

# D

**Walls, Edges & Fences**



## Design Strategy

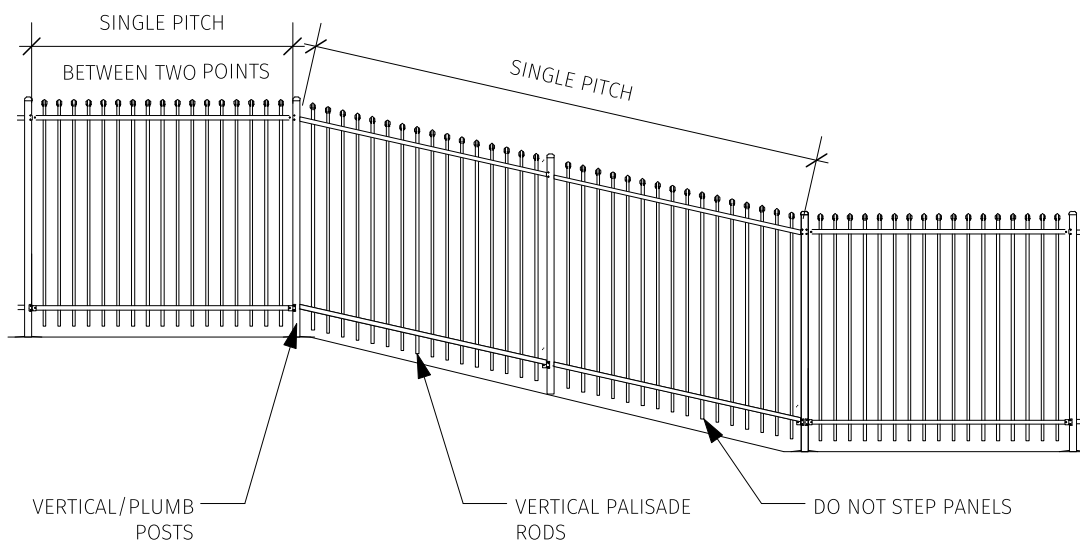
The design approach to walls, edges and fences aims to use materials that complement the existing campus and create a contemporary bushland campus.

## Design Considerations

- Ensure compliance with all relevant Australian Standards and building codes
- Due to the varying topography on Campus, structures may be required at a number of locations to integrate level areas into the existing landform.

## Principles

- Use simple, robust and sustainable materials
- Minimise the number of designs, materials and finishes to create consistency and reduce visual clutter
- Materials are robust and low maintenance
- Where possible, walls are to be seating height to provide additional functionality
- Where possible height of walls should be less than 1m high or terraced to avoid the need for balustrades and avoid large wall surfaces
- Do not use concrete blocks in public areas or applied finishes (render, paint, tiles etc.)
- Install lowest fence/wall possible to minimise visual impact



## Typical Fence Elevation (Palisade, Fence or Chainlink)

# Masonry Walling

D-01

## Specifications

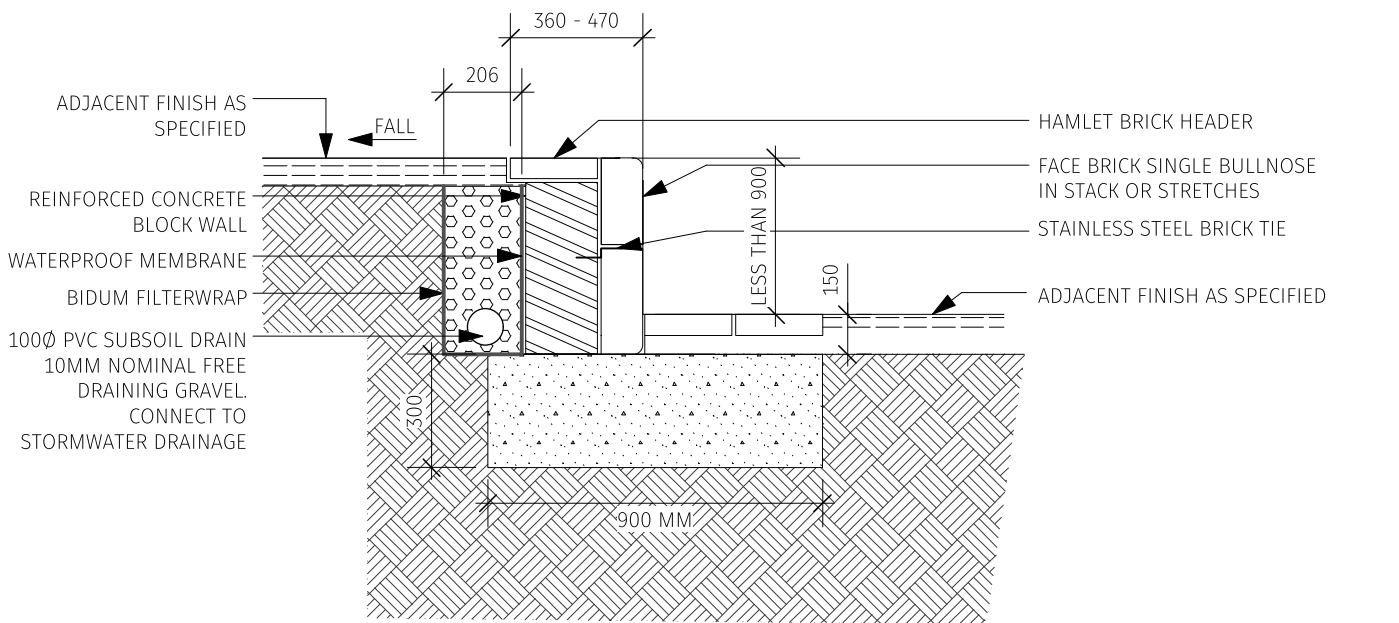
|                     |                                                                                                                                                 |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Masonry Wall                                                                                                                                    |
| <b>Standards</b>    | <ul style="list-style-type: none"><li>AS 4678 Earth-retaining structures</li></ul>                                                              |
| <b>Materials</b>    | Hamlet Paver<br>Size: 230 L x 110 W x 75 H mm                                                                                                   |
| <b>Finish</b>       | <ul style="list-style-type: none"><li>Clay dry pressed brick</li><li>Mortar: Yellow brick sand with grey cement</li><li>Ironed joints</li></ul> |
| <b>Installation</b> | <ul style="list-style-type: none"><li>Face brick single bullnose in stack bond</li><li>Footing design to engineer's detail</li></ul>            |
| <b>Maintenance</b>  | <ul style="list-style-type: none"><li>Pressure clean where necessary</li><li>Graffiti removal where necessary</li></ul>                         |
| <b>Supplier</b>     | Austral Masonry or approved equivalent<br>australbricks.com.au                                                                                  |
| <b>Comments</b>     | <ul style="list-style-type: none"><li>Retaining walls to be as low as possible</li></ul>                                                        |
| <b>Location</b>     | -                                                                                                                                               |



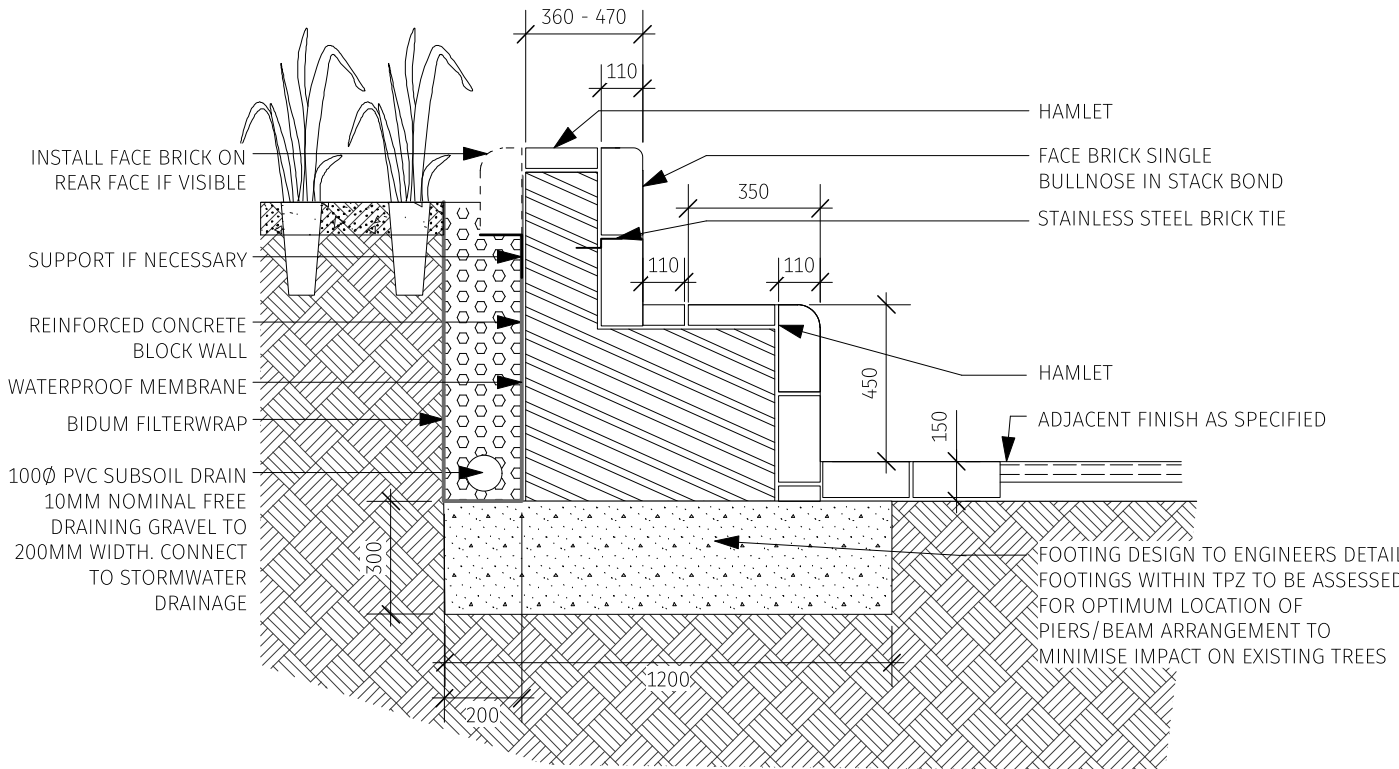
Masonry Walling

D-01

Technical Details



1. Masonry Retaining Wall  
Section 1:20



1. Seated Masonry Retaining Wall  
Section 1:20

# Concrete Walling

D-02

## Specifications

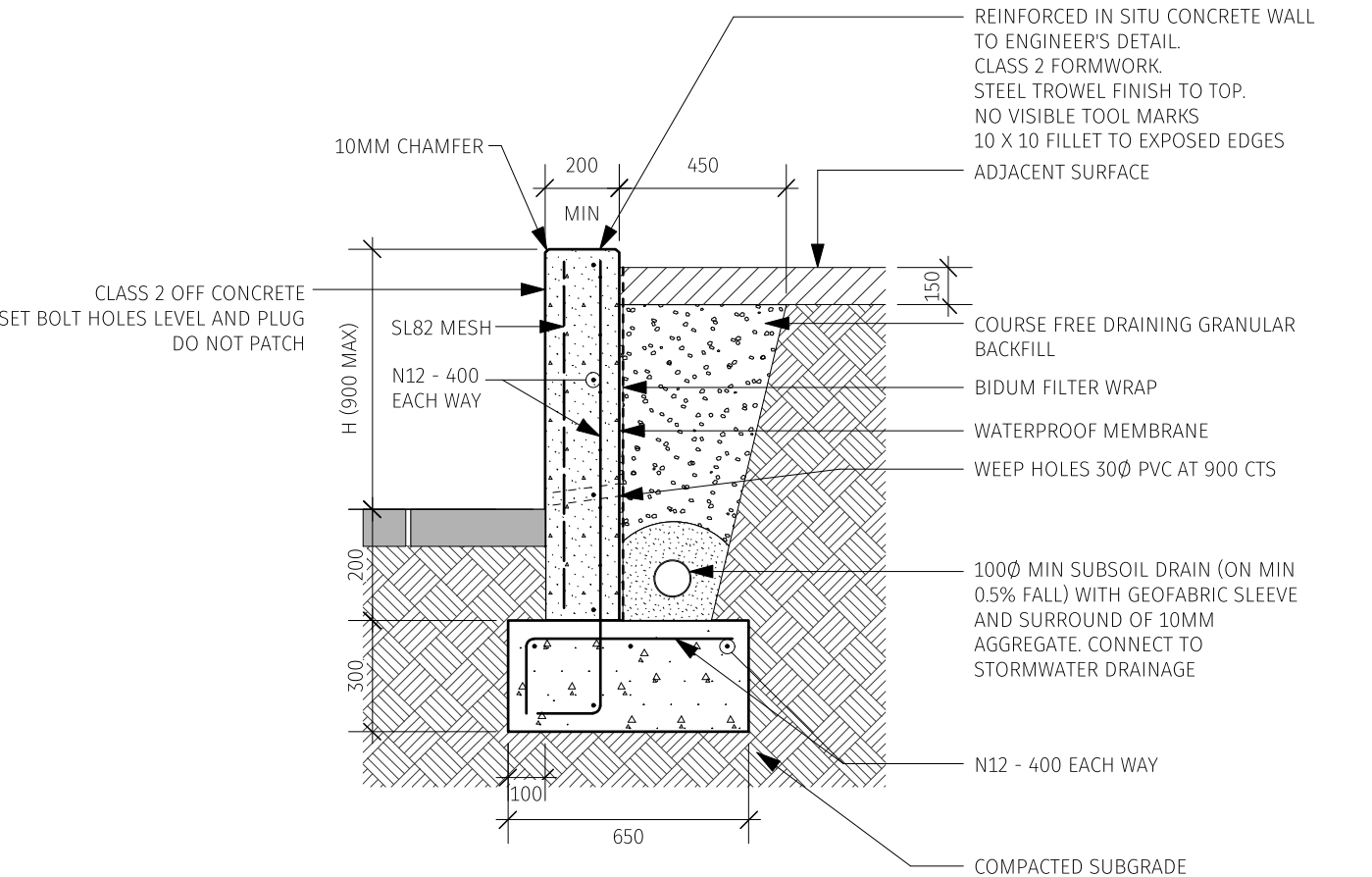
|                     |                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | In situ concrete wall                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS 4678 Earth-retaining structures</li> <li>AS 1379 Specification and supply of concrete</li> </ul>                                                                                                                                                                                                                                                             |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>In situ concrete</li> <li>Class 2 formwork - do not patch</li> </ul>                                                                                                                                                                                                                                                                                            |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Steel trowel finish to top</li> <li>10x10mm chamfer fillet to external corners</li> <li>No oxides or colour to be used</li> </ul>                                                                                                                                                                                                                               |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Tie bolt and formwork panel layout to be plumb/vertical and even CTS</li> <li>Fillers for tie bolt holes to be recessed grouted</li> <li>Joints to be maximum 10mm, caulking, to be recessed with thin chamfer</li> <li>Caulk to match concrete colour</li> </ul>                                                                                               |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Pressure clean where necessary</li> </ul>                                                                                                                                                                                                                                                                                                                       |
| <b>Supplier</b>     | Sealer: Facael Oleo HD, Crommelin Barricade NSW or approved equivalent                                                                                                                                                                                                                                                                                                                                 |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Used as retaining wall or as free standing feature wall</li> <li>Site specific engineering design to all locations</li> <li>To suit design approach and precinct character</li> <li>Waterborne matt penetrative (non-sacrificial) anti-graffiti sealer. Must not unduly change the surface appearance. Sample must be provided prior to application.</li> </ul> |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                      |



Concrete Walling

D-02

Technical Details



Concrete Retaining Wall  
1. Section 1:20

- NOTES
- Structural engineering design required

# Stone Walling

D-03

## Specifications

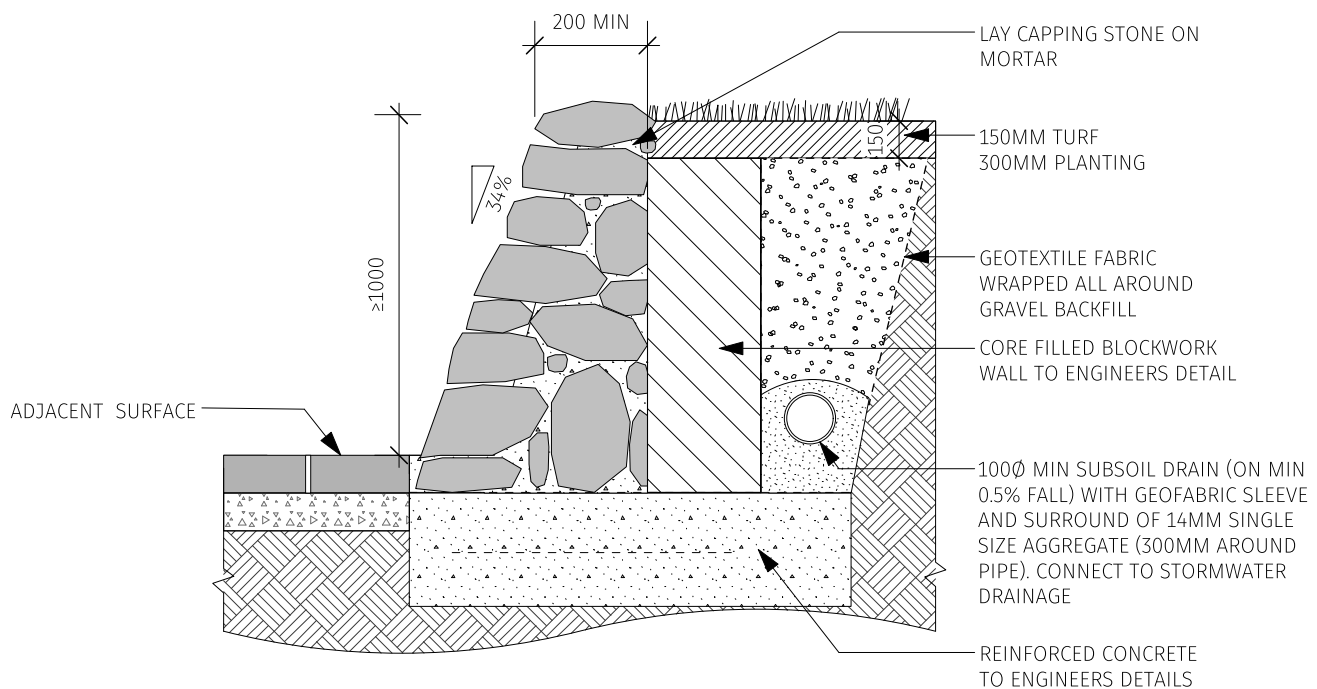
|                     |                                                                                                                                                                                |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Dry stone or dry stone faced retaining wall                                                                                                                                    |
| <b>Standards</b>    | <ul style="list-style-type: none"><li>AS 4678 Earth-retaining structures</li></ul>                                                                                             |
| <b>Materials</b>    | <ul style="list-style-type: none"><li>Bluestone or Karuah redstone quarry stone for retaining walls, facing and capping to match existing wall's size range of stone</li></ul> |
| <b>Finish</b>       | <ul style="list-style-type: none"><li>No grout/mortar seen from face</li><li>Single pitch (height and face)</li><li>Lay in stretcher bond</li></ul>                            |
| <b>Installation</b> | <ul style="list-style-type: none"><li>Core filled block with stone facing (if over 500 high and not near buildings)</li><li>Face slope</li></ul>                               |
| <b>Maintenance</b>  | <ul style="list-style-type: none"><li>Visually inspect annually and repair as necessary</li><li>Remove weeds from between stones</li></ul>                                     |
| <b>Supplier</b>     | -                                                                                                                                                                              |
| <b>Comments</b>     | <ul style="list-style-type: none"><li>Dry stone wall</li><li>New stone for stone walls to match existing</li></ul>                                                             |
| <b>Location</b>     | -                                                                                                                                                                              |



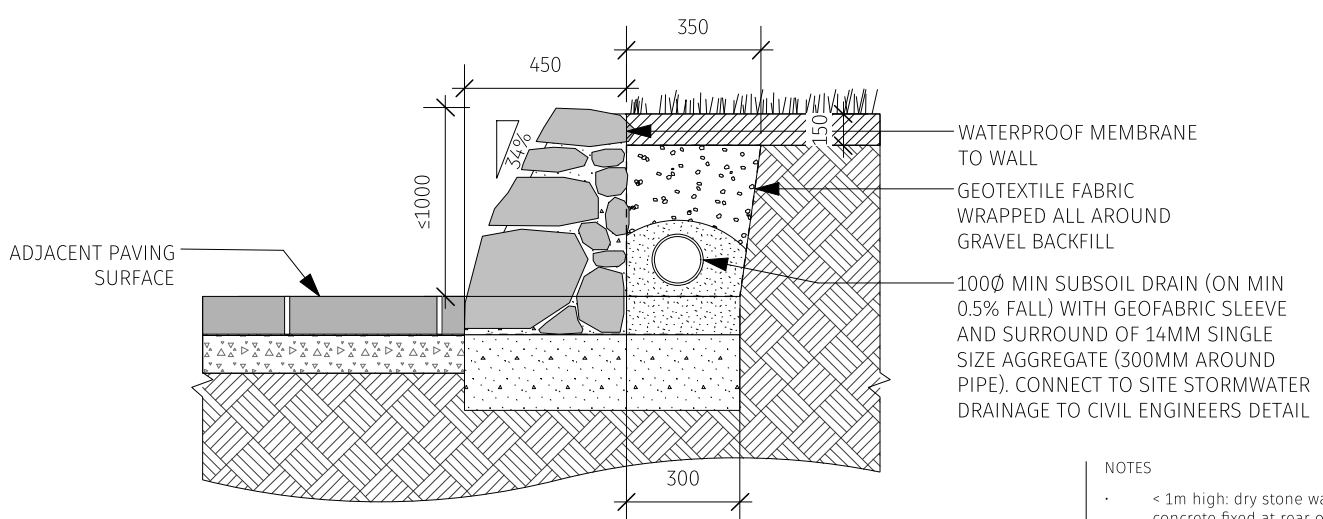
# Stone Walling

## D-03

### Technical Details



#### 1. Stone Wall - ≥ 1000mm Section 1:20



#### 1. Stone Wall - ≤ 1000mm Section 1:20

#### NOTES

- < 1m high: dry stone wall, concrete fixed at rear of wall, hiding concrete grout
- > 1m high: core filled block wall, stone faced and capped

# Gabion Walling

D-04

## Specifications

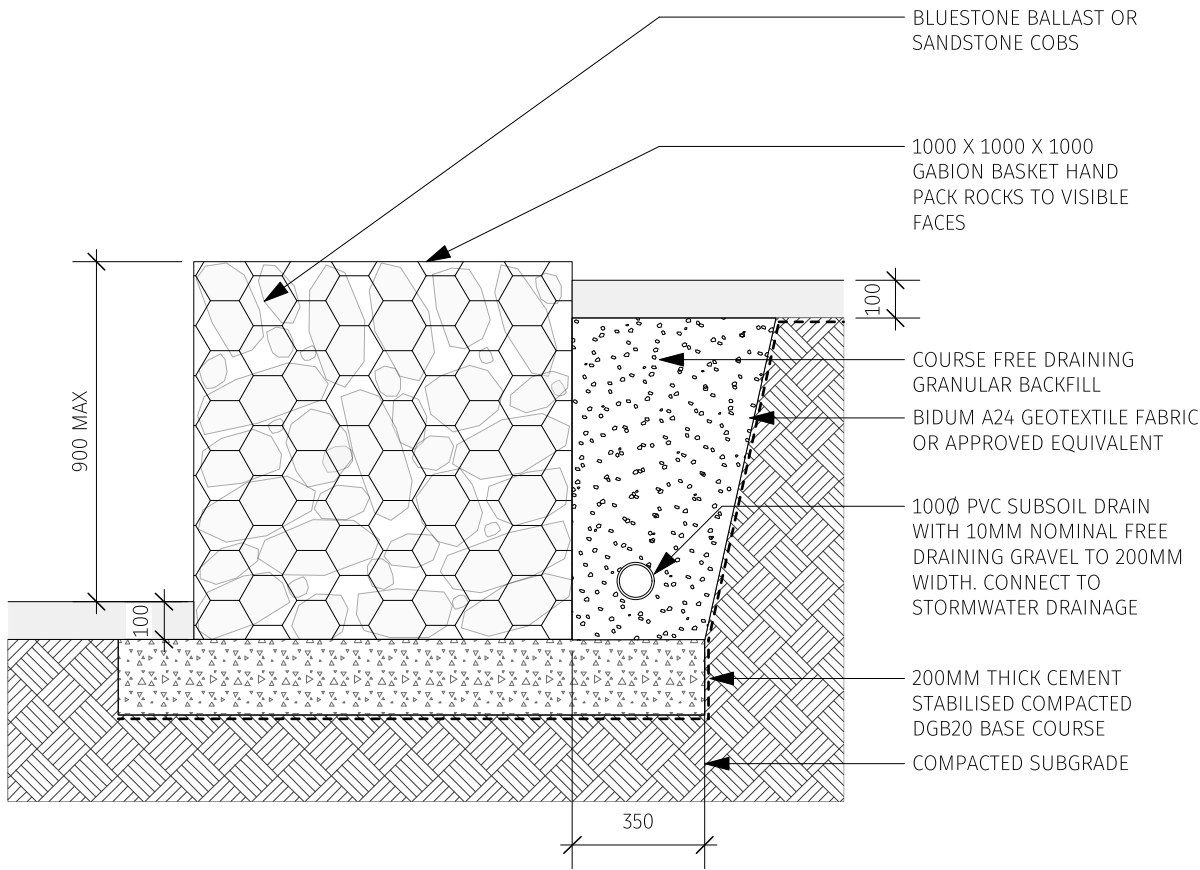
|                     |                                                                                                                                                                                                                                                                                                                                                   |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Mass Gravity Gabion Wall                                                                                                                                                                                                                                                                                                                          |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS 4678 Earth-retaining structures</li> <li>AS 2758.4 Aggregates and rock for engineering purposes - Aggregate for gabion baskets and wire mattresses</li> </ul>                                                                                                                                           |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Galmac Maccaferri hexagonal double twisted wire mesh</li> <li>Aggregate: Bluestone ballast - or sandstone rock</li> <li>Rock in fill - nominal grade: <ul style="list-style-type: none"> <li>minimum 100mm x 100mm (to 40% of total)</li> <li>maximum 200 x 200mm (to 20% of total)</li> </ul> </li> </ul> |
| <b>Finish</b>       | -                                                                                                                                                                                                                                                                                                                                                 |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Hand packed fill to all visible faces. Where gabion is a structural retaining wall, machine filling is acceptable behind the hand packed visible face</li> <li>Hand pack evenly</li> </ul>                                                                                                                 |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Visually inspect mesh annually for signs of rust, damage, localised bulging or vegetation on the face</li> <li>Seek advice on treatment from a structural engineer</li> </ul>                                                                                                                              |
| <b>Supplier</b>     | Gabions:<br>Geofabrics or approved equivalent<br>geofabrics.co                                                                                                                                                                                                                                                                                    |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Less than 900mm high</li> <li>Can be used as retaining wall or as free standing wall</li> <li>Site specific engineering design needed for wall greater than 1m.</li> </ul>                                                                                                                                 |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                 |



# Gabion Walling

D-04

## Technical Details



**Gabion Wall**  
**1. Section 1:20**

# Sandstone Wall

D-05

## Specifications

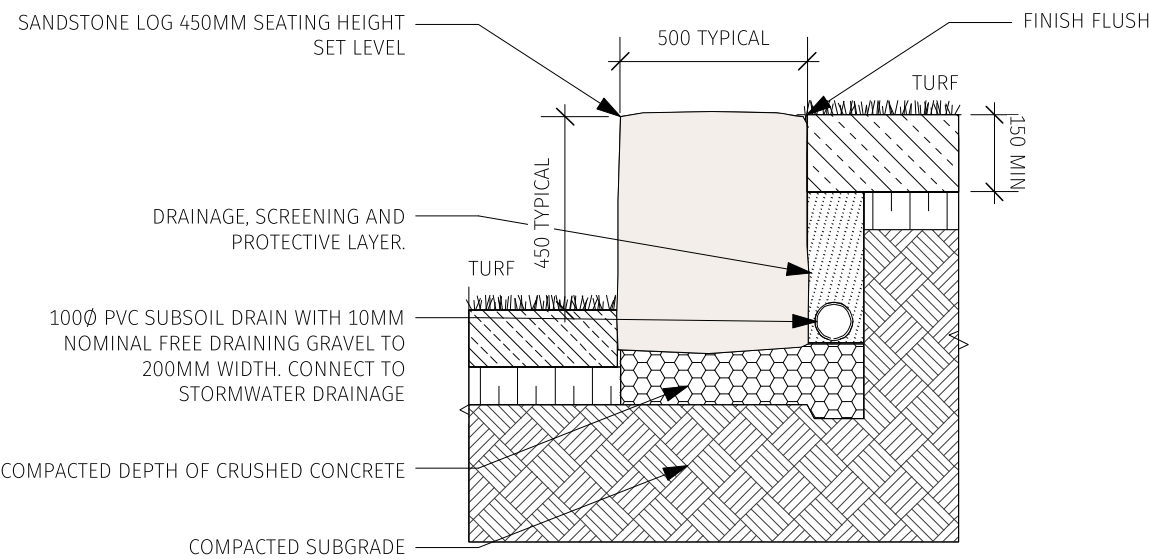
|                     |                                                                                                                                                                                                                                                                                                |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Element</b>      | Sandstone Log Wall                                                                                                                                                                                                                                                                             |
| <b>Standard</b>     | <ul style="list-style-type: none"><li>AS 4678 Earth-retaining structures</li></ul>                                                                                                                                                                                                             |
| <b>Materials</b>    | Mount White - Brown Range Sandstone - no banding                                                                                                                                                                                                                                               |
| <b>Finish</b>       | Split natural face and back, sawn top, bottom and sides                                                                                                                                                                                                                                        |
| <b>Installation</b> | <ul style="list-style-type: none"><li>Select and use the least uniform blocks for the base courses of the wall then work up using the most uniform blocks on the higher courses.</li><li>Line up the front of the blocks and fill from the rear to take up any variances at the rear</li></ul> |
| <b>Maintenance</b>  | -                                                                                                                                                                                                                                                                                              |
| <b>Supplier</b>     | Hunter Retaining Wall Construction or approved equivalent<br>hrwc.com.au                                                                                                                                                                                                                       |
| <b>Comments</b>     | <ul style="list-style-type: none"><li>Avoid installing on south facing slopes</li></ul>                                                                                                                                                                                                        |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                              |



Sandstone Wall

D-05

Technical Details



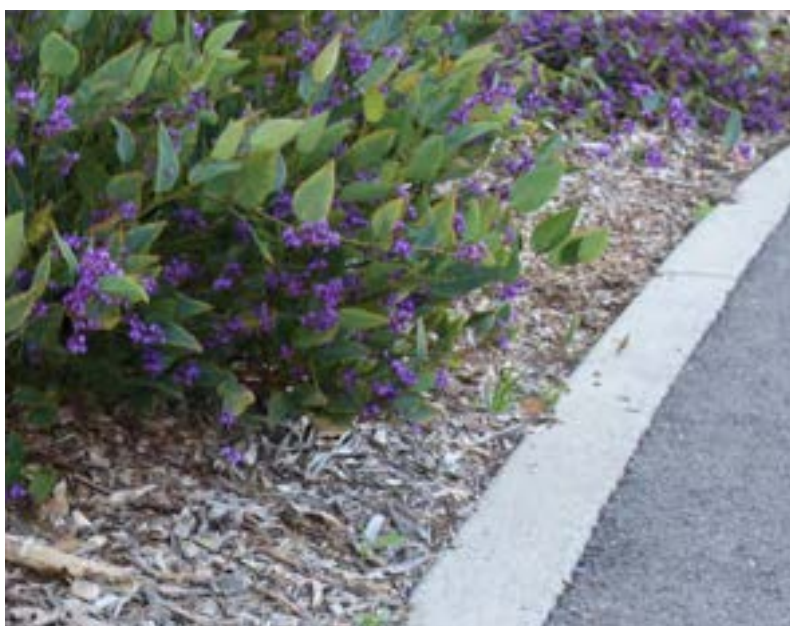
1. Sandstone Retaining Wall  
Section 1:20

