

WESTERN SYDNEY
UNIVERSITY



Infrastructure & Commercial
LANDSCAPE STANDARD

V23.0



Version History

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1 Purpose of this Document

The purpose of this document is to create a unified Landscape Standard that can be applied across all Western Sydney University campuses.

1.1 Background

The University has a number of sites across Western Sydney, as well as in some regional areas. The landscaping selected to complement each campus, contains a number of similar factors which need to be taken into account in designing new areas.

The development of this Landscape Standard will simplify the design process across any of the University's sites.

This document compliments the Landscape Management Plan (Hawkesbury), Landscape Master Plans and Guidelines and Campus Master Plans.

1.2 Applicability

This Standard is to be applied to the design of all new landscaping projects across the University. It should also be consulted in the repair or extension of existing landscape.

It is '**mandatory**' to read this document in conjunction with the University Architectural Design Standard, Bins and Outdoor Furniture Standard and the Landscape Management Plan (Hawkesbury).

1.3 Technical Overview

Items listed in this Standard shall comply with the most recent editions of all relevant Australian Standards and Codes. Where Australian Standards and Codes do not exist, the appropriate British and International Standards or Codes shall apply.

2 Specifications

2.1 Preparation of Site

2.1.1 Protection of Trees – Fencing

Trees which are adjacent to new building or excavation works associated with upgrading existing landscapes and require protection from machinery, damage to roots with the Tree Protection Zone (TPZ) shall have 'Protective Fencing' installed prior to the works being carried out. Fencing shall comprise 3mm galvanised chainmesh fencing set on star picket posts set not less than 1.8 metres high from ground level. Alternatively use commercially available mobile tubular steel frames with inset galvanised fencing mesh.

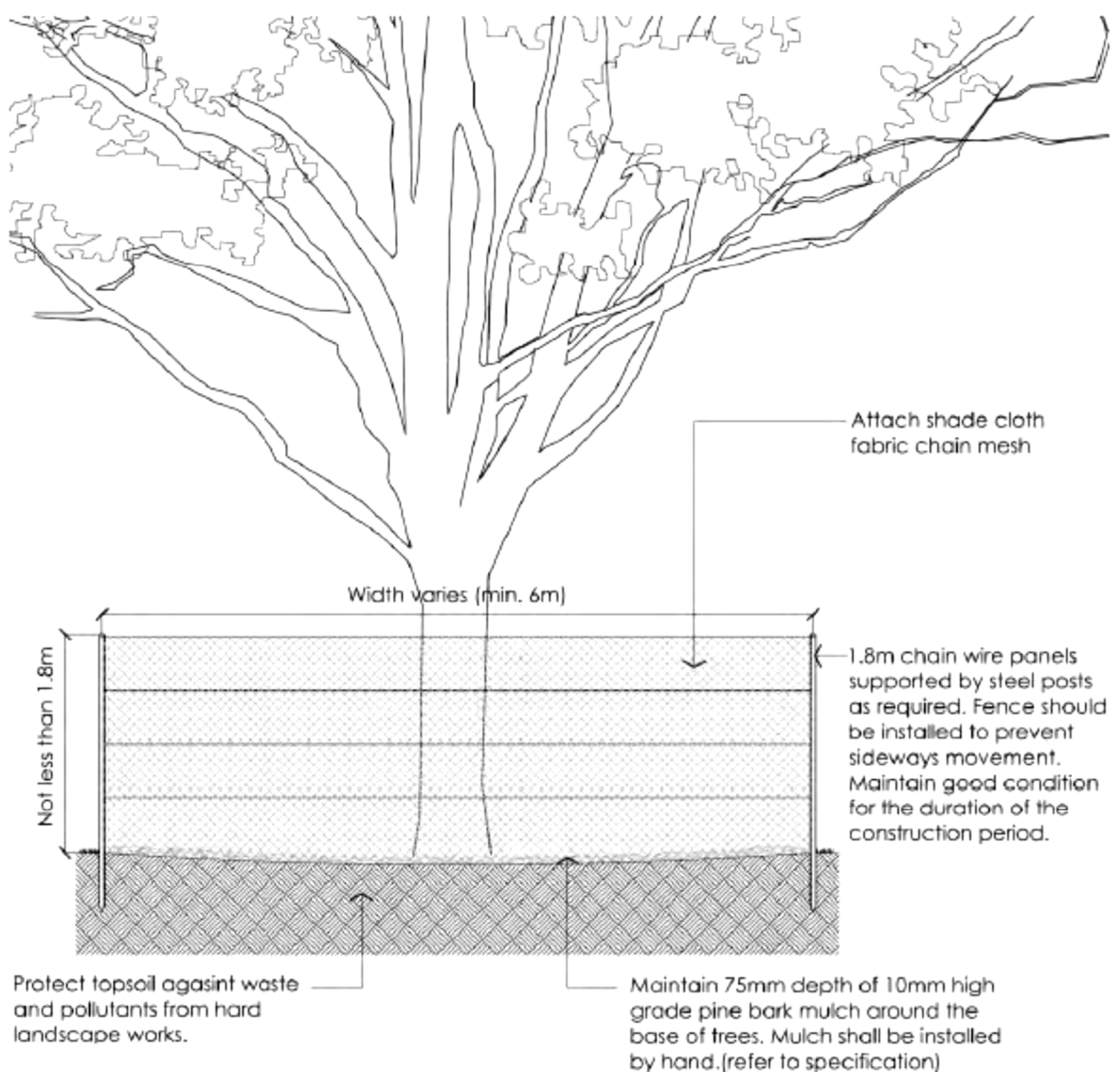


Figure 1. Tree Protection Fencing scale 1:50 @A4

2.1.2 Silt Arrestor Fencing

In accordance with environmental protection legislation all water ways, stormwater and drainage need to be protected from potential contamination from soil and sediment. Therefore, the use of erosion and sediment control measures are required on all landscaping works. These controls, in the form of fencing with silt arresting fabric, shall be placed around all existing and temporary pits and drainage grates.

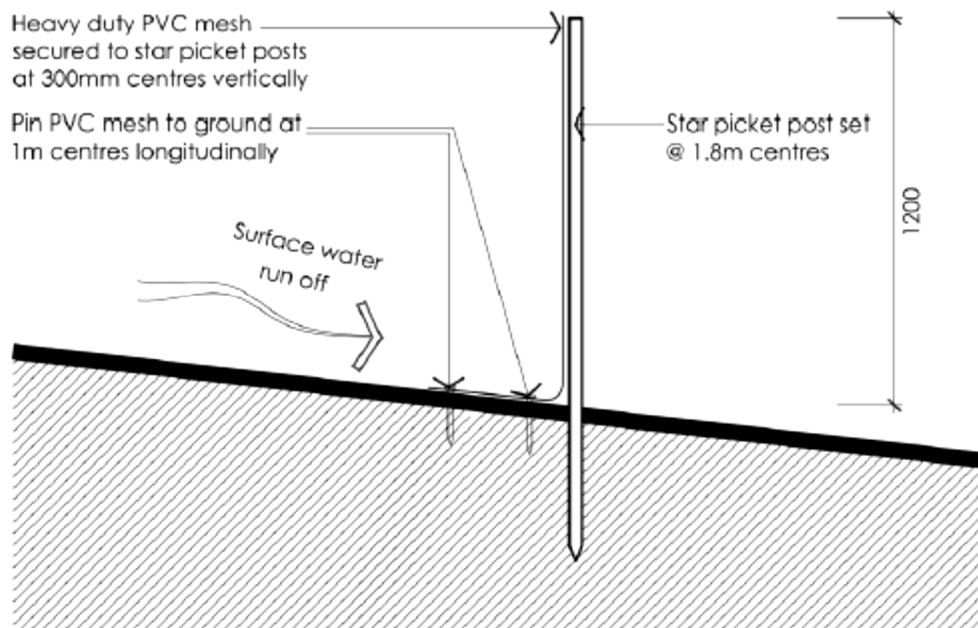


Figure 2. Silt Arresting Fencing Scale 1:20 @A4

2.2 Topsoil

Topsoil shall be imported to the site unless the topsoil type can be provided from material recovered from the site. Design Consultant shall specify placement, consolidation and depth.

Imported topsoil shall mean commercially available premium grade sandy loam. Coarse sand shall mean washed, sharp, coarse river sand 0.25 to 2.0mm diameter. Organic matter shall mean commercially available aged and composted green waste or manure. It shall comprise: -

- 30% imported topsoil
- 60% coarse sand
- 10% organic matter plus amendments as determined to achieve a pH and fertility suitable to promote vigorous growth and establishment.

Topsoil, sand and organic matter shall be clean from impurities.

Imported topsoil shall be delivered, backfilled and spread into garden beds on the same day. It should be protected from contamination from all other building works and waste material until all planting is completed.

Topsoil shall not be handled and spread in wet or saturated conditions.

Topsoil for Garden Beds

All topsoil shall be backfilled to a depth of less than 300mm to conform to *AS 4419: Soils for Landscaping and Garden Use*. It shall be smooth to even grades and shall be brought slightly above the levels of adjoining surfaces to allow settlement.



2.2.1 Topsoil for Grassed Areas

Topsoil shall be laid and spread lightly to a depth of not less than 100mm. Topsoil shall be lightly compacted to eliminate air pockets and uneven surfaces. Topsoil shall be graded approximately 20mm higher than adjoining concrete and paved surfaces to allow minor subsidence post turfing.

2.3 Turf

2.3.1 Turf Underlay

New turf in amenity and high profile areas will be established 150mm on lightly consolidated 'ANL®' turf underlay soil mix or similar. Areas to receive turf shall have the soil mix well consolidated with raking and light watering.

When turfing ovals and sporting fields the underlay used will be a recommended sports turf underlay, appropriate for high use areas.

