stems, and rake to an even surface flush with the surrounding finished levels.

GRAVEL MULCH: Nominal 15- 20 mm diameter gravel. Mulch to be free of any fines prior to application.

SAMPLE: The Contractor is to provide a sample of all mulch types, as specified in the SAMPLES SCHEDULE to the Superintendent prior to delivery to site.

Final Grading

- ▶ Garden beds shall be finished to give a gentle crowned appearance to ensure positive drainage or to conform with levels indicated on the drawing and shall finish flush with paved surfaces and kerbs. Finished levels of mulch shall be at least 50 mm below weepholes and/or damp proof courses and grade evenly towards grated pits and other drainage structures.
- ▶ Provide gentle transition zones at toes of batters and embankments. These should be gently rolling in appearance rather than having a sharp angled profile.
- ▶ Grade lawn areas evenly or to conform with levels indicated on the drawing.

Shrub & Groundcover Planting

General

The Contractor shall provide plant material from an approved nursery/supplier, fertilisers, stakes and labour to plant out the garden beds as set out and scheduled on the drawings. The size of the plant material covered in this section includes cells, tubestock, 100 mm, 140 mm and 200 mm dia. pots.

Plant Material

All plant material shall be obtained from an approved nursery/supplier where plants are exposed and have been hardened off in the open. Plants are to be healthy, well-grown specimens, free of pest, injury and diseases.

The Contractor shall confirm the availability of the stated species and shall contact the Superintendent should there be any difficulty in securing all the plants for the project. Prior to planting, the plants shall be cared for adequately to the satisfaction of the Superintendent. Superintendent is to inspect and approve trees prior to the Contractor taking delivery. Plants are to be delivered to site in such a manner as to prevent damage in transit.

Setting Out

The Contractor shall set out the plant material in accordance with the planting plan and obtain the on-site approval, of the Landscape Architect prior to planting.

Planting in large areas may be staged to ensure plants are not on site, in containers for longer than 24 hours.

Planting Conditions

Planting shall not be carried out if the soil is very wet and waterlogged, or during periods of adverse or extreme weather or windy conditions.

Where possible the Contractor shall install plants directly in place, immediately after delivery to site and store other materials in a secure location on site. If plant material cannot be installed immediately after delivery, the trees must be heeled in or covered with moist soil or hessian or as directed by the Superintendent.

It is the Contractors responsibility to adequately protect and maintain vegetative material against any adverse or damaging climatic conditions before and during the planting procedure.

Planting Procedure for Shrubs & Groundcovers

- ▶ Thoroughly soak the plant before planting.
- ▶ Over excavate each plant hole by at least twice the pot diameter and pot height.
- ▶ If the soil is very dry, fill with water and allow to drain completely.

Fertilise at the following rates:

Table 5 Fertilising strengths

	100-150 mm pot	200-300 mm pot
'Agriform'	2 tablets	3 tablets
or		
'Osmocote'(long life)	1.5 teaspoons	3 teaspoons
or		
'Megamp' K	1.5 teaspoons	3 teaspoons

- ▶ Place the fertiliser in the bottom of the hole and cover with soil to ensure there is no contact between the roots and fertiliser.
- ▶ Remove plant from pot and gently tease out roots taking care not to damage the root structure.
- ▶ Place the plant into the hole and backfill with approved garden soil free from weeds, stones, clods of sub soil and other extraneous matter.
- ▶ Plants are to be set plumb and level with the adjacent soil – ensure no soil is placed against the stem of the root crown.
- ▶ Backfill around plant with subsoil and topsoil.
- ▶ Gently apply pressure by hand for smaller tubestock planting to ensure contact with soil and roots is made.
- ▶ Form a watering 'bowl' around the plant.
- ▶ Thoroughly water in plants, with a minimum of 5 litres of water for each plant.

1.4 Planting in Sand

1.4.1 General

As per 5.6 "Shrub and Groundcover" planting, detail "Planting in Sand", plus the following:

1.4.2 Brush Matting

- ▶ Tea-tree and other coastal shrub branches are to be sourced from well-established reserves where excess branches are available.
- ▶ Branches are to be laid around dune plantings in a crisscross fashion to provide mulch.

1.5 Semi Advanced Tree Planting

1.5.1 Presentation Criteria

Contractor to ensure that all advanced tree stock must be free of pests and pathogens, free of scarring, damaged leaders, abrasions of the bark, disfigured knots or fresh cuts of limbs that have not been callused. Advanced trees to show a vigorous central leader, open branching framework and well formed open 'V' limb crotches. All limbs and trunks to be well formed, sturdy and well rooted. All dead wood and branches are to be removed.