# Concrete Edging

D-06

## Specifications

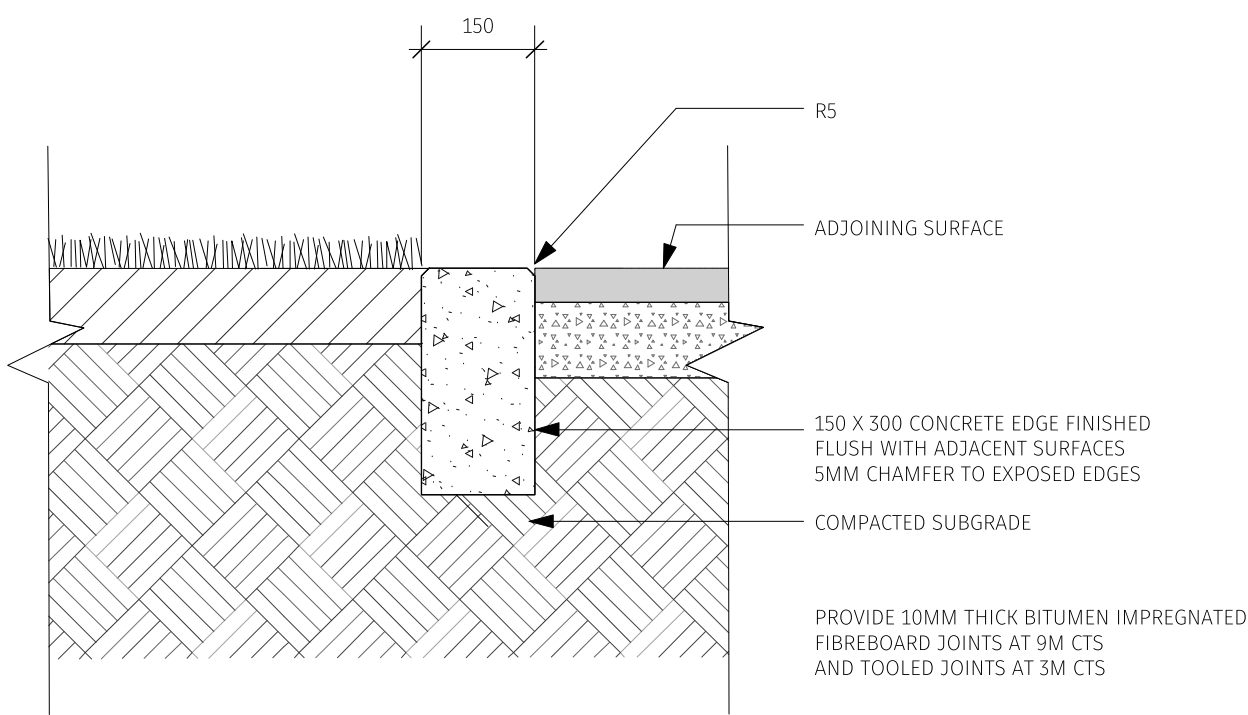
|                     |                                                                                                                                                                                                                                                                           |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Concrete edge                                                                                                                                                                                                                                                             |
| <b>Standard</b>     | <ul style="list-style-type: none"><li>AS 1379 Specification and supply of concrete</li></ul>                                                                                                                                                                              |
| <b>Materials</b>    | <ul style="list-style-type: none"><li>Grade N20 Concrete</li></ul>                                                                                                                                                                                                        |
| <b>Finish</b>       | <ul style="list-style-type: none"><li>Wood float finish</li><li>No visible edge tool marks</li></ul>                                                                                                                                                                      |
| <b>Installation</b> | <ul style="list-style-type: none"><li>Place in a shallow trench between timber forms.</li><li>Wood float finish flush with the adjacent finished grass level.</li><li>Provide control joints, filled with resilient bituminous material, at 3 m maximum centres</li></ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"><li>Pressure clean as necessary</li></ul>                                                                                                                                                                                               |
| <b>Supplier</b>     | <ul style="list-style-type: none"><li>Contractor to nominate based on specifications</li></ul>                                                                                                                                                                            |
| <b>Comments</b>     | <ul style="list-style-type: none"><li>Cost-effective edging solution</li></ul>                                                                                                                                                                                            |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                         |



# Concrete Edging

D-06

## Technical Details



1. Concrete Edge  
Section 1:10

# Steel Edging

D-07

## Specifications

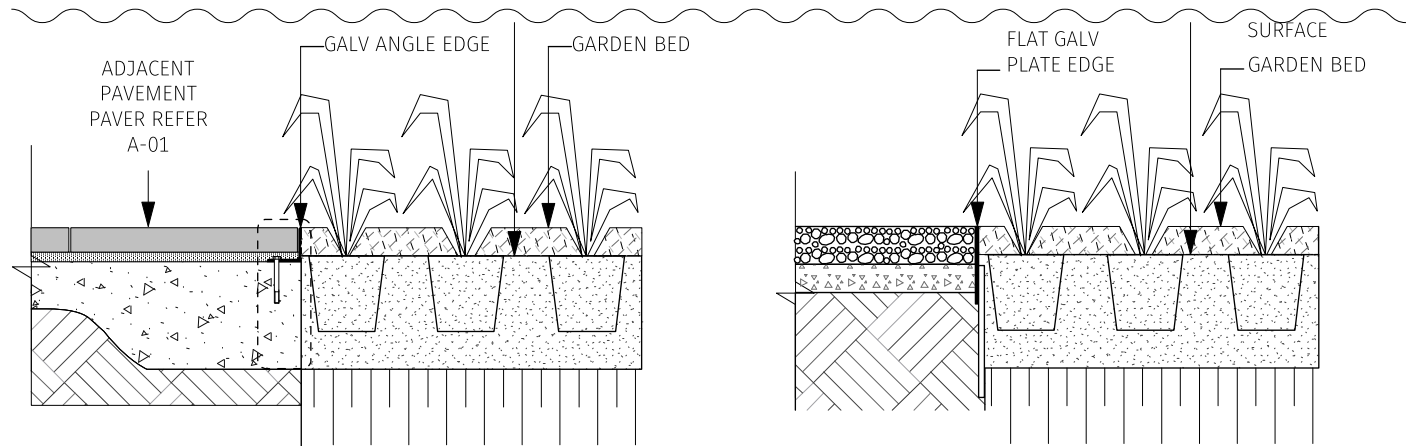
|                     |                                                                                                                                                                                                                                                                        |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Steel edge                                                                                                                                                                                                                                                             |
| <b>Standards</b>    | AS/NZS 1594 Hot-rolled steel flat products                                                                                                                                                                                                                             |
| <b>Materials</b>    | <ul style="list-style-type: none"><li>Hot-dipped galvanised steel - 150mm x 8mm plate or 150 x 75 x 6mm galvanised angle</li></ul>                                                                                                                                     |
| <b>Finish</b>       | -                                                                                                                                                                                                                                                                      |
| <b>Installation</b> | <ul style="list-style-type: none"><li>Top edge flush with adjacent levels</li><li>For curves,install with smooth continuous curves with no kinks</li><li>Ensure that joins occur in straight sections of edging</li><li>Anchor rods at minimum 600mm centres</li></ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"><li>Replace damaged sections as required</li></ul>                                                                                                                                                                                   |
| <b>Supplier</b>     | <ul style="list-style-type: none"><li>Contractor to nominate based on specifications</li></ul>                                                                                                                                                                         |
| <b>Comments</b>     | -                                                                                                                                                                                                                                                                      |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                      |



# Steel Edging

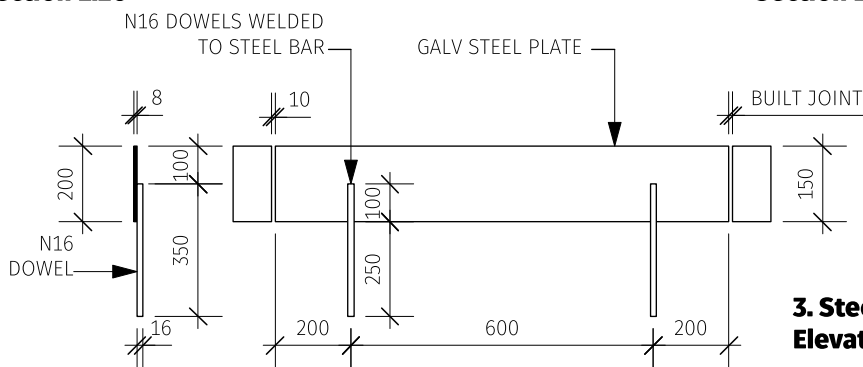
## D-07

### Technical Details

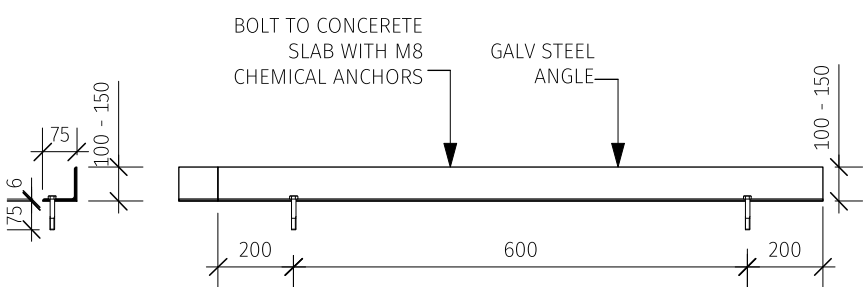


**1. Steel Angle  
Section 1:20**

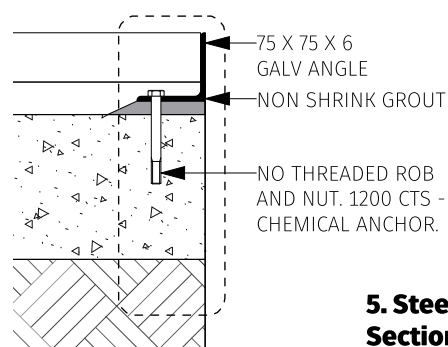
**2. Flat Plate Steel Edge  
Section 1:20**



**3. Steel Edge  
Elevation 1:20**



**4. Steel Angle  
Elevation 1:20**



**5. Steel Angle  
Section 1:20**

**NOTES**

- ALL STEEL WORK TO BE HOT DIPPED GALVANISED
- ALL STEEL WORK BELOW GROUND TO BE PAINTED WITH TWO COATS OF BITUMINOUS PAINT

# Fences - Security Palisade

D-08

## Specifications

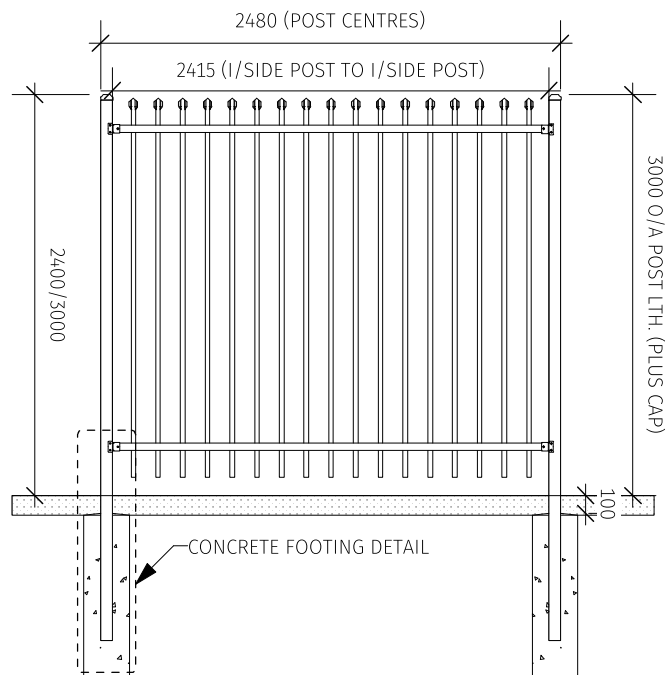
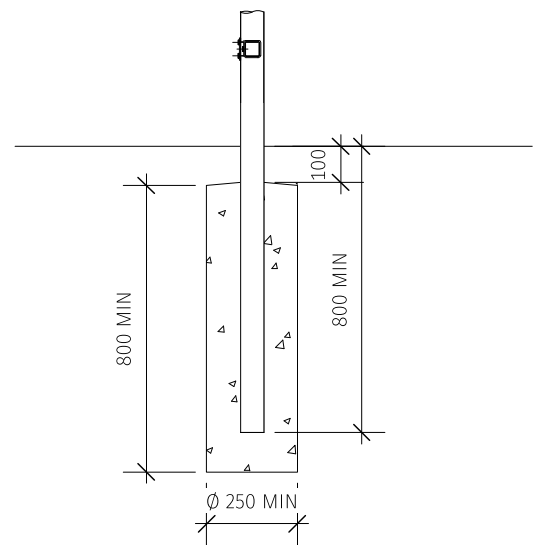
|                     |                                                                                                                                                                                                                                                          |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Protective Fencing Steel Tubular Fencing                                                                                                                                                                                                                 |
| <b>Standards</b>    | <ul style="list-style-type: none"><li>• AS 1725 Chain-link fabric security fences and gates</li><li>• AS 1926.1 Swimming pool safety, Part 1: Safety barriers for swimming pools</li><li>• AS 4506 Metal finishing - Thermoset powder coatings</li></ul> |
| <b>Materials</b>    | <ul style="list-style-type: none"><li>• Steel - Galvanised</li></ul>                                                                                                                                                                                     |
| <b>Finish</b>       | <ul style="list-style-type: none"><li>• Black powder coated</li></ul>                                                                                                                                                                                    |
| <b>Installation</b> | <ul style="list-style-type: none"><li>• Assembled using ready made fence panels and posts</li><li>• Use raked fence panels to accommodate slope</li></ul>                                                                                                |
| <b>Maintenance</b>  | Replace damage parts or panels as required                                                                                                                                                                                                               |
| <b>Supplier</b>     | Bluedog Fencing or approved equivalent<br>bluedogfences.com.au                                                                                                                                                                                           |
| <b>Comments</b>     | <ul style="list-style-type: none"><li>• Height 2400 or 3000mm</li></ul>                                                                                                                                                                                  |
| <b>Location</b>     | Equipment, plant and storage areas                                                                                                                                                                                                                       |



# Fences - Security Palisade

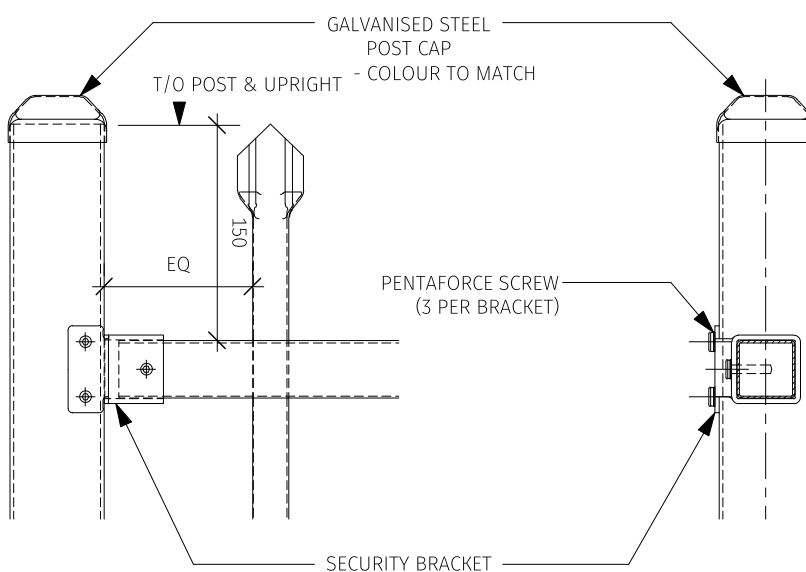
D-08

## Technical Details



**1. Palisade Fence**  
**Elevation 1:40**

**2. Palisade Fence Footing**  
**Section 1:20**



**1. Palisade Fence Details**  
**1:5**

# Flat Top and Rod Panel Fence

D-09

## Specifications

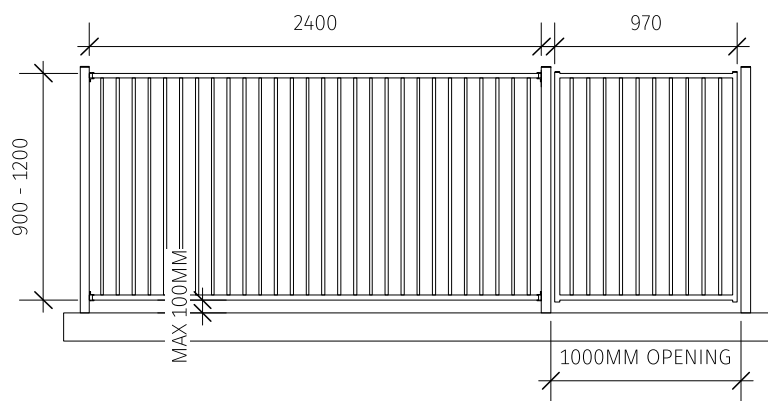
|                     |                                                                                                                                                                                                       |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Element</b>      | 900-1200mm high flat top and rod panel fence                                                                                                                                                          |
| <b>Standard</b>     | AS 1926 Swimming pool safety - Standards Set                                                                                                                                                          |
| <b>Materials</b>    | 6063 T6 Aluminium                                                                                                                                                                                     |
| <b>Finish</b>       | Powdercoated Satin Black                                                                                                                                                                              |
| <b>Installation</b> | <ul style="list-style-type: none"><li>• Vertical/plumb posts</li><li>• Vertical rods</li><li>• Single pitch on slope</li><li>• Single pitch between two panels</li><li>• Do not step panels</li></ul> |
| <b>Maintenance</b>  | Hand clean as needed                                                                                                                                                                                  |
| <b>Supplier</b>     | Oxworks or approved equivalent<br>oxworks.com.au                                                                                                                                                      |
| <b>Comments</b>     | -                                                                                                                                                                                                     |
| <b>Location</b>     | -                                                                                                                                                                                                     |



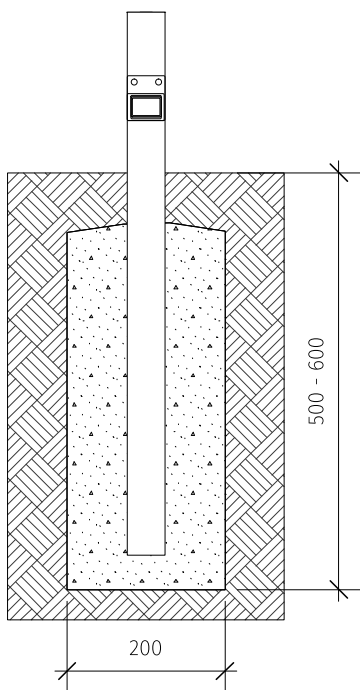
# Flat Top and Rod Panel Fence

**D-09**

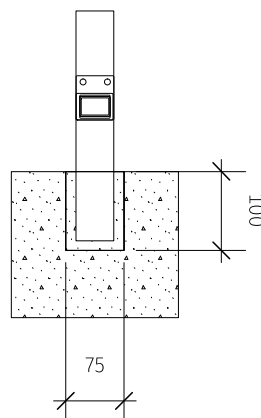
## Technical Details



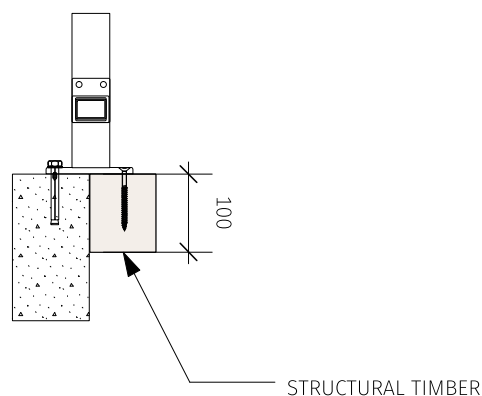
**1. Flat Top and Rod Panel Fence**  
**Elevation 1:40**



**2. In Ground Post Detail**  
**Elevation 1:20**



**3. Core Drill Post Detail**  
**Elevation 1:20**



**4. Flanged (On Slab) Post Detail**  
**Elevation 1:20**

# Wire Mesh Fence

D-10

## Specifications

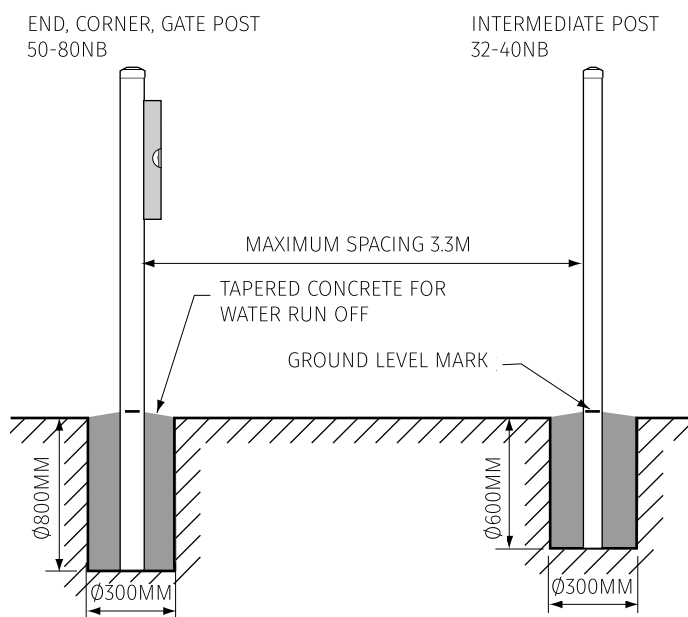
|                     |                                                                                                                                                                              |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Chainwire Black Fence                                                                                                                                                        |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS 1725-2010 – Chain link fabric fencing</li> <li>Galvanising to Standard Grade – Class B (AS1650-2.2)</li> </ul>                     |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Galvanised steel posts and frame</li> <li>Concrete footings</li> <li>Mesh to be 3.15mm steel - chain mesh PVC coated black</li> </ul> |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Black powdercoated poles and rails</li> <li>Mesh to have black PVC coating</li> </ul>                                                 |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Subsurface installation</li> <li>Surface installation on concrete</li> </ul>                                                          |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Ensure mesh is in good condition, replace as necessary</li> </ul>                                                                     |
| <b>Supplier</b>     | Longain Fencing or approved equivalent<br>longainfencing.com.au                                                                                                              |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Lower profile fence</li> <li>Barbed wire is not to be used</li> <li>Height: 900/1200mm</li> </ul>                                     |
| <b>Location</b>     | <ul style="list-style-type: none"> <li>Low exposure areas where a low-cost solution is needed</li> </ul>                                                                     |



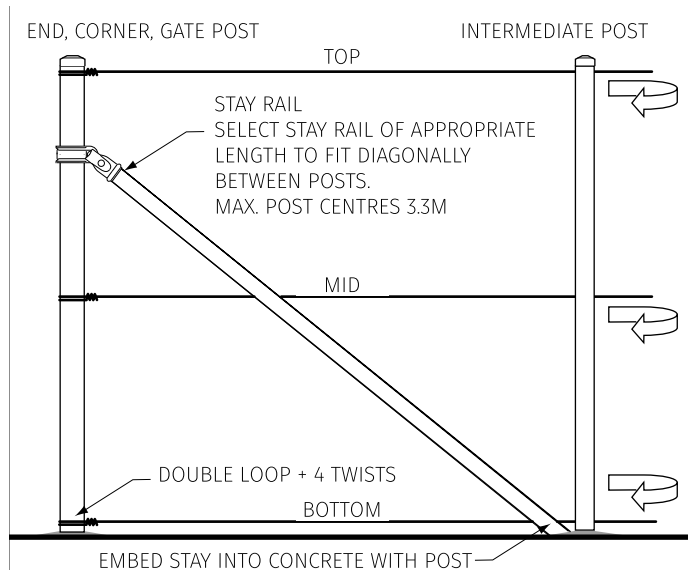
# Wire Mesh Fence

## D-10

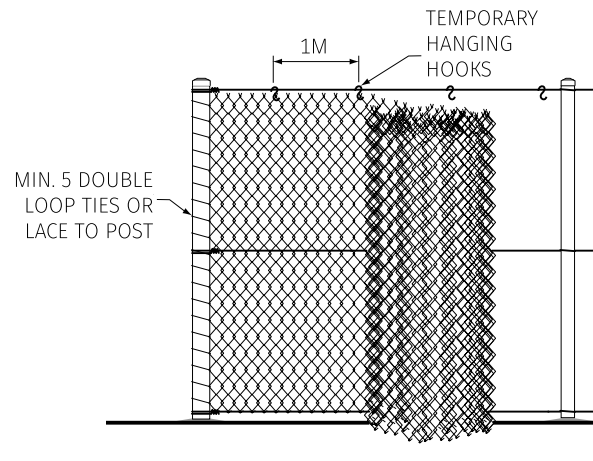
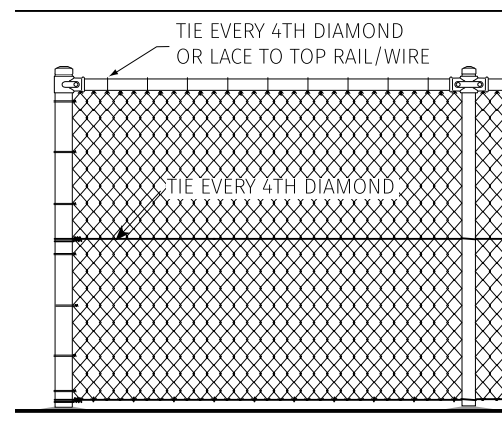
### Technical Details



#### 1. Post arrangement and footings



#### 3. Corner and intermediate posts



#### 2. Mesh installation

# Enclosures

## D-11

### Specifications

|                     |                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Louvred Slat System (Welded)                                                                                                                                                                                                                                                                                                                                                            |
| <b>Standards</b>    | -                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>6063 T6 Aluminium - Powder Coated</li> </ul>                                                                                                                                                                                                                                                                                                     |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>To match existing predominate surrounding building colour or from standard palette</li> <li>Pause point if colour is chosen out of the accepted principles around screen colour</li> </ul>                                                                                                                                                       |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Bolt posts to level concrete surface to manufacturers details</li> <li>Install slats to posts to manufacturers specifications</li> </ul>                                                                                                                                                                                                         |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Hand clean as needed</li> </ul>                                                                                                                                                                                                                                                                                                                  |
| <b>Supplier</b>     | Oxworks or approved equivalent<br><a href="http://oxworks.com.au">oxworks.com.au</a><br>SB Glass or approved equivalent<br><a href="http://sbglass.com.au">sbglass.com.au</a>                                                                                                                                                                                                           |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>100 x 20 x 1.8mm Aluminium Elliptical Slat</li> <li>Slats are rotated 75° and slightly overlapped to create the louvred style</li> <li>Slats are welded into Stile</li> <li>CNC Routed Centre Back Strap Support for panels over 1500mm wide</li> <li>Raking is not possible with louvred products</li> <li>Set behind building lines</li> </ul> |
| <b>Location</b>     | <ul style="list-style-type: none"> <li>Gas and air conditioning enclosures, plant areas</li> </ul>                                                                                                                                                                                                                                                                                      |

Latch/lock to UoN  
door hardware  
specification

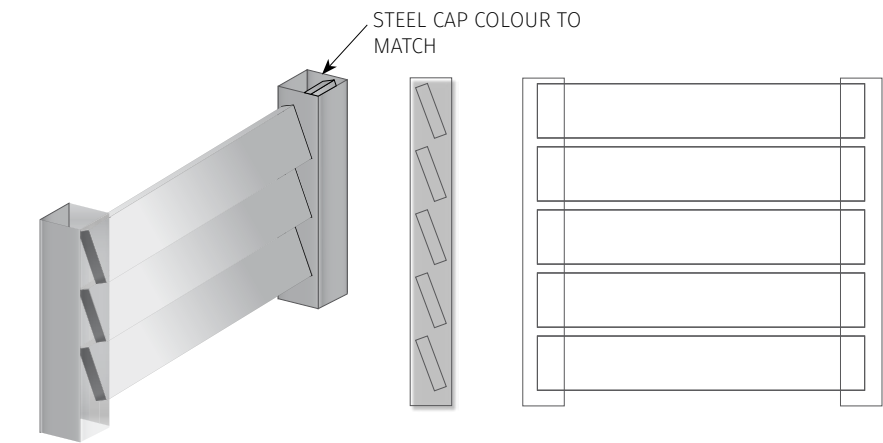
Set back from  
building line



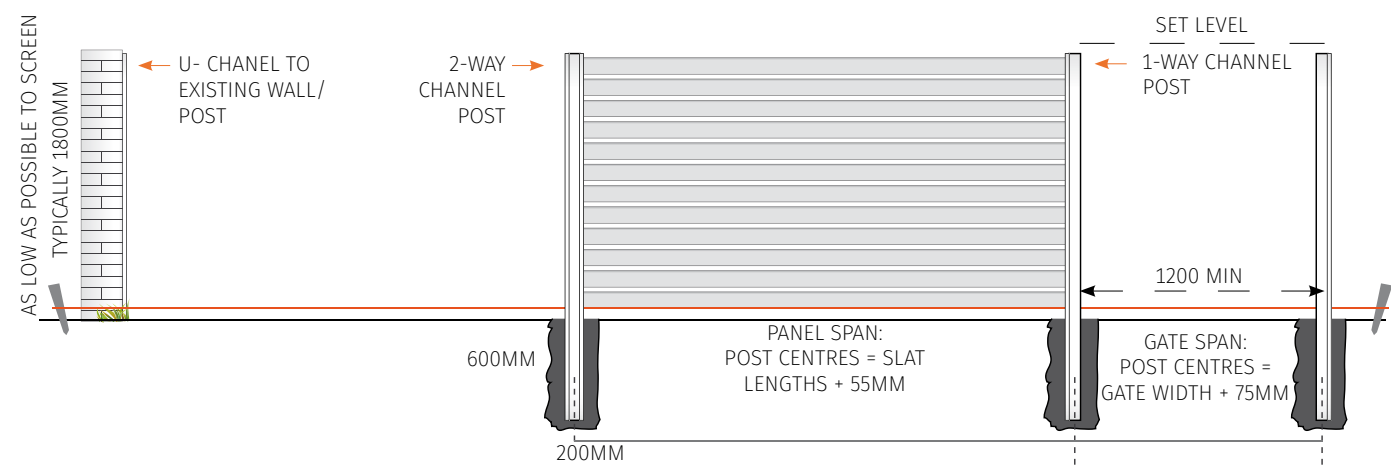
Enclosures

D-11

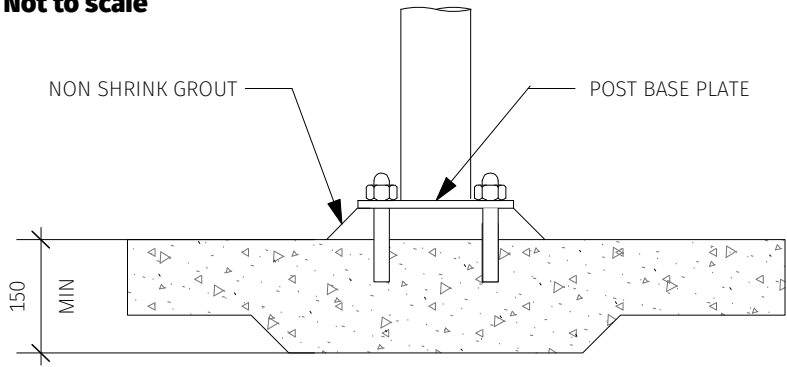
Technical Details



1. Slat arrangement



2. Elevation  
Not to scale



2. Typical Surface Mount Detail  
Section 1:10

# Screens

## D-12

### Specifications

|                     |                                                                                                                                                                                                                                                          |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | 15mm or 30mm Slat Screen Fencing                                                                                                                                                                                                                         |
| <b>Standards</b>    | -                                                                                                                                                                                                                                                        |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>6063 T6 Aluminium - Powder Coated - or Ekodeck composite timber</li> </ul>                                                                                                                                        |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>To match existing predominate surrounding building colour or from standard UoN palette</li> <li>Composite timber: Alpine Ash</li> </ul>                                                                           |
| <b>Installation</b> | As per suppliers instructions<br>SLAT OPTIONS <ul style="list-style-type: none"> <li>65 x 16 x 1.4mm Aluminium Slat</li> <li>38 x 16 x 1.4mm Aluminium Slat</li> </ul> LENGTHS: <ul style="list-style-type: none"> <li>1800mm</li> <li>2400mm</li> </ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Pressure clean as necessary</li> <li>Graffiti removal as necessary</li> </ul>                                                                                                                                     |
| <b>Supplier</b>     | Oxworks or approved equivalent<br><a href="http://oxworks.com.au">oxworks.com.au</a><br>SB Glass or approved equivalent<br><a href="http://sbglass.com.au">sbglass.com.au</a>                                                                            |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Colour to suit surrounds</li> </ul>                                                                                                                                                                               |
| <b>Location</b>     | -                                                                                                                                                                                                                                                        |

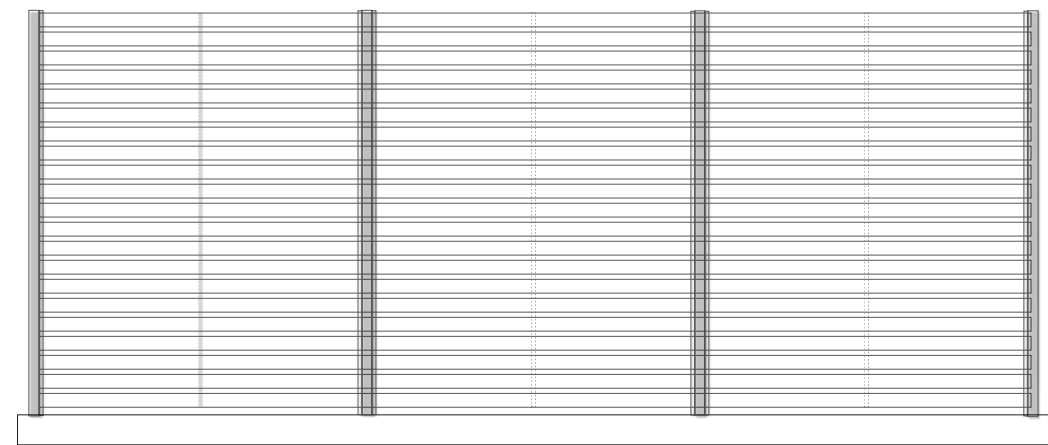


Screens

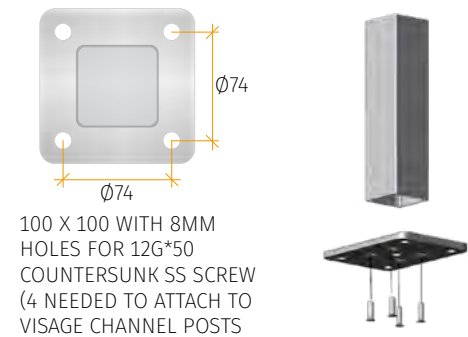
D-12

Technical Details

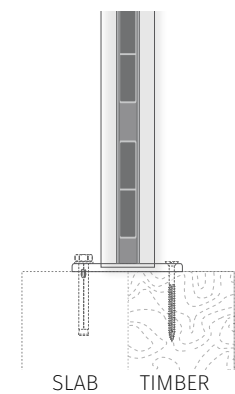
38/65 X 16MM SLATS AT SPECIFIED SPACINGS



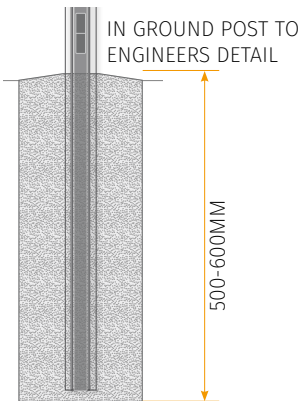
1. Front Elevation



2. Channel Base Plate



3. Flanged (on slab) Post Detail



4. In Ground Post End Detail

NOTES

- Drawings not to scale



# E

**Lighting, Electrical  
& Service Fixtures**

## Design Strategy

The aim to provide a safe, welcoming and inclusive campus at all times. The campus is used by students, staff and residents 24/7.