2.3.2 Turf Laying

Turf species selection will be at the discretion of the University.

Turf shall be obtained from a specialist grower of cultivated turf, and shall be free of weeds and other foreign matter. All turf will be purchased and installed in rolls.

The turf shall be laid in staggered rows; butt jointed and shall be blended to form continuous even surfaces. Topsoil and sharp sand will be brushed into the joints between the turf sods. The turf areas shall be lightly tamped to provide an even finished surface.

Where turf areas adjoin paved surfaces or brick edging to planter beds, the turf sods shall be cut neatly with a sharp cutting tool to fit and abut the edges without overlap or gaps. Finished levels of turf laying should be approximately 20mm higher than the adjoining surface or edge to allow for underlay settlement.

All newly laid turf areas will be thoroughly watered immediately after laying. All turf areas are to be maintained in a moist but not over-wet condition until the turf sods have developed new root systems in the underlay topsoil.

The laid turf shall not be cut until the sods are well established. The first cut shall not be shorter than 50mm.

2.4 Tree Removal and Branch Pruning

Prior to any tree removal, the University will obtain a Tree Preservation Order (TPO) from the appropriate Local Government Authority.

Tree removal shall be undertaken by a fully qualified, and appropriately insured, arborist or tree removal company.

All tree removal and branch pruning is to be compliant with the issued TPO, *AS 4373: Pruning of Amenity Trees* and conducted in accordance with NSW Work Cover Authority Code of Practice, Tree Work 2007.

The University shall not be held responsible for any damage, liability and associated costs of any tree or tree limbs which may cause injury to persons or damage to property within the area during the tree felling, pruning and removal operations.

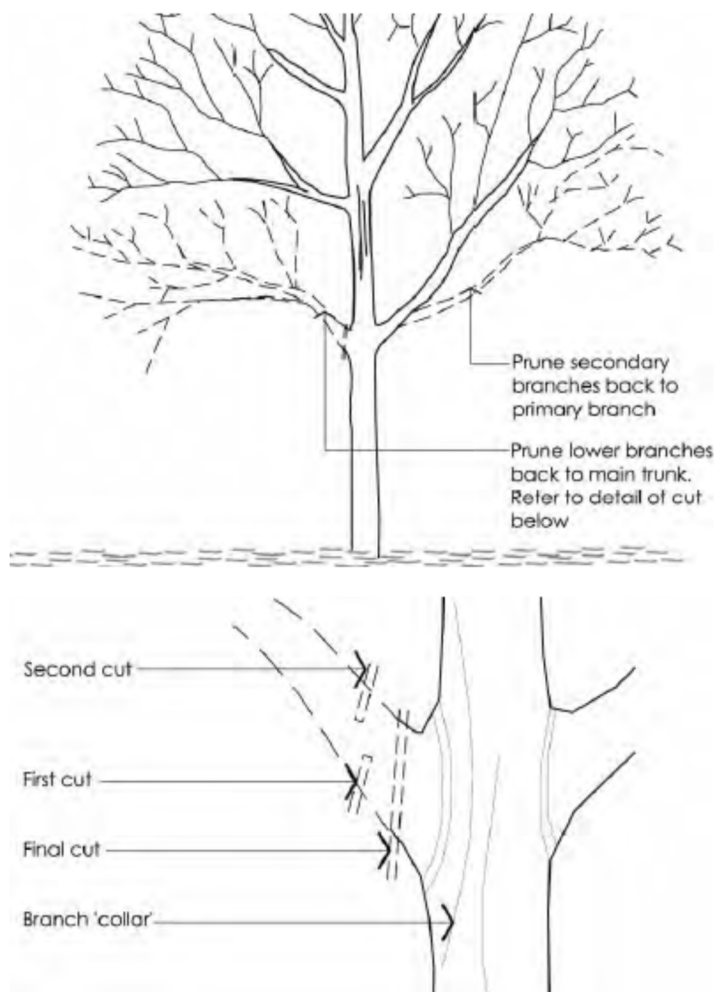


Figure 3. Tree Branch Pruning

2.5 Trees - New

The size and species of trees will be determined by the University or their agent.

It is expected that trees purchased to be installed within the University premises will:

- Have foliage size and colour consistent with that shown in healthy specimens of the species

- Be free from pest and disease
- Have extensive growth consistent with that shown in healthy specimens of the species
- Have been grown in similar climatic conditions to that of the subject site
- Be free from mechanical wounds and sunburnt areas
- Be in weed-free containers. The containers shall be sufficiently rigid to hold the root ball shape and to protect the root mass whilst in transit to the site

Trees will also be labelled. Labels shall be weather proof and fixed securely to the tree. The label shall not cause damage to the tree. Ensure that supplied trees are labelled with the following information: -

- Genus
- Species
- Cultivar, where applicable
- Supplier

Only utilise trees where:

- They are free of recent pruning cuts. If trees require pruning on site, they should be pruned according to Section 2.4 of this Standard
- The distance from the centre of the trunk to the extremity of the root ball does not vary by plus or minus 10%
- A calliper placed at any given point on the stem is greater than the calliper at any higher point on the stem
- The main stem of the tree and branches are self-supporting
- The central stem is not divided at any point lower than the nominated clear stem height
- The crown bulk does not vary by plus or minus 10% on opposite sides
- The branch/stem bark ridges are convex
- The depth of the root ball in the container is greater than or equal to the stem diameter at soil grade
- They are free from girdling, circling and kinked roots. The roots shall grow radially or downwards from the point of initiation. Any deviation from the radial or downward direction shall be less than 45°
- The root distribution is uniform throughout the growing media and root growth is typical for healthy specimens of the species. When the unsupported root balls are handled, at least 90% of the soil volume shall remain intact.

2.5.1 Planting of Trees

Ensure that specified trees are delivered to site on the same day as installation. Trees shall be handled in such a manner so as to avoid damage.

Protect trees throughout the installation works. Ensure that no planting is undertaken in unsuitable weather conditions such as extreme heat, cold, wind or rain. Planting operations shall be suspended should adverse weather prevail.

Refer to Figure 4 for guidelines on pit preparation.

The root ball should be prepared by removing the container completely without damaging the tree. Loosen the outer 5mm of the root ball with a clean and sharp tool edge to ensure that roots will grow laterally. Avoid excessive disturbance to the roots during trimming.

Trees are placed in the planting hole with their stems set vertically. The top of the root ball shall be set at equal height to the finished level of the surrounding soil. Once the tree is in place the planting holes are to be backfilled with imported topsoil in layers not greater than 200mm.

Each layer shall be lightly consolidated before the next layer is added to prevent excessive settlement after planting. Ensure all voids around and under root balls are filled and that no air pockets are retained.



Topsoil shall not be handled and spread in a wet or saturated condition. It shall be graded to smooth even grades, and shall be brought slightly above the levels of adjoining surfaces to allow for settlement.

2.5.2 Watering of Trees

The planted trees shall be thoroughly watered immediately after planting. Prevent the root balls from drying out during the planting phase. Ensure that watering is directed into the root ball. Provide temporary irrigation as required to maintain the trees in peak condition until hand over of the site.

2.5.3 Mulching

Trees surrounds shall be mulched to a depth of 75mm with 10mm high grade pine bark mulch conforming to *AS 4454: Composts, Soil Conditioners & Mulches*. The mulch shall be pulled back from the plants' stem by 50mm.