The Contractor is to ensure that the trees are true to species and size specified on the drawings and in the schedule. The Superintendent is to inspect and approve all trees prior to the Contractor placing deposits with the Nursery. The Contractor must provide the Superintendent with three (3) days notice to inspect the trees. The Superintendent has the right to reject any trees and request that alternate trees be sourced.

1.5.2 Planting Hole

The Contractor is to observe proper precautions so as not to disturb or damage sub-surface conditions. Before doing any excavation the Contractor is to ascertain location of existing underground services. In the event such are uncovered, the Contractor is to promptly notify the Superintendent to enable the relocation of plant material.

The Contractor is to confirm location of trees prior to excavation of tree holes. The tree planting holes must be prepared in fine weather only, as wet weather will damage soil structure. The holes are to be free from glazing and clay sides. If glazing occurs, the Contractor is to loosen the affected soil with spade or other hand tool. Excess spoil must be disposed of from the site.

Contractor to dig the hole to sufficient size, approximately 2.5-3 times the width of the rootball with angled sides as per tree-planting detail. The Contractor is to ensure that the tree hole is only as deep as the rootball, so that the top of the root ball is flush with finished surface level. Contractor must ensure that the tree hole is not over excavated as this will cause saturation at the base.

If the Contractor encounters any soil or drainage conditions which may be detrimental to the growth of the plant material, the Contractor must notify the Superintendent and discontinue any tree hole excavation works until the Superintendent has inspected the soil or drainage condition.

1.5.3 Planting

All trees, unless otherwise specified on the drawings, are to be supplied by the Principal and delivered to the site by the nursery. No advanced trees are to be stored on site. The advanced trees are to be handled carefully to ensure that no damage to limbs, bark or rootball occurs. If damage does occur, the Contractor must replace the damaged tree at their own expense. The rootball must rest gently on the base of the hole and be supported during backfilling. The tree must be located centrally in the hole and in a vertical upright position. Plant is to be set plumb and level with adjacent soil, with no soil placed against the stem of the root crown.

1.5.4 Backfilling

Gently cover the roots with backfill material in layers of 150mm and compacted around the perimeter of the hole with the foot to ensure there are no air pockets and that all root ends bend downwards. Ensure roots are not pressed against the bottom of the hole by backfilling too quickly or using lumpy soil.

1.5.5 Watering

Contractor to thoroughly water trees with a minimum of 10 litres of clean water immediately after planting, and at such times during the contract period as required to maintain growth, free from water stress. Any signs of water stress (leaf drop or yellowing) should be reported to the Superintendent for further investigation.

1.5.6 Staking & Tying

Hardwood stakes, as per details to be installed immediately after planting. Stakes are to be driven 600mm into the ground or deep enough to ensure that the stake will remain stable and vertical. Tie tree to stakes using "figure eight" ties of canvas or Velcro or approved equivalent. Contractor to provide a sample of the tree tie to be used prior to ordering. The ties are to be no further than one-third the height of the tree, from the base of the trunk. Stakes and ties are to be inspected by the Superintendent on completion of these works. Stakes and ties to be matt black in colour. Refer to the drawings for details.

Maintenance

The Landscape Contractor is responsible for all losses of plant material due to nursery stock failure or improper horticultural care during the Defects Liability Period/Plant Establishment Period.

The Contractor must water and maintain the plants for a period of 13 weeks from the date of Practical Completion, unless otherwise specified on the schedule.

Weeding of garden beds and around trees is to be done at regular intervals of not less than a week or sooner as directed and just prior to the end of the maintenance period.

Landscape Establishment / Maintenance

General

The defects liability period shall cover all hard, soft and irrigation landscape works for a period of 52 weeks and synchronous with the plant establishment/maintenance period. The synchronous Landscape Establishment / Maintenance period will be for 52 weeks from the date of Practical Completion.

The Contractor is responsible for the satisfactory maintenance of all Landscape Works and parts thereof for the duration of the maintenance establishment period until the issuance of the Final Completion Certificate. Practical Completion of the planting works shall include but not be limited to replacement of plants which have failed or been damaged or stolen during the work under the Contract.

Maintenance shall mean the care and maintenance of the contract area by accepted horticultural practices, as well as rectifying any defects that may become apparent in the works under normal use.

The Landscape Contractor is advised to maintain all insurances during the Maintenance Period.

Period Commencement

The planting establishment period shall commence from the Date of Practical Completion of the Works or from the Date of Practical Completion of the planting works (hereby specified to be a separable part of the Works), whichever is the later

Practical Completion

Practical completion of the soft landscape works includes, but is not limited to, the complete germination of grassed areas, establishment of turfed areas, and replacement of plants which have failed, been damaged or been stolen during the works.