Good lighting and CCTV cameras help University Security provide a safe place but also contribute to the feel and amenity in both the day and night-time.

The lighting strategy aim is to provide good quality and consistent light rather than lots of light to enable people to move safely, help wayfinding and improve the visual amenity.

Where possible, lights should be a consistent height and spaced to help unify the public domain and avoid under or over-lit areas. The use of Multipoles and coordinating light poles will also reduce visual clutter.

Feature lighting for specific sites or buildings should be designed with advice from a specialist lighting design and electrical consultant.

## Design Considerations

- CCTV cameras are to be located with consideration to sight lines and passive surveillance
- Lights should be mounted at a consistent height and evenly spaced along pathways.

## Principles

- Only light primary paths routes
- Improve legibility and wayfinding at night and reduce visual clutter, light spill and energy consumption
- Minimise the number of light poles and fittings to reduce clutter
- Poles to be multifunctional: integrate all services where possible (power, CCTV, PA, functional, Architectural, spotlighting)
- Lighting design must address minimum lighting levels as defined in the UON-ESS-103 External Lighting Specification
- Ensure light spill does not impact residential areas of the campus and environmentally sensitive areas
- Provide power efficient LED fittings.

Exterior lighting design shall be as per AS 1158.3.1:2020. The following lighting categories shall be used for the purpose of lighting design:

| Area                           | Category | Pole height (m) |
|--------------------------------|----------|-----------------|
| Campus Roads                   | PR3      | 8               |
| Pedestrian Crossings           | PE2      | 8               |
| Carparks                       | PC2      | 6-8             |
| Disabled Parking               | PCD      |                 |
| Walkways                       | PP2      | 4.5             |
| Areas containing a bus shelter | PA2      |                 |

## Luminaire Selection

Apply the following general criteria for luminaire selection:

- Luminaires to be LED
- CR > 80 [The colour rendering of the light needs to be high so that peoples skin tones are flattering and the space appears colourful and alive (Colour Rendering Index is a measure of how accurately a light source renders a range of colours)]
- CCT 3000k [The colour appearance of the light is warm, as cold light makes a space appear harsh and sterile. Cold light also has more impact on the biota and the night sky.]
- Lens Based Luminaires [Glare from the lights should be minimized]
- Avoid the use of lights that use direct LEDs, as the glare from these types of fittings is generally poorly controlled
- Manufactures warranty minimum 5 years
- Appropriate light distribution and energy efficiency (best design practice).



# Light and CCTV Poles

## E-01

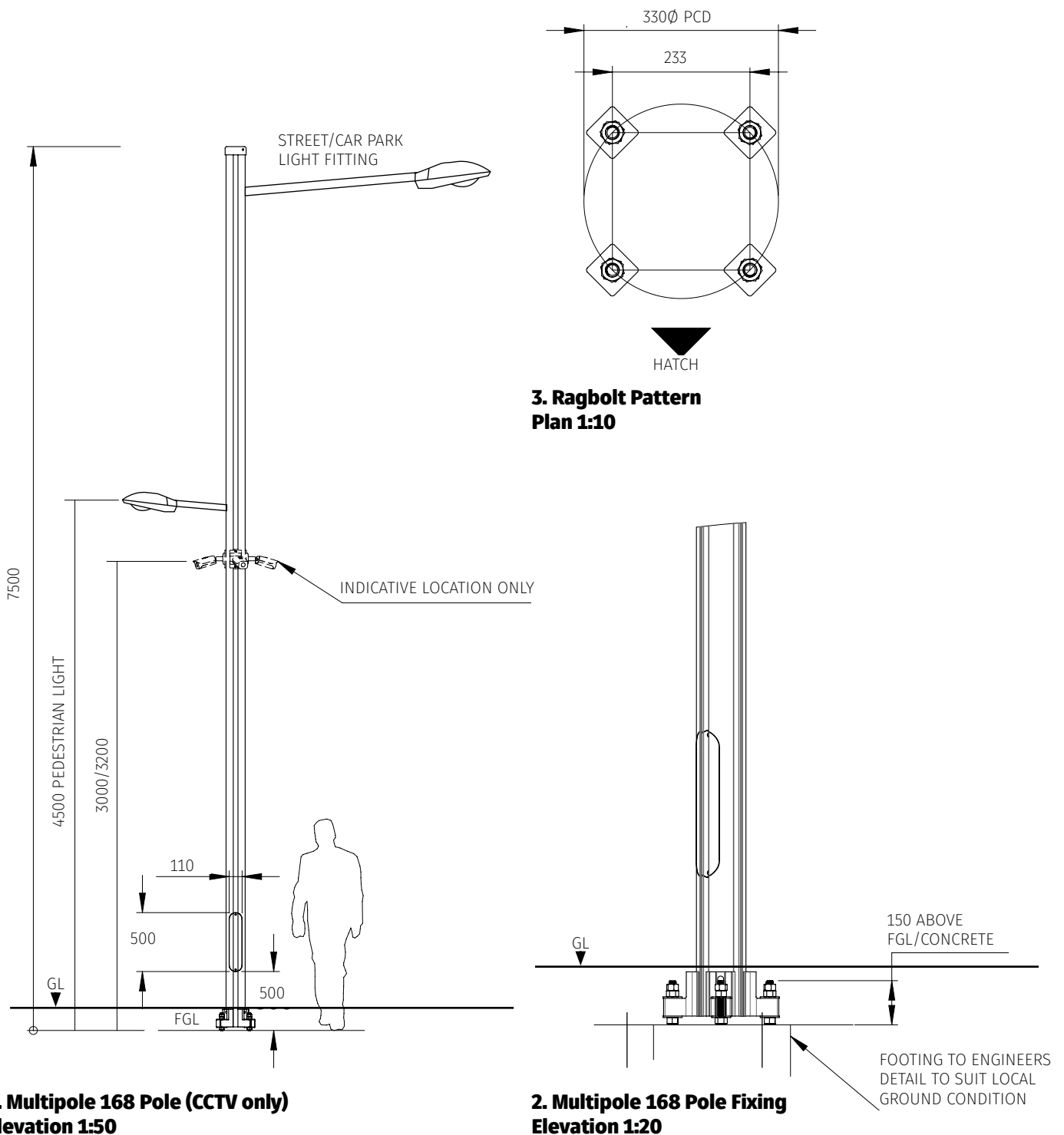
### Specifications

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Marine Grade Structural Aluminium                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS/NZS 4677:2010 Steel Utility Services Poles</li> <li>AS 4282 – Control of the Obtrusive Effects of Outdoor Lighting</li> <li>AS/NZS 1158.3.1:2020 – Lighting for roads and public spaces, Part 3.1: Pedestrian area (Category P) Lighting – Performance and design requirements</li> <li>AS/NZS 1798 – Streetlight Poles and Outreaches</li> <li>AS/NZS 3000 – Wiring Rules</li> </ul> <p>University Specification</p> <ul style="list-style-type: none"> <li>UON-ESS-103 Exterior Lighting Specification</li> <li>Project Specification For University Of Newcastle CCTV System</li> <li>Telecommunication and Data Cabling Technical Specification</li> </ul>                                                                 |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Multipole 168 Series Pole with thickened wall for CCTV poles (5mm nom). Maximum height 7.0m</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Anodised Black</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Subsurface footing to manufactures detail</li> <li>Pole baseplate (top) 150mm above adjacent finished ground level for poles in grass/gardens &amp; paved areas</li> <li>DUREBILD STE coating all buried components</li> <li>CCTV mounting bracket or arm dependant on CCTV Contractor requirements</li> <li>Multipod enclosure for pole mounted equipment (if not in building or on-ground cabinet)</li> <li>Sign bracket (for RMS/ street signs – if next to the road)</li> <li>Recommended pole height will be typically: <ul style="list-style-type: none"> <li>- 4.5m for CCTV and pedestrian lightings with camera at about 3m.</li> <li>- 7m in a car park (I.e. 600mm from face of kerb) and roads</li> </ul> </li> </ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>To manufacturers specification</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Supplier</b>     | Multipole<br>multipole.com.au                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Avoid water pooling at base of pole</li> <li>Install pole on plinth in soft landscaping</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

# Light and CCTV Poles

E-01

## Technical Details



# Tapered Light Pole

E-02

## Specifications

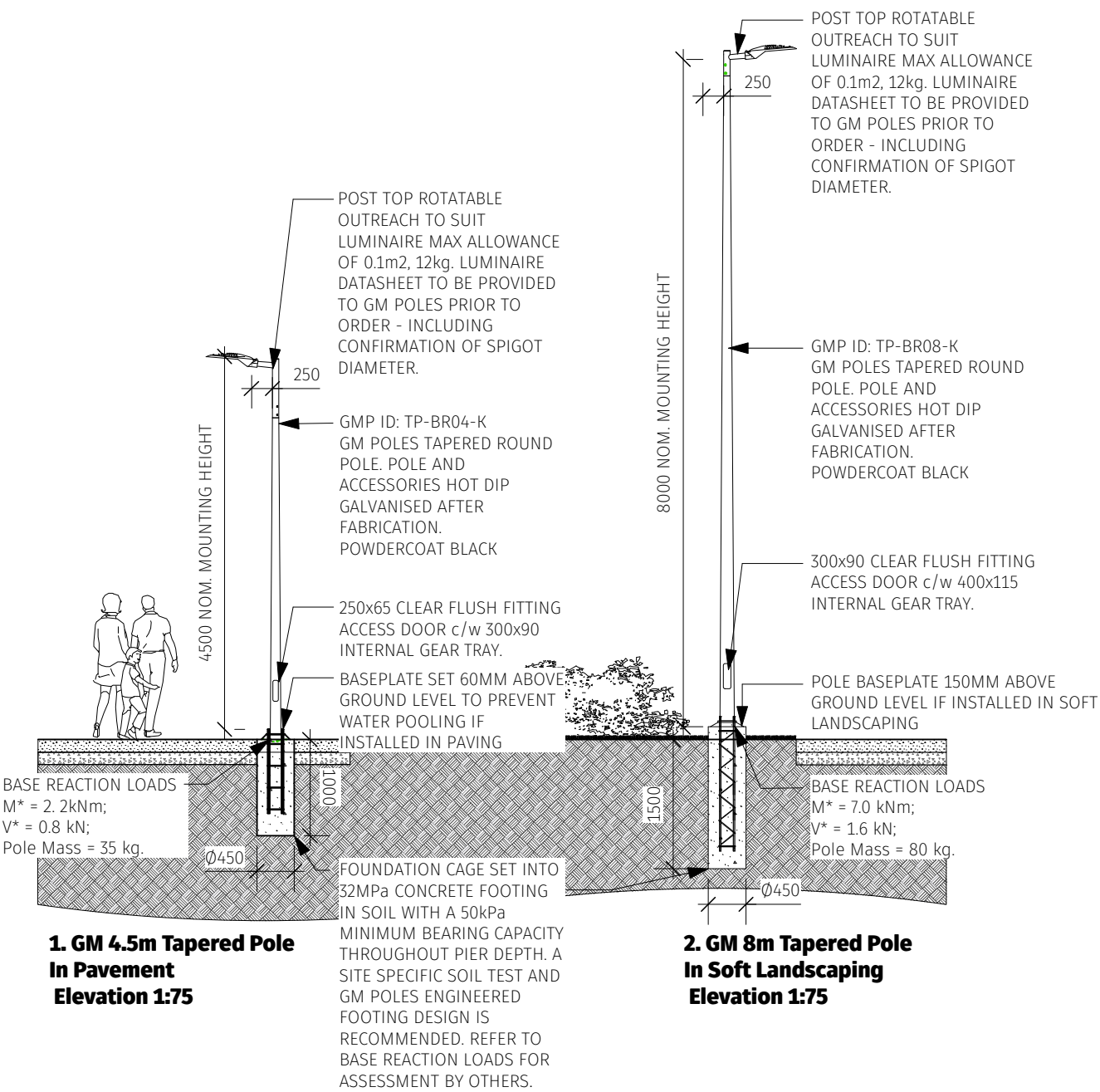
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Element</b>      | Tapered light pole                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS/NZS 4677:2010 Steel Utility Services Poles</li> <li>AS 4282 – Control of the Obtrusive Effects of Outdoor Lighting</li> <li>AS/NZS 1158.3.1:2020 – Lighting for roads and public spaces, Part 3.1: Pedestrian area (Category P) Lighting – Performance and design requirements</li> <li>AS/NZS 1798 – Streetlight Poles and Outreaches</li> <li>AS/NZS 3000 – Wiring Rules</li> </ul> <p>University Specification</p> <ul style="list-style-type: none"> <li>UON-ESS-103 Exterior Lighting Specification</li> </ul> |
| <b>Materials</b>    | Galvanised Steel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Finish</b>       | Powdercoat black                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>All pole footing installation shall be constructed in accordance with an engineer's drawings and relevant Australian Standards, in particular the latest revision of AS3600 Concrete structures and SAA HB64 Guide to concrete construction.</li> <li>Pole baseplate (top) 150mm above adjacent finished ground level for poles in grass/gardens &amp; paved areas</li> </ul>                                                                                                                                          |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>To manufacturers specification</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Supplier</b>     | GM Poles<br>gmpoles.com.au                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Avoid water pooling at base of pole</li> <li>Install weep hole in grout below baseplate, above ground level</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |



Tapered Light Pole

E-02

Technical Details



3. Base Plate  
Plan 1:5

# On-wall CCTV

## Specifications

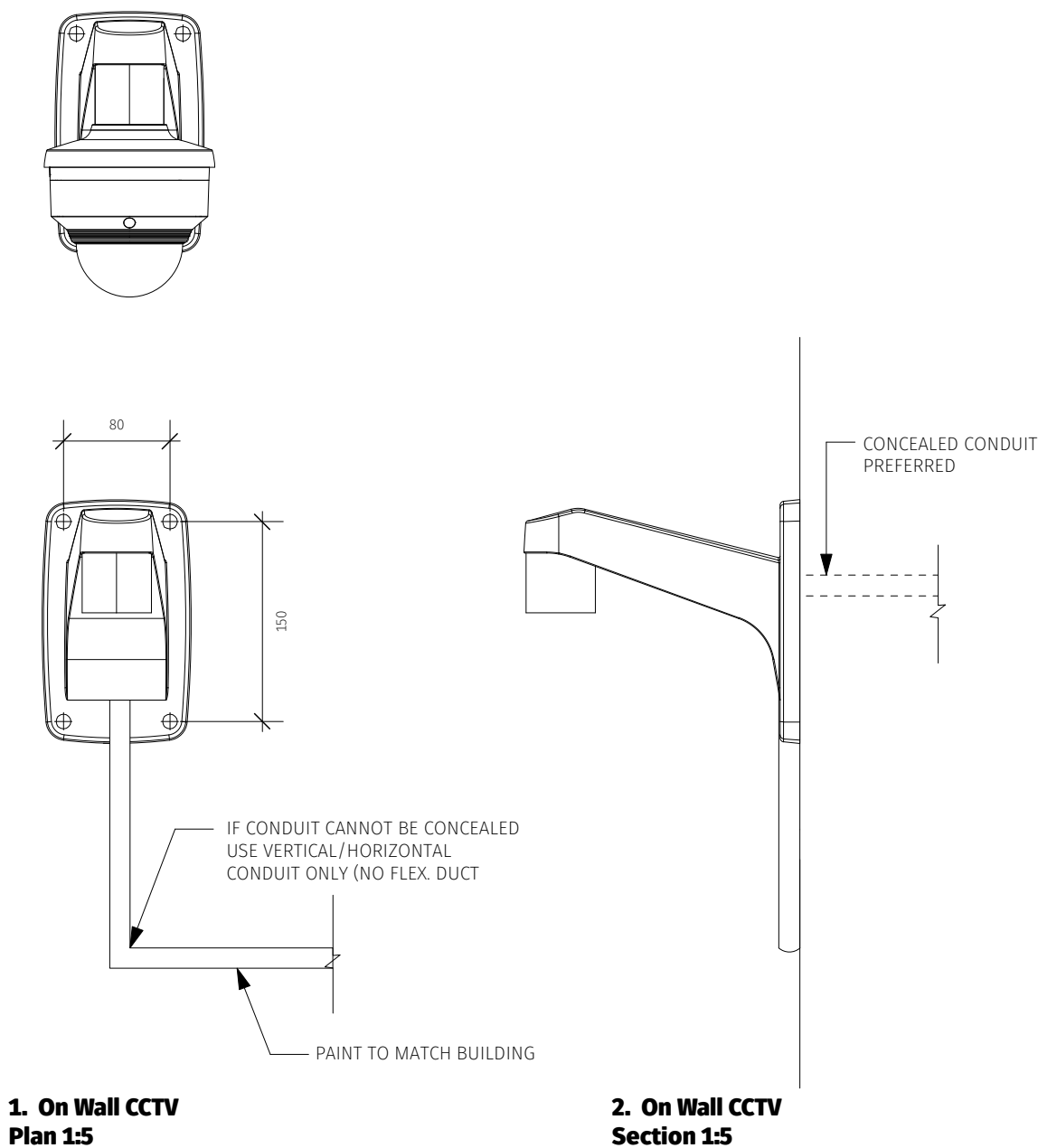
|                     |                                                                                                                                                                                                                                                                                                    |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | On-wall CCTV camera                                                                                                                                                                                                                                                                                |
| <b>Standards</b>    | <ul style="list-style-type: none"><li>• AS 4806.1-2006 Closed Circuit Television (CCTV) – Management And Operation University Specification</li><li>• Project Specification For University Of Newcastle CCTV System</li><li>• Telecommunication and Data Cabling Technical Specification</li></ul> |
| <b>Materials</b>    | <ul style="list-style-type: none"><li>• To electricians specification</li></ul>                                                                                                                                                                                                                    |
| <b>Finish</b>       | <ul style="list-style-type: none"><li>• Mid-grey or to match adjacent surface</li></ul>                                                                                                                                                                                                            |
| <b>Installation</b> | <ul style="list-style-type: none"><li>• No visual conduits where possible</li><li>• If surface mounted conduits to be horizontal or vertical only</li><li>• Bracket to be supplied with camera to ensure system (camera + bracket) compatibility</li></ul>                                         |
| <b>Maintenance</b>  | -                                                                                                                                                                                                                                                                                                  |
| <b>Supplier</b>     | -                                                                                                                                                                                                                                                                                                  |
| <b>Comments</b>     | <ul style="list-style-type: none"><li>• Concealed cabling (i.e. no surface mount conduit)</li><li>• 3m mounting height &amp; above</li><li>• Wall mount camera to be IK10 rated</li></ul>                                                                                                          |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                  |



On-wall CCTV

E-03

Technical Details



# Help Points

## E-04

### Specifications

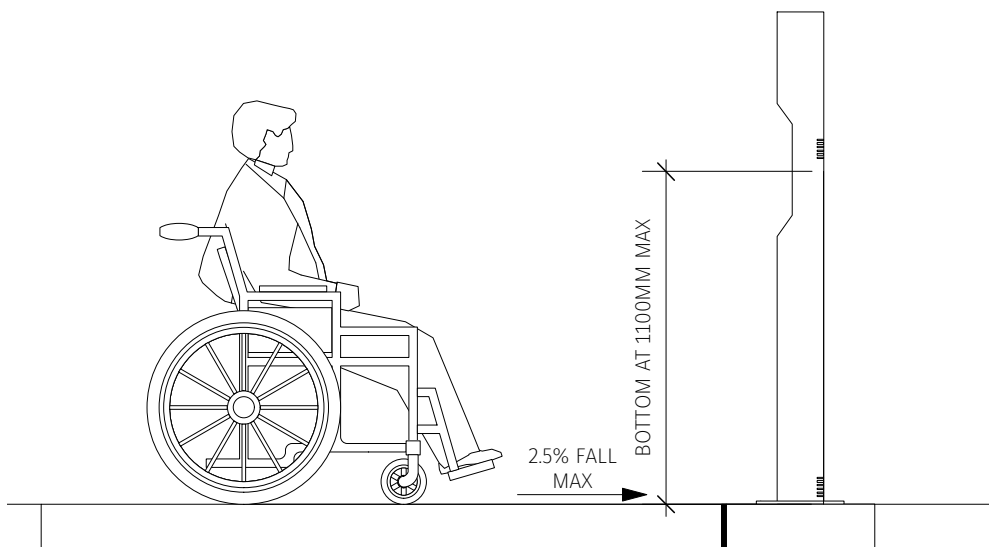
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Help Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS/NZS 4677:2010 Steel Utility Services Poles</li> <li>AS/NZS 4421:2011- Guard and patrol security services</li> <li>AS 1428 Design for access and mobility</li> </ul> University Specification <ul style="list-style-type: none"> <li>Project Specification For University Of Newcastle CCTV System</li> <li>Telecommunication and Data Cabling Technical Specification</li> <li>IFS Exterior Lighting Specification (2020)</li> </ul> |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Powdercoat steel</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Blue powder coat finish with yellow contrasting signage &amp; identifier</li> </ul>                                                                                                                                                                                                                                                                                                                                                     |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Interface at 1100mm above adjacent ground level (within common reach zone from AS 1428.1)</li> </ul>                                                                                                                                                                                                                                                                                                                                    |
| <b>Maintenance</b>  | Clean as necessary                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Supplier</b>     | Varley or approved equivalent<br>varleygroup.com                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Locate on a level surface, adjacent to paths. Do not place in garden beds</li> <li>Intercom to be oriented to adjacent path</li> <li>CCTV and lighting at all help points</li> </ul>                                                                                                                                                                                                                                                    |
| <b>Location</b>     | <ul style="list-style-type: none"> <li>Primary paths</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                |



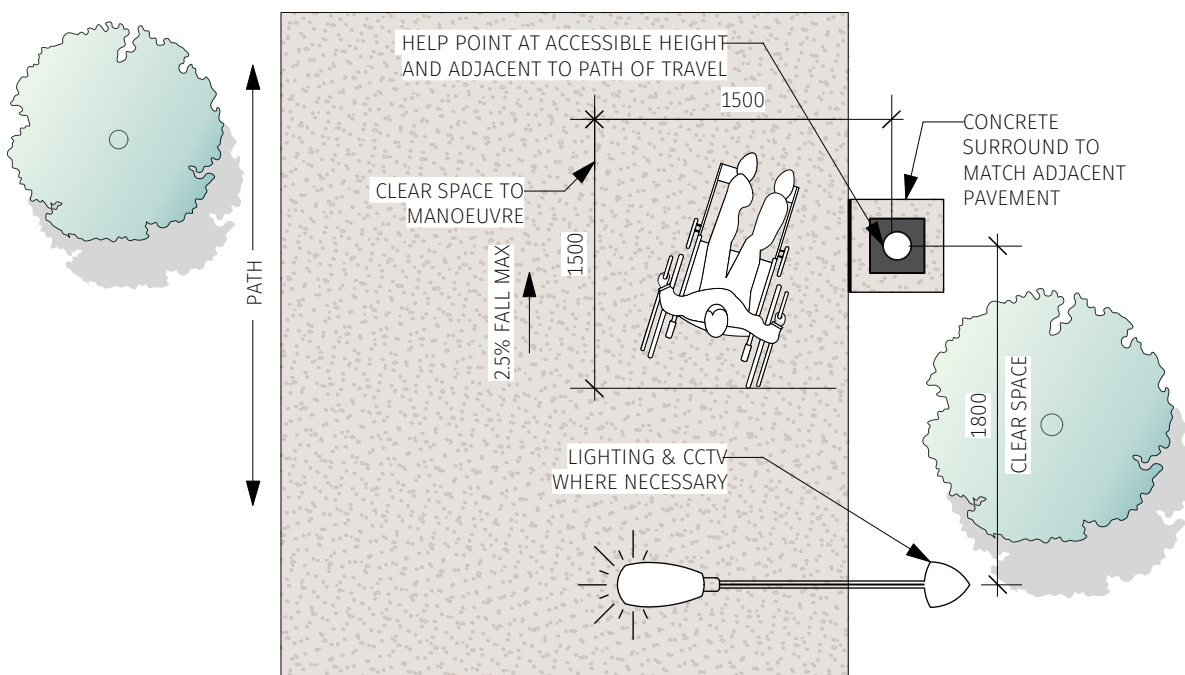
# Help Points

## E-04

### Technical Details



#### 1. Help Point Elevation 1:25



#### 1. Help Point Arrangement Plan 1:40

# External Switchboard Cabinets

E-05

## Specifications

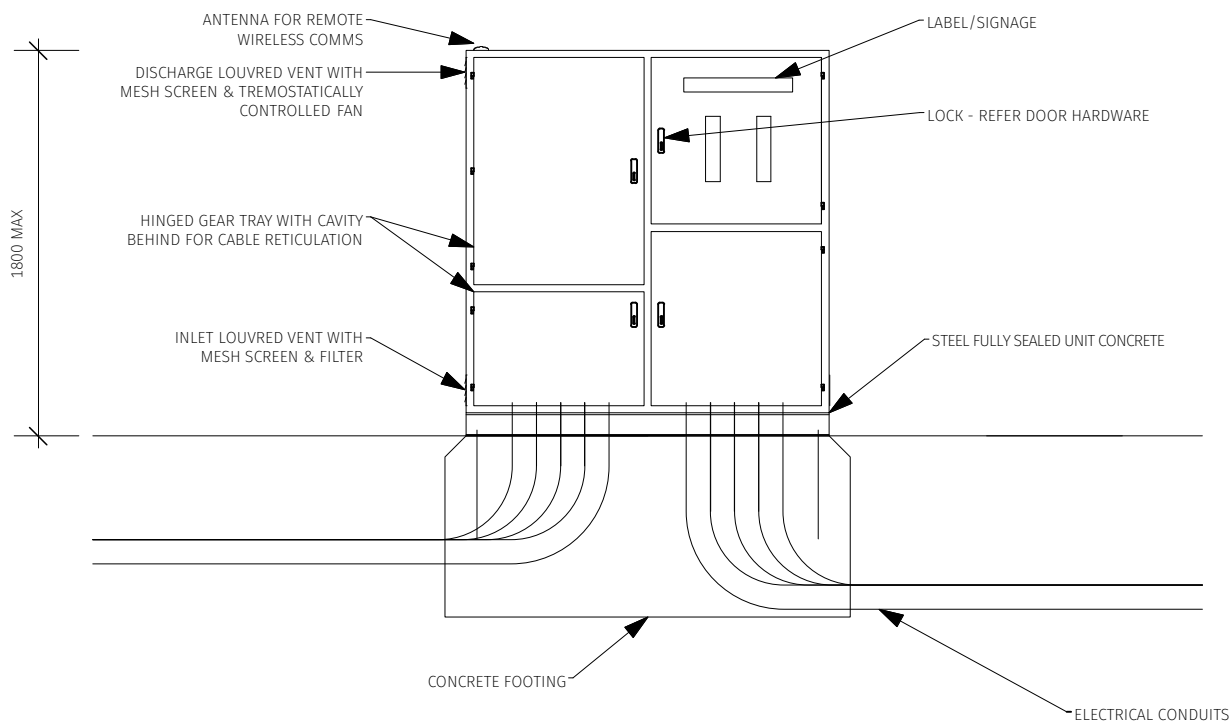
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | External switchboard cabinet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS/NZS 61439.1:2016 Low-voltage switchgear and controlgear assemblies General rules</li> <li>AS/NZS 63439.3:2016 Low-voltage switchgear and controlgear assemblies Distribution boards intended to be operated by ordinary persons</li> <li>AS 60529 Degrees of protection provided by enclosures</li> </ul>                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Powdercoat steel</li> <li>Lockable doors</li> <li>Reinforced concrete footing</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Powdercoated Stromboli/light grey with section of X15 orange as agreed by IFS Asset engineer and in accordance with the electrical guidelines</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Install services inside building where possible</li> <li>If switchboards and services are required to be installed outside, locate in discreet location with the smallest cabinet possible</li> <li>Ensure cabinet is waterproof (IP56 minimum) without need for a hat or similar roofing</li> <li>Use neutral colours for cabinet</li> <li>200mm high max concrete plinth, cabinet footprint + 50mm wide</li> <li>General Main Label &amp; Additional Labelling of all functional units and outgoing submain cable</li> <li>Refer to University of Newcastle electrical standards.</li> <li>Sufficient mechanical protection against vehicles need to be in place</li> </ul> |
| <b>Maintenance</b>  | Clean air filters or vents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Supplier</b>     | Contractor to supply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>X 15 Orange must be used to indicate voltage within the equipment as per UON induction</li> <li>The amount of orange required can be discuss reviewed and approved but the IFS Electrical engineer prior to install Cabinet must include label/signage</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |



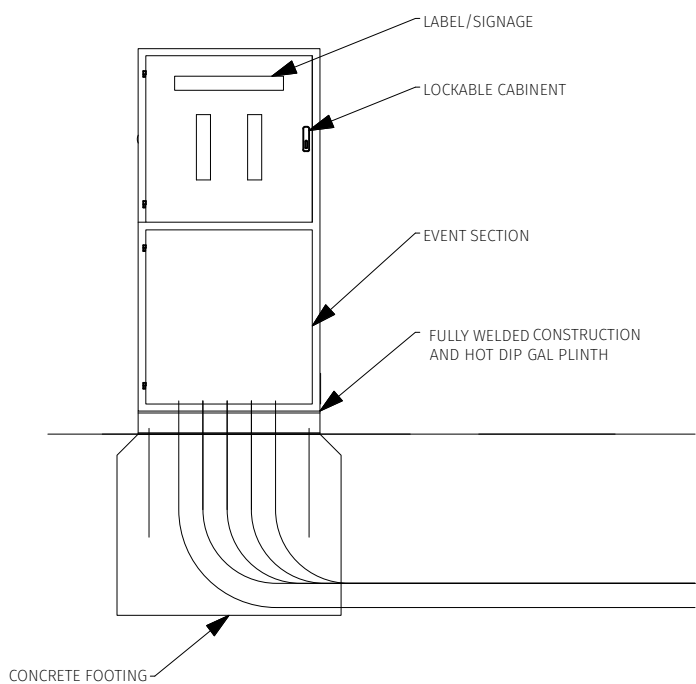
# External Switchboards Cabinets

## E-05

### Technical Details



#### 1. Distribution Switchboards with Comms/CCTV Sections Section 1:25



#### 2. Distribution Switchboards without Comms/CCTV Sections Section 1:25

# Cabinets

## E-06

### Specifications

|                     |                                                                                                                                                                                          |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Service Cabinet                                                                                                                                                                          |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS 60529 Degrees of protection provided by enclosures</li> </ul>                                                                                  |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Powdercoat steel</li> <li>Lockable doors</li> </ul>                                                                                               |
| <b>Finish</b>       | Stromboli, dark grey                                                                                                                                                                     |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Ensure cabinet is waterproof (IP56 minimum) - sealed all round</li> <li>Only cabinets on poles to be Multipods® at 3.5m height minimum</li> </ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Hand and brush clean as needed</li> </ul>                                                                                                         |
| <b>Supplier</b>     | To be nominated based on specifications                                                                                                                                                  |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Position cabinets in concealed location to minimise visual impact (garden etc.)</li> </ul>                                                        |
| <b>Location</b>     | -                                                                                                                                                                                        |



# Laptop & USB Charge Points

## E-07

|                     |                                                                                                                                                  |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Element</b>      | Legrand Soliroc outdoor power socket type 77894                                                                                                  |
| <b>Standards</b>    | AS/NZS 3112 Approval and test specification - Plugs and socket-outlets                                                                           |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>• Metal alloy housing</li> <li>• Arteor Socket outlet 240v</li> <li>• Arteor USB female socket</li> </ul> |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>• Metal alloy finishing plate and cover</li> </ul>                                                        |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>• As per manufacturer's instruction</li> </ul>                                                            |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>• Brush clean as needed</li> </ul>                                                                        |
| <b>Supplier</b>     | HPM Legrand - Australia<br>www.legrand.com.au                                                                                                    |
| <b>Comments</b>     |                                                                                                                                                  |
| <b>Location</b>     | <ul style="list-style-type: none"> <li>• Social, collaborative and seating areas</li> </ul>                                                      |



# Wireless Charge Points

E-08

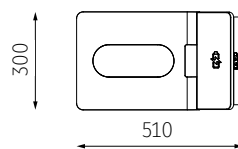
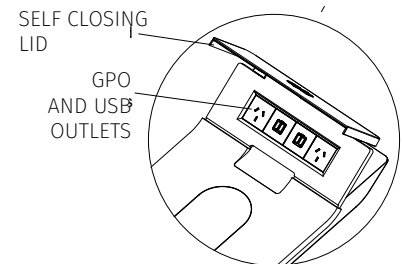
## Specifications

|                     |                                                                                                                                                                                                                                                                                                                          |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Street Furniture Australia PowerMe Table                                                                                                                                                                                                                                                                                 |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS/NZS 3100:2017 Approval and test specification - General requirements for electrical equipment</li> </ul>                                                                                                                                                                       |
| <b>Materials</b>    | -                                                                                                                                                                                                                                                                                                                        |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Textura 'Monument' Frame (GL329A)</li> <li>Textura 'Woodland Grey' Top (Textura GL333A)</li> </ul>                                                                                                                                                                                |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Surface or subsurface fixed</li> </ul>                                                                                                                                                                                                                                            |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Clean as necessary</li> </ul>                                                                                                                                                                                                                                                     |
| <b>Supplier</b>     | Street Furniture Australia or approved equivalent<br>streetfurniture.com                                                                                                                                                                                                                                                 |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Raised power outlets only installed in covered areas</li> <li>Power outlets can include general power outlets or female USB sockets in tailored arrangement</li> <li>Ability to be integrated into other Street Furniture Australia furniture or as a standalone unit.</li> </ul> |
| <b>Location</b>     | <ul style="list-style-type: none"> <li>Social, collaborative and seating areas</li> </ul>                                                                                                                                                                                                                                |



**E-08**

Diagram of a rectangular plate with a central hole. The plate has a width of 520 and a height of 300. The hole is a rounded rectangle with a width of 200 and a height of 100.