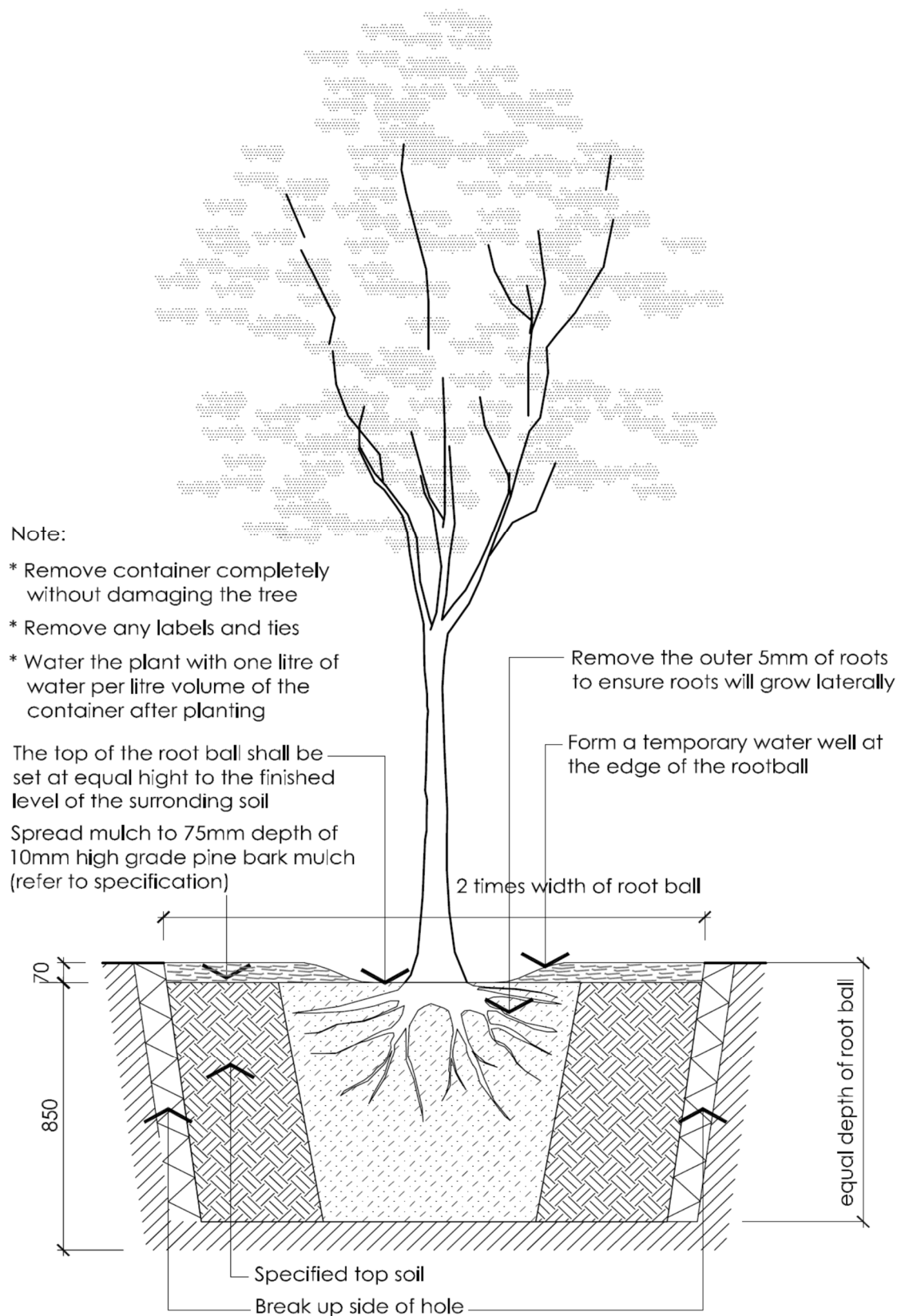


Figure 4. Tree Pit Preparation and Tree Planting scale 1:20 @A4

2.6 Plants and Garden Beds – New

The University has a preference for native, water tolerant planting. However, in choosing plants it should be noted that the University does not install Cumberland Plain species on campuses. In selecting plants and native ground covers, care should be made to select those that do not provide habitat for snakes. Fire resistant planting must be selected for areas prone to bushfire risk, such as Hawkesbury. As a guide to those species already in use across the campuses refer to tables 1-3.

It is expected that plants and shrubs purchased to be installed within the University premises will:

- Have foliage size and colour consistent with that shown in healthy specimens of the species
- Be free from pest and disease
- Have extensive growth consistent with that shown in healthy specimens of the species
- Have been grown in similar climatic conditions to that of the subject site
- Be free from mechanical wounds and sunburnt areas
- Be in weed-free containers. The containers shall be sufficiently rigid to hold the root ball shape and to protect the root mass whilst in transit to the site.

Plants will also be labelled. Labels shall be weather proof and fixed securely to the tree. The label shall not cause damage to the tree. Ensure that supplied trees are labelled with the following information: -

- Genus
- Species
- Cultivar, where applicable
- Supplier

Only utilise plants where:

- They are free of recent pruning cuts
- The crown bulk does not vary by plus or minus 10% on opposite sides
- The root crown is at the surface of the root ball
- The roots are free from girdling, circling and kinking. The roots shall grow radially or downwards from the point of initiation. Any deviation from the radial or downward direction shall be less than 45°
- The root distribution is uniform throughout the growing media and root growth is typical for healthy specimens of the species. When the unsupported root balls are handled, at least 90% of the soil volume should remain intact.

Woody plants should be self-supporting.

2.6.1 Bed Preparation

Ensure that all garden beds are thoroughly de-compacted and free from stones, concrete lumps, banding wire, sheet plastic, plastic membranes. Garden beds shall be free draining to the sub-soil base.

Table 1: Heritage Planting List

Code	Botanical Name	Common Name	Pot Size	Mature Height
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Trees

Can	<i>Cupaniopsis anacardiodes</i>	Tuckeroo	200 Litre	8m
Cau	<i>Cyathea australis</i>	Rough Tree Fern	500mm clear stem	4m
Emic	<i>Eucalyptus microcorys</i>	Tallowood	45 Litre	25m
Eret	<i>Elaeocarpus reticulatus</i>	Blueberry Ash	45 Litre	6m
Erob	<i>Eucalyptus robusta</i>	Swamp Mahahognay	45 Litre	30m
Fgr	<i>Fraxinus griffithii</i>	Evergreen Ash	100 Litre	7m
FoR	<i>Fraxinus oxycarpa "Raywoodii"</i>	Claret Ash	200 Litre	10-12m
Gax	<i>Gordonia axillaris</i>	Poached Egg Tree	100 Litre	5m-6m
Hap	<i>Harpullia pendula</i>	Tulipwood	100 Litre	12m
Jm	<i>Jacaranda mimosifolia</i>	Common Jacaranda	45 Litre	12m
Lcon	<i>Lophostemon conferta</i>	Brush Box	100 Litre	18m
LiIS	<i>Largestroemia indica</i>	Crepe Myrtle- single stem	200 Litre	7.0m
Lnob	<i>Laurus nobilis</i>	Bay Laurel	300mm	4-5m
Mgd	<i>Magnolia grandiflora</i>	Bull Bay Magnolia	200 Litre	8m-9m
PcB	<i>Pyrus calleryana "Bradford"</i>	Bradford Ornamental Pear Tree	200 Litre	12.0m
Pp	<i>Prunus persica</i>	Flowering Peach	25 Litre	9.0m
Pus	<i>Pyrus ussuriensis</i>	Manchurian Pear	200 Litre	9.0m
Wfl	<i>Waterhousia floribunda</i>	Weeping Lily Pilly	100 Litre	6.0m

Shrubs

AiBB	<i>Austromyrtus inophloia</i> 'Blushing Beauty'	Blushing Beauty Myrtle	200mm	3.0m
Bsem	<i>Buxus sempervirens (Hedge)</i>	English Box Hedge	200mm	1-2m
CGBF	<i>Callistemon Great Balls of Fire</i>	Great Balls of Fire Bottlebrush	200mm	1.3m
ChtS	<i>Choisya ternata 'Sundance'</i>	Mexican Mock Orange	200mm	1.5m-2m
Chy	<i>Camellia Hiryu</i>	Hiryu Camellia	200mm	1.8m
Csas	<i>Camellia sasanqua</i>	Common Camellia	200mm	2.5m
CsMM	<i>Camellia sasanqua</i> 'Marge Miller'	Marge Miller Camellia	200mm	3m
CsY	<i>Camellia sasanqua 'Yultide'</i>	Yultide Camellia	200mm	2.0m
DSG	<i>Duranta "Sheenas Gold" (Hedge)</i>	Golden Dew Drop (Hedge)	300mm	2.0m
GaF	<i>Gardenia augusta "Florida"</i>	Florida Gardenia	300mm	1m
Lang	<i>Lavendula angustifolia</i>	narrow-leaved/English Lavender	200mm	1.2m
Lor	<i>Loropetalum chinense</i>	Chinese Fan Flower	200mm	1.5m
Msl	<i>Magnolia soulangeana</i>	Saucer Magnolia	300mm	4.0m
PGP	<i>Pittosporum Green Pillar</i>	Green Pillar Pittosporum (Hedge)	200mm	2.5m
PRR	<i>Photinia Red Robin</i>	Red Robin Photinia (Hedge)	200mm	2.5m
SAS	<i>Syzygium Aussie Southern (Hedge)</i>	Lilly Pilly Hedge	300mm	4m
SBC	<i>Syzygium Bush Christmas</i>	Bush Christmas Lily Pilly	300mm	2m



TfSS	<i>Teucrium fruticans</i> 'Silver Sapphire'	Silver Germanda	200mm	1.0m
Tsp	<i>Telopea speciosissima</i>	Waratah	200mm	1.5m-2m
Vo	<i>Viburnum odoratissimum</i>	Sweet Viburnum (Hedge)	200mm	2.3m
VoPS	<i>Viburnum opulus</i> 'Pink Sensation'	Pink Guelder Rose cvs	200mm	3.0m
Wef	<i>Weigela florida</i>	Pink Weigela	200mm	2.5m

Ground Covers

Ak	<i>Azalea kurume</i>	Kurume Azaleas cvs	200mm	700mm
Ao	<i>Agapanthus orientalis</i>	Nile Lily	100mm	500mm
Cf	<i>Chrysanthemum frutescens</i>	Shasta Daisy/Margarite	150mm	500mm
Cgl	<i>Ceanothus gloriosus</i>	Point Reyes Creeper	150mm	300mm
Cmin	<i>Clivea miniata</i>	Kaffir Lily	150mm	500mm
Ctom	<i>Cerastium tomentosum</i>	Snow in Summer	150mm	300mm
CWA	<i>Callistemon "White Anzac"</i>	White Anzac Bottlebrush	150mm	200mm
DMG	<i>Duranta Mini Gold</i>	Dwarf Golden Dew Drop	200mm	550mm
DSS	<i>Dianella Silver Streak</i>	Silver Streak Flax Lily	150mm	450mm
Gxr	<i>Gardenia X radicans</i>	Prostrate Gardenia	200mm	400mm
LEG	<i>Liriope Evergreen Giant</i>	Giant Lily Turf	200mm	400mm
Lmv	<i>Liriope muscari variegata</i>	Variegated Lily Turf	150mm	200mm
PAQ	<i>Phormium "Apricot Queen"</i>	Apricot Queen NZ Flax	200mm	700mm
Phf	<i>Phlomis fruticosa</i>	Jerusalem Sage	200mm	500mm
RSM	<i>Rhaphiolepis 'Snow Maiden'</i>	Snow Maiden Indian Hawthorn	200mm	500mm
Rxh	<i>Rosa x Hybrida</i>	Hybrid Rose spp	200mm	500mm
Sca	<i>Scaevola aemula</i>	Common Fan-flower	200mm	180mm
TjT	<i>Trachelospermum jasminoides</i> Tricolor	Tricolor Star Jasmin	200mm	250mm

Accent Plants

SrD	<i>Strelitzia reginae</i> "Dwarf"	Dwarf Bird of Paradise	10 Litre	1.2m
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Turf