Grassed areas are required to be properly established with an even dense grass sward and to have been mown at least once before they are accepted as having reached a stage of Practical Completion.

The Landscape Contractor shall request an inspection of the works by the Superintendent for granting of Practical Completion. Minimum notice of seven days is to be given before the requested date for the Practical Completion inspection. The Landscape Architect shall inspect the works and if any defects or deficiencies are found they shall be rectified within 14 days.

Before requesting the inspection of the works, the Landscape Contractor shall ensure that all works of the Contract are complete.

The date of Practical Completion shall be the date of acceptance of the works as Practically Complete by the Superintendent.

Program

Furnish a proposed planting maintenance program, and amend it as required by the Superintendent. Comply with the amended program.

Log Book

Keep a log book recording when and what maintenance work has been done and what materials, including toxic materials, have been used. Make the log book available for inspection on request.

Existing Planting and Grass

Where existing planting or grass is within the landscape contract area, maintain it as for the corresponding classifications of new grassland or planting.

Recurrent Works

Throughout the planting establishment period, continue to carry out recurrent works of a maintenance nature including, but not limited to, watering, mowing, weeding, rubbish removal, fertilising, pest and disease control, reseeding, returfing, staking

and tying, replanting, cultivating, pruning, hedge clipping, aerating, renovating, top dressing, and keeping the site neat and tidy.

Grass Areas

Commence grass maintenance works at the completion of sowing, hydroseeding, turfing and the like, and continue to carry out grass maintenance throughout the contract and planting establishment period, maintaining healthy weed free growth and mowed as required to maintain the grass height between 50 – 100 mm.

Garden Beds

Continue to replace failed, damaged or stolen plants. The cost for replacement of plants which fail as a result of poor nursery stock or poor horticultural practices shall be borne by the Landscape Contractor. All garden beds to be kept free from weeds and rubbish at all times.

Mulched Surfaces

Maintain the surface in a clean and tidy condition, free from weeds and reinstate the mulch as necessary to maintain the specified depth.

Stakes and ties: Adjust, straighten or replace as required. Remove those not required at the end of the planting establishment period

Watering

Grassed and planted areas are to be watered to maintain a healthy condition and stress free growth. The Landscape Contractor shall be responsible for provision of appropriate temporary water supply if necessary to meet these requirements.

Where an irrigation system exists, the Landscape Contractor shall be responsible for the programming and management of the system and shall ensure that adequate watering is provided to the landscape whilst taking care to ensure that such areas are not over watered.

Final Completion

The Contractor shall ensure that all works of the Contract are complete immediately prior to the expiry date of the Contract time. The Contractor shall remove all debris from the site and any material he may have stored on or adjacent to the site and leave the area tidy to the satisfaction of the Superintendent.

Grass areas shall have a healthy and vigorous grass sward appropriate to the area and trees and shrubs shall show signs of healthy vigorous growth.

Sample Schedule

The following items are to be inspected by the Superintendent prior to site delivery. Where testing of the items are indicated within the specification, the Contractor is to supply the Superintendent with a copy of the report prior to the inspection.

- ▶ Bioretention Materials:
 - Mulch;
 - Filter Media;
 - Drainage Layer;

- ▶ Landscape Materials:
 - Mulch;
 - Rock Materials for Scour Protection;
 - Topsoil;
 - Compost; and
 - Trees.

6. CLEAN UP AND SITE RESTORATION

Surface Restoration

- ▶ The Contractor must make permanent repairs to the unpaved off-carriageway surfaces, including nature strips, make temporary repairs to the paved surfaces (or final repairs to the requirements of City of Port Phillip or VicRoads) and leave the surfaces in a safe condition, unless with the written permission of the property owner, council or other authority having care, management or control of any thoroughfare.
- ▶ The Contractor shall after the removal of all debris, surplus material, temporary works and construction plant restore the Site and all other areas utilised by it by filling, shaping, or levelling to a stable, free draining state.
- ▶ Unless a clearance is obtained from the relevant authority, the Contractor must maintain any temporary repairs to paved surfaces until a permanent repair is done.
- ▶ The Contractor must pay all costs associated with maintenance and temporary and permanent restoration.

Surface Works

The Contractor must grade the final surrounding surface to suit the level of all surface structures and fittings and ensure that there are no low lying areas and that the site is free draining.

Cleaning Up

- ▶ The Contractor must remove all surplus materials from the site and any other area used by the contractor for the Works.
- ▶ The contractor must leave the site and other areas clean and tidy as determined by the superintendent.

The materials and rubbish removed from the Site or other areas used by the contractor must be disposed of lawfully.