### Front view

**Side view**  
Surface fixed  
Raised with power outlets

50

EXISTING SEAT

WIRELESS CHARGING PADS

TABLETOP

BLUE LED AMBIENT LIGHTING

Frame

BLUE LED SYMBOL

Flat  
Recommended for outdoors

Raised with power outlets  
Covered places only

NOTES

- Not to scale



# F

**Furniture**

## Design Strategy

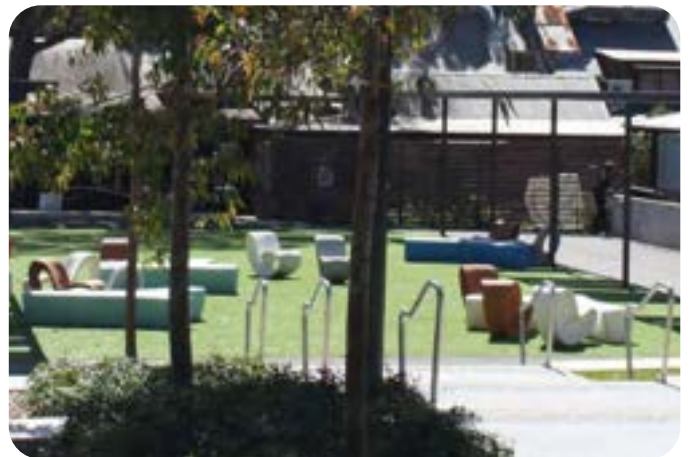
Proprietary products have been nominated to ensure ease of procurement, maintenance, and installation. The overall objectives of this palette are to evoke a unified look and feel throughout the Campus in order to create a cohesive identity.

## Design Considerations

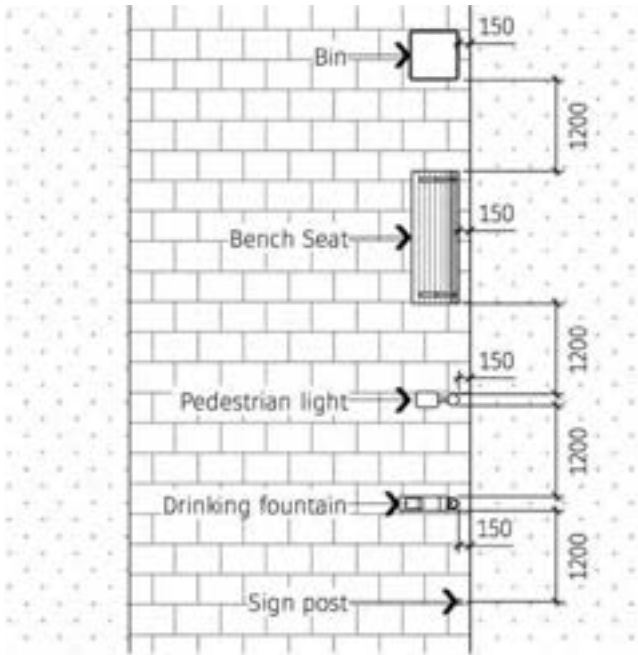
- Furniture and seating are located to take advantage of outlook and available shade at different times of day, and both benefitting from and to provide passive surveillance
- Equitable seating (allowing use by children, wheelchair users etc. alongside standard furniture), some with seat backs and arm rests, is provided across the Campus to provide frequent resting places
- Ensure adequate circulation space is provided around furniture elements to allow equitable access
- Resilience to wear and tear due to environmental conditions, potential relocation, and vandalism
- Adopt best practices of urban sustainability through recycled materials and low embodied energy costs
- Bespoke furniture elements limited to special places

## Principles

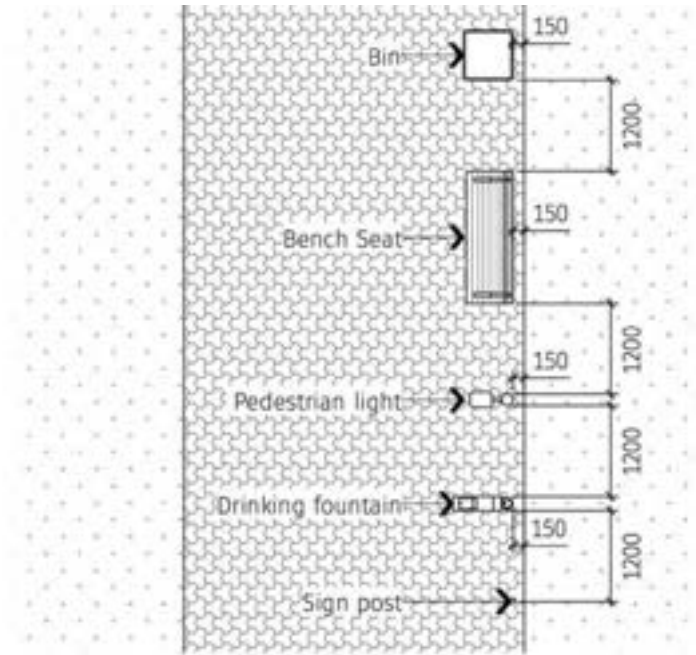
- Promotes a recognisable character for the campus
- Avoid visual clutter
- Be accessible to all campus users including those with disabilities
- Be comfortable and appropriately located.



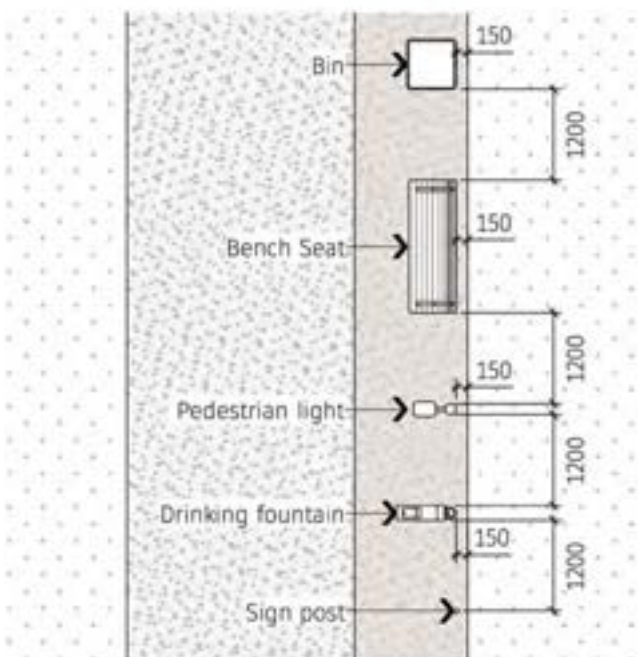
## Furniture - General arrangement along paths



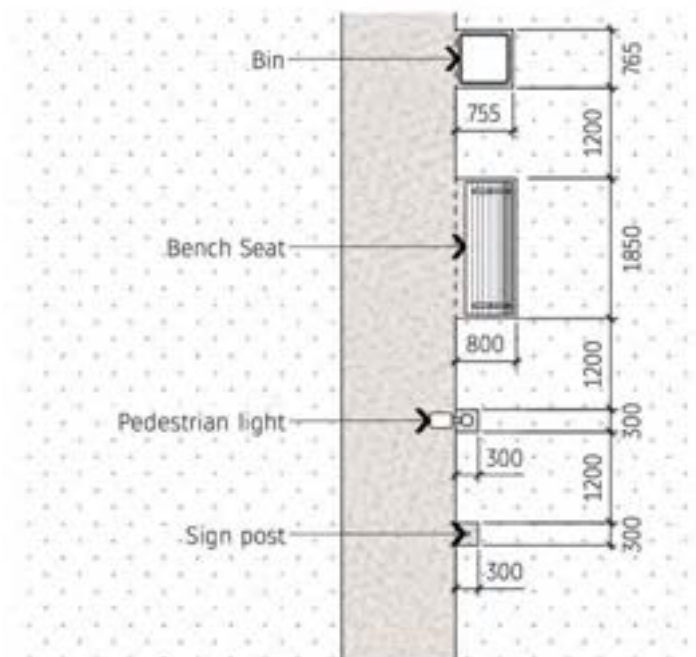
**A. Promenade**



**B. Civic Area**

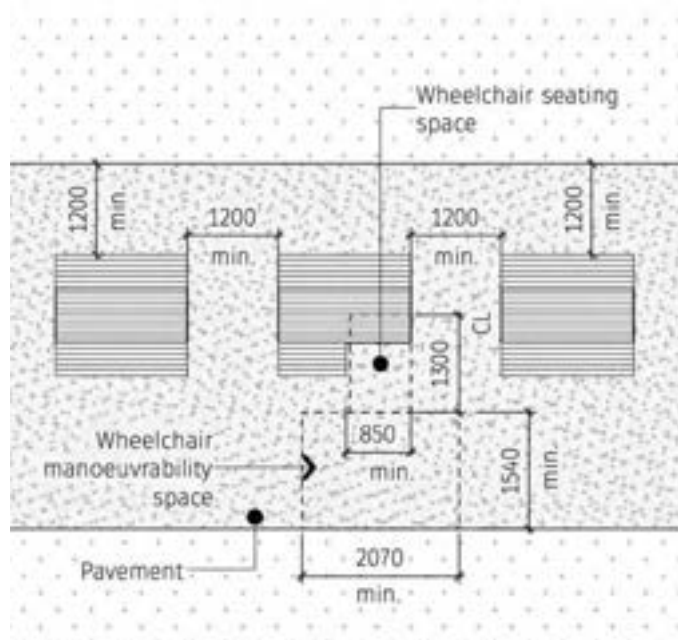


**C. Primary Path**

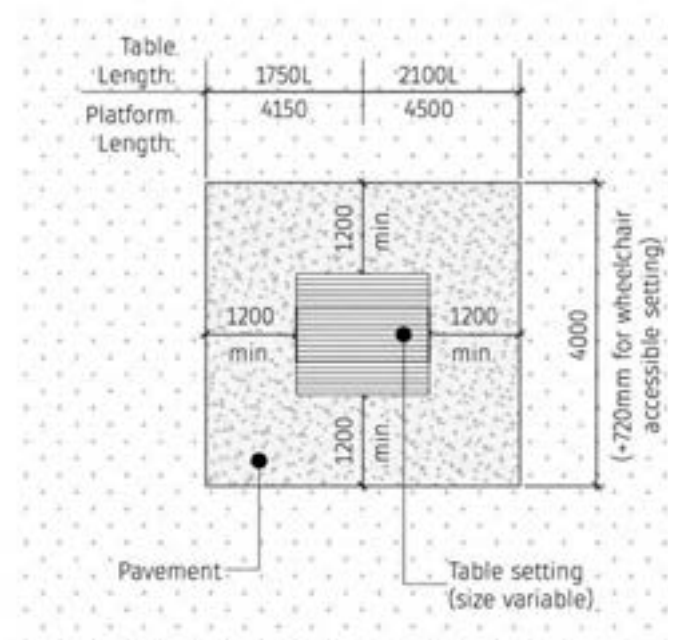


**D. Secondary Path**

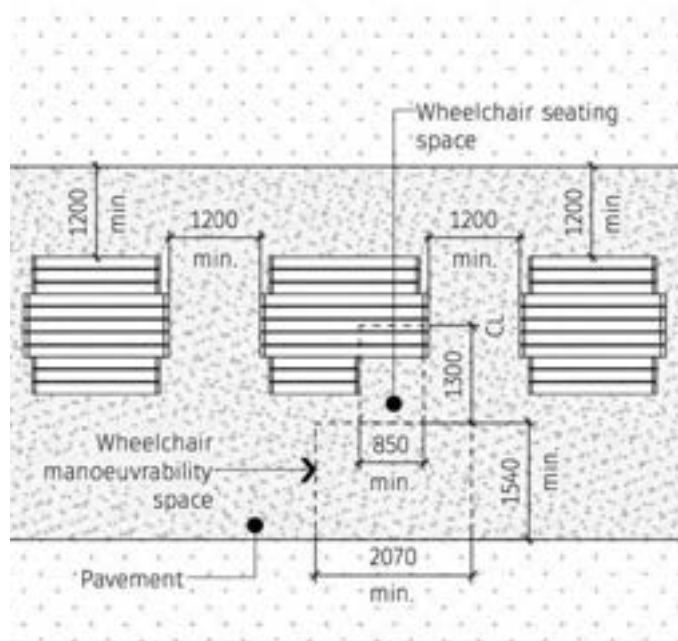
## Table Setting Layouts



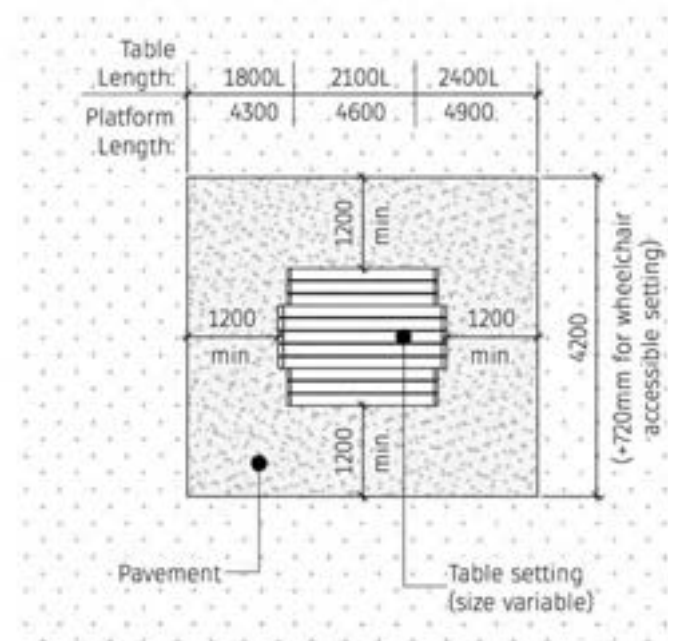
**A. Table setting (Type A) General Layout**



**B. Table setting (Type A) Platform Layout**



**C. Table setting (Type B) General Layout**



**D. Table setting (Type B) Platform Layout**



# Table Setting Type A

F-01

## Specifications

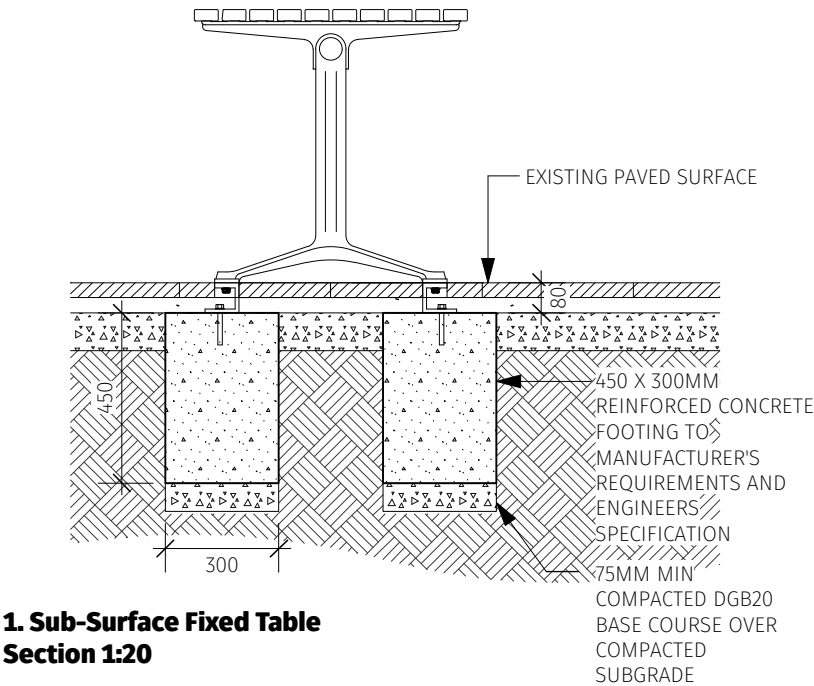
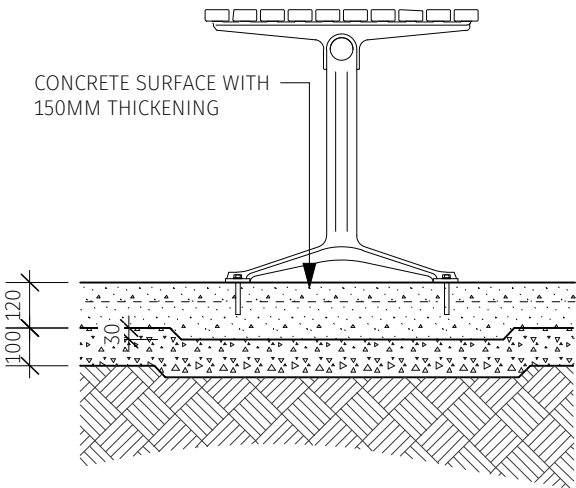
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Mall Table                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS 1428.1-2009 Design for access and mobility-General requirements for access - New building work</li> <li>AS 1428.2-1992 (R2015) Design for access and mobility - Enhanced and additional requirements - Buildings and facilities</li> </ul>                                                                                                                                                                    |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Cast aluminium legs and frame, aluminium battens or recycled plastic composite battens</li> </ul>                                                                                                                                                                                                                                                                                                                |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Textura Dark Bronze / Textura Monument / Eucalyptus Green / Bondi Blue panels and end caps</li> <li>Palladium silver legs and frame</li> </ul> <p>Table Options</p> <ul style="list-style-type: none"> <li>Mall Table</li> <li>Mall Table DDA CMM6-DDA 1750mm</li> </ul> <p>Seat Options</p> <ul style="list-style-type: none"> <li>Mall DDA Seat (CMM7) (no armrest)</li> <li>Mall Slim Bench (CMM8)</li> </ul> |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Install as per manufacturers specification</li> <li>Surface or subsurface mounting</li> <li>Surface mounted seats shall be installed on surface with less than 2% cross-fall</li> </ul>                                                                                                                                                                                                                          |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Pressure clean and remove graffiti as needed</li> </ul>                                                                                                                                                                                                                                                                                                                                                          |
| <b>Supplier</b>     | Street Furniture Australia or approved equivalent<br>streetfurniture.com                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>At least 10% of seating to have armrests within an area to provide accessible option</li> <li>Bench seat can be shortened and frame can be modified to meet accessibility standards</li> </ul>                                                                                                                                                                                                                   |
| <b>Location</b>     | <ul style="list-style-type: none"> <li>To be used in general social, collaborative and outdoor dining and open spaces</li> <li>Primary purpose is for eating, but can be used as an area of rest/study</li> <li>Location provides ample shade in summer (note heat loading on aluminium slats) and partial shade in winter.</li> </ul>                                                                                                                  |



Table Setting Type A

F-01

Technical Details



- NOTES
- For table lay out refer to chapter principles
  - For seat details refer F-04

# Table Setting Type B

F-02

## Specifications

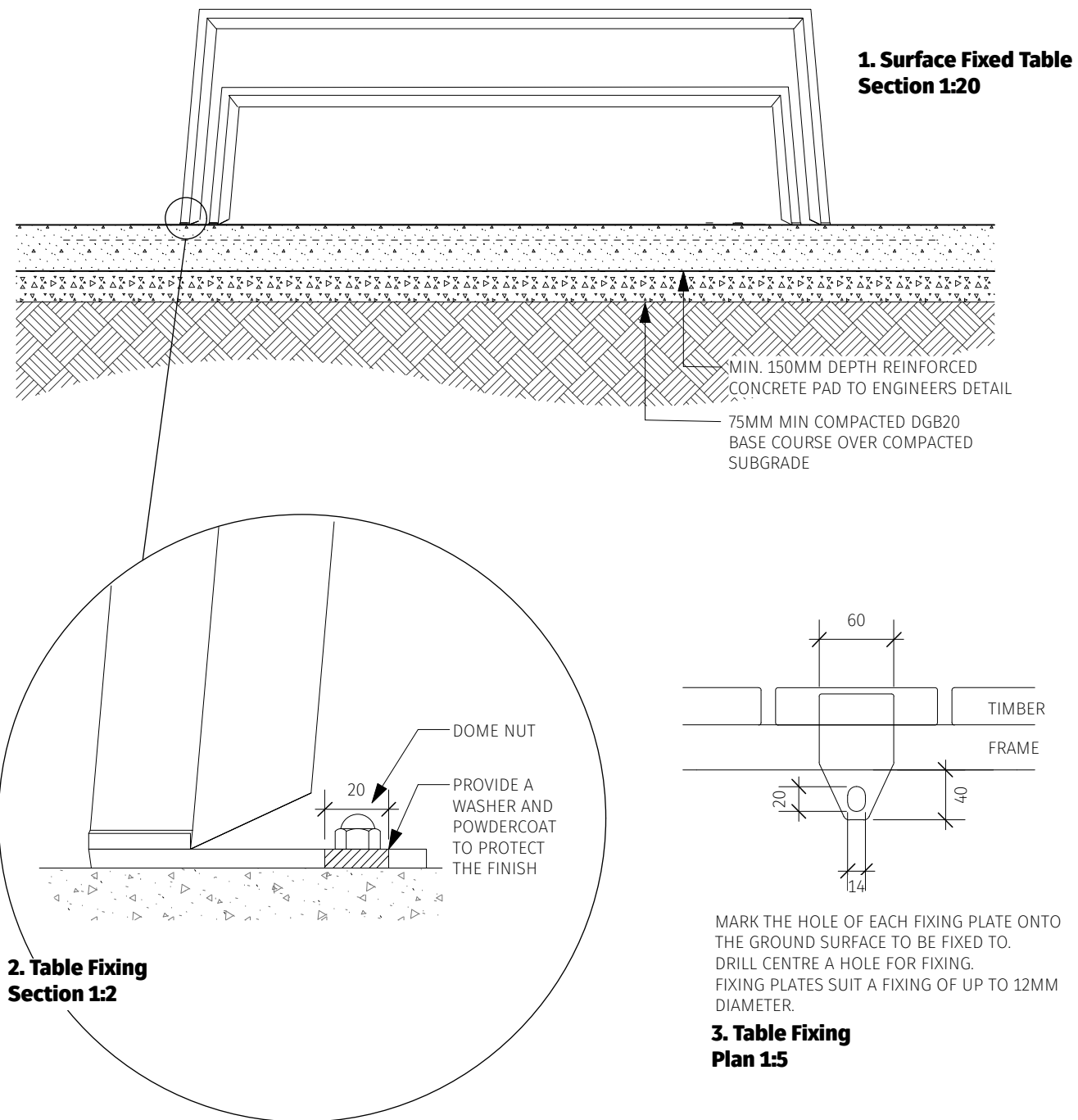
|                     |                                                                                                                                                                                                                                                                                                            |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Kink Table and Benches                                                                                                                                                                                                                                                                                     |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS 1428.1-2009 Design for access and mobility-General requirements for access - New building work</li> <li>AS 1428.2-1992 (R2015) Design for access and mobility - Enhanced and additional requirements - Buildings and facilities</li> </ul>                       |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Zinc-plated steel frame</li> <li>Spotted Gum timber slats</li> </ul>                                                                                                                                                                                                |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Frame to be powder coated finish - coated black</li> <li>Spotted Gum finished with 'Deck Doc' exterior oil</li> </ul>                                                                                                                                               |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Install to manufacturers recommendations</li> <li>Surface mounted options only</li> <li>Surface mounted seats shall be installed on flat concrete surfaces with a slope less than 2%</li> <li>Bench without kink is available</li> <li>Concealed fixings</li> </ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>For tannin guidance, refer to the Care &amp; Maintenance page on Tait's website</li> <li>Five year structural warranty</li> </ul>                                                                                                                                   |
| <b>Supplier</b>     | Tait or approved equivalent<br>madebytait.com.au                                                                                                                                                                                                                                                           |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Highly customisable</li> <li>At least 10% of table and seating be an accessible option. Consider wheelchair circulation space</li> </ul>                                                                                                                            |
| <b>Location</b>     | <ul style="list-style-type: none"> <li>To be used in key social, collaborative and outdoor dining hubs</li> </ul>                                                                                                                                                                                          |



# Table Setting Type B

F-02

## Technical Details



# Bench Seat

F-03

## Specifications

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Mall Seat                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS 1428.1-2009 Design for access and mobility-General requirements for access - New building work</li> <li>AS 1428.2-1992 (R2015) Design for access and mobility - Enhanced and additional requirements - Buildings and facilities</li> </ul>                                                                                                                                     |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Cast aluminium legs and frame, aluminium battens or recycled plastic composite battens</li> </ul>                                                                                                                                                                                                                                                                                 |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Textura Dark Bronze / Textura Monument / Eucalyptus Green / Bondi Blue panels and end caps</li> <li>Palladium silver legs and frame</li> <li>Splayed Legs</li> </ul>                                                                                                                                                                                                              |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Install as per manufacturers specification</li> <li>Surface or subsurface mounting - set level</li> <li>Surface mounted seats shall be installed on surface with less than 2% cross-fall</li> </ul>                                                                                                                                                                               |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Pressure clean and remove graffiti as needed</li> </ul>                                                                                                                                                                                                                                                                                                                           |
| <b>Supplier</b>     | Street Furniture Australia or approved equivalent<br>streetfurniture.com                                                                                                                                                                                                                                                                                                                                                 |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>At least 10% of seating to have armrests within an area to provide accessible option.</li> <li>Armrest options also discourages use by skateboarders</li> <li>Best used with multiple benches in linear rows or groups</li> <li>Wall mounted option available</li> <li>PowerMe Table offers charging and optional public WiFi 4G available to integrate with Mall seat</li> </ul> |
| <b>Location</b>     | <ul style="list-style-type: none"> <li>General social and outdoor spaces</li> <li>Bus stops</li> <li>Adjacent main and secondary pathway. Provide seating or rest point at 75m intervals.</li> <li>Ensure seats are clear of path of travel</li> <li>Seats to face pedestrian thoroughfare or towards view</li> </ul>                                                                                                    |





# Bench

## F-04

### Specifications

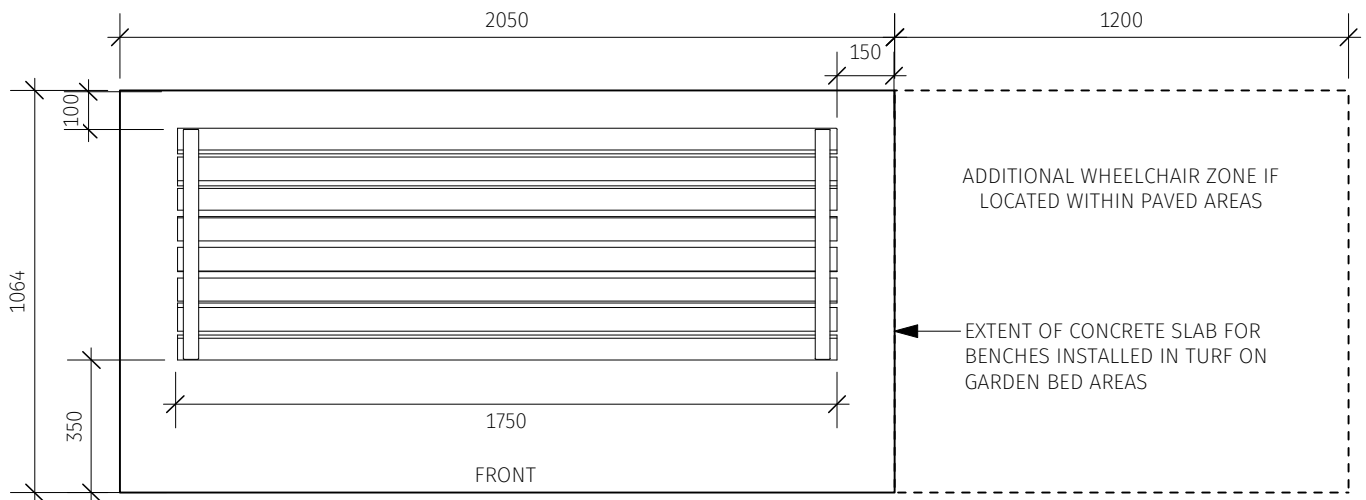
|                     |                                                                                                                                                                                                                                                                                                     |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Mall Bench - curved bench also available                                                                                                                                                                                                                                                            |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS 1428.1-2009 Design for access and mobility-General requirements for access - New building work</li> <li>AS 1428.2-1992 (R2015) Design for access and mobility - Enhanced and additional requirements - Buildings and facilities</li> </ul>                |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Cast aluminium legs and frame, aluminium battens or recycled plastic composite battens</li> <li>Available with or without arms</li> </ul>                                                                                                                    |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Textura Dark Bronze / Textura Monument / Eucalyptus Green / Bondi Blue panels and end caps</li> <li>Palladium silver legs and frame</li> <li>Splayed Legs</li> </ul>                                                                                         |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Install as per manufacturers specification</li> <li>Surface or subsurface mounting options available - subsurface mounting preferred</li> <li>Set level</li> <li>Surface mounted seats shall be installed on surface with less than 2% cross-fall</li> </ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Pressure clean and remove graffiti as needed</li> </ul>                                                                                                                                                                                                      |
| <b>Supplier</b>     | Street Furniture Australia<br>streetfurniture.com                                                                                                                                                                                                                                                   |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>'Mall Slim Bench' used in table setting without armrests</li> <li>Armrests can be added to provide accessibility option</li> </ul>                                                                                                                           |
| <b>Location</b>     | <ul style="list-style-type: none"> <li>Seats to be set back from path</li> </ul>                                                                                                                                                                                                                    |