	<i>Cynodon dactylon</i> v Legend	Legend Couch Grass	Rolls	
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Table 2: Period Planting List

Code	Botanical Name	Common Name	Pot Size	Mature Height
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Trees

Can	<i>Cupaniopsis anacardiodes</i>	Tuckeroo	100 Litre	8m
Csal	<i>Corymbia saligna</i>	Sydney Blue Gum	45 Litre	25-30m
Emic	<i>Eucalyptus microcorys</i>	Tallowood	45 Litre	25m
Eret	<i>Elaeocarpus reticulatus</i>	Blueberry Ash	45 Litre	6m
Erob	<i>Eucalyptus robusta</i>	Swamp Mahahognay	45 Litre	30m
FoR	<i>Fraxinus oxycarpa "Raywoodii"</i>	Claret Ash	200 Litre	10-12m
Jch	<i>Jubea chilensis</i>	Chilean Wine Palm	2m clear stem	12m
Jm	<i>Jacaranda mimosifolia</i>	Jacaranda	100 Litre	12m
Lcon	<i>Lophostemon conferta</i>	Brush Box	200 Litre	20m
Lia	<i>Livistona australis</i>	Cabbage Tree Palm	3m clear stem	15m
LiIS	<i>Largestroemia indica "Indian Summer"</i>	Indian Summer Crepe Myrtle- single stem	200 Litre	7m
LIW	<i>Largestroemia indica "White"</i>	White Crepe Myrtle- single stem	200 Litre	7m
Mgd	<i>Magnolia grandiflora</i>	Bull Bay Magnolia	200 Litre	8m-9m
MLG	<i>Magnolia Little Gem</i>	Little Gem Magnolia	75 Litre	4-5m
Pcan	<i>Phoenix canariensis</i>	Phoenix Canary Palm	2m clear stem	12m
PcB	<i>Pyrus calleryana "Bradford"</i>	Bradford Ornamental Pear Tree	200 Litre	12m
PcC	<i>Pyrus calleryana "Chanticleer"</i>	Chanticleer Ornamental Pear	200 Litre	12m
Por	<i>Platanus orientalis</i>	Plane Tree	100 Litre	20m
Wfil	<i>Washingtonia filifera</i>	Cotton Palm/Fan Palm	3m clear stem	18m
Wfl	<i>Waterhousia floribunda</i>	Weeping Lily Pilly	100 Litre	6m

Shrubs

Ak	<i>Azalea kurume spp</i>	Kurume Azalea spp	200mm	1.5m
Bsem	<i>Buxus sempervirens (Hedge)</i>	English Box Hedge	200mm	1-2m
CGBF	<i>Callistemon Great Balls of Fire</i>	Great Balls of Fire Bottlebrush	200mm	1.3m
Chy	<i>Camellia Hiryu</i>	Hiryu Camellia	200mm	1.8m
Csas	<i>Camellia sasanqua</i>	Common Camellia	200mm	2.5m
DSG	<i>Duranta Sheenas Gold</i>	Golden Dew Drop (Hedge)	200mm	2.0m
DSG	<i>Duranta "Sheenas Gold" (Hedge)</i>	Golden Dew Drop (Hedge)	300mm	2.0m
GaF	<i>Gardenia augusta "Florida"</i>	Florida Gardenia	300mm	1m
GS	<i>Grevillea 'Superb'</i>	Superb Grevillea Cvs	200mm	1.5m
LfCP	<i>Leptospermum flavescens 'Cardwell Pink'</i>	Pink Tea Tree	200mm	1.5m
Lor	<i>Loropetalum chinense</i>	Chinese Fan Flower	200mm	1.5m
Pmy	<i>Philotheca myoporoides</i>	Long Leaved Wax Flower	200mm	1.0m
PRR	<i>Photinia Red Robin</i>	Red Robin Photinia (Hedge)	200mm	2.5m
SAS	<i>Syzygium Aussie Southern (Hedge)</i>	Lilly Pilly Hedge	300mm	4m



SBC	<i>Syzigium Bush Christmas</i>	Bush Christmas Lily Pilly	300mm	2m
Vo	<i>Viburnum odoratissimum</i>	Sweet Viburnum (Hedge)	200mm	2.3m

Ground Covers

CLJ	<i>Callistemon 'Little John'</i>	Little John Bottlebrush	150mm	500mm
Cmin	<i>Clivea miniata</i>	Kaffir Lily	150mm	500mm
CWA	<i>Callistemon "White Anzac"</i>	White Anzac Bottlebrush	150mm	200mm
DcCB	<i>Dianella 'Cassa Blue'</i>	Cassa Blue Flax Lily cvs	200mm	550mm
DMG	<i>Duranta Mini Gold</i>	Dwarf Golden Dew Drop	200mm	550mm
DSS	<i>Dianella Silver Streak</i>	Silver Streak Flax Lily	150mm	450mm
GBR	<i>Grevillea 'Bronze Rambler'</i>	Bronze Rambler Grevillea	200mm	150mm
Gxr	<i>Gardenia X radicans</i>	Prostrate Gardenia	200mm	400mm
HvRC	<i>Hardenbergia violacea "Carpet Royal"</i>	Carpet Royal Sarsparilla Vine	200mm	150mm
Lang	<i>Lavendula angustifolia</i>	narrow-leaved/English Lavender	200mm	600mm
LEG	<i>Liriope Evergreen Giant</i>	Giant Lily Turf	200mm	400mm
LLB	<i>Leptospermum Little Bun</i>	Little Bun Tea Bush	200mm	500mm
Lmv	<i>Liriope muscari variegata</i>	Variegated Lily Turf	150mm	200mm
PAQ	<i>Phormium "Apricot Queen"</i>	Apricot Queen NZ Flax	200mm	700mm
Rha	<i>Rhodanthe anthemoides</i>	Camomile Sunray	150mm	250mm
Rxh	<i>Rosa X hybrida</i>	Hybrid Rose var	150mm	500mm
Sca	<i>Scaevola aemula</i>	Common Fan-flower	200mm	180mm
TjT	<i>Trachelospermum jasminoides Tricolor</i>	Tricolor Star Jasmin	200mm	250mm

Accent Plants

De	<i>Doryanthes excelsa</i>	Gynea Lily	300mm	2m leaves
SrD	<i>Strelitzia reginae "Dwarf"</i>	Dwarf Bird of Paradise	10 Litre	1.2m

Turf

	<i>Cynodon dactylon v Legend</i>	Legend Couch Grass	Rolls	
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Table 3: Contemporary Plantings

Code	Botanical Name	Common Name	Pot Size	Mature Height
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Trees

Ahet	<i>Araucaria heterophylla</i>	Norfolk Island Pine	100 Litre	30m
Cmac	<i>Corymbia maculata</i>	Spotted Gum	25 Litre	20m
CSR	<i>Corymbia Summer Red</i>	Summer Red Eucalyptus spp	25Litre	5m-6m
Emic	<i>Eucalyptus microcorys</i>	Tallowood	45 Litre	25m
Eret	<i>Elaeocarpus reticulatus</i>	Blueberry Ash	45 Litre	6m
Erob	<i>Eucalyptus robusta</i>	Swamp Mahahognay	45 Litre	30m
Fgr	<i>Fraxinus griffithii</i>	Evergreen Ash	100 Litre	7m
FoR	<i>Fraxinus oxycarpa "Raywoodii"</i>	Claret Ash	200 Litre	10-12m
Hym	<i>Hymenosporum flavum</i>	Native Frangipani	45 litre	10m-12m
Jm	<i>Jacaranda mimosifolia</i>	Common Jacaranda	45 Litre	12m
Lia	<i>Livistona australis</i>	Cabbage Tree Palm	3m clear stem	15m
LiIS	<i>Largestroemia indica "Indian Summer"</i>	Indian Summer Crepe Myrtle- single stem	200 Litre	7.0m
LIW	<i>Largestroemia indica "White"</i>	White Crepe Myrtle- single stem	200 Litre	7.0m
Mgd	<i>Magnolia grandiflora</i>	Bull Bay Magnolia	200 Litre	8m-9m
MLG	<i>Magnolia Little Gem</i>	Little Gem Magnolia	75 Litre	4-5m
Pcan	<i>Phoenix canariensis</i>	Phoenix Canary Palm	2m clear stem	12.0m
PcB	<i>Pyrus calleryana "Bradford"</i>	Bradford Ornamental Pear Tree	200 Litre	12.0m
PcC	<i>Pyrus calleryana "Chanticleer"</i>	Chanticleer Ornamental Pear	200 Litre	12.0m
Pus	<i>Pyrus ussuriensis</i>	Manchurian Pear	200 Litre	9.0m
Wfil	<i>Washingtonia filifera</i>	Cotton Palm/Fan Palm	3 m clear stem	18.0m
Wfl	<i>Waterhousia floribunda</i>	Weeping Lily Pilly	100 Litre	6.0m

Shrubs

AiBB	<i>Austromyrtus inophloia</i> 'Blushing Beauty'	Blushing Beauty Myrtle	200mm	3.0m
BGC	<i>Bankisa</i> 'Giant Candles'	Giant Candles Banksia	300mm	3.0m +
Bsem	<i>Buxus sempervirens</i> (Hedge)	English Box Hedge	200mm	1-2m
Cg	<i>Ceratopetalum gummiferum</i>	NSW Christmas Bush	300mm	5.0m
CGBF	<i>Callistemon Great Balls of Fire</i>	Great Balls of Fire Bottlebrush	200mm	1.3m
Chy	<i>Camellia Hiryu</i>	Hiryu Camellia	200mm	1.8m
CKPS	<i>Callistemon 'Kings Park Special'</i>	Kings Park Specia Bottlebrush	200mm	3.0m
Csas	<i>Camellia sasanqua</i>	Common Camellia	200mm	2.5m
DSG	<i>Duranta Sheenas Gold</i>	Golden Dew Drop (Hedge)	200mm	2.0m
DSG	<i>Duranta "Sheenas Gold" (Hedge)</i>	Golden Dew Drop (Hedge)	300mm	2.0m
GaF	<i>Gardenia augusta "Florida"</i>	Florida Gardenia	300mm	1m
GS	<i>Grevillea 'Superb'</i>	Superb Grevillea Cvs	200mm	1.5m
LfCP	<i>Leptospermum flavescens</i> 'Cardwell Pink'	Pink Tea Tree	200mm	1.5m
Lor	<i>Loropetalum chinense</i>	Chinese Fan Flower	200mm	1.5m