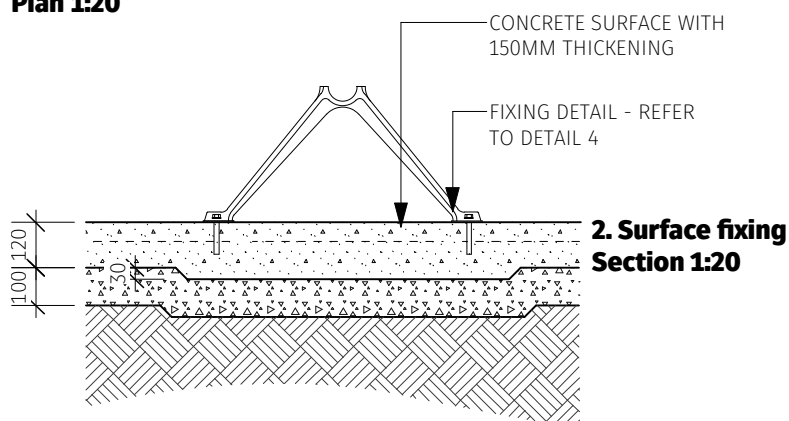
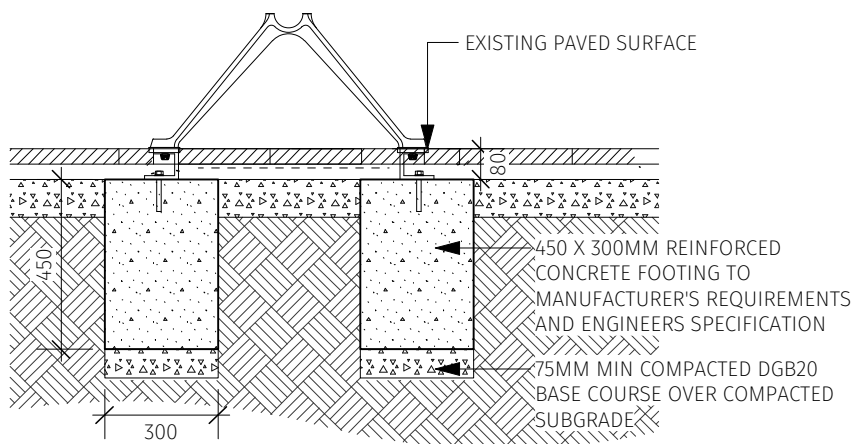
# Bench

# F-04

## Technical Details



### 1. Typical Bench on Slab Plan 1:20



### 3. Sub-Surface fixing Section 1:20

# Platform Bench

F-05

## Specifications

|                     |                                                                                                                                                                                                                                                                                      |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | 'Mall' Platform                                                                                                                                                                                                                                                                      |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS 1428.1-2009 Design for access and mobility-General requirements for access - New building work</li> <li>AS 1428.2-1992 (R2015) Design for access and mobility - Enhanced and additional requirements - Buildings and facilities</li> </ul> |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Cast aluminium legs and frame, aluminium battens or recycled plastic composite battens</li> </ul>                                                                                                                                             |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Textura Dark Bronze / Textura Monument / Eucalyptus Green / Bondi Blue panels and end caps</li> <li>Palladium silver legs and frame</li> <li>Pole legs</li> </ul>                                                                             |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Install as per manufacturers specification</li> <li>Surface or subsurface mounting options available - subsurface mounting preferred</li> <li>Surface mounted platforms shall be installed on surface with less than 2% cross-fall</li> </ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Pressure clean and remove graffiti as needed</li> </ul>                                                                                                                                                                                       |
| <b>Supplier</b>     | Street Furniture Australia<br>streetfurniture.com                                                                                                                                                                                                                                    |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Mall Platform is a seating and table solution in one element</li> </ul>                                                                                                                                                                       |
| <b>Location</b>     | <ul style="list-style-type: none"> <li>Ideal for picnic areas and social spaces</li> </ul>                                                                                                                                                                                           |

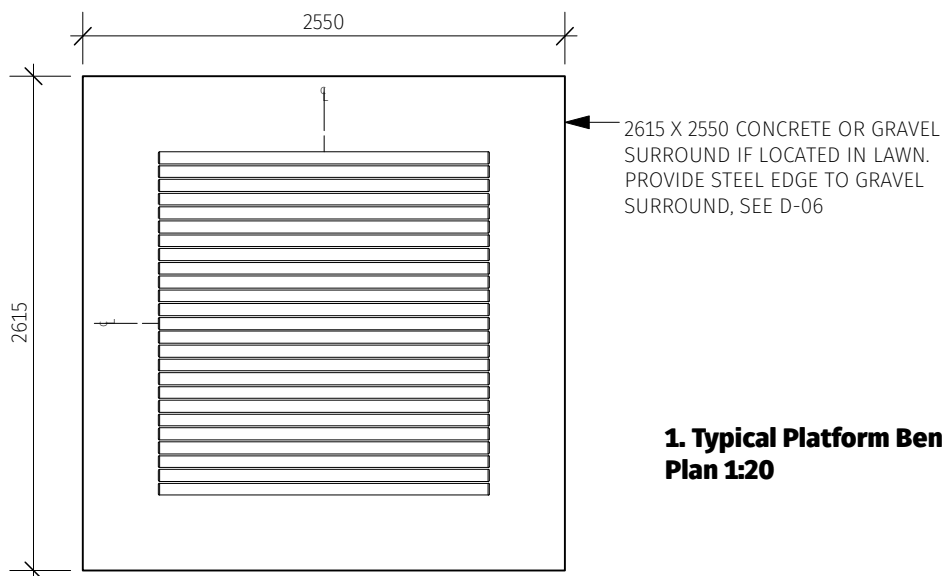
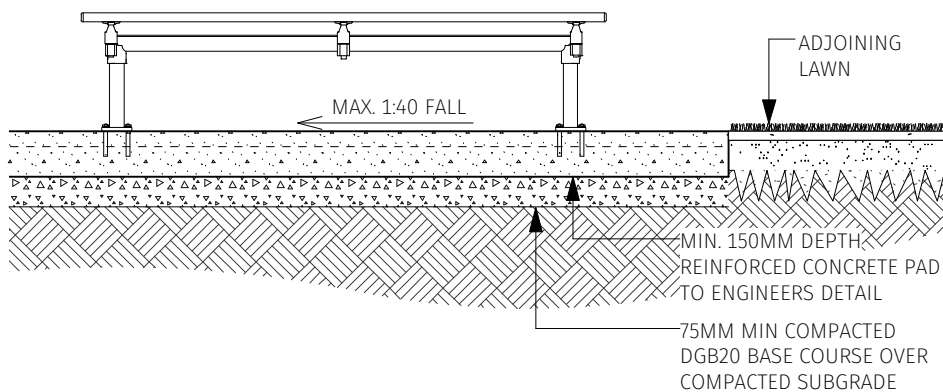
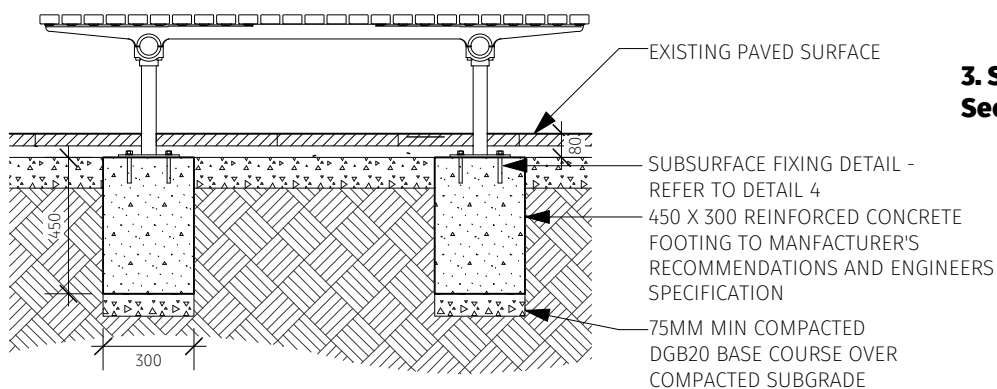


**Subsurface fixed platform (legs with baseplates)**

# Platform Bench

F-05

## Technical Details



# Stools

F-06

## Specifications

|                     |                                                                                                                                                                  |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | 'Box' Low Stool With No Backrest and Box Bar Stool                                                                                                               |
| <b>Standards</b>    |                                                                                                                                                                  |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>• Slats - Spotted Gum</li> <li>• Frame - Fully welded 25mm square steel tube</li> <li>• Footrest - Spotted Gum</li> </ul> |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>• Frame Black or White powdercoated</li> </ul>                                                                            |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>• Freestanding or surface fixed</li> </ul>                                                                                |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>• Hand clean as necessary</li> <li>• Re-oil timber slats every 12 months</li> </ul>                                       |
| <b>Supplier</b>     | Botton & Gardiner or approved equivalent<br>bottongardiner.com.au                                                                                                |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>• Order low stools with no backrest to maximise usability and flexibility.</li> </ul>                                     |
| <b>Location</b>     | -                                                                                                                                                                |



BOX STOOL LOW

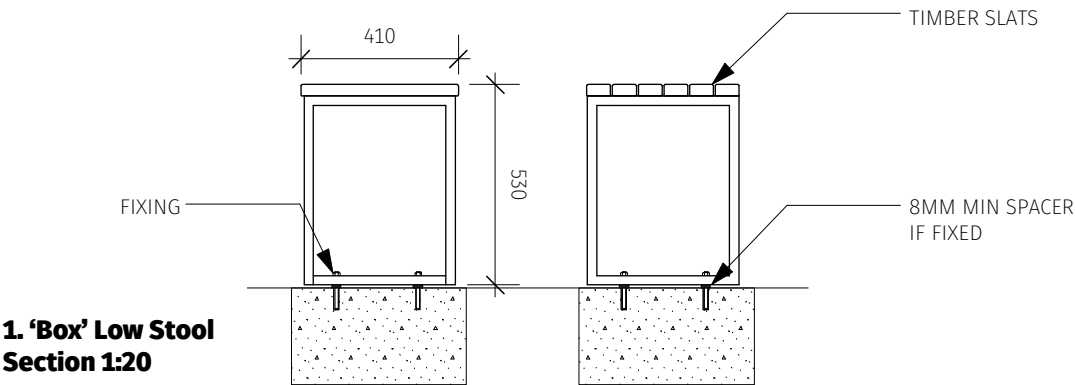
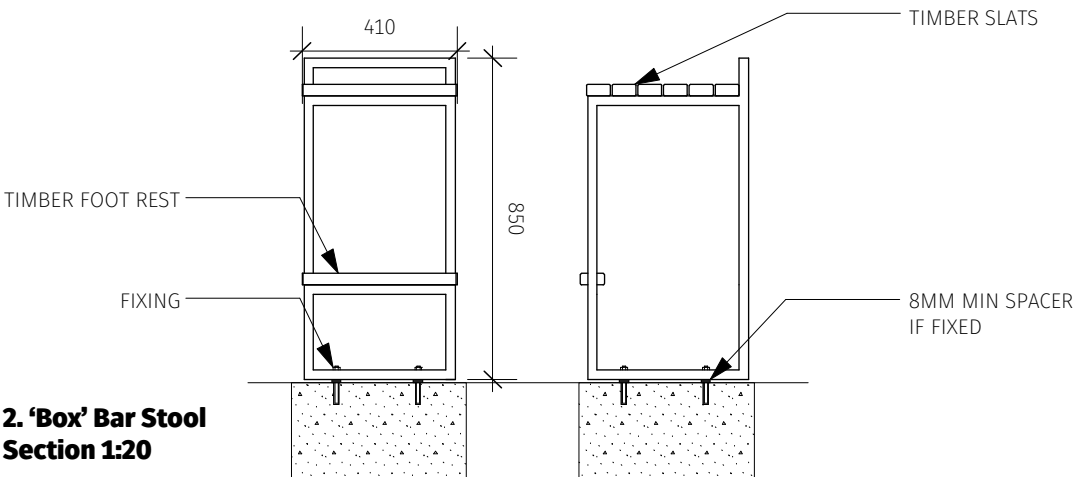
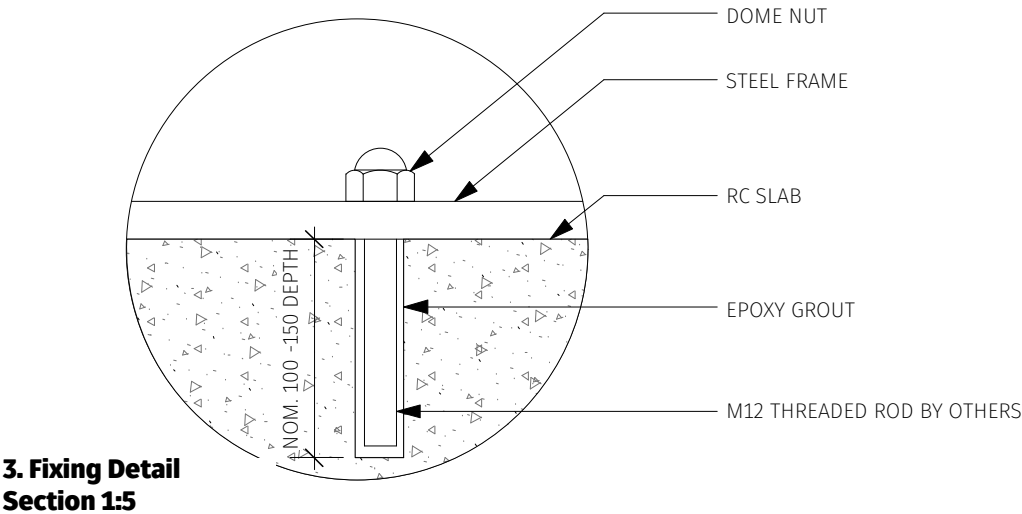


BOX STOOL HIGH

Stools

F-06

Technical Details



# Recycled Plastic Stools

F-07

## Specifications

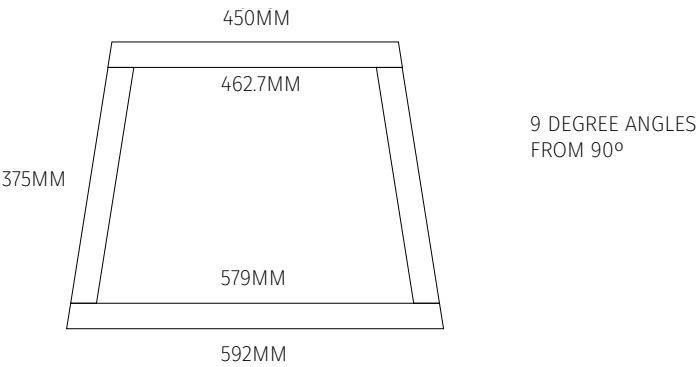
|                     |                                                                                                                                                                                                                                                                                      |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Stool Seat - 'Eco Pod'                                                                                                                                                                                                                                                               |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS 1428.1-2009 Design for access and mobility-General requirements for access - New building work</li> <li>AS 1428.2-1992 (R2015) Design for access and mobility - Enhanced and additional requirements - Buildings and facilities</li> </ul> |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Recycled plastic</li> </ul>                                                                                                                                                                                                                   |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Blue, grey or black</li> </ul>                                                                                                                                                                                                                |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Free standing or fixed</li> </ul>                                                                                                                                                                                                             |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Pressure clean and remove graffiti as needed</li> </ul>                                                                                                                                                                                       |
| <b>Supplier</b>     | Replas Australia or approved equivalent<br>replas.com.au                                                                                                                                                                                                                             |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Replas products are a part of the University's plastic recycling program</li> <li>Countersunk screws and chemical anchor</li> </ul>                                                                                                           |
| <b>Location</b>     | <ul style="list-style-type: none"> <li>To be used in social and outdoor dining hubs for flexible seating</li> </ul>                                                                                                                                                                  |



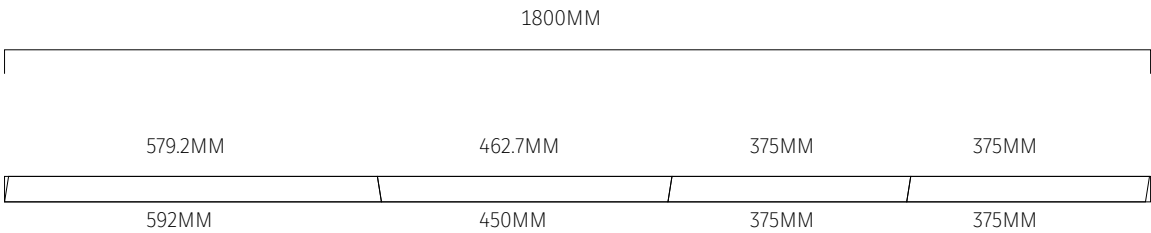
# Recycled Plastic Stools

## F-07

### Technical Details



#### 1. Side view



#### 2. Frame parts

# Bike Rack

F-08

## Specifications

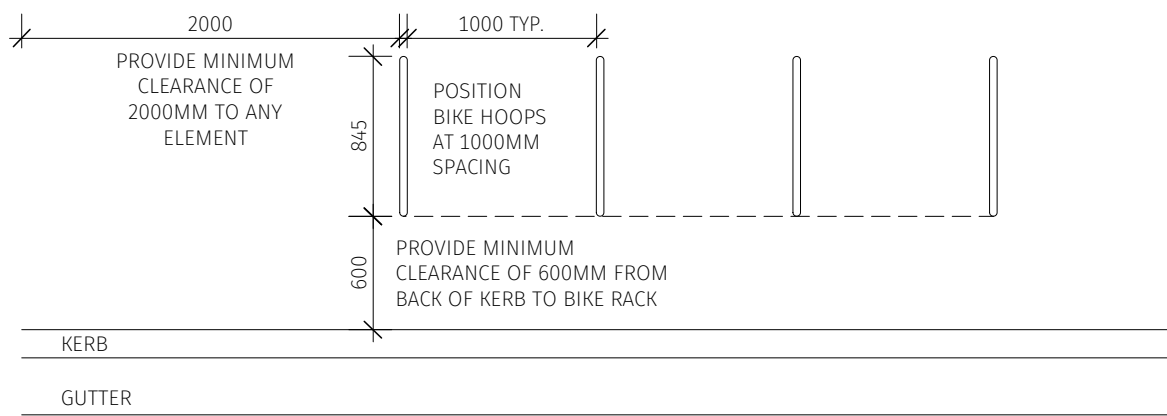
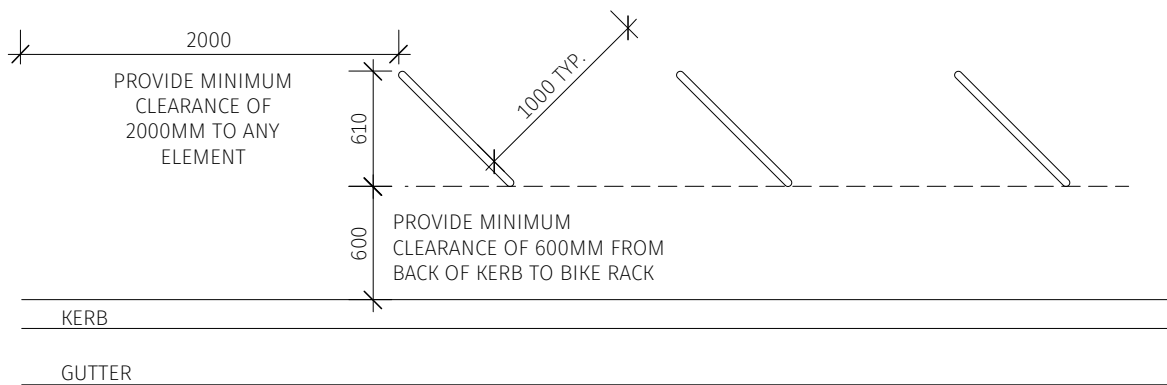
|                     |                                                                                                                                                                                                                                                                                                                                             |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Semi-circular bike ring                                                                                                                                                                                                                                                                                                                     |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS 2890.3:2015 Parking facilities Bicycle parking</li> <li>Austroads Research Report AP-R528-16 Bicycle Parking Facilities: Updating the Austroads Guide to Traffic Management</li> </ul>                                                                                                            |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Stainless 316 No.4 Finish (brushed)</li> </ul>                                                                                                                                                                                                                                                       |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Stainless Steel No.4 Finish 316 or Hot Dipped Galvanised Steel</li> </ul>                                                                                                                                                                                                                            |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Install to manufacturers specification</li> <li>All new installations to be sub-surface fixed where practical</li> </ul>                                                                                                                                                                             |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Pressure clean and remove graffiti as needed</li> </ul>                                                                                                                                                                                                                                              |
| <b>Supplier</b>     | Street Furniture Australia or approved equivalent<br><a href="https://streetfurniture.com">https://streetfurniture.com</a>                                                                                                                                                                                                                  |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Can be installed singularly or in groups.</li> <li>Where sub-surface installation (core-drilled or subsurface fixed) is not practical, then surface mounted is acceptable</li> <li>A minimum pedestrian thoroughfare must be maintained at all times of 1.5 metres from the building line</li> </ul> |
| <b>Location</b>     | <ul style="list-style-type: none"> <li>Adjacent high activity spaces. Ensure clear circulation space and path of travel.</li> <li>Careful consideration needed to locate to minimise the likelihood of theft.</li> <li>Evenly distributed around campus to encourage bike use for short trips</li> </ul>                                    |



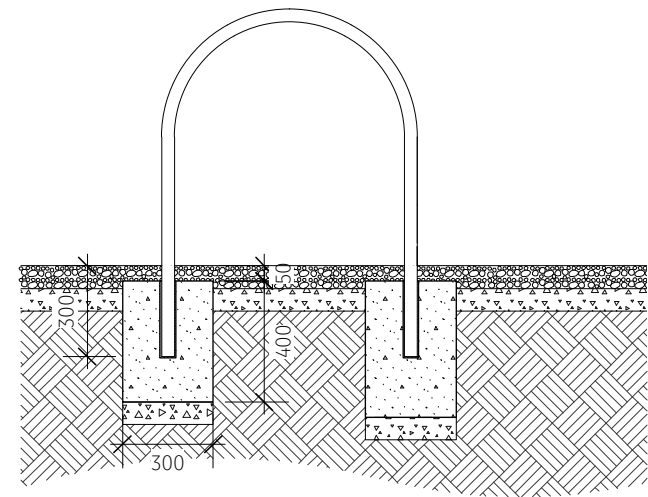
Bike Rack

F-08

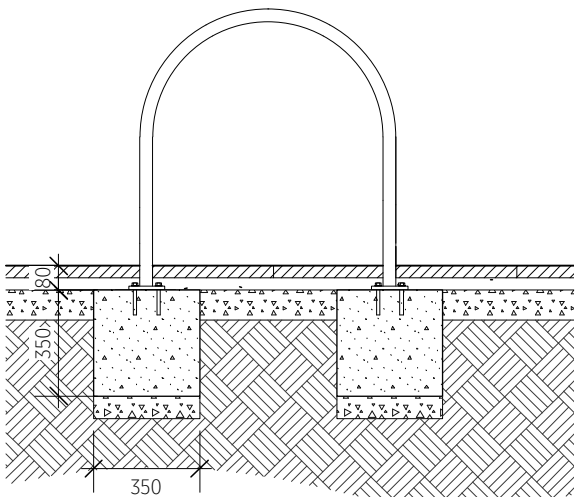
Technical Details



1. Typical Bike Rack Arrangement  
Plan 1:40



2. Bike Rack - Core Drill Fixing  
Plan 1:20



2. Bike Rack - Sub Surface Fixing  
Plan 1:20

# Bin Enclosures

F-09

## Specifications

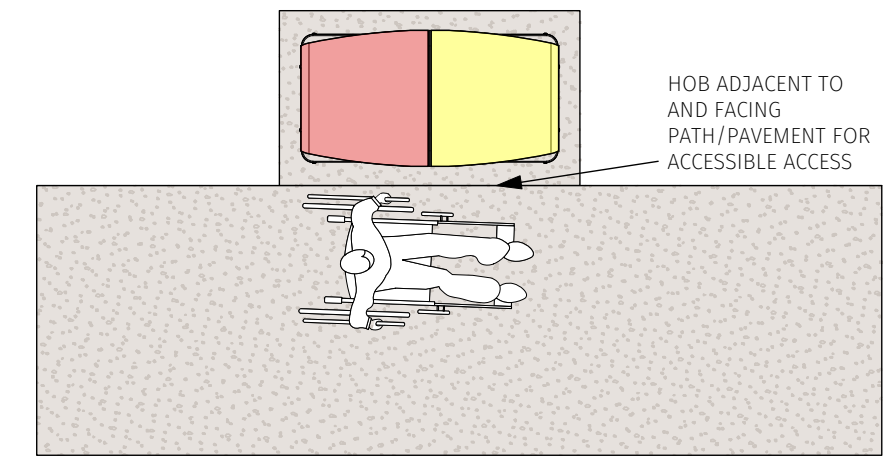
|                     |                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | 120L Atessa Heritage dual bin enclosure                                                                                                                                                                                                                                                                                                                                                         |
| <b>Standards</b>    | <ul style="list-style-type: none"><li>AS 1428.2 Design for access and mobility - Enhanced and additional requirements - Buildings and facilities</li></ul> University Specification: <ul style="list-style-type: none"><li>University Door Hardware and Locks Design Standard</li></ul>                                                                                                         |
| <b>Materials</b>    | <ul style="list-style-type: none"><li>Clear anodised extrusion slats for cabinet</li><li>Fabricated aluminium lid</li><li>316 stainless steel chute</li><li>H/duty vandal resistant slam latch lock with 8mm Tri key</li></ul>                                                                                                                                                                  |
| <b>Finish</b>       | <ul style="list-style-type: none"><li>Bin enclosure hoods - waste to be Flame Red, recycle to be Yellow Gold</li><li>Frame and side panels to be powder coated Woodland Grey</li></ul>                                                                                                                                                                                                          |
| <b>Installation</b> | <ul style="list-style-type: none"><li>Subsurface mounted</li><li>Ensure enclosure is installed on level footings to allow for door clearance</li><li>Install adjacent to footpaths</li><li>Check and ensure wheelchair circulation zone and cross fall</li><li>Stainless steel fixing to manufacturers specification</li><li>Signage to be provided</li><li>Delivered fully assembled</li></ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"><li>Pressure clean and remove graffiti as needed</li></ul>                                                                                                                                                                                                                                                                                                    |
| <b>Supplier</b>     | Grillex or approved equivalent<br>grillex.com.au                                                                                                                                                                                                                                                                                                                                                |
| <b>Comments</b>     | <ul style="list-style-type: none"><li>Locate near exits on main paths of travel</li><li>120L preferred to reduce visual impact</li><li>Use 240L in high uses areas</li><li>Where necessary include cigarette butt disposal units to prevent bushfire risk (additional specification of Grillex proprietary 'Ash Can' which can be bolted to bin.)</li></ul>                                     |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                               |



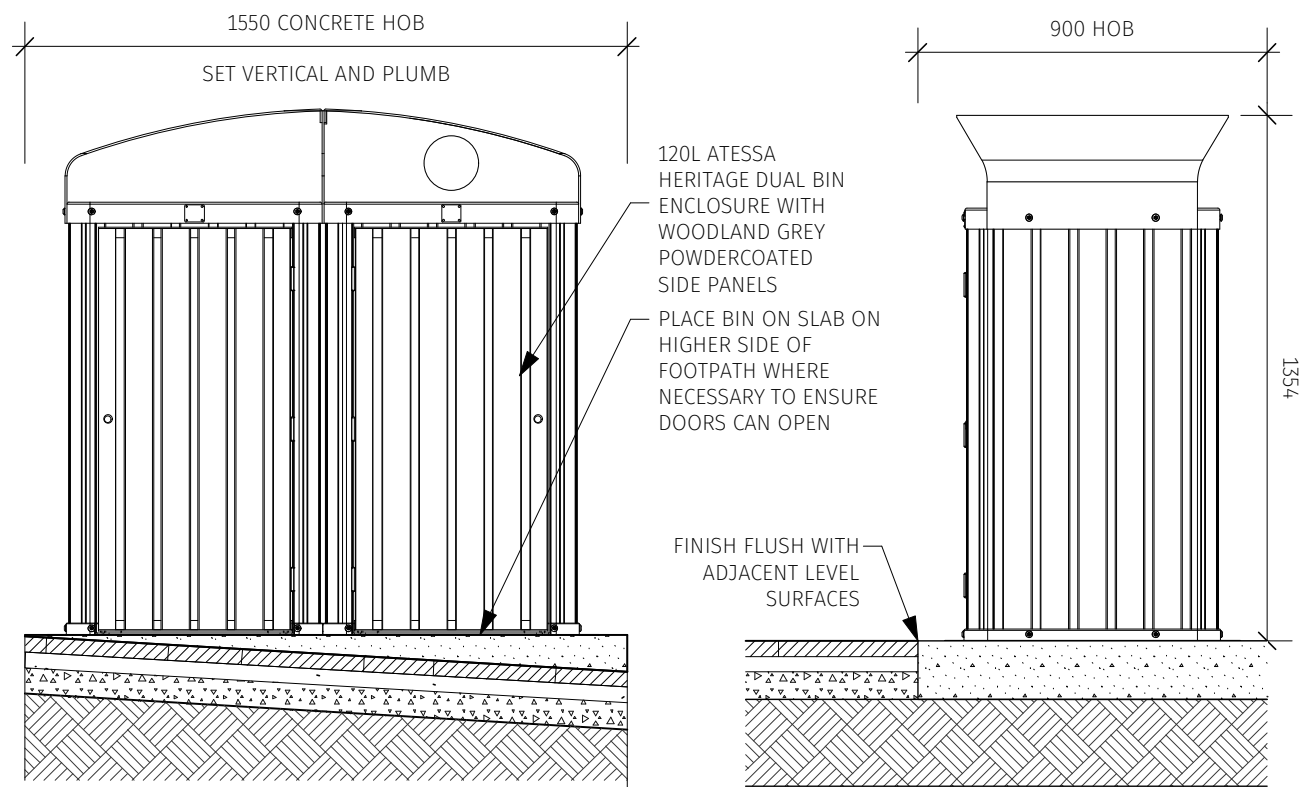
Bin Enclosures

F-09

Technical Details



1. Bin Enclosure Adjacent Footpath  
Plan 1:40



2. Bin Enclosure Adjacent Sloping Footpath  
Elevation 1:20

3. Bin Enclosure Adjacent Flat Footpath  
Section 1:20

- NOTES
- Place bin on slab on higher side of footpath where necessary to ensure doors can open
  - Where bin is located adjacent to existing paths, provide a spacer to set level and plumb

# Bollard Type A

F-10

## Specifications

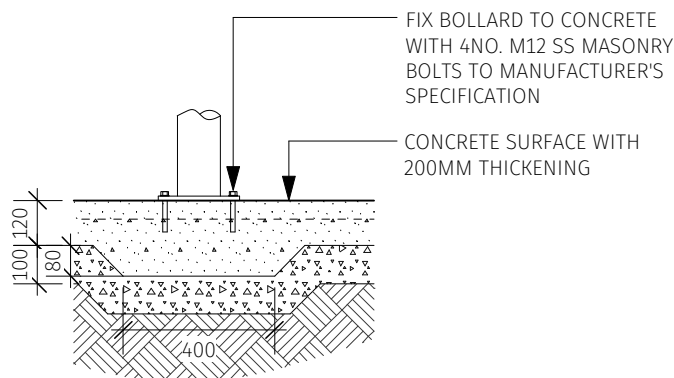
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Wide Bollard (B3F Head) with 100mm White reflective strip<br>Mounting: Subsurface fixed or removable in-ground                                                                                                                                                                                                                                                                                                                                                      |
| <b>Standards</b>    | <ul style="list-style-type: none"><li>AS/NZS 2890 Parking Facilities</li><li>University Specification:</li><li>University Door Hardware and Locks Design Standard</li></ul>                                                                                                                                                                                                                                                                                         |
| <b>Materials</b>    | <ul style="list-style-type: none"><li>Steel body</li><li>Aluminium head</li></ul>                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Finish</b>       | <ul style="list-style-type: none"><li>Body: Stainless 304 No.4 finish (brushed) or Powdercoat Night sky or Eucalypt Green (Street Furniture Australia Colours)</li><li>Head: Polished, 50mm wide with white or red reflective tape at 750mm</li></ul>                                                                                                                                                                                                               |
| <b>Installation</b> | <ul style="list-style-type: none"><li>Install to manufacturer's specification</li><li>Set vertical and plumb.</li><li>Subsurface fixing options preferred</li><li>Install at 1.5m centres</li><li>Careful consideration is required to ensure elements are visible where vehicles are turning or reversing.</li><li>Bollards to not impede accessible paths of travel.</li><li>Install removable option in roads, driveways or any other trafficable area</li></ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"><li>Clean as needed</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Supplier</b>     | Street Furniture Australia or approved equivalent<br>streetfurniture.com                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Comments</b>     | <ul style="list-style-type: none"><li>Available in fixed and removable versions</li></ul>                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Location</b>     | <ul style="list-style-type: none"><li>High quality civic areas</li></ul>                                                                                                                                                                                                                                                                                                                                                                                            |



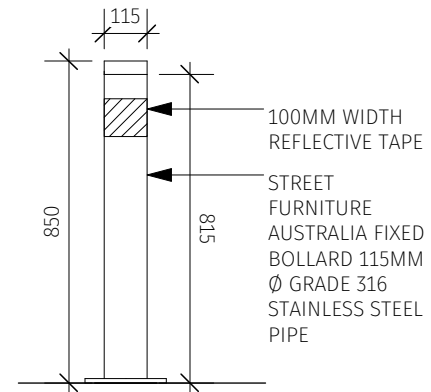
# Bollard Type A

F-10

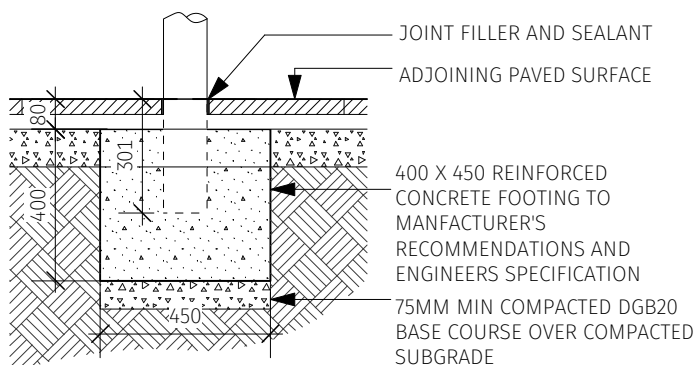
## Technical Details



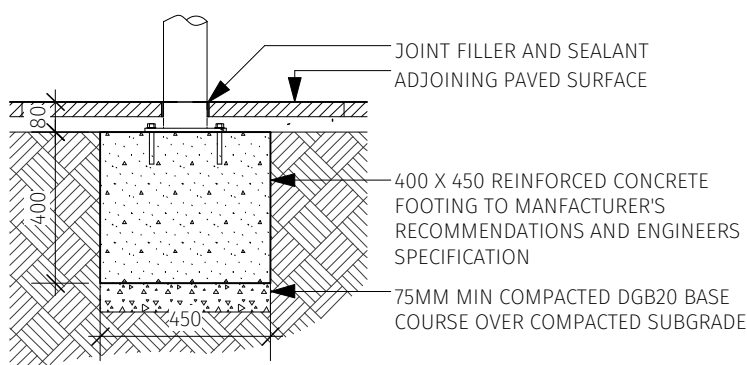
**1. Surface fixed**  
**Section 1:20**



**4. Bollard Type A & Reflective tape**  
**Section 1:20**



**2. Sub Surface Fixed - Core Drilled**  
**Section 1:20**



**3. Sub Surface fixed**  
**Section 1:20**

# Bollard Type B

F-11

## Specifications

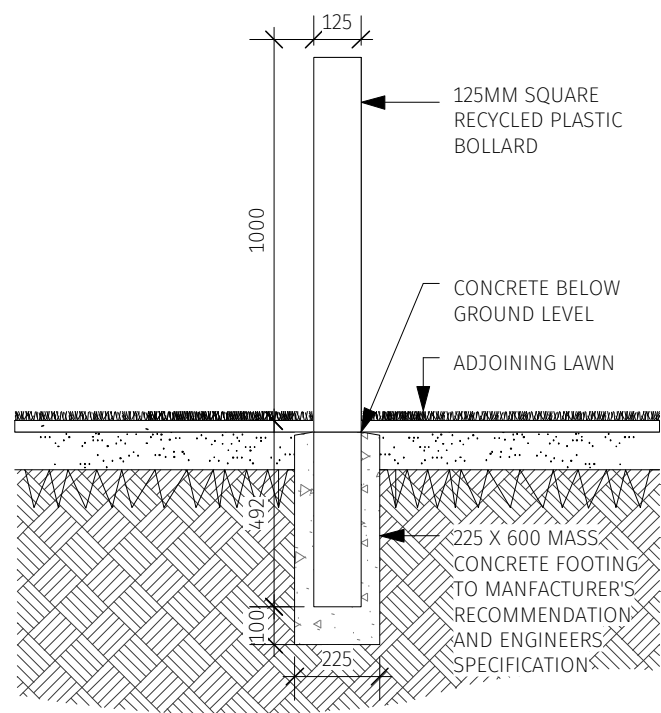
|                     |                                                                                                                                                                                                                                                                                                              |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Replas Bollard - BO2010                                                                                                                                                                                                                                                                                      |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS/NZS 2890 Parking Facilities</li> </ul> University Specification: <ul style="list-style-type: none"> <li>University Door Hardware and Locks Design Standard</li> </ul>                                                                                              |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Solid recycled composite plastic</li> </ul>                                                                                                                                                                                                                           |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Black</li> </ul>                                                                                                                                                                                                                                                      |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Set vertical and plumb in concrete footing</li> <li>Install at 1.5m centres</li> <li>Careful consideration is required to ensure elements are visible where vehicles are turning or reversing.</li> <li>Elements to not impede accessible paths of travel.</li> </ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Replace as needed</li> </ul>                                                                                                                                                                                                                                          |
| <b>Supplier</b>     | Replas Australia or approved equivalent<br>replas.com.au                                                                                                                                                                                                                                                     |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Metal caps available as modification</li> <li>Reflectors available from supplier</li> <li>Replas products are a part of the University's plastic recycling program.</li> </ul>                                                                                        |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                            |



Bollard Type B

F-11

Technical Details



1. Bollard Type B  
Section 1:10

# Bollard Type C

F-12

## Specifications

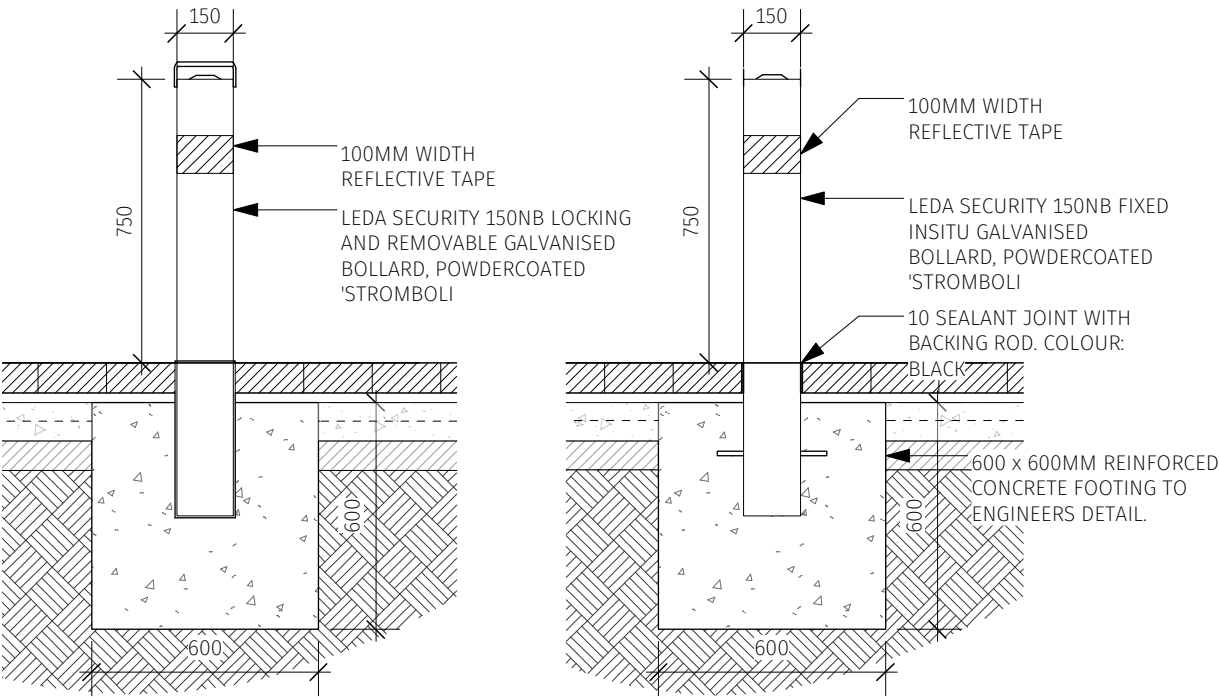
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Sentinel 150NB (Fixed In Situ or Locking and Removable)<br>White reflective tape (RTH50)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS/NZS 2890 Parking Facilities</li> <li>University Specification:</li> <li>University Door Hardware and Locks Design Standard</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>150NB (165.1) x 5.4mm HD galvanised structural pipe</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Electrostatically powder coated - colour Stromboli (RAL GK148A)</li> <li>50mm reflective strip (white)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Core drill into existing ground-based concrete slab of minimum 200mm thickness (slabs less than 200mm may require a new concrete footing)</li> <li>Install at 1.5m centres</li> <li>Where slab depth is insufficient or surface is bitumen, pavers or the like, bollards are installed using a sleeve fixed into a reinforced concrete footing</li> <li>Footing to manufacturers requirements in consultation with civil engineer</li> <li>Install removable option in roads, driveways or any other trafficable area</li> </ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Replace reflect tape as needed</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Supplier</b>     | Leda or approved equivalent<br>ledasecurity.com.au                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Can be secured into the sleeve using a padlock.</li> <li>Easily and quickly removable to allow vehicle access when required.</li> <li>Carry handle for added support and movability.</li> <li>Ensure storage sleeves are installed adjacent to bollard area (code SS1 for single sleeve; code SS2 for dual sleeve)</li> </ul>                                                                                                                                                                                                    |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



Bollard Type C

F-12

Technical Details



- NOTES
- Reinforced concrete strip footings are required in security applications

# Hostile Vehicle Barrier

F-13

## Specifications

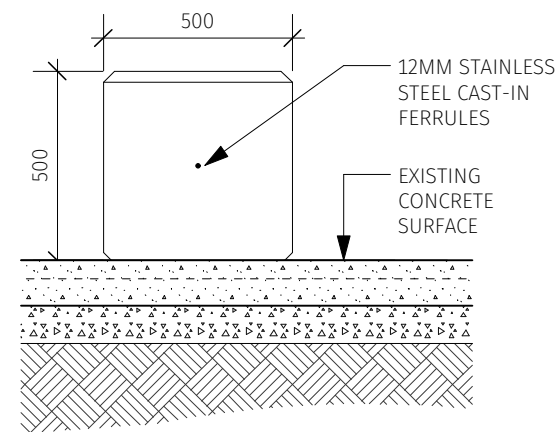
|                     |                                                                                                                                                                                                                                                                                    |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | 500x 500 x 500mm high 'Cube' Vehicle access control delineator                                                                                                                                                                                                                     |
| <b>Standards</b>    | Hostile Vehicle Guidelines for Crowded Places: A Guide For Owners, Operators and Designers (ANZCTC)                                                                                                                                                                                |
| <b>Materials</b>    | <ul style="list-style-type: none"><li>• 30MPa oxide concrete</li><li>• 80NB (88.9) x 5.0mm heavy duty galvanised pipe</li></ul>                                                                                                                                                    |
| <b>Finish</b>       | <ul style="list-style-type: none"><li>• Colour: Off-white,</li><li>• Lightly sand blasted</li></ul>                                                                                                                                                                                |
| <b>Installation</b> | <ul style="list-style-type: none"><li>• 12mm stainless steel cast-in ferrules for lifting</li><li>• Careful consideration is required to ensure elements are visible where vehicles are turning or reversing</li><li>• Elements to not impede accessible paths of travel</li></ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"><li>• Pressure clean and remove graffiti as needed</li></ul>                                                                                                                                                                                     |
| <b>Supplier</b>     | Leda Security or approved equivalent<br>ledasecurity.com.au                                                                                                                                                                                                                        |
| <b>Comments</b>     | <ul style="list-style-type: none"><li>• The purpose of the barrier is restrict vehicle movement to discourage the use of vehicles in a hostile vehicle attack.</li></ul>                                                                                                           |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                  |



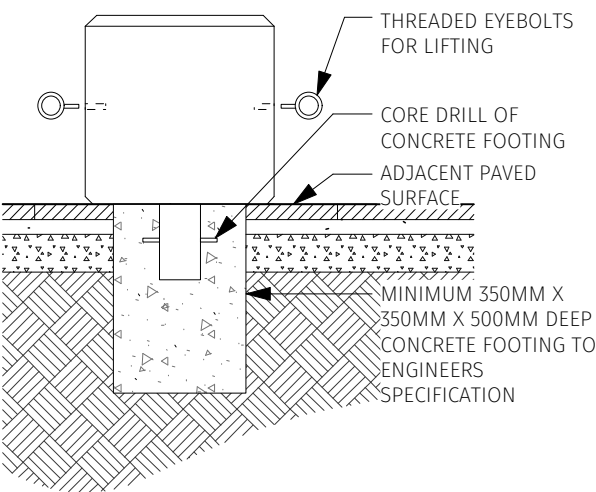
Hostile Vehicle Barrier

F-13

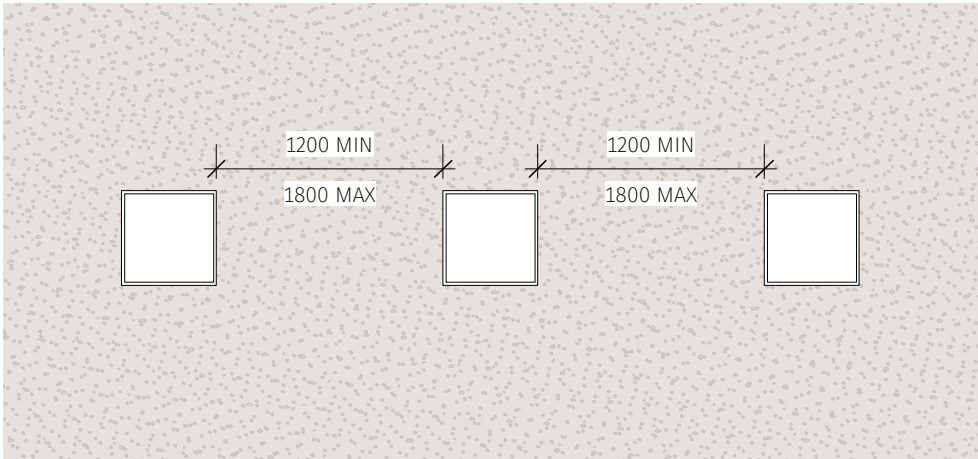
Technical Details



1. HVB  
Section 1:20



2. HVB - Core Drill Fixed  
Section 1:20



3. HVB Spacing  
Plan 1:40

# Fountain & Bottle Refill Station Type A F-14

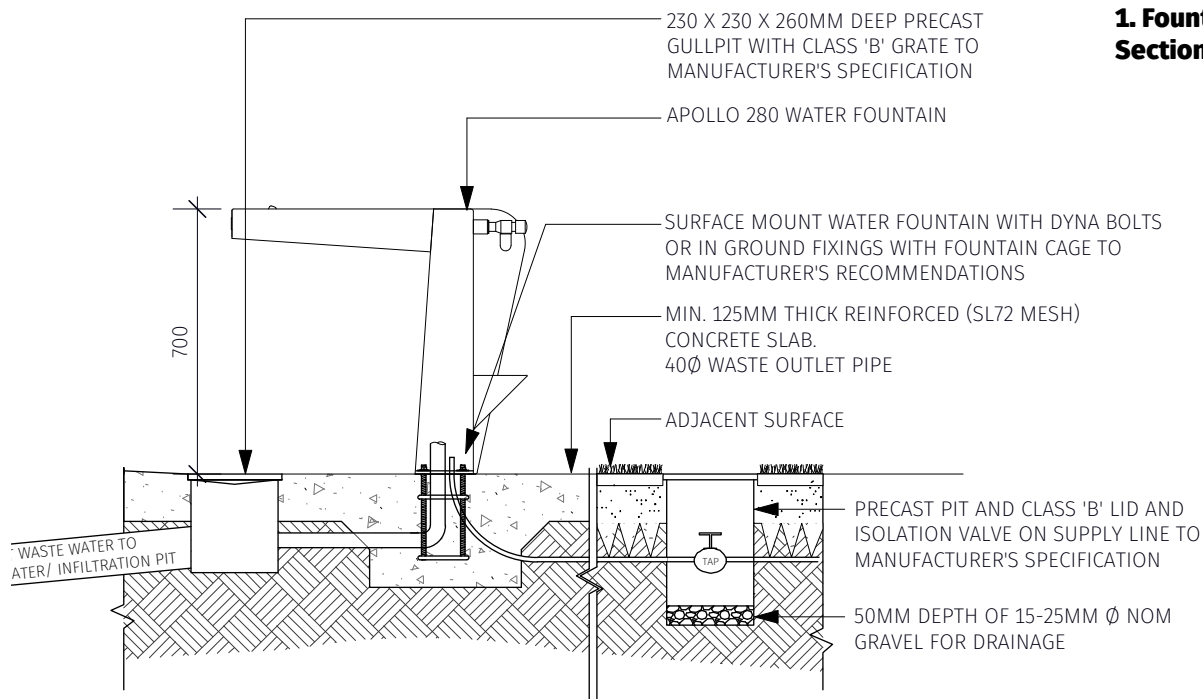
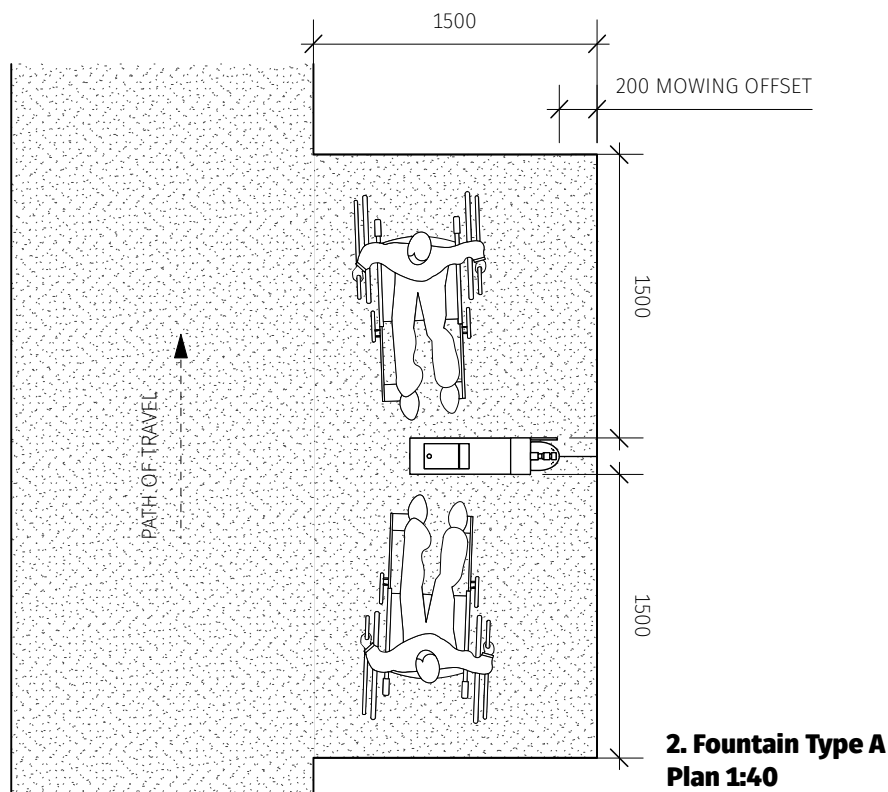
## Specifications

|                     |                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Apollo 280 accessible contactless fountain with bottle refill - contactless sensor unit                                                                                                                                                                                                                                                                                                    |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS1428.1 Design for Access &amp; Mobility Part 1: General Requirement for Access – New Building Work incorporating amendment No 1 2010.</li> <li>AS1428.2 Design for access and mobility - Enhanced and additional requirements - Buildings and facilities.</li> </ul>                                                                              |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Marine grade stainless steel and powder coated galvanised steel</li> </ul>                                                                                                                                                                                                                                                                          |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Grade 316 stainless steel basin, tap and nozzle</li> <li>Charcoal grey powder coated galvanised steel post</li> </ul>                                                                                                                                                                                                                               |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Surface mounted with Dyna bolts</li> <li>In-ground fixings with foundation cage</li> <li>Install to manufacturers specification</li> <li>316 Stainless steel security screws</li> </ul>                                                                                                                                                             |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Regular washing down of the exterior surface</li> <li>Do not use any solvents on the surface</li> <li>Check the fountain internal connections, water flow and all external access screws and fixing bolts regularly (every 3mths)</li> <li>In high debris areas remove debris to prevent blocking of the basin or the waste outlet pipe.</li> </ul> |
| <b>Supplier</b>     | Urban Fountains and Furniture or approved equivalent<br><a href="http://www.urbanff.com.au">http://www.urbanff.com.au</a>                                                                                                                                                                                                                                                                  |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Extended basin is required to meet accessibility requirements. This is a standard alternative offered by the manufacturer</li> <li>Waste water must either be directed to a sewer or a soakage pit to accord with building standards</li> <li>All internal bolts</li> </ul>                                                                         |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                          |



# Fountain & Bottle Refill Station Type A F-14

## Technical Details



# Fountain & Bottle Refill Station Type B F-15

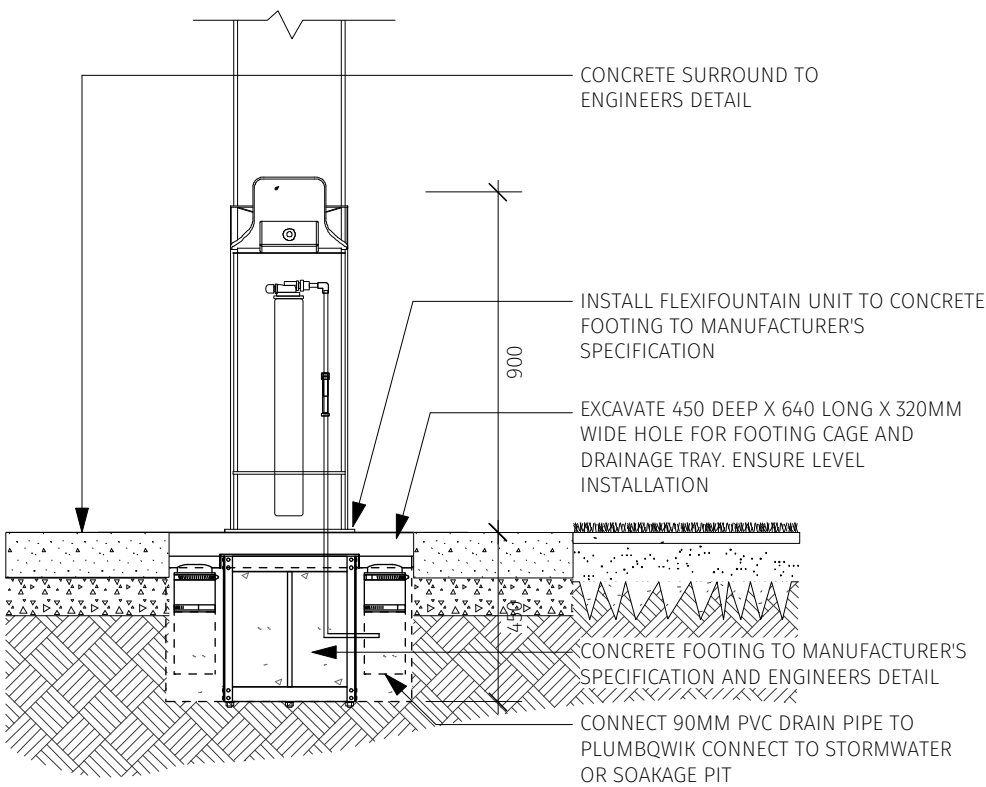
## Specifications

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Aquafil® FlexiFountain 1500BF (accessible and touch-free unit to be specified)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS1428.1 Design for Access &amp; Mobility Part 1: General Requirement for Access – New Building Work incorporating amendment No 1 2010.</li> <li>AS1428.2 Design for access and mobility - Enhanced and additional requirements - Buildings and facilities.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Housing Frame - Stainless Steel</li> <li>Housing Unit - Anodised Aluminium</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Finish</b>       | <ul style="list-style-type: none"> <li>Customisable, interchangeable signage panels with graffiti protection</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Position the drinking fountain adjacent to the path of travel.</li> <li>Ensure sufficient circulation space for wheelchairs and mobility aids.</li> <li>Check path grades and cross fall comply</li> <li>Sub-surface mount and bolt to a concrete footing</li> <li>Connect drainage pipes to sewer or soakage pit as approved by the University</li> <li>The operating pressure is not to exceed 19.5N.</li> <li>Installation of all plumbing items shall be to manufactures specification by a licensed plumber.</li> <li>All fountains must be supplied with a plumber's certificate once installed.</li> <li>Vertical and plumb</li> <li>Install a shut-off valve to facilitate maintenance without shutting of mains supply.</li> </ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Pressure clean and remove graffiti as needed</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Supplier</b>     | Civiq Public-Use Products or approved equivalent<br>civiq.com.au                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Bottle refill points</li> <li>DDA-compliant wheelchair-accessible design</li> <li>Inbuilt water filter</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

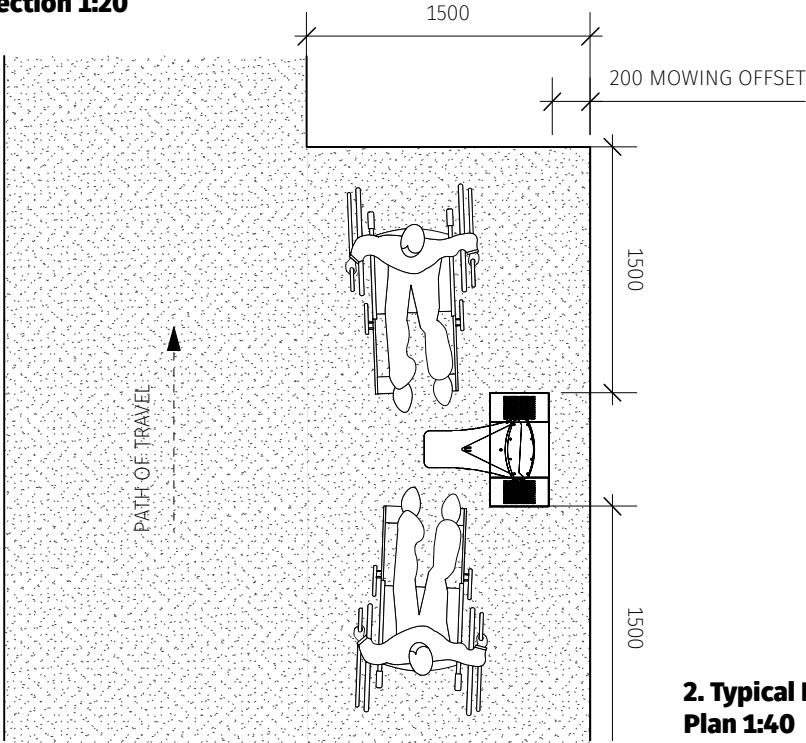


# Fountain & Bottle Refill Station Type B F-15

## Technical Details



### 1. Fountain Type B Installation Section 1:20



### 2. Typical Fountain Type B Arrangement Plan 1:40

# Anti-Skate Device

F-16

## Specifications

|                     |                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Skateboard Deterrent                                                                                                                                                                                                                                                                                                                                                         |
| <b>Standards</b>    | -                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>316 stainless steel</li> </ul>                                                                                                                                                                                                                                                                                                        |
| <b>Finish</b>       | -                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Stem size (spigot) is 6(D) x 30(L)mm.</li> <li>8mm hole - chemical anchor</li> </ul>                                                                                                                                                                                                                                                  |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Replace where necessary</li> </ul>                                                                                                                                                                                                                                                                                                    |
| <b>Supplier</b>     | Astra Street Furniture or approved equivalent<br>astrastreetfurniture.com.au                                                                                                                                                                                                                                                                                                 |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>Skate deterrent for Public environments</li> <li>Deterrent to stop skaters from skating on pathways &amp; building features</li> <li>Skate deterrence should be considered in the overall design.</li> <li>Areas of the campus should be identified where skating is allowed, to control skateboard use in suitable spaces</li> </ul> |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                            |

### Design principles to minimise damage to public domain elements:

1) Design spaces which discourage use by skateboarders by:

- The use of textured non-skateable paving such as cobblestone or gravel (while not creating accessibility issues) in front of elements prone to skating such as walls, terraces, stairs and seats.
- The strategic location of furniture (light poles, bins, seats etc) at key approach zones - i.e. near the end of walls etc.
- The detailing of walls, terraces and seats with rebates, protrusions or armrests which eliminate skateboard use.

2) Providing steel edges or pipe edges in walls and terraces to accommodate skateboard use in desirable areas without damaging public domain elements. The location of skateable elements must minimise conflict with pedestrians and other users and minimise noise impacts to buildings and people nearby.

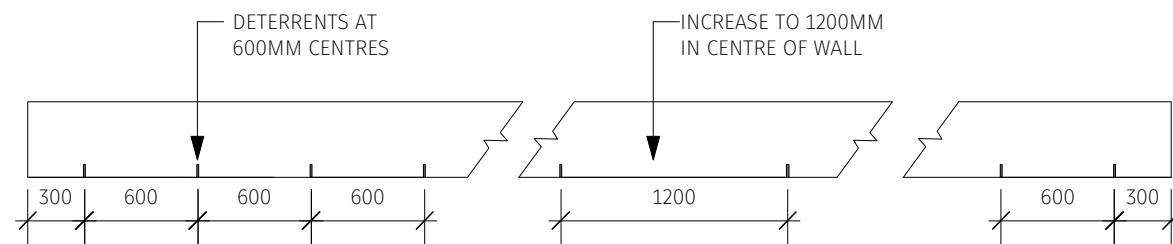
3) Install anti-skate deterrents and buttons on handrails.



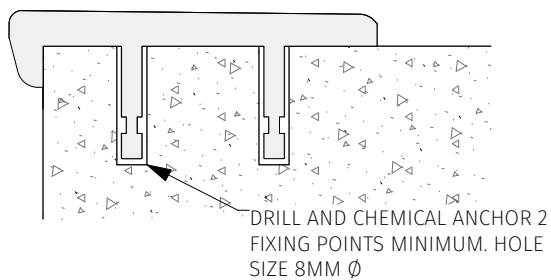
# Anti-Skate Device

F-16

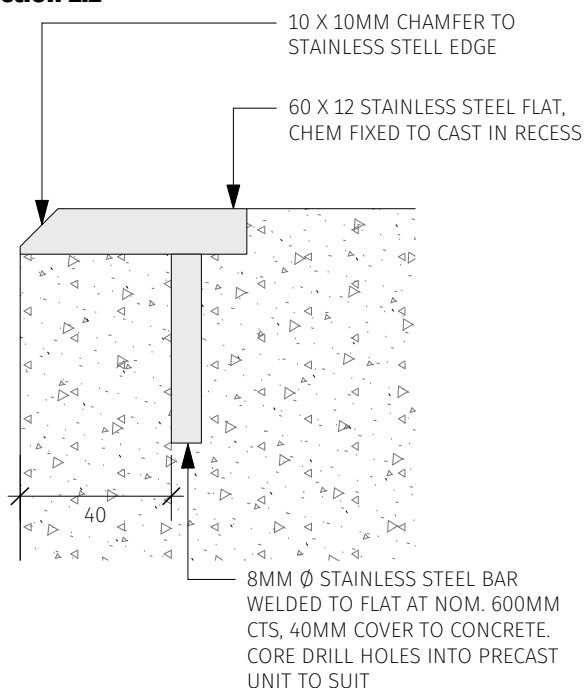
## Technical Details



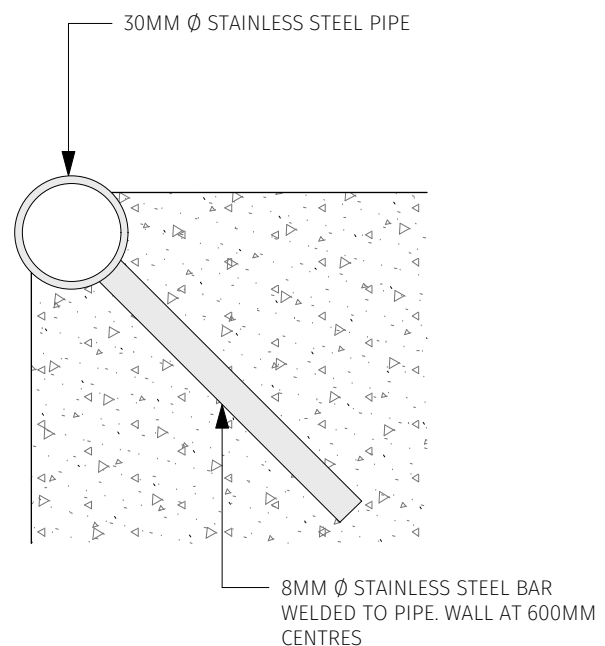
### 1. Typical Skate Deterrent Arrangement Plan 1:40



### 2. Anti Skate Device Instalation Section 1:2



### 3. Stainless Steel Edge Skate Device Section 1:2



### 4. Stainless Steel Pipe Skate Device Section 1:2





# **Soft Landscaping**

## Design Strategy

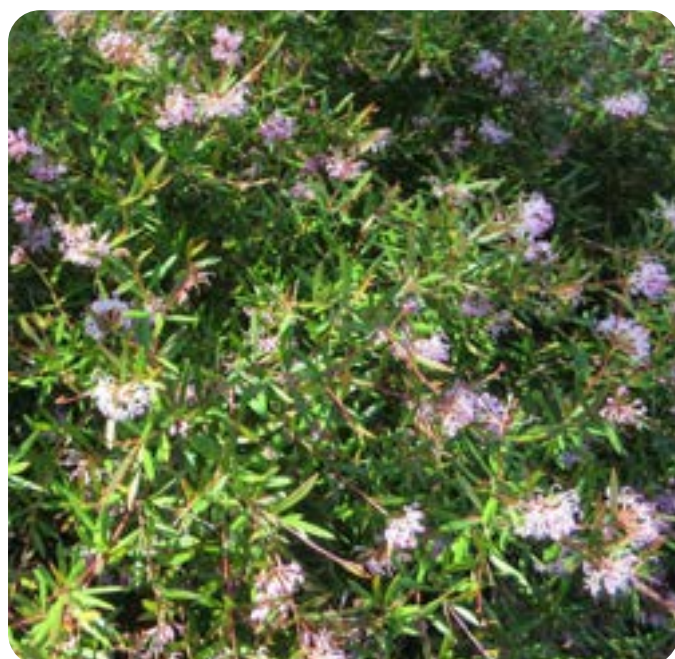
The University of Newcastle Callaghan is an exemplar bushland campus. The planting strategy aim is to retain, respect and enhance the existing native flora and create a contemporary bushland campus.