PGP	<i>Pittosporum Green Pillar</i>	Green Pillar Pittosporum (Hedge)	200mm	2.5m
PRR	<i>Photinia Red Robin</i>	Red Robin Photinia (Hedge)	200mm	2.5m
SAS	<i>Syzygium Aussie Southern (Hedge)</i>	Lilly Pilly Hedge	300mm	4m
SBC	<i>Syzygium Bush Christmas</i>	Bush Christmas Lily Pilly	300mm	2m
Tsp	<i>Telopea speciosissima</i>	Waratah	200mm	1.5m-2m
Vo	<i>Viburnum odoratissimum</i>	Sweet Viburnum (Hedge)	200mm	2.3m

Ground Covers

CLJ	<i>Callistemon 'Little John'</i>	Little John Bottlebrush	150mm	500mm
ABGS	<i>Anigozanthos Bush Gem Series</i>	KangarooPaw cvs	150mm	500mm
Cmin	<i>Clivea miniata</i>	Kaffir Lily	150mm	500mm
CWA	<i>Callistemon "White Anzac"</i>	White Anzac Bottlebrush	150mm	200mm
DcCB	<i>Dianella 'Cassa Blue'</i>	Cassa Blue Flax Lily cvs	200mm	550mm
DMG	<i>Duranta Mini Gold</i>	Dwarf Golden Dew Drop	200mm	550mm
DSS	<i>Dianella Silver Streak</i>	Silver Streak Flax Lily	150mm	450mm
GBR	<i>Grevillea 'Bronze Rambler'</i>	Bronze Rambler Grevillea	200mm	150mm
Gxr	<i>Gardenia X radicans</i>	Prostrate Gardenia	200mm	400mm
HvRC	<i>Hardenbergia violacea "Carpet Royal"</i>	Carpet Royal Sarsparilla Vine	200mm	150mm
Lang	<i>Lavendula angustifolia</i>	narrow-leaved/English Lavender	200mm	600mm
LEG	<i>Liriope Evergreen Giant</i>	Giant Lily Turf	200mm	400mm
LLB	<i>Leptospermum Little Bun</i>	Little Bun Tea Bush	200mm	500mm
LIT	<i>Lomandra longifolia 'Tanika'</i>	Tanika Matt Rush	100mm	500mm
Lmv	<i>Liriope muscari variegata</i>	Variegated Lily Turf	150mm	200mm
PAQ	<i>Phormium "Apricot Queen"</i>	Apricot Queen NZ Flax	200mm	700mm
Rha	<i>Rhodanthe anthemoides</i>	Camomile Sunray	150mm	250mm
RSM	<i>Rhaphiolepis 'Snow Maiden'</i>	Snow Maiden Indian Hawthorn	200mm	500mm
Sca	<i>Scaevola aemula</i>	Common Fan-flower	200mm	180mm
TjT	<i>Trachelospermum jasminoides Tricolor</i>	Tricolor Star Jasmin	200mm	250mm
WJG	<i>Westringia 'Jervis Gem'</i>	Dwarf Coast Rosemary cvs	200mm	600mm

Accent Plants

De	<i>Doryanthes excelsa</i>	Gynea Lily	300mm	2m leaves
SrD	<i>Strelitzia reginae "Dwarf"</i>	Dwarf Bird of Paradise	10 Litre	1.2m

Turf

	<i>Cynodon dactylon v Legend</i>	Legend Couch Grass	Rolls	
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All excavated waste and deleterious material greater than 40mm diameter shall be removed from site. Grade and level all garden beds to smooth even grades prior to installation of topsoil.

2.6.2 Planting

Ensure that plants are delivered to site on the same day as installation. Plants shall be handled in such a manner so as to avoid damage. Protect plants throughout the installation works. Ensure that no planting is undertaken in unsuitable weather conditions such as extreme heat, cold, wind or rain. Planting operations shall be suspended should adverse weather prevail.

The root ball should be prepared by removing the container completely without damaging the plant. Loosen the outer 5mm of the root ball with a clean and sharp tool edge to ensure that outer roots will grow laterally. Avoid excessive disturbance to the roots during trimming.

Ensure the plants are placed in the planting hole with their stems set vertically. The top of the root ball shall be set at equal height to the finished level of the surrounding soil. Once the plants are in place the planting holes are to be backfilled with imported topsoil in layers not greater than 300mm. Each layer shall be lightly consolidated before the next layer is added to prevent excessive settlement after planting. Ensure all voids around and under root balls are filled and that no air pockets are trapped around the root ball.

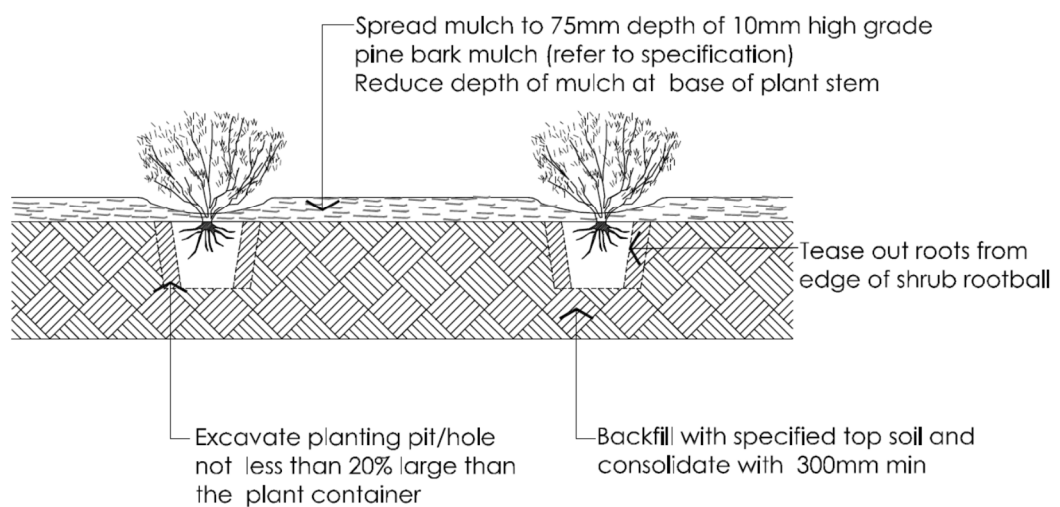


Figure 5. Typical Planting Details

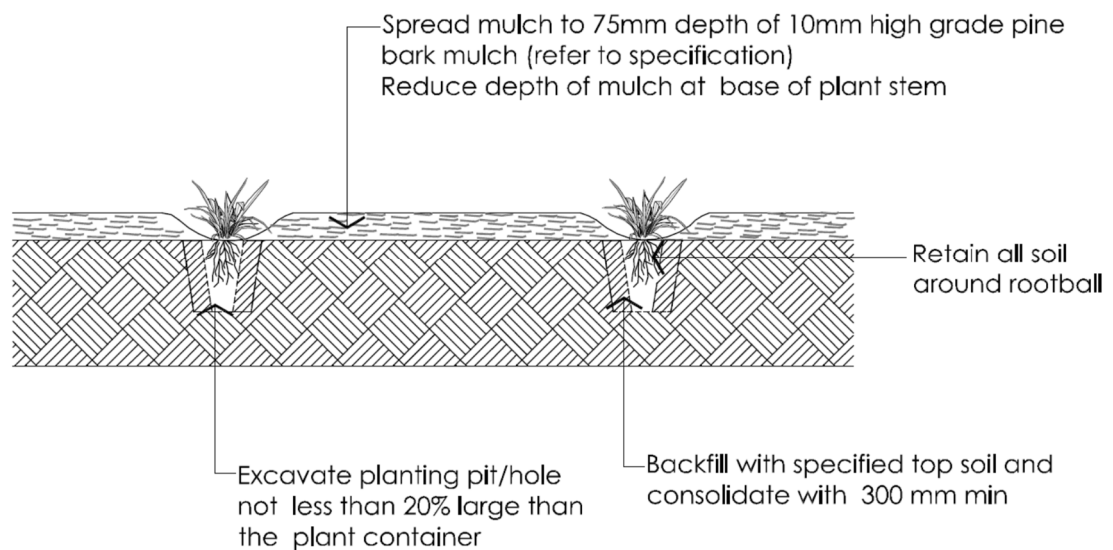


Figure 6. Typical Ground Cover Planting Details

2.6.3 Watering of Plants

All plants shall be thoroughly watered immediately after planting. Prevent the root balls from drying out during the planting phase. Ensure that watering is directed into the root ball. Provide temporary irrigation as required to maintain the plants in peak condition until hand over of the site.

2.6.4 Mulching

Mulch the garden beds to a depth of 75mm with 10mm high grade pine bark mulch conforming to *AS 4454: Composts, Soil Conditioners & Mulches*. The mulch shall be pulled back from the plants' stem by 50mm.

2.7 Edging

Note: Under no circumstances are timber edges to be installed on any campus.

2.7.1 Spade Edging

Spade edging around garden beds shall be formed mechanically and comply with Figure 7 Typical Spade Edging. Ensure that the spade edge is cut sufficiently sharp and deep to prevent grass stolons from growing into the planter beds. Sufficient depth of cut shall be allowed for 70mm of mulch within the garden bed surface without being level or higher than the surface height of the turf.