The planting palette must be consistent with the endemic ecological communities and plant species to create a complex, diverse and beautiful campus for public enjoyment and habitat. The key communities include:

- Coastal Foothills Spotted Gum - Ironbark Forest - Dry Variant
- Coastal Foothills Spotted Gum - Ironbark Forest
- Moist Variant and Riparian Closed Forest

The base planting palette could be further enriched for the following reasons:

- To highlight a special place such as entries
- To strengthen existing planting
- To emphasise landscape character or reconstruct ecologies
- For functional (shade, screening) or aesthetic use.



## Principles

- Improve Campus amenity
- Avoid dense mid level plants to ensure good sight lines for safety and security
- Establish a green grass or low shrub ground plane and tree trunk character
- Minimise maintenance in bushland areas.
- Increase biological diversity and support indigenous bushland structure.
- Manage erosion.
- Minimise weed presence
- Create seasonal flowering interest and variation
- Create a green, complex, diverse and lush landscape planting which improve the visual amenity.

## Treatments

- Plant areas prone to erosion with suitable fast growing ground-covers in soil stabilising matting.
- Plant suitable indigenous plants according to aspect, vegetation community and soils.
- Upon weeding and weed removal, mass plant with suitable indigenous plants.
- Fast establishing indigenous plants such as Acacias should be used in succession with longer lived plants to provide a long term bushland treatment to minimise ongoing work.

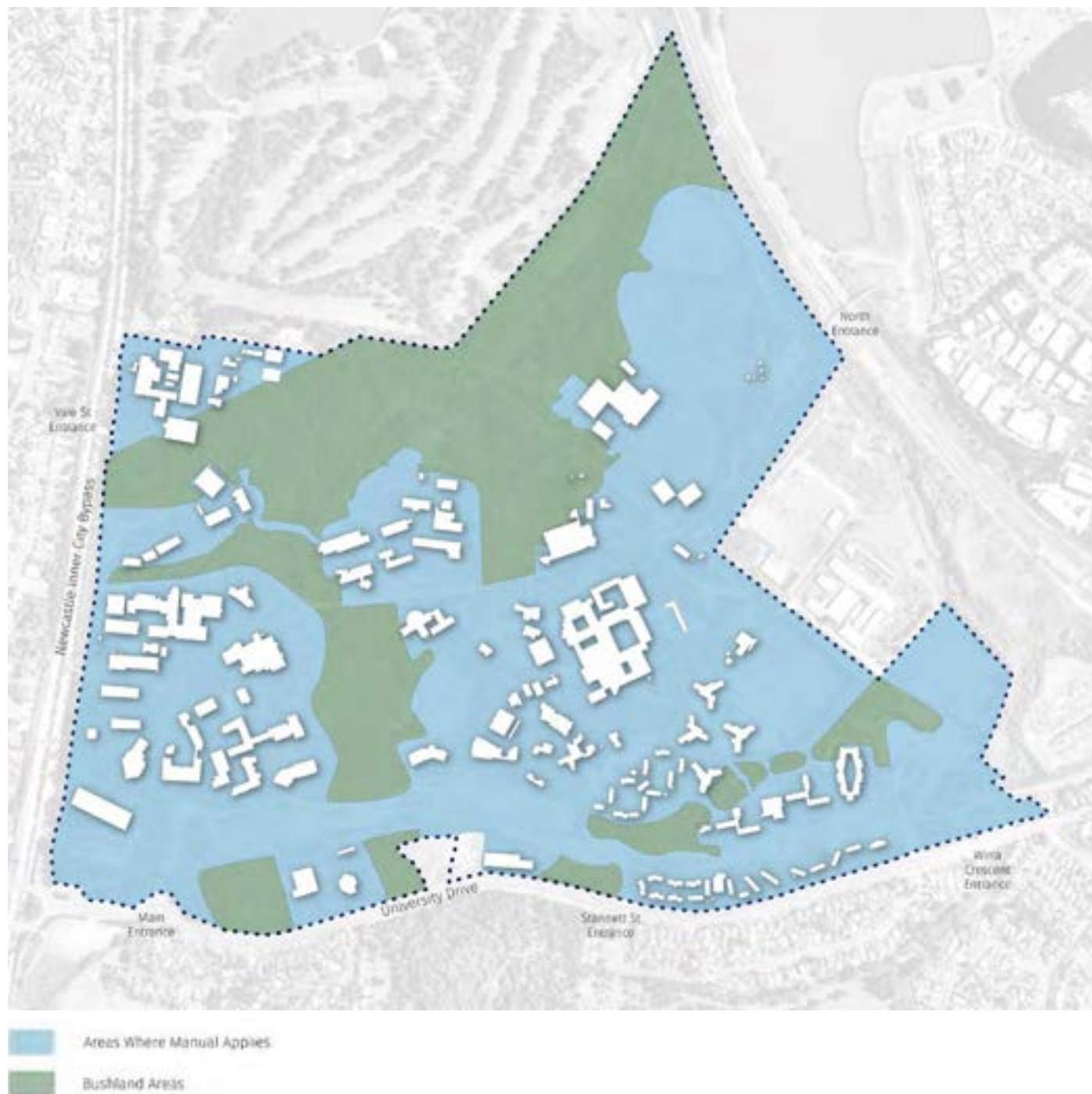
## Materials

- Soil additive: 'Terracottem' or equivalent to dosages and treatments as recommended by manufacturer.
- Erosion control products including degradable mesh, coir logs and/or netting as required and

## Soils and Mulch

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Topsoil Type A<br/>Imported<br/>Planting Topsoil</b> | <ul style="list-style-type: none"> <li>The mix must meet all the requirements of AS 4419 – Landscape Soils for Soil Blends.</li> <li>Control sample and soil testing certificate required</li> <li>Topsoil Mix Type A must be an organically enriched well drained sandy loam topsoil mix designed to provide aeration and nutritional as well as water holding benefits for tree root zones.</li> <li>Location: top 300mm of mass planted beds and tree pits – refer drawings.</li> <li>Components by volume <ul style="list-style-type: none"> <li>Medium grade clean sand 50-60%</li> <li>Sandy loam soil 20-30%</li> <li>Composted organic matter conforming with AS 4454 SC 10-20%.</li> </ul> </li> <li>Alternatively a sandy loam to which 25% composted garden waste is applied could achieve the same particle size properties as a sand/soil mix.</li> </ul>                                                                                                                                                |
| <b>Turf Underlay</b>                                    | <ul style="list-style-type: none"> <li>Imported topsoil classed as Quarried Virgin Excavated Natural Material (VENM).</li> <li>Clay/silt content as determined by AS1141.12 (Wash Grading) is to be between 5-10% by weight. 60-70% fine washed river sand, 20-30% sandy loam soil, 10% organic matter.</li> <li>The material is to be compliant by providing a recent test result in accordance with the above requirements for approval prior to delivery.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Topdressing</b>                                      | <ul style="list-style-type: none"> <li>Imported coarse sand to AS 4419, suitable for application to grass areas.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Topsoil Type B<br/>Tree Pit Backfill</b>             | <ul style="list-style-type: none"> <li>Designed to provide maximum drainage rate and compaction resistance.</li> <li>Water and nutrient holding capacity is enhanced by the addition of some soil but the matrix is very sandy. A very small amount of particulate organic matter (e.g. pine bark) is acceptable to provide better water holding without impeding drainage.</li> <li>If the sand contains some fine material lesser amounts of soil than those suggested may be required.</li> <li>A small amount of fertiliser is added to promote rapid initial root growth.</li> <li>Components by volume: <ul style="list-style-type: none"> <li>Medium grade clean sand 70-80%</li> <li>Sandy loam soil 10-20%</li> <li>Composted organic matter conforming with AS 4454 SC 10 %</li> </ul> </li> </ul>                                                                                                                                                                                                          |
| <b>Organic Mulch</b>                                    | <p>Mulch is to be free of deleterious and extraneous matter such as soil, weeds and sticks. Do not include fine mulch.</p> <p><b>Standard:</b></p> <ul style="list-style-type: none"> <li>Particle size, physical and chemical contaminants: To AS 4454 Table 3.1(A).</li> <li>pH, electrical conductivity, ammonium, chlorine and other nutrients: To AS 3743 Table 2.1 for regular mix.</li> <li>Organic mulches: Free of stones and debris.</li> <li>Mulch material: Brush chippings and leaf litter recovered from site clearing, if available; otherwise, ANL 'Forest Fines' or approved equivalent.</li> </ul> <p><b>Brush chippings and leaf litter:</b></p> <ul style="list-style-type: none"> <li>Vegetative material processed through a chipper to pieces not larger than 50 x 50 x 15 mm</li> <li>Material permitted: Leaf matter and tree loppings</li> <li>Material not permitted: Leaf matter and tree loppings from privet, camphor laurel, coral tree, poplar, willow, and noxious weeds.</li> </ul> |

## Applicable Areas



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# Turf Grass

G-01

## Specifications

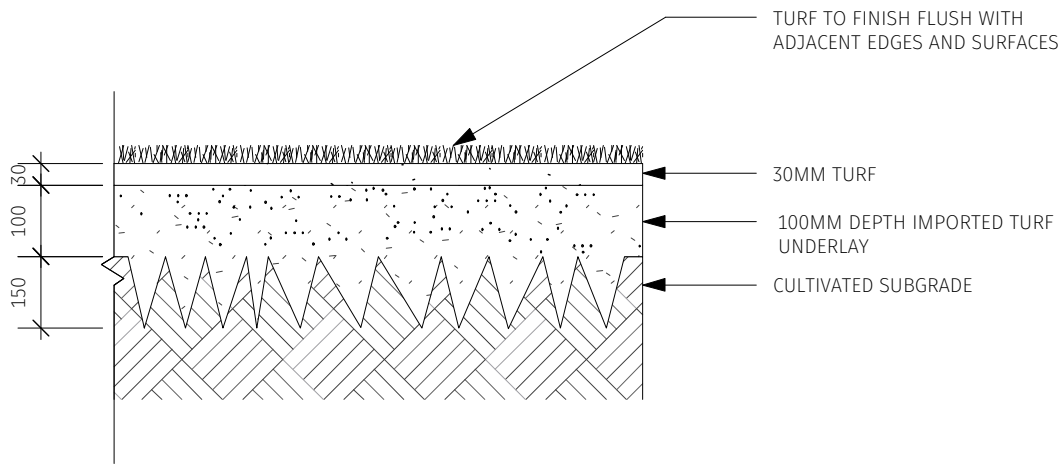
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Sir Walter Buffalo Grass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS 4419—2003 - Soils for Landscaping and Garden Use</li> <li>AS 4454-2003 Compost Soil Conditioners and Mulches</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>Turf as specified</li> <li>Turf underlay - ensure underlay is sufficiently compacted and therefore settles to create an even surface to ensure the removal of trip hazards with adjacent edges</li> <li>Imported topsoil as specified</li> <li>Fertiliser: Losco Ronstar Plus Pre-Emergent Herbicide and Starter Fertiliser' or approved equivalent</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Finish</b>       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Deliver within 24 hours of cutting, and lay within 36 hours of cutting</li> <li>Prevent drying between cutting and installing.</li> <li>Turf underlay will be applied as necessary to correct levels. Ensure turf underlay completed to 95%</li> <li>Lay each piece in stretcher bond hard up against the last to avoid air pockets and any drying out</li> <li>Water immediately after laying. Moisten the topsoil to its full depth.</li> <li>Apply fertiliser as required</li> <li>When the turf is established, mow, remove cuttings and lightly top dress to a depth of 10mm. Rub the dressing well in to the joints and correct any unevenness in the turf surface.</li> <li>Allow for topdressing of the turf following installation, to establish surface smoothness and turf density following establishment</li> <li>Water every day for the first four to six weeks</li> </ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Lawn areas to be mown at a regular height range of 40mm to 60mm</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Supplier</b>     | Certified turf grass grower                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Comments</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |



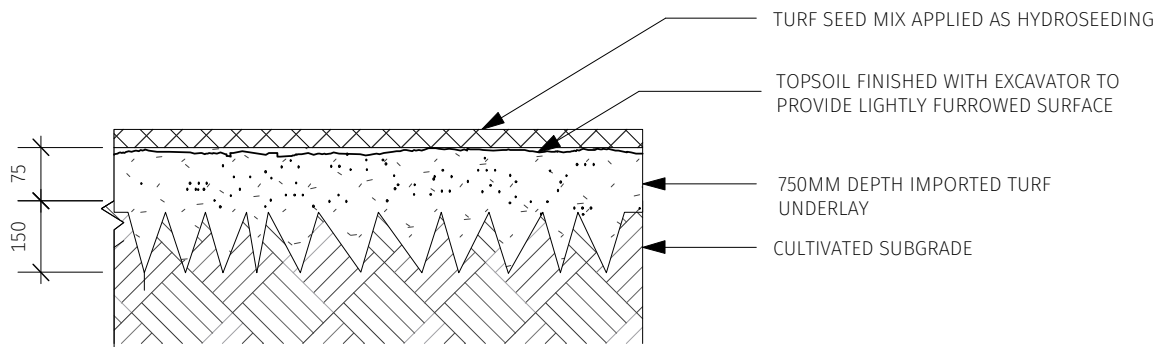
Turf Grass

G-01

Technical Details



1. Turf  
Section 1:10



2. Hydroseeding  
Section 1:10

# Planting

## G-02

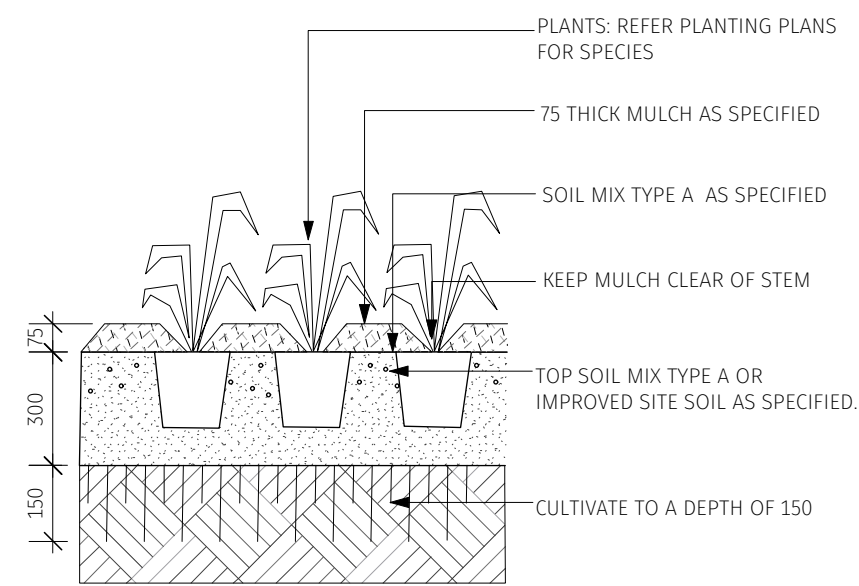
### Specifications

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Native Shrub And Groundcover Planting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>• AS 4419:2018 Soils for landscaping and garden use</li> <li>• AS 4454-2012 Composts, soil conditioners and mulches</li> <li>• AS 3743-2003 Potting mixes</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Materials</b>    | <p><b>Shrubs</b> - 200mm, 140mm pots or tubestock as specified</p> <p><b>Topsoil</b> - Improved site topsoil or imported topsoil Type A as specified</p> <p><b>Mulch</b> - 'Forest Fines' as specified</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>• Rip existing subgrade to 150mm depth</li> <li>• Excavate hole twice the diameter of the root ball and at least 100mm deeper than the root ball</li> <li>• Tubes may require water when first received. Using spray nozzle or watering rose wet thoroughly.</li> <li>• Water thoroughly ½ hour prior to planting to comply with Hunter Water's Smart Water Choices initiative</li> <li>• Soil level should be equal to that of the media in the tube, however raised planting may be a good idea in boggy areas (building the soil up from its normal level to increase drainage).</li> <li>• When in ground settle with thorough water</li> <li>• Do not put fertilizer straight in planting hole</li> <li>• If unable to plant immediately, containers can be kept in a moist and partly sunny position away from hot afternoon sun and also kept well watered.</li> <li>• When moving plant into the planting hole, disturb the rootball as little as possible</li> <li>• Place shrub in center of hole. If necessary, straighten or stabilize by adjusting or filling beneath the root ball with backfill</li> <li>• To encourage root growth, tease the outer roots from the soil</li> <li>• If the roots are tightly matted, use a knife to score the root mass in several places and gently loosen the root ball</li> <li>• Shrubs should be checked and watered every other day for the first two weeks</li> <li>• When planting around existing trees plant by hand using trowel being sensitive of existing tree roots</li> </ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>• Water each day for the first 2 – 3 weeks</li> <li>• For the following month, taper off to watering every 3 days</li> <li>• Protect stock in very hot or windy weather</li> <li>• Reinstall mulch as needed</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Supplier</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Comments</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

Planting

G-02

Technical Details



1. Planting  
Section 1:10

# Tree Protection

## G-03

### Specifications

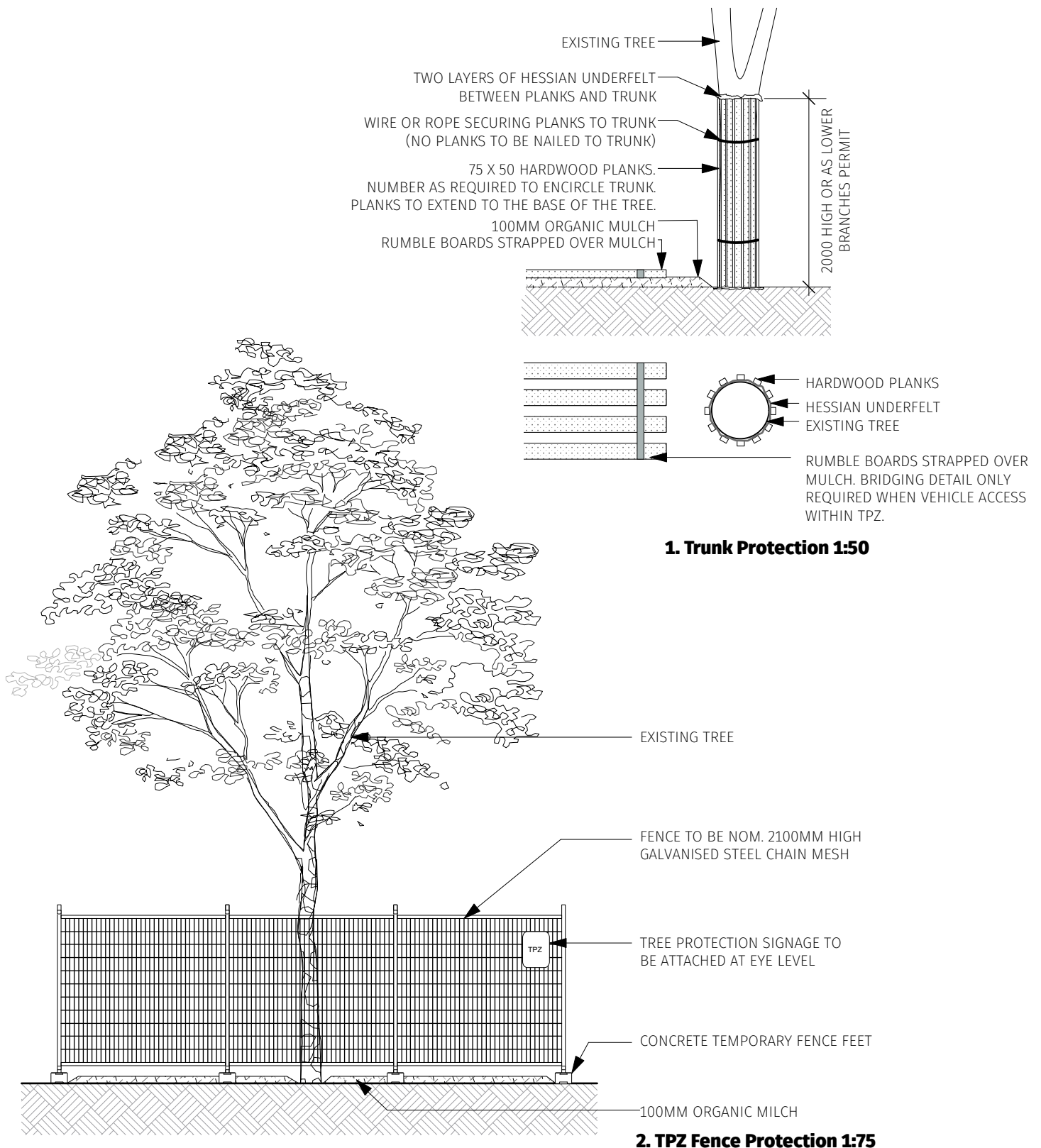
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Tree protection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Standards</b>    | AS 4970 Protection of Trees on Development Sites<br>AS 4687 Galvanised Construction Site Temporary Fencing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Materials</b>    | <ul style="list-style-type: none"> <li>• Cyclone fencing</li> <li>• Concrete fence feet</li> <li>• Hardwood planks</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Finish</b>       | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>• As per details</li> <li>• In accordance with Australian Standard AS 4970-2009</li> <li>• Secure hardwood planks to tree with wire or rope</li> <li>• Cyclone fencing must not be within the canopy dripline zone</li> <li>• Any compaction/excavation or tree surgery must be approved by the University prior to proceeding</li> </ul>                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>• Check protective fencing is not impacting on the root, branches and canopy of the tree and is upright</li> <li>• Inspect tree and fencing on a weekly basis during works period</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Supplier</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Comments</b>     | <ul style="list-style-type: none"> <li>• Before commencing work assess and identify on site all trees and shrubs to be retained and protected with the University's superintendent</li> <li>• Tree protection shall be in place prior to any other site work</li> <li>• Provide trunk protection to individual trees within a construction zone</li> <li>• Provide TPZ fence protection groups of trees to be retained within a construction zone</li> <li>• Undertake any demolition or excavation within the tree drip zone by hand</li> <li>• Do not rest spoils, building materials, or machinery on or near exposed tree roots</li> <li>• Where any roots are exposed by works, cover with a layer of light organic sandy loam soil</li> </ul> |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



# Tree Protection

## G-03

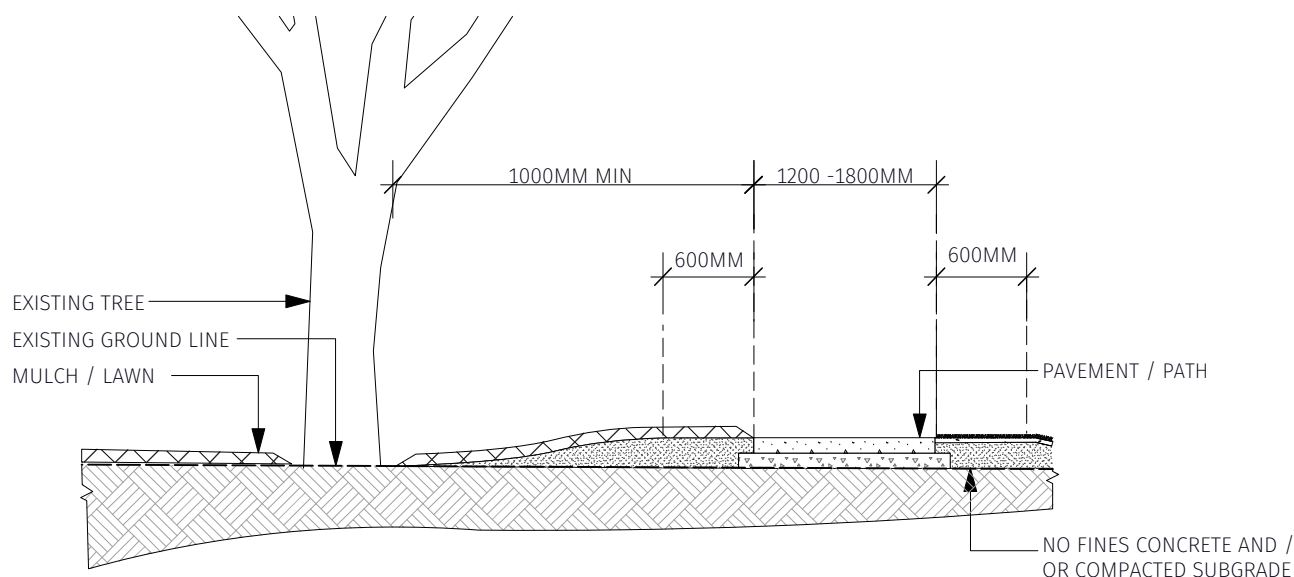
### Technical Details



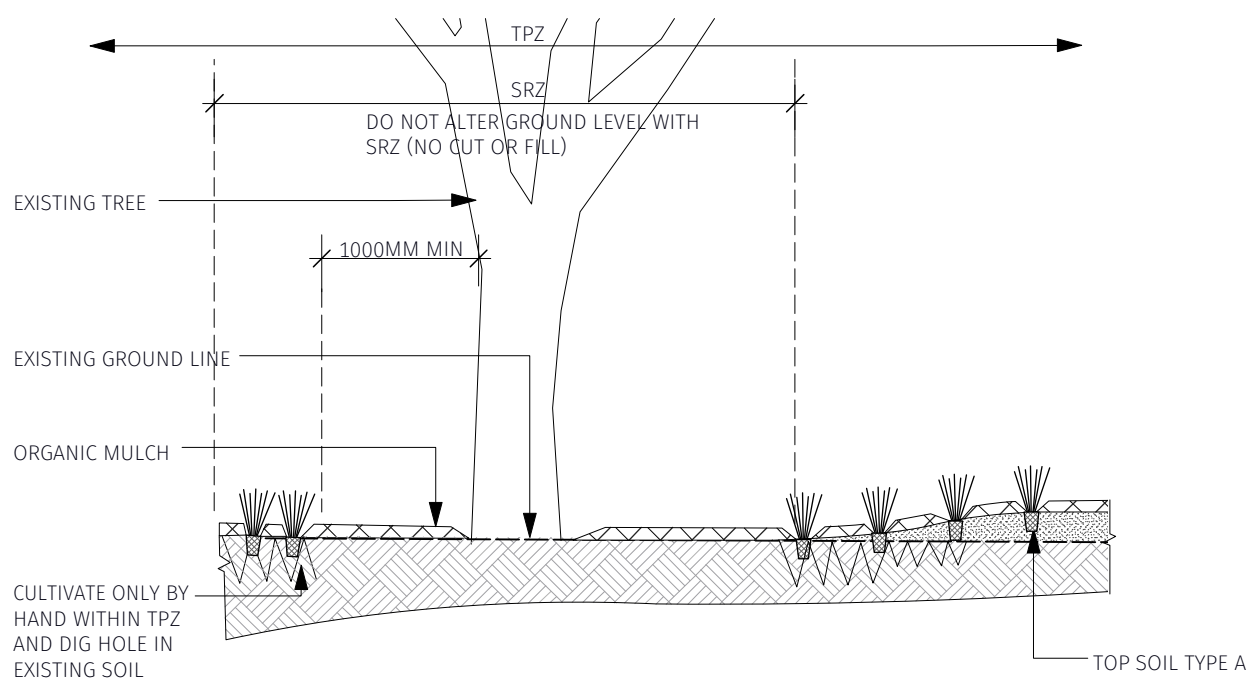
# Tree Protection

G-03

## Technical Details



### 3. Pavement Within TPZ Section 1:50



### 4. Planting Within TPZ Section 1:50

# G-03



# Tree Installation - Garden Bed

## G-04

### Specifications

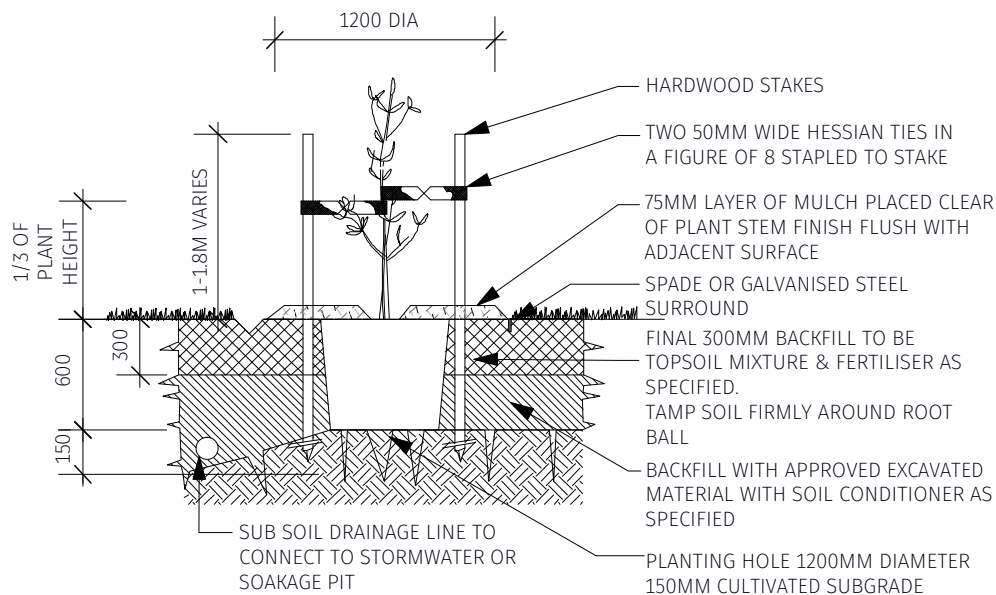
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Transplanted or containerised native mature tree stock                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Standards</b>    | <ul style="list-style-type: none"><li>• AS 4419:2018 Soils for landscaping and garden use</li><li>• AS 4454-2012 Composts, soil conditioners and mulches</li><li>• AS 2303:2015 Tree stock for landscape use</li></ul>                                                                                                                                                                                                                                                                                                                             |
| <b>Materials</b>    | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Finish</b>       | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Installation</b> | <ul style="list-style-type: none"><li>• Excavate a hole twice the diameter of the root ball. Break up the base of the hole to a depth of 150mm, and loosen compacted sides of the hole to help root growth</li><li>• Supply and install 3 wooden stakes for all trees</li><li>• Thoroughly water plants before and after planting, and as required to maintain growth rates</li><li>• Do not plant in unsuitable weather conditions such as extreme heat, cold, wind or rain</li><li>• Mulch kept 50mm from trunks to prevent collar rot</li></ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"><li>• Watering shall be carried out on a regular basis twice weekly for the first 2 weeks and then as required according to weather conditions, rainfall and soil type</li><li>• Regularly check timber stakes and hessian ties</li><li>• Check for insects and diseases</li><li>• Reinstate mulch where needed</li></ul>                                                                                                                                                                                        |
| <b>Supplier</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Comments</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |



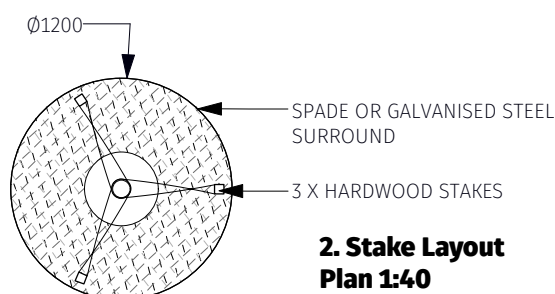
# Tree Installation - Garden Bed

## G-04

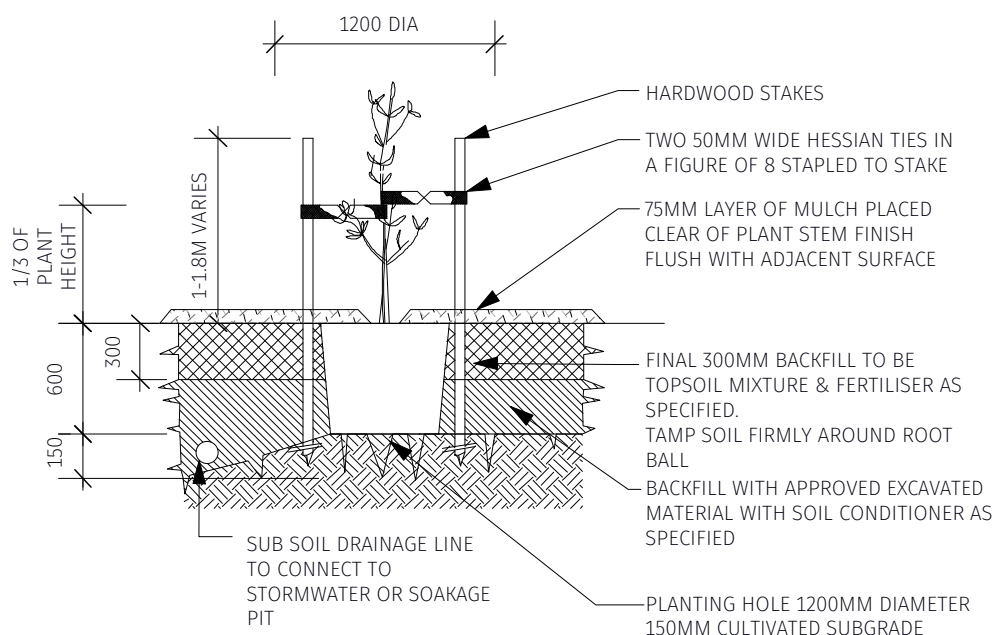
### Technical Details



**1. Tree In Turf  
Section 1:40**



**2. Stake Layout  
Plan 1:40**



**3. Tree In Garden Bed  
Section 1:40**

# Tree Installation - Hard Pavement

G-05

## Specifications

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Transplanted or containerised native mature tree stock                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Standards</b>    | <ul style="list-style-type: none"> <li>AS 4419:2018 Soils for landscaping and garden use</li> <li>AS 4454-2012 Composts, soil conditioners and mulches</li> <li>AS 2303:2015 Tree stock for landscape use</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Materials</b>    | <p><b>Tree</b> - 75 to 1000L tree as specified</p> <ul style="list-style-type: none"> <li>Trees supplied to be free from stress resulting from inadequate watering, excessive shade or excessive sunlight experienced at any time during their development</li> <li>Trees to be grown and hardened off to suit anticipated site conditions at the time of delivery.</li> <li>Trees to be free from attack by pests or disease</li> <li>Restrict plant supply to those with evidence of previous attack to less than 15% of the foliage and make sure actively feeding insects are absent</li> </ul> <p><b>Stakes</b> - 50 x 50mm hardwood timber with 50mm hessian ties</p> <p><b>Topsoil</b> - Topsoil mix Type A and B as specified</p> <p><b>Mulch</b> - 'Forest Fines' mulch as specified</p> <p><b>Fertiliser</b> - 'Langleys Tree Tablets for Australian Natives' or approved equivalent</p> |
| <b>Finish</b>       | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>Align tree to centre of pit</li> <li>Surrounding paving edged with galvanised steel angle</li> <li>Install necessary root barriers below surface</li> <li>Thoroughly water plants before and after planting, and as required to maintain growth rates.</li> <li>Do not plant in unsuitable weather conditions such as extreme heat, cold, wind or rain.</li> <li>Install organic or resin bonded mulch (SEE A-05)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>Watering shall be carried out on a regular basis twice weekly for the first 2 weeks and then as required according to weather conditions, rainfall and soil type</li> <li>Regularly check timber stakes and hessian ties</li> <li>Check for insects and diseases</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Supplier</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Comments</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

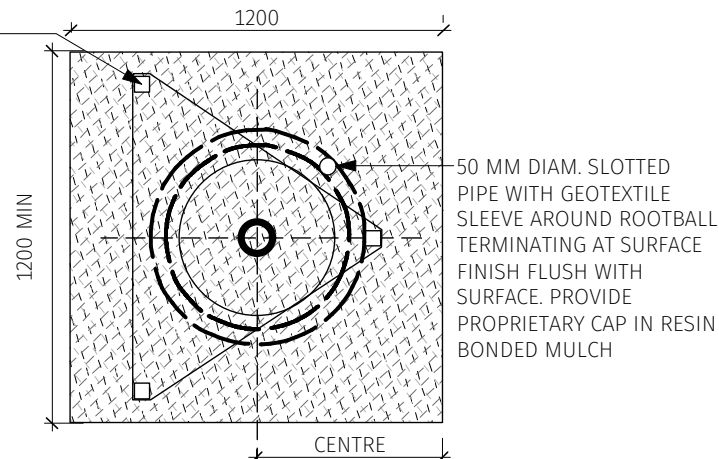


# Tree Installation - Hard Pavement

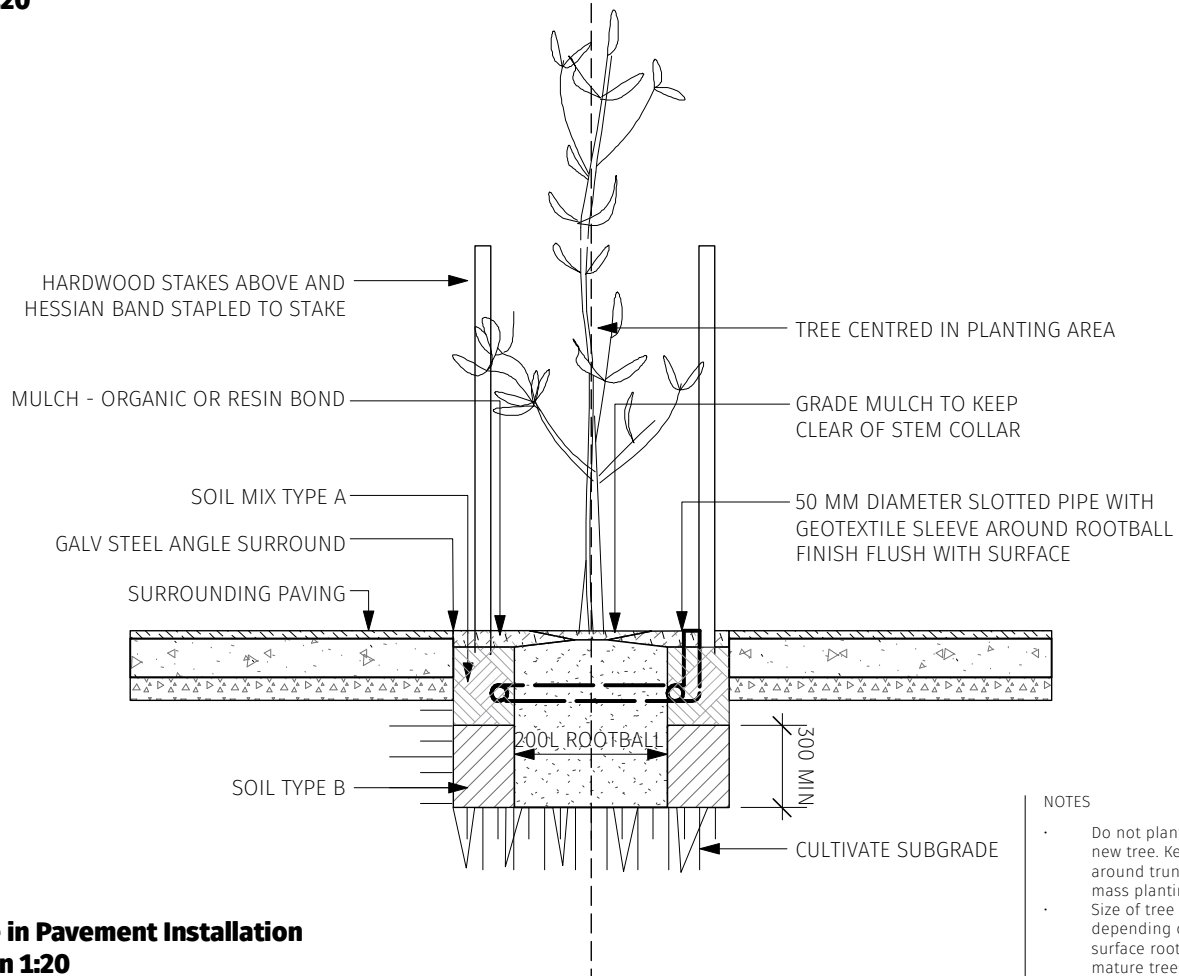
G-05

## Technical Details

TEMPORARY TREE GUARD USING THREE 50X50X1800MM HARDWOOD STAKES AT EDGE OF PLANTING PIT. ARRANGE IN TRIANGULAR FORM. OMIT IF USING RESIN BOND MULCH SURROUND



### 1. Stake Layout Plan 1:20



### 2. Tree in Pavement Installation Section 1:20

#### NOTES

- Do not plant into rootball of new tree. Keep nom. 400mm around trunk of tree free of mass planting.
- Size of tree pit may vary depending on depth of surface roots or trunk flare of mature trees.
- Tree pit surface to be installed level with surrounding paving, leaving surface roots exposed where necessary.

# Ballast Mulch

G-06

## Specifications

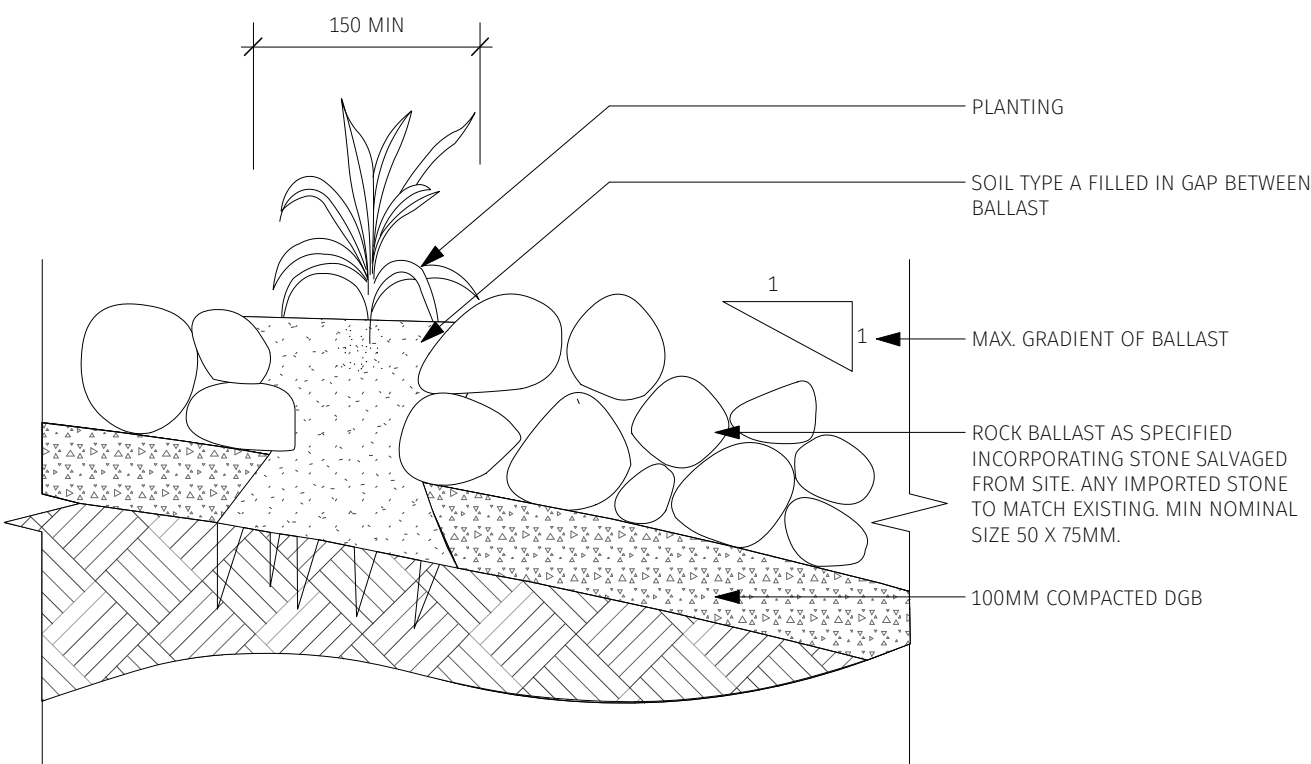
|                     |                                                                                                                                                                                     |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Rock Ballast Mulch                                                                                                                                                                  |
| <b>Standards</b>    | -                                                                                                                                                                                   |
| <b>Materials</b>    | <ul style="list-style-type: none"><li>Stone salvaged from site or nom 50 x 75 mm imported bluestone ballast</li></ul>                                                               |
| <b>Finish</b>       | -                                                                                                                                                                                   |
| <b>Installation</b> | -                                                                                                                                                                                   |
| <b>Maintenance</b>  | <ul style="list-style-type: none"><li>Top up with stones where there is localised sinking</li><li>Remove weeds and leaf debris</li></ul>                                            |
| <b>Supplier</b>     | Proprietary aggregate supplier. Control sample to be provided for approval                                                                                                          |
| <b>Comments</b>     | <ul style="list-style-type: none"><li>To be used in high profile spaces as an alternative to organic mulch</li><li>To be used where pedestrian access is not required</li></ul>     |
| <b>Location</b>     | <ul style="list-style-type: none"><li>The use of ballast mulch is recommend around external eating areas and under decks to stop establishment of vermin and rats burrow.</li></ul> |



# Ballast Mulch

G-06

## Technical Details



**1. Rock Ballast Planting**  
**Section 1:10**

# Irrigation Products

G-07

## Specifications

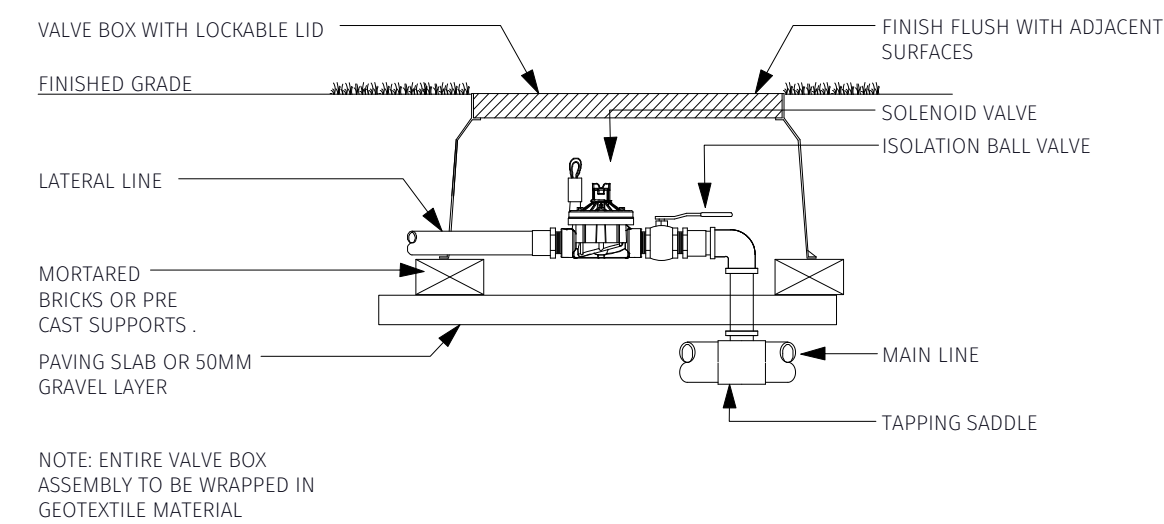
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                          |                                                                      |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| <b>Principles</b>   | <ul style="list-style-type: none"> <li>The purpose of providing irrigated areas is to improve the amenity and usability of key campus areas such as entries, central ceremonial recreation lawns and active sport fields and to help lawn or plants health to reduce maintenance. This use of irrigation is be targeted to maximize benefit and reduce potable water use.</li> <li>The collection of roof or stormwater run-off for reuse in desirable.</li> <li>Ensure awareness of and compliance with the University's<br/><b>Irrigation water saving options for University of Newcastle Callaghan Campus (Feb 2020)</b></li> </ul> |                                                                                                                          |                                                                      |
| <b>Element</b>      | <b>Irrigation Controller</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Solenoid Boxes</b>                                                                                                    | <b>Sprinklers</b>                                                    |
| <b>Materials</b>    | Rainbird esp-rpz 6 Station Wifi Controller                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | High density UV stabilised commercial strength polyethylene valve box with green lockable lid                            | Proprietary pop up sprinkler system                                  |
| <b>Installation</b> | Installed in discreet location in a position to be confirmed with a University representative, at eye height<br>Install in lockable, water proof cabinet.<br>Power Connection / GPO required                                                                                                                                                                                                                                                                                                                                                                                                                                            | Top of box to be flush with adjacent finished surface.<br>Installed in discreet location                                 | Top of sprinkler to be flush with adjacent soil surface level        |
| <b>Maintenance</b>  | Immediate repair to any leak, component failure or malfunction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                          |                                                                      |
| <b>Supplier</b>     | Suitable qualified Irrigation Designer and Licensed Contractor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                          |                                                                      |
| <b>Comments</b>     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | All valve box lids to have stainless steel labels fitted reading: Irrigation Control Valve-Do Not Drink-Irrigation Water | Dripline in planting areas TBC<br>Rainbird copper-coloured dripline. |
| <b>Location</b>     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                          |                                                                      |



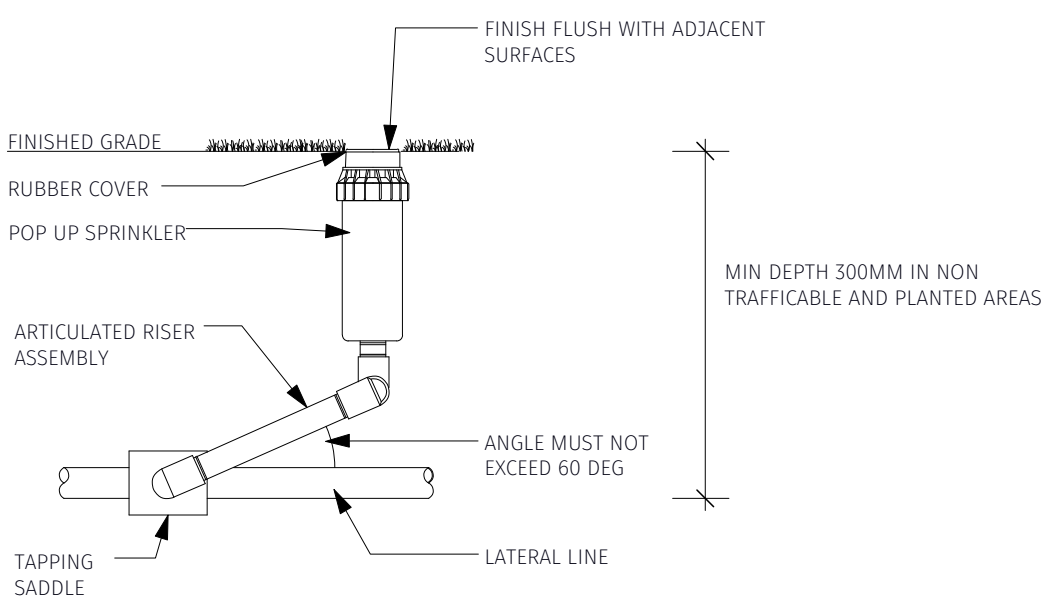
Irrigation Products

G-07

Technical Details



1. Typical Solenoid Valve Assembly



2. Typical Sprinkler Assembly

NOTES

- Not to scale

# Drainage Swales

G-08

## Specifications

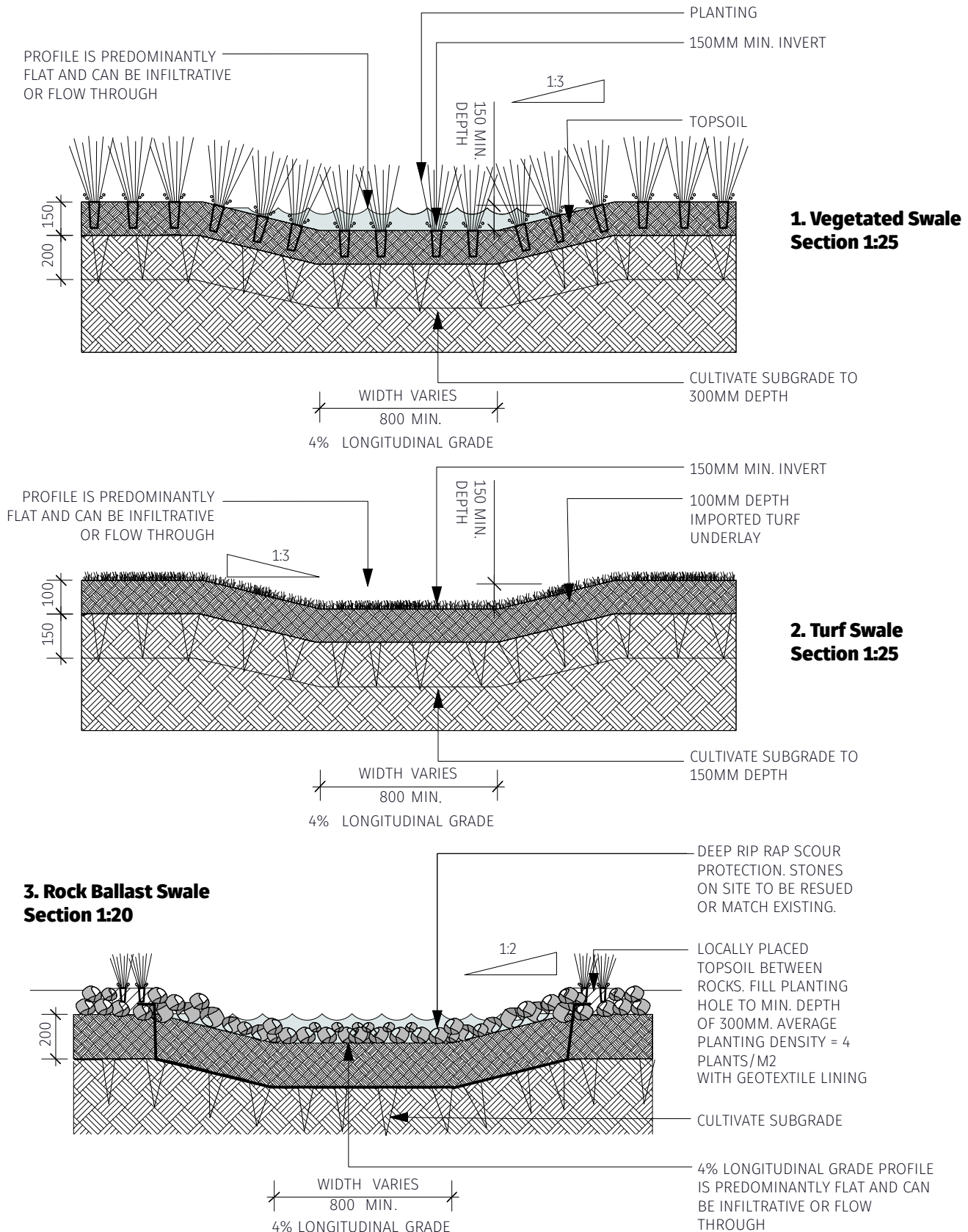
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Drainage Swale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Standards</b>    | AS4419: Soils for Landscaping and Garden Use                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Materials</b>    | <ul style="list-style-type: none"><li>• Mixture of ballast and vegetation types</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Finish</b>       | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Installation</b> | <ul style="list-style-type: none"><li>• Design to ensure flows are well distributed across the full width of the swale and the longitudinal grade of the swale is kept low enough (typically less than 4% grade) to maintain slower flow conditions.</li><li>• Direct swales along contours to low point where possible</li><li>• Planting or turf can involve a variety of vegetation types including turf, sedges and tufted grasses</li><li>• Ballast can be used as surface treatment on steeper grade</li><li>• Planting is required to cover the whole width of the swale</li><li>• Swale planting must be capable of withstanding design flows</li><li>• Plant distribution within swale must be of sufficient density to prevent scouring via flow paths</li></ul> |
| <b>Maintenance</b>  | <ul style="list-style-type: none"><li>• During installation that swales are easily maintainable.</li><li>• Replacement of any damaged turf or inferior plants</li><li>• Weeding as necessary</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Supplier</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Comments</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |



# Drainage Swales

## G-08

### Technical Details



# Rain Gardens

## G-09

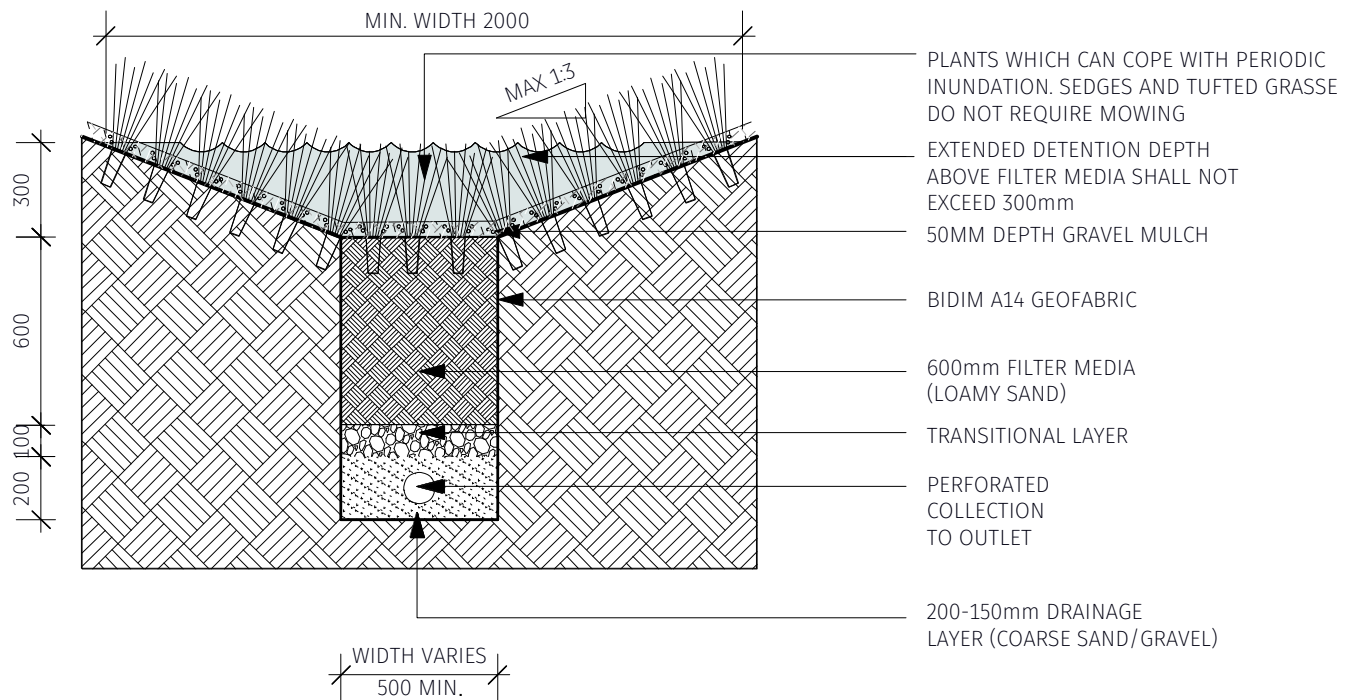
### Specifications

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>      | Bioretention Raingarden<br>The purpose of a rain garden is to remove surface contaminants (oils and silts) in storm water running off from paved areas, car parks and roads. The aim is to clean storm water before it runs into a natural creek system or to collect the water for reuse.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Standards</b>    | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Materials</b>    | <p><b>Drainage (Bottom) Layer</b><br/>Min 200mm deep (minimum) consisting of clean gravel 2mm to 5mm to provide 50mm of cover over the sub-soil drain</p> <p><b>Transition (Middle) Layer</b><br/>Min 100mm deep (minimum) sand/ coarse sand material to filter smaller particles from filter layer to drainage layer</p> <p><b>Filter Media (Top Layer)</b><br/>This layer is where the majority of the water quality treatment occurs and so the sourcing and placement of this material is critical to the effective operation of the system.<br/>This layer is 600mm deep (minimum) containing:</p> <ul style="list-style-type: none"> <li>• Clay and silt (&lt;3%) (&lt;0.05mm)</li> <li>• Very fine sand (5% to 30%) (0.05mm to 0.15mm)</li> <li>• Fine sand (10% to 30%) (0.15mm to 0.25mm)</li> <li>• Medium to coarse sand (40% to 60%) (0.25mm to 1.0mm) Coarse sand (7% to 10%) (1.0mm to 2.0mm)</li> <li>• Fine gravel (&lt;3%) (2.0mm to 3.4mm)</li> </ul> |
| <b>Finish</b>       | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Installation</b> | <ul style="list-style-type: none"> <li>• Size, depth and location of rain gardens should be coordinated by the stormwater engineer and landscape architect</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Maintenance</b>  | <ul style="list-style-type: none"> <li>• Replacement of any damaged or inferior plants, weeding, pruning</li> <li>• Replenishment and restoration of gravel mulch</li> <li>• Manual removal of sediment from sediment forebay or scour pad every 3-6 months</li> <li>• Manual scraping/tilling of clogged layer of filtration media.</li> <li>• Clogged layer to be appropriately disposed off approximately every 5-7 years testing dependent</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Supplier</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Comments</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Location</b>     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

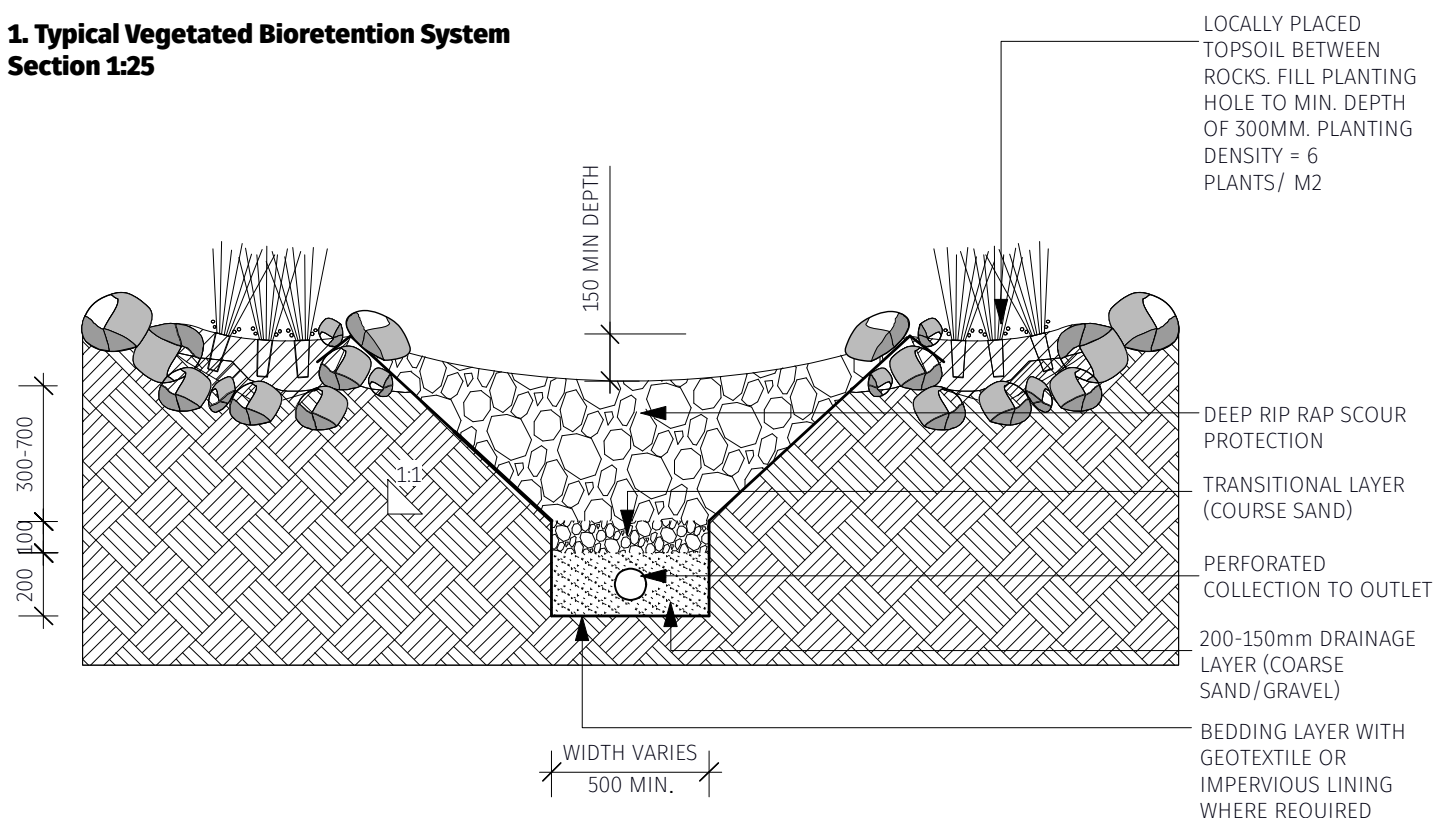
# Rain Gardens

## G-09

### Technical Details



#### 1. Typical Vegetated Bioretention System Section 1:25



#### 1. Typical Rock Ballast Bioretention System Section 1:25