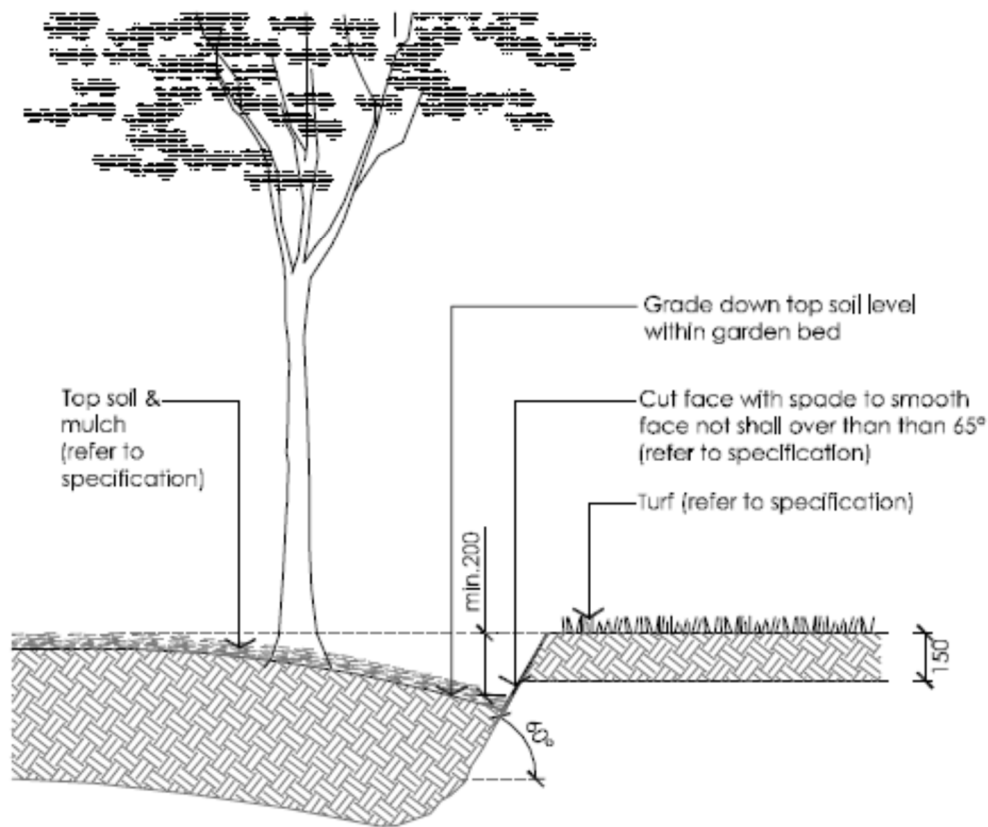


Figure 7. Typical Spade Edging

2.7.2 Brick Edging

Brick edging is utilised between garden beds and turfed areas. The colour and make of brick will be determined by the University. However, the brick used will complement the paving and other brickworks around the campus.

Bricks shall be set with the 110mm longitudinally to the garden bed edge with the flat face upwards. Refer to Figure 8 Typical Brick Edging Detail.

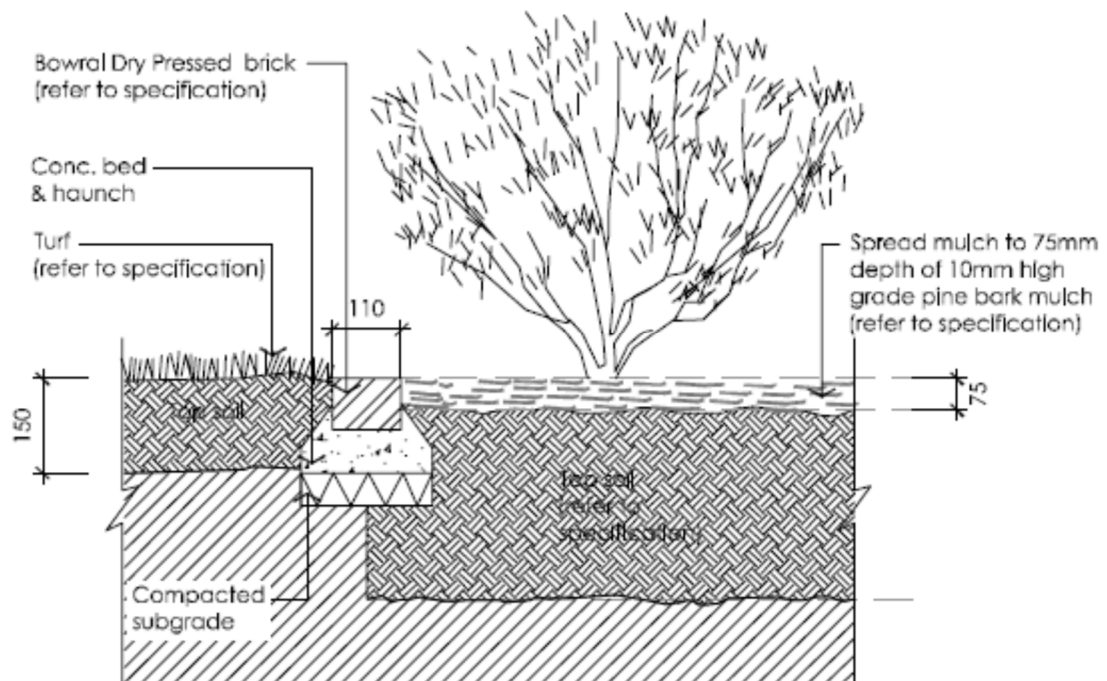


Figure 8. Typical Brick Edging Detail

2.7.3 Gravel Edging

As a buffer between buildings and garden beds gravel or pebble edging is installed. The selection of stone will be at the discretion of the University. However, as a guide 20mm Cowra/Aussie Gold or Nepean River Stones have been utilised on the Hawkesbury campus.

The edging will be 200mm wide, with a 25X100mm treated timber separating board. The depth of the edging pit will vary according to building ventilation. All edging pits will be lined with Bidium 46 Geofabric. Refer to Figure 9 Gravel Edging to Buildings.

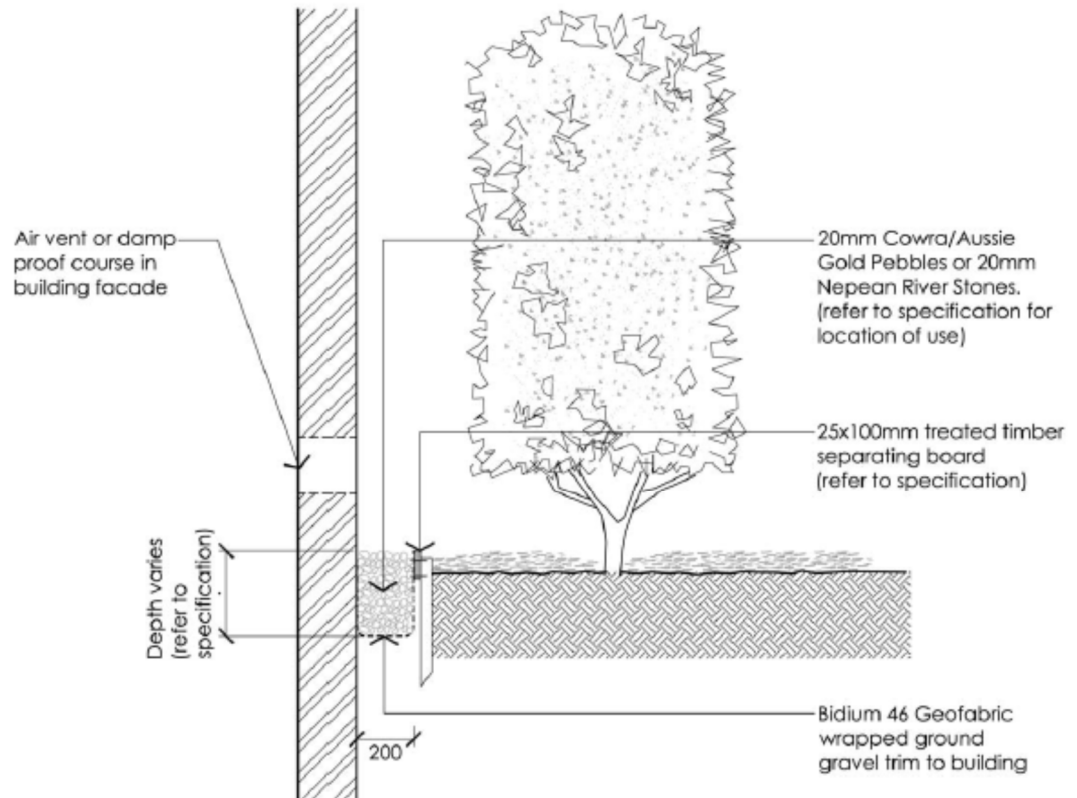


Figure 9. Gravel Edging to Buildings



2.8 Paving

All paths, steps and ramps shall comply with AS 1428.1-Design for Access and Mobility and BCA codes for step risers and treads.

The selection of paving type, colour and make will be undertaken by the University. As a rule, paving will complement a campus' existing paving. For example, Hawkesbury campus has a number of areas paved with PGH Pompeii Range (230x114x50).

Generally, the University has a preference for all paving units to be laid on crusher dust on minimum 75mm thick reinforced concrete base-course complete with control joints to suit type of traffic, isolation and expansion joints where abutting rigid structures to permit movement of the slab.

Paving shall be set with true specified angles, expansion joints as applicable, mortar joints and coursing shall be consistent throughout, verticals shall be plumb, and all work shall be clean of mortar staining, and faced work shall be true, flush and cleanly finished.

2.8.1 Preparation

Excavate to not less than 270mm deeper than the finished surface levels and grade alignment of footpaths, steps and paved surfaces. All underground service conduits and service lines for water irrigation, electricity, Telco, fibre optic cables, drainage lines, catch pits, detention tanks shall be installed and connected prior to the pavement excavation, preparation, set-out, road-base backfilling and concrete base installation.

Soft and yielding and other unsuitable material within or under new paved areas shall be removed and the sub-grade shall be thoroughly compacted and finished to a firm, even surface of uniform bearing value. The foundation shall be brought to true grade and cross sections as shown on the drawings by filling as necessary with nominated bedding materials.

2.8.2 Setting Out

Survey pegs, level pegs and bench marks for the paving works shall not be covered, removed or otherwise disturbed prior to being approved by the University Project Manager who shall inspect and confirm the set out. The work shall be constructed in accordance with the specifications and plans unless stated in writing.

2.8.3 Grades

All paving works shall have smooth even grades, and shall be free of any 'trip points' and inconsistencies of elevation.

All finished levels shall be laid to fall to given RL's as provided by the University to allow for unimpeded surface water run-off to the nearest drainage pits grates. Concrete surfaces shall be laid to fall away from building facades.

2.8.4 Formwork for Edging and Containment

Timber formwork shall be installed around all perimeters to the proposed paved surfaces, proposed tree and shrub planters, openings for underground service inspection pits, drainage pits and supply of electrical power points for lighting and signage.

Formwork shall be built true to line and braced in a substantial manner. It shall be mortar tight and the interior surfaces shall be adequately oiled, greased or soaped to ensure non-adhesion to the concrete. Formwork is to be provided at vertical faces.

The material used for exposed surfaces shall be sized softwood timber dressed on one side and both edges. Undressed timber may be used for backing to unexposed surfaces. All timber shall be free of rough surfaces and splinters. Timber ends shall have clean sawn or planed finishes. All joints shall be flush or right angled finishes. Screw and nail heads shall be countersunk.

Install timber shuttering boards at edges of the concrete base courses works as applicable to define and separate new paving works from existing paving, footpaths, steps, ramps, building facades and soft landscape areas. Timber shutters shall not be less than the depth of the aggregate concrete surface and road base course combined.

2.8.5 Steel Reinforcement Mesh

Supply and lay on 65mm stirrup/chairs and lay SL82 Reinforcement Mesh (or similar approved in writing) for all new paved surfaces over the road base prior to pouring the concrete paving base. All reinforcement sheets shall be square tied together at not less than 500mm centres.

2.8.6 Concrete Base Course

Soft, yielding and other unsuitable material shall be removed from site and the sub-grade shall be thoroughly compacted and finished to a firm, even surface of uniform bearing value. The concrete base shall be laid to smooth even grades with consistent mortar mix and continuous concrete pours. The foundation shall be brought true to grade by filling and excavating as necessary.

A concrete base course 100mm thick shall be poured and reinforced. Concrete shall comprise normal class concrete with a minimum strength of 20 MPa at 28 days in accordance with AS 3600 Concrete Structures, Steel & Tendons. Finished concrete surface shall be timber float levelled to smooth even grades with falls to accommodate final RL's, and openings for all underground services, planter beds, drainage outlets, grates and connection points.

2.8.7 Expansion Joints

Expansion joints will be fitted within the concrete base at not less than 4.5 metre centres. Expansion joints shall be formed from 10mm thick compressible bituminous filler board (mastic jointing material) existing and new work as applicable.

2.8.8 Bedding Material

A bedding material of crusher dust, 75mm thick, levelled and compacted with vibrating pad to smooth evenly. Bedding shall be trimmed to appropriate levels and moistened as necessary.

2.8.9 Concrete Placement

Use wet mix concrete and lay concrete into the specified paved areas to finished RL's and falls as specified. Pour and lay base course continuously so that no discrepancies of texture and viscosity shall occur. Backfill to formwork and shuttering by continuous tamping, vibrating, spading or slicing and into reinforcement mesh and flush to the form work and shuttering. Work the coarsest aggregate back from exposed vertical and horizontal surfaces.

2.8.10 Installation

Pavers shall be set on 10mm-15mm cement bedding, over 100mm cast concrete base. Paving shall be set in herringbone pattern set perpendicular to the principal gridlines with header course set perpendicular to the edge of the paved surfaces. Refer Figure 10 Installation of Clay Pavers & Set Out Pattern.

A header courses shall be provided around the external edges of paved areas including garden planters, steps and kerb lines.

Contractor shall also lift the existing edge headers and "key" into the existing herringbone pattern where the proposed path joins the existing newly formed footpaths. All paving joins from new paving to existing paving shall be visually "seamless".

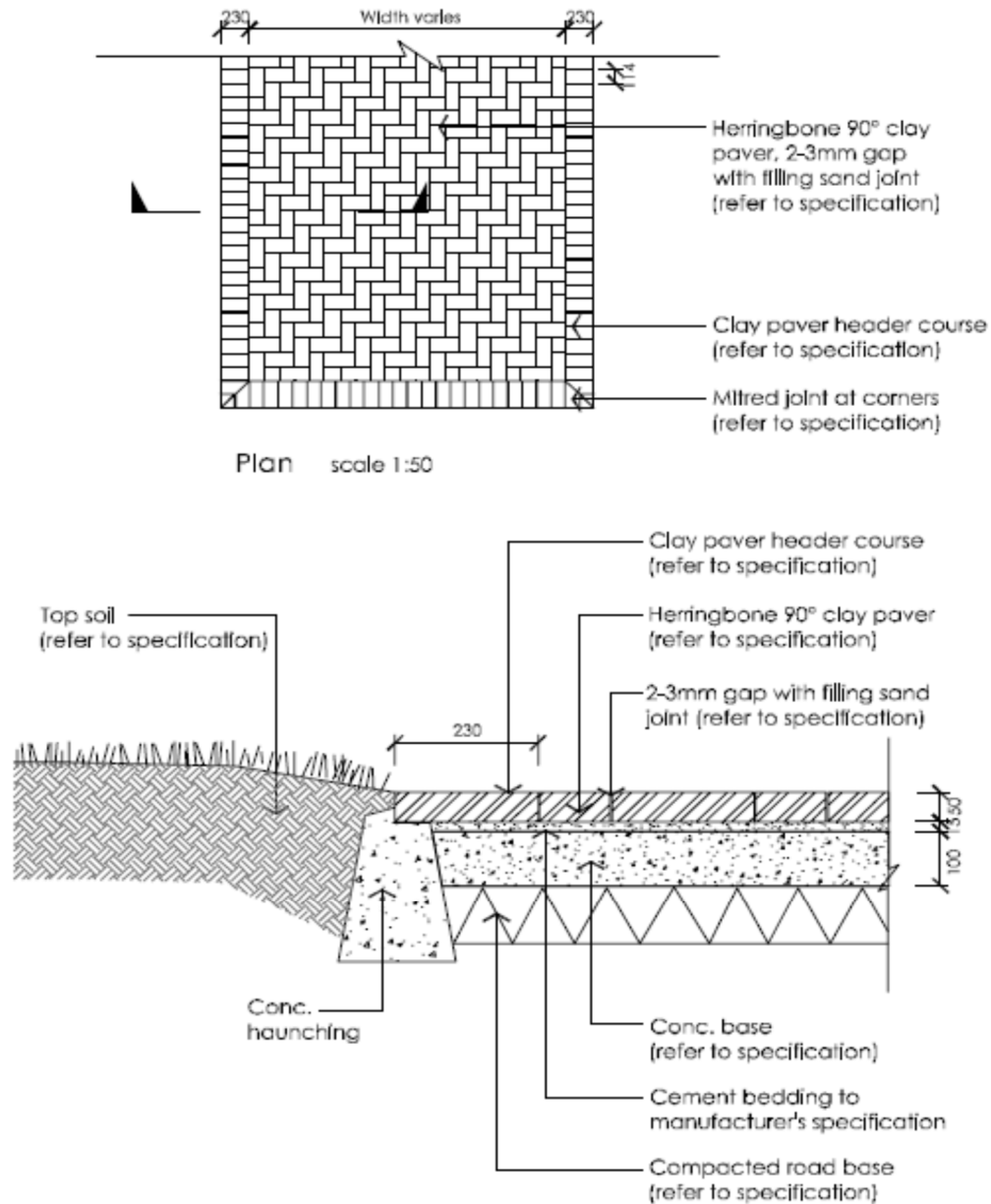


Figure 10. Installation of Clay Pavers & Set Out Pattern.

2.8.11 Cut Edges

All cut edges to pavers shall be mechanically sawn with clean flush faces and shall be flush to adjoining surfaces with no vertical trip points. Pavers shall be butt jointed with no gaps along the joint lines.

2.8.12 Mitred Corners

Internal and external returns of pavers shall be cut with a mitred corner.

All cut edges to precast pavers shall be mechanically sawn with clean flush faces and shall be flush to adjoining surfaces with no trip points. Pavers shall be butt jointed with no gaps along the joints.



2.8.13 Camber of Footpath

Paved footpaths shall be laid with a slight cross fall (laterally), not steeper than 1 in 80 to shed heavy surface rainwater to one side. No dips and depressions within the footpath surfaces will be accepted.

2.8.14 Haunching

Edges of header courses to turf and garden beds shall be provided with concrete haunching. Top level of all haunching shall be set lower, by not less than 30mm, than the finished level of the adjoining topsoil for planter beds or turf areas.

2.9 In-Situ Concrete Paving

2.9.1 Preparation

Excavate to not less than 250mm deeper than the finished surface levels and grades for proposed footpaths, steps, patios and terraces within the campus.

Refer to Figure 11 Installation of In-situ Concrete Paving.

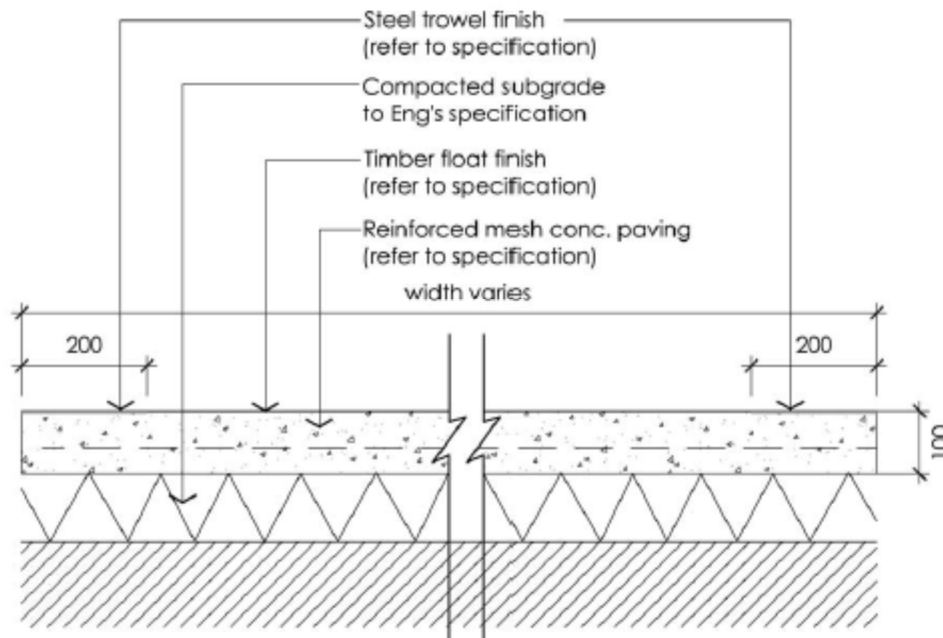
2.9.2 Setting Out

Survey pegs, level pegs and bench marks for the paving works shall not be covered, removed or otherwise disturbed prior to being approved by the Project Manager who shall inspect and confirm the set out. The work shall be constructed in accordance with the confirmed specifications unless stated otherwise in writing.

2.9.3 Base Course

Soft and yielding and other unsuitable material shall be removed and the sub-grade shall be thoroughly compacted and finished to a firm, even surface of uniform bearing value. The foundation shall be brought to true grades and cross sections as shown on the drawings by filling and excavating as necessary.

Bedding material shall be a minimum 100mm thick road base (compacted to minimum 98% maximum dry density). Bedding shall comprise 50mm thick sand compacted to a density index of not less than 65%, which shall be trimmed to the appropriate levels and moistened as necessary.



Refer to Figure 11 Installation of In-situ Concrete Paving.

2.10 Retaining Walls

Prominently located walls shall be designed to discourage skate-boarding abuse, and may include interference stainless steel strips embedded into the walls. The choice of brick, concrete masonry or concrete block retaining walls will be at the discretion of the University.

Waterproof membranes to the rear of retaining walls shall be installed in a manner which provides durable and permanent waterproofing to external wall faces and will not compromise any drainage lines or statutory underground services.

Structure of walls should comply with Figures 12-13

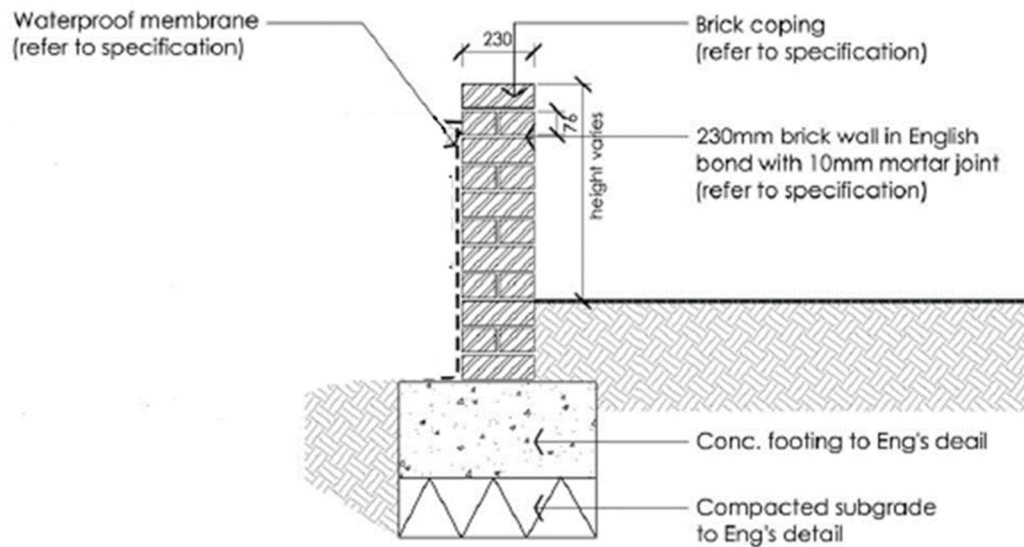


Figure 12. Brick Retaining Wall

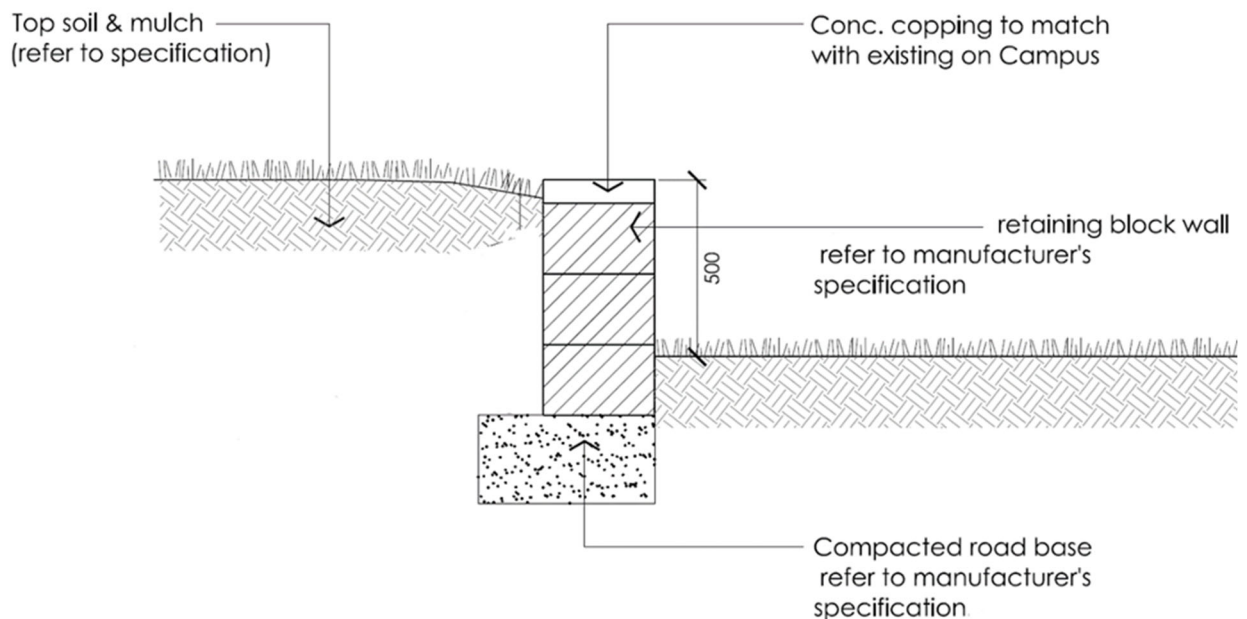


Figure 13. Concrete Block retaining wall

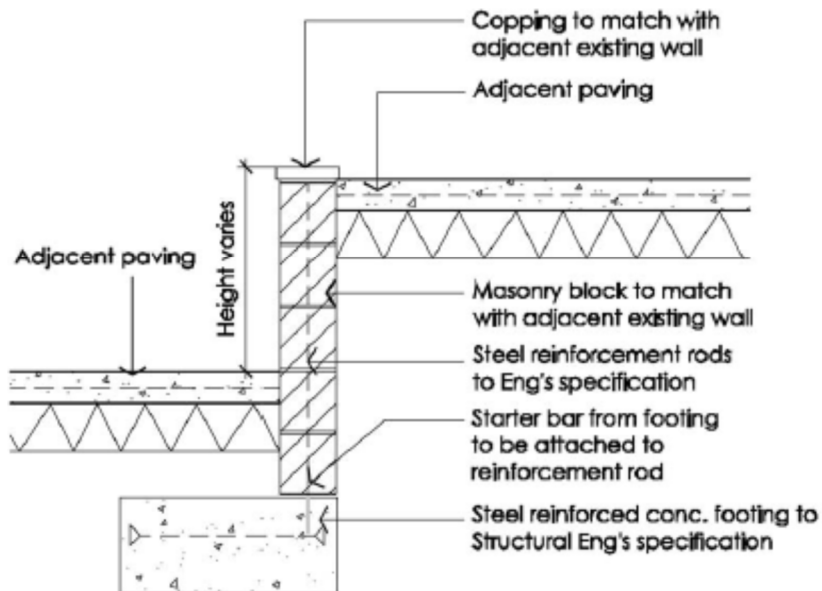


Figure 14. Concrete Masonry Retaining Wall

2.11 Irrigation

2.11.1 Potable Water

Cross Reference: Western Sydney University Irrigation System – Potable Water Standard Specification.

2.11.2 Recycled Water, Rainwater and Stormwater

Cross Reference: Western Sydney University Irrigation System – Non-potable Standard Specifications.

2.12 Drainage

Cross Reference: Western Sydney University Hydraulic Services Standard Section 2.12 Stormwater Drainage - Sub Soil Drainage